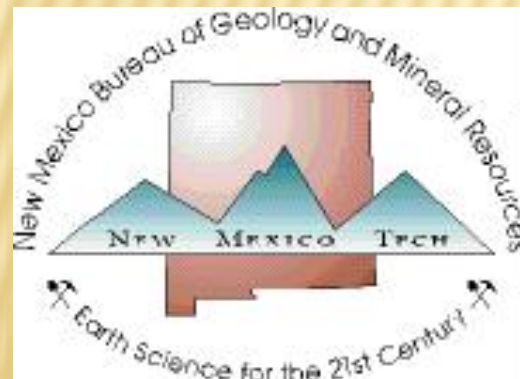


# NEW MEXICO ABANDONED MINES STUDY: ROSEDALE MINING DISTRICT, SOCORRO COUNTY, NEW MEXICO

Virginia T. McLemore

*New Mexico Bureau of Geology and Mineral  
Resources, New Mexico Tech, Socorro, NM*



# COAUTHORS

---

Virginia T. McLemore, Marcus Silva, John Asafo-Akowitz, William Zutah, Amy Trivitt-Kracke, Joseph Blais, Navid Mojtabai, Ingar Walder, John Durica, Bon Durica, and Ashlynn M. Winton

# ACKNOWLEDGEMENTS

## ✘ Funding

- + Energy Minerals and Natural Resources Department (Abandoned Mine Lands Bureau), U.S. Department of the Interior, Office of Surface Mining and Reclamation (OSMRE)
- + New Mexico EPSCoR, National Science Foundation, NSF, award #IIA-1301346)
- + New Mexico Geological Society
- + NMBGMR and NMIMT Mineral Engineering Department

## ✘ Two M.S. theses/independent studies (3<sup>rd</sup> underway)

## ✘ Professional staff and many students who worked on these projects



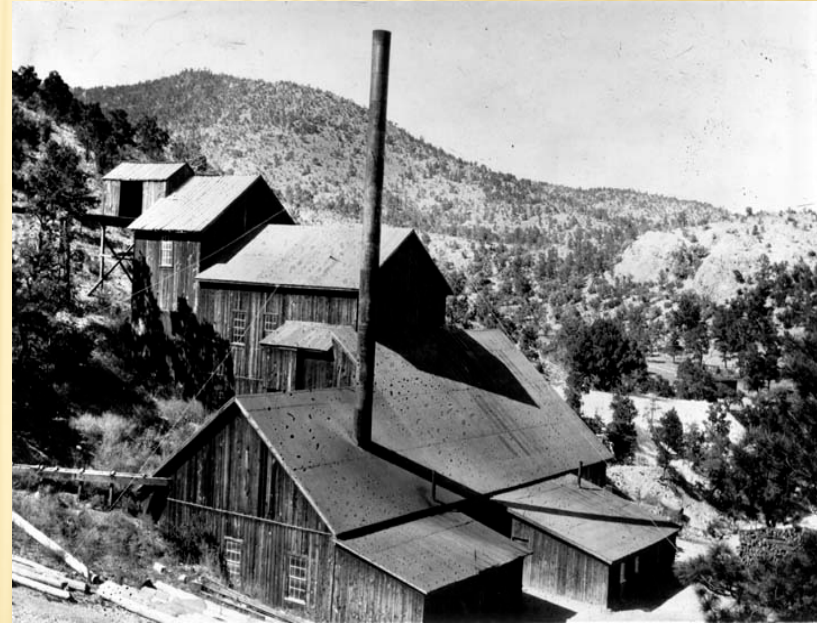


PM 12:01 MAR. 25. 2016



# PREVIEW

- Define the problem
- Purpose of NMBGMR AML mines program
- Sources of information on mine feature locations (pre-field inventory)
- Location and mining history, Rosedale district
- Inventory
- **Student presentations**
- Lessons learned
- Questions/issues
- Schedule



Mill and cyanide plant at the Rosedale mine, looking north about 1905 (NMBGMR historical photos #p-00970).

# PRESENTATIONS

---

- ✘ McLemore—Introduction, history, procedures, summary
- ✘ J. Ducia—Inventory process for inactive/abandoned mines
- ✘ B. Sears—Historical mine research
- ✘ M. Silvia—Mineralogy and chemistry of abandoned mines
- ✘ B. Ducia—Soil Mechanics of the Abandoned Mine Lands Project
- ✘ W. Zutah—Origin and mineral resource potential
- ✘ McLemore—Results, conclusions, questions/issues to be resolved, schedule



# DEFINE THE PROBLEM



**Bell Mine Adit\_1\_NMSO0061**

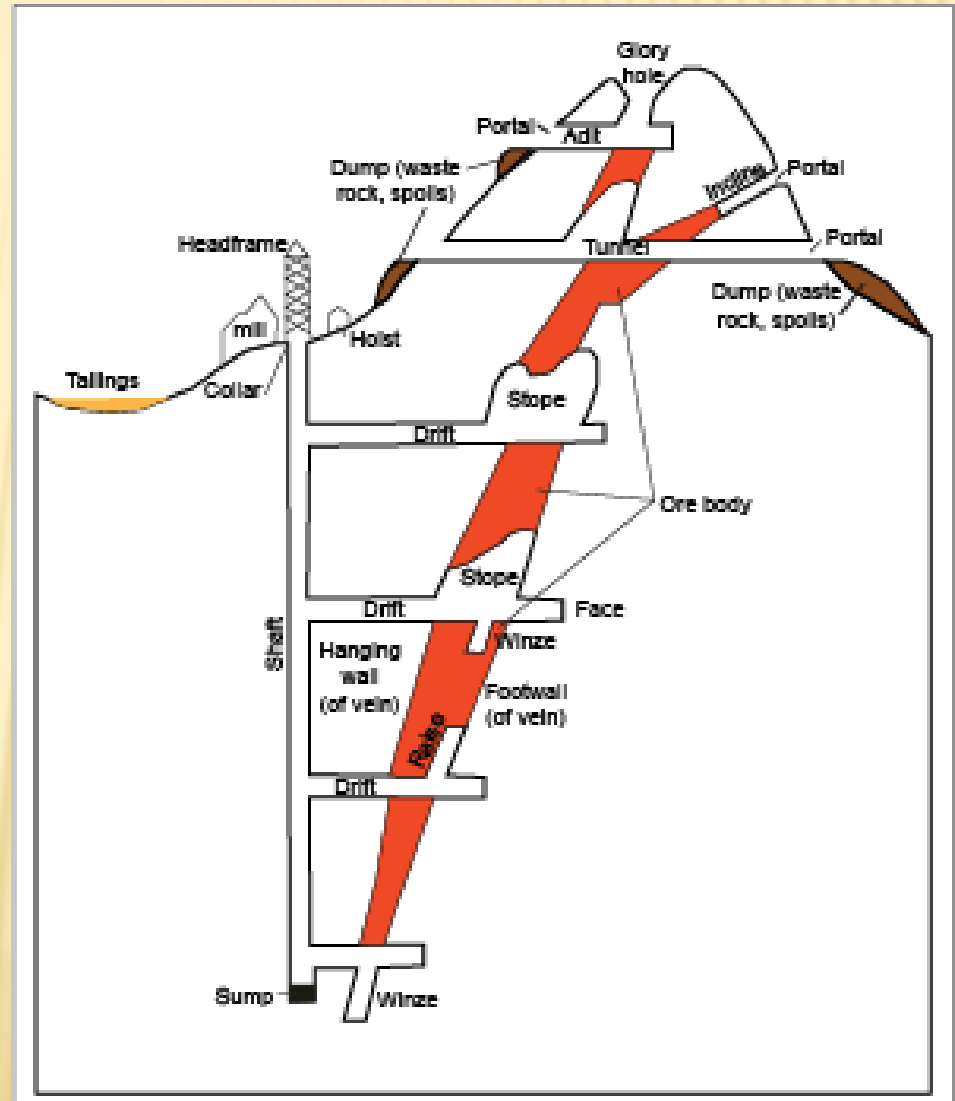


**Bell Mine Shaft  
1\_NMSO0601**



# DEFINITION OF MINE

- ✘ any opening or excavation in the ground for extracting minerals, even if no actual production occurred, mine feature





# DEFINITION OF AML (ABANDONED MINE LANDS)

---

- ✘ Lands that were excavated and left unreclaimed where no individual or company has reclamation responsibility and there is no closure plan in effect
- ✘ Excavations, either caved in or sealed, that have been deserted and where further mining is not intended in the near future, generally >10 yr old
- ✘ Includes mines and mine features left unreclaimed on Federal, State, private and Native American lands because the current owner was not legally responsible for reclamation at the time the mine was created
- ✘ Also called inactive, legacy, and orphaned mines

# WHAT ARE POTENTIAL IMPACTS ASSOCIATED WITH LEGACY MINES?

---

- ✘ Mine workings, rock piles, tailings, and heap leach facilities—physical hazards
- ✘ Acid rock drainage and contamination by metals and other constituents is a problem at some sites in NM
- ✘ Since there is no complete inventory, we do not know the extent of any problems





**Hillsboro**



**Pinos Altos**



**Hillsboro**



**Jicarilla**



# EROSION AND SEDIMENTATION



*Tunnel collapsed to form a gully*



*Tunnelling through a berm*



*Waste dump with small rip lines and little erosion on left, large rip lines and gullies on right.*



# CHURCH ROCK TAILINGS SPILL, NM

- ✘ 1,100 tons of radioactive tailings and 94 million gallons of acidic wastewater were released to the Puerco River in the spill
- ✘ Spill fluids traveled at least 80 miles downstream in the Puerco River



The 20-foot breach in the tailings dam formed around 5:30 am on the morning of July 16, 1979.



# GOLD KING SPILL

## ANIMAS RIVER



Figure 60.—Photograph showing that the flow had been routed back toward the half-round pipe by 12:06 p.m. on August 5, 2015 (photograph from EPA Project Files).





# PURPOSE OF NMBGMR AML PROGRAM



Rosedale mill launder,  
now buried under cover  
of the Longtail tailings  
(from Sherman and  
Sherman, 1975:179)

Looking NE across  
reclaimed Rosedale tailings,  
2012.





# PURPOSE OF NMBGMR AML PROGRAM

Provide data on districts, mines, and mills in New Mexico

- Help plan and assess reclamation procedures
- Determine background concentrations
- Understand geologic processes
- Compare trace-element concentrations in mined versus undisturbed areas
- Provide background data that can assist with the planning of future mining operations



Summit mine,  
Steeple Rock  
district, Grant  
County (operated  
2009-2014, on  
stand by)



# PURPOSE—CONTINUED

To make informed decisions about

- Economic impacts
- Resource development and management (mineral resource potential)
- Impacts on water supplies
- Impacts on land use
- Environmental impacts (including potential sources of AD [acid drainage] or other MIW [mine influenced waters])
- Physical hazard assessment and remediation



Adit, Jicarilla  
Mountains,  
Lincoln County

# **SOURCES OF INFORMATION ON MINE FEATURE LOCATIONS (PRE-FIELD INVENTORY)**

---

The New Mexico Bureau of Geology and Mineral Resources (NMBGMR) has been collecting data on mining districts since it was created in 1927

We are slowly converting these data into electronic form and import into ArcGIS



# Mining Archives



AM8:23 SEP.9.2015

# MINE ARCHIVES

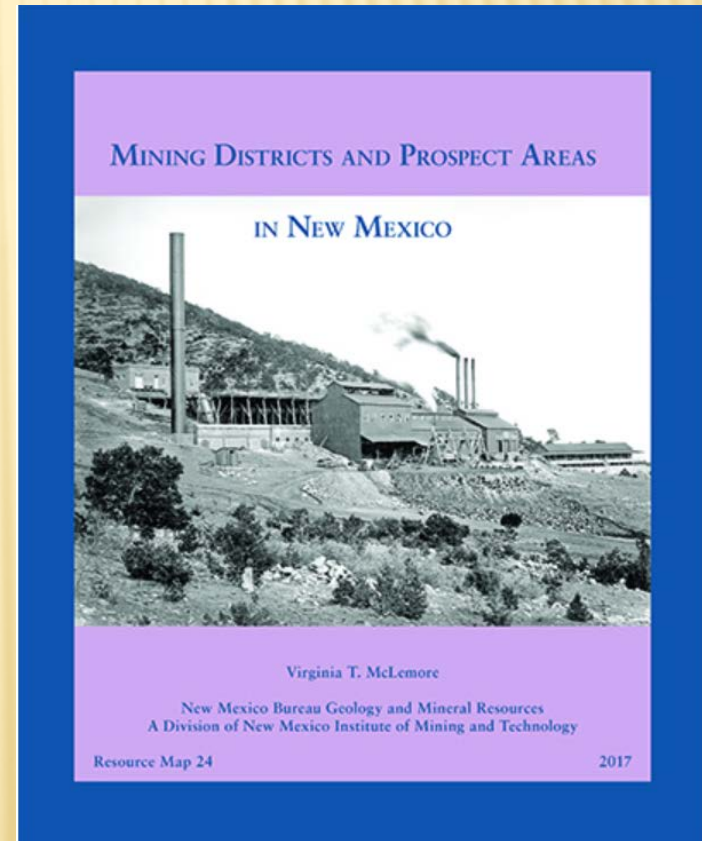
---

- ✘ Organize, catalog and scan the mining archives
- ✘ NM Mine File Catalog (>16,000 mines) with links to more detailed location by section, township range files (>6,000 file cards)
- ✘ More than 2,000 mine plats scanned and cataloged
- ✘ Scan and catalog thousands of reports, both published and unpublished, accompanying mine maps, newspaper articles, assay reports, and historical mine photographs



# GIS DATA

- ✘ Coal fields and Mining districts
- ✘ Coal mines and reserve data
- ✘ **Mines and mills**
- ✘ Geochemistry
- ✘ **Photographs**
  - + (both recent and historic)
- ✘ Bibliography
- ✘ **Mine maps**
- ✘ **Mine production**
- ✘ Mine reserves
- ✘ **Drill data** (Petroleum records)
- ✘ Well logs (Coal library and Petroleum records)



# Mines Records by Location and Name (~20,000 records)

M604

T~~6~~<sup>5</sup>, R~~5W~~<sup>6</sup>, Sec. ~~7~~<sup>6</sup>, N. M. P. M.  
District Rosedale County Securo

Property or claim name:  
Great London Lode + mill site

Number of claims ?

Lode  Placer \_\_\_\_\_ Other M.S.

Survey No. 1076-A & B

Year Patented  Rejected \_\_\_\_\_

Owner's Name: \_\_\_\_\_ Address: \_\_\_\_\_ Date: \_\_\_\_\_

The W. N. Martin Co.

Operator: \_\_\_\_\_

Production: Total \_\_\_\_\_

From \_\_\_\_\_ To \_\_\_\_\_

Present Rate \_\_\_\_\_ per \_\_\_\_\_ Date \_\_\_\_\_

R5W- Sec 6+7 (See other side for general information)

R6W- " 1+12 24.479 acres

MS- on Sec 6

Location if Twp. and Range not given:

Classification:

Chief Mineral \_\_\_\_\_

Accessory Minerals \_\_\_\_\_

Status \_\_\_\_\_ Date \_\_\_\_\_

County Clerk's Record:

Book \_\_\_\_\_ Page \_\_\_\_\_

Source of Information:

\* Locke, Augustus, short rept. on the 'Rosedale' mine. Jan. 1, 1921

\* T. Lindsley papers, Letter on the Rosedale mine. Aug. 1913, U. Wyoming

\* Bush, J. E., July 11th, 1910, Letter rept. on Rosedale. Swarth Papers. Amer. zinc file #423 UN/MD/ROLLA



# USGS MRDS, Mineral Commodity, topo mines data



USGS Home  
Contact USGS  
Search USGS

Mineral Resources On-Line Spatial Data

Mineral Resources / Online Spatial Data



USGS Home  
Contact USGS  
Search USGS

## Mineral Resources Data

MRDS is a collection of reports describing geologic characteristics, production, reserve service provides a subset of the database available as well. Current status: As of 2017-12-01

## Mineral Resources Online Spatial Data

Interactive maps and downloadable data for regional and global Geology, Geochemistry, Geophysics, and Mineral Resources



ScienceBase-Catalog

Communities Help

Log in

ScienceBase Catalog → USGS Data Release Products → Prospect- and Mine-Related...

## Prospect- and Mine-Related Features from U.S. Geological Survey 7.5- and 15-Minute Topographic Quadrangle Maps of the United States

View

### Dates

Publication Date : 2017-12-01

Start Date : 1888

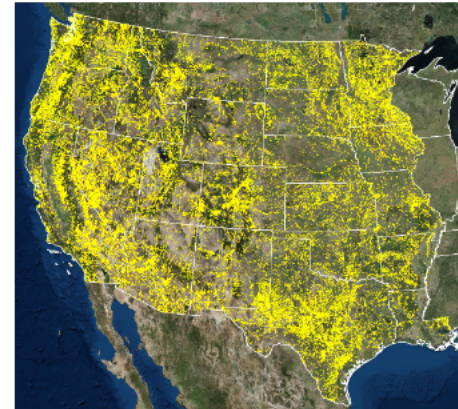
End Date : 2006

### Citation

Horton, J.D., and San Juan, C.A., 2017, Prospect- and Mine-Related Features from U.S. Geological Survey 7.5- and 15-Minute Topographic Quadrangle Maps of the United States: U.S. Geological Survey data release, <https://doi.org/10.5066/F78W3CHG>.

### Summary

These data are part of a larger USGS project to develop an updated geospatial database of mines, mineral deposits and mineral regions in the United States. Mine and prospect-related symbols, such as those used to represent

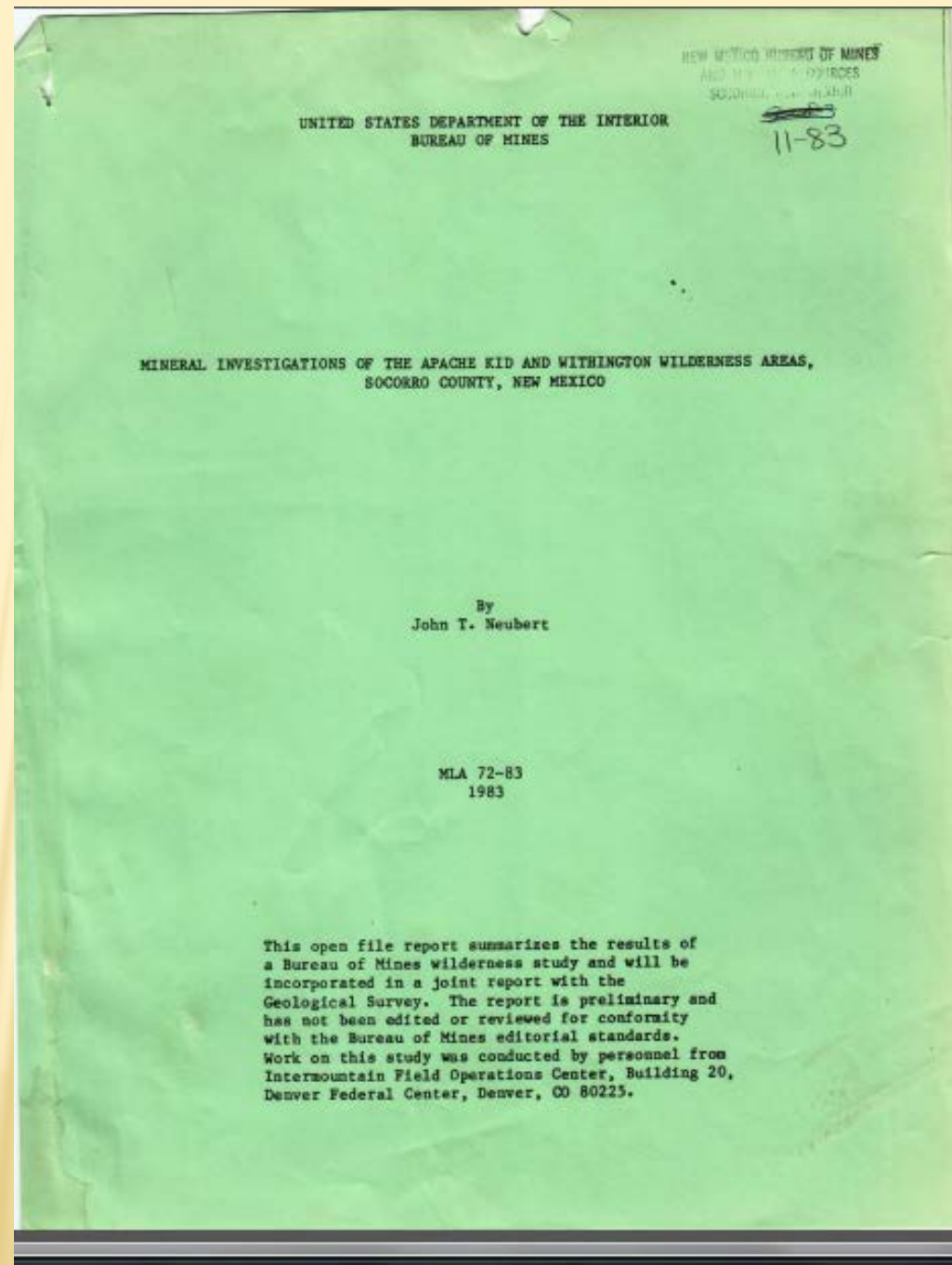


https://ww

<https://mrdata.usgs.gov/>,

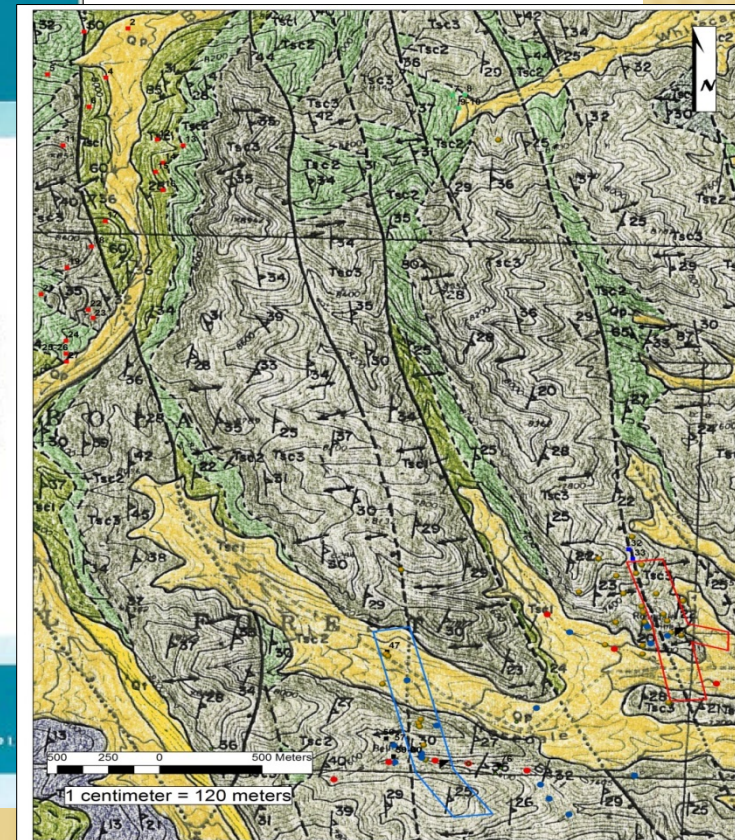
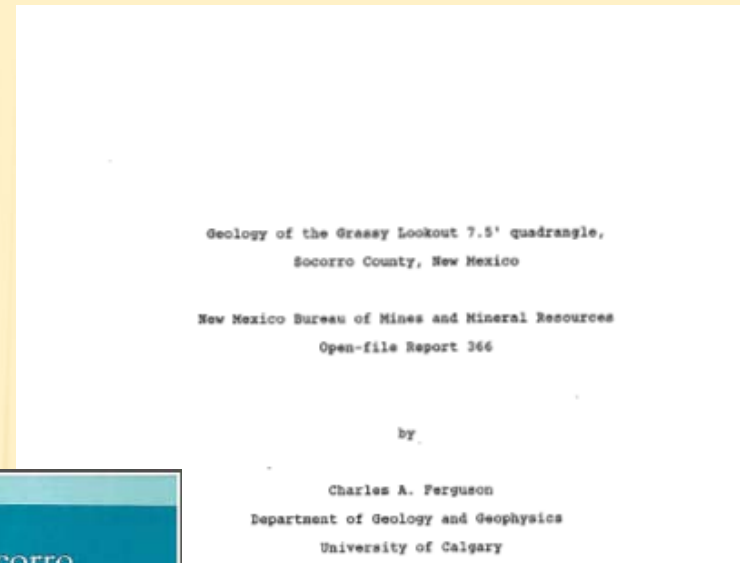
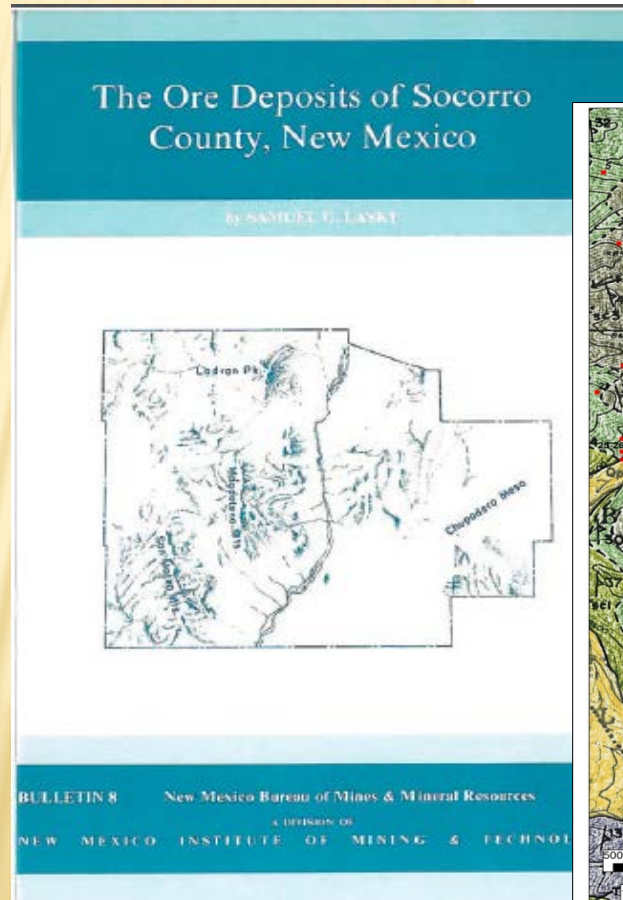
<https://www.sciencebase.gov/catalog/item/5a1492c3e4b09fc93dcfd574>

# USBM and USGS mineral resource assessments



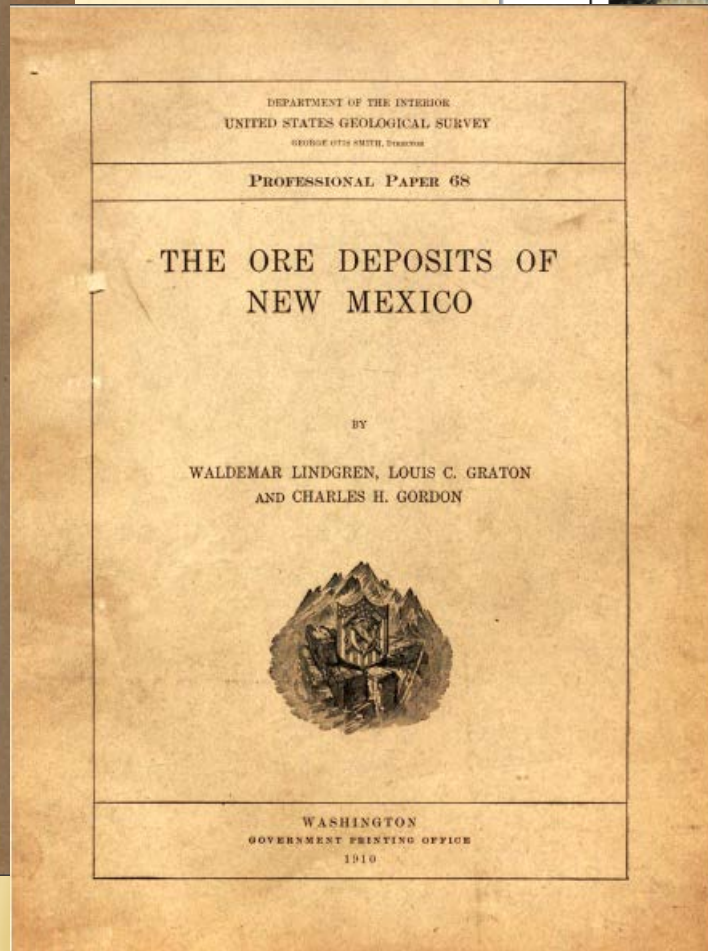
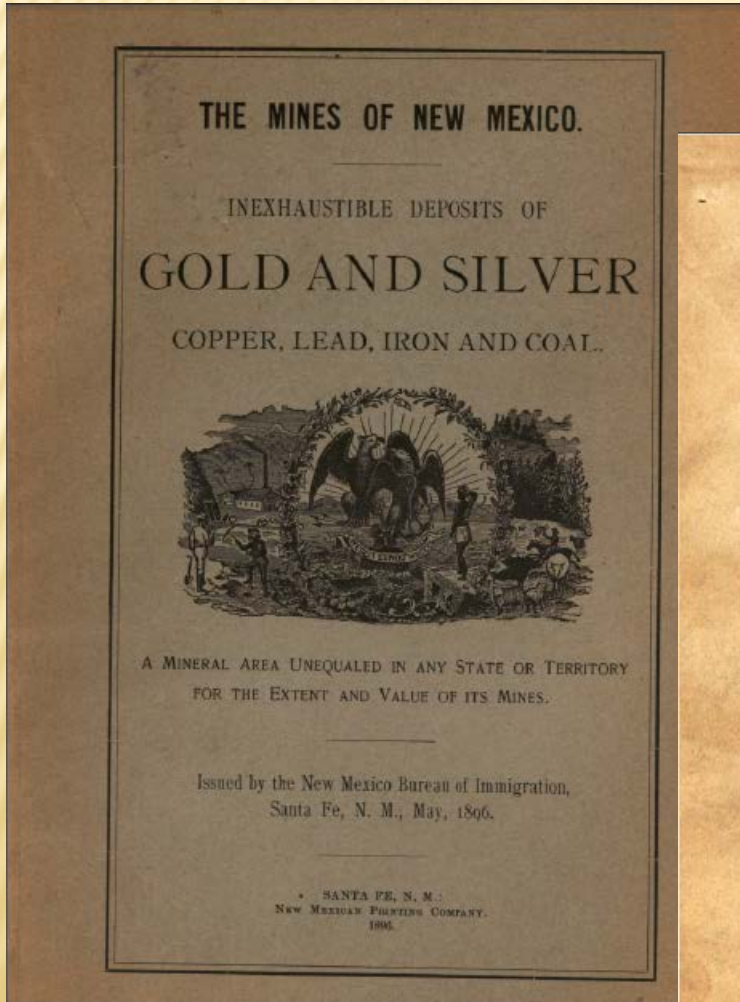


# NMBGMR mapping projects, bulletins, and open file reports





# Other reports, company reports, published and unpublished



Historic Documentation, Archaeological  
Monitoring, and Salvage Excavations  
Undertaken at the Rosedale Gold Mine,  
Mill, and Townsite, Cibola National Forest,  
Magdalena Ranger District,  
Socorro County, New Mexico

(A CERCLA Project)

Prepared By:  
Michael S. Burney  
and Angela M. Scarlata

Burney & Associates  
P.O. Box 2329  
Tosca, New Mexico 87571

Barbara L. Scott, Final Eye  
Volume Editor

February 29, 2008



# BLM mineral patents and mining claims records

The image shows a screenshot of the Bureau of Land Management (BLM) website. The top navigation bar includes the BLM logo, the text "U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT", and "General Land Office Records". Below this is a search bar and navigation links for "Search Documents", "Reference Center", "Support", and "Shopping Cart".

The main content area is titled "Search Documents" and features three search filters: "Search Documents By Type", "Search Documents By Location", and "Search Documents By Identifier". Under "Search Documents By Type", there are links for "Patents", "Surveys", "LSR", and "CDI".

A search form is visible with a "Search" button and a "Clear Form" link. Below the search form, there is a section titled "Land & Mineral System Reports" with a sub-section "Report Status and Updates".

The "Report Status and Updates" section contains the following text:

**Report Status and Updates**

- The CR Serial Register Page (SRP) was updated to include the "Other Query Parameters".
- Reports that are still under construction are the CR Duration of Plans, and the ST Serial Register Pages - Other Query Parameters.
- The CR ROW Solar Energy Report is now available. The User Guide is in the process of being updated and will be posted as soon as possible.

Below the list, there is a paragraph of text:

The Bureau of Land Management (BLM) administers more public land - over 245 million surface acres - than any other Federal agency in the United States. Most of this land is located in the 12 Western states, including Alaska. The BLM's Legacy Rehost System, called LR2000, provides reports on BLM land and mineral use authorizations for oil, gas, and geothermal leasing, rights-of-way, coal and other mineral development, land and mineral title, mining claims, withdrawals, classifications, and more on federal lands or on federal mineral estate. The LR2000 enables users to access the same information over the Internet as in the BLM State Office Information Access Centers.

LR2000 provides access to the following systems. To run reports you will need to know which of the following systems the information you are looking for is in:

<https://gloreCORDS.blm.gov/search/default.aspx>;

<https://reports.blm.gov/reports.cfm?application=LR2000>





# NMMMD active mines and permits



Contact MMD   FAQs   RFPs/ITBs   Publications

Home   Programs   Commissions   MMD Online   GIS & Maps   Information

## MARP - Pending Permit Activities (Applications, Revisions, Modifications and Closeout Plans)

Follow the links below to review Mining Act Reclamation Program pending permit applications, modifications and revisions for exploration projects, minimal impact mines and regular mines, and approved and denied exploration applications. Permits are listed in each section by descending permit number.

**NOTE:** Approved, Denied, Withdrawn and Released sites older than approximately 6 months are removed from this website.

[Application and Annual Reporting Forms](#)  
[Pending Permit Activities](#)  
[Announcements, Public Notices, RFP/ITB](#)  
[Guidance and Guidelines](#)  
[FAQ - MARP](#)  
[Annual Report to the Mining Commission](#)  
[Rules and Regulations](#)

Pending Exploration Applications

[Minimal Impact](#)  
[Regular Explor](#)

Pending Mi

[Minimal Impact](#)  
[Minimal Impact](#)  
[Regular - New](#)  
[Regular - Exis](#)



Contact MMD   FAQs   RFPs/ITBs   Publications

Home   Programs   Commissions   MMD Online   GIS & Maps   Information



## GIS, MAPS AND MINE DATA

MMD uses a Geographic Information System (GIS) to locate and track its mining activities in the state. This is a computer system that can capture, store, analyze and display geographically referenced (location) information. The power of this system is its ability to draw conclusions about relationships between data that have a spatial component. GIS provides a method of displaying accurate mapping and database information to the staff and public.

<http://www.emnrd.state.nm.us/MMD/MARP/MARPPermitsRevModClose.html>;

<http://www.emnrd.state.nm.us/MMD/gismapminedata.html>

# New Mexico Mines Database

Relational database in ACCESS that will ultimately be put on line with GIS capabilities

- ACCESS is commercial software and this design is compatible with other formats
- Metadata (supporting definitions of specific fields) can be inserted into the database
- ACCESS is flexible and data can be easily added to the design
- Easily imported into ArcGIS



# MINING DISTRICTS AND COAL FIELDS

- ✘ 274 coal fields and mining districts in NM
  - + ~30 districts have had zero production
- ✘ Each district is classified by predominant commodity
- ✘ Each district can have more than 1 commodity type
- ✘ 28 coal fields
- ✘ 40 industrial minerals districts
- ✘ 173 metals districts
- ✘ 32 uranium districts



# MINES

- ✘ Each mine is classified by predominant commodity
- ✘ Each mine can have more than 1 commodity type
- ✘ 9000 mines in the database that include active, inactive, abandoned, and exploration sites
- ✘ Not all mines have workings
- ✘ Some mines have multiple workings



Questa mine, Taos County



# INDUSTRIAL MINERALS

- Any rock, mineral, or other naturally occurring material of economic value, excluding metals, energy minerals, and gemstones
- One of the nonmetallics
- Includes aggregates



**White Mesa gypsum mine**



**M.I.C.A. mica mine (closed)**

# NMBGMR AML WEBPAGE—ROSEDALE PORTIFOLIO

The screenshot shows the top portion of the NMBGMR website. On the left is a sidebar with the NMBGMR logo, a search bar, and a 'your maps & books' icon. The main header features a large aerial photograph of a desert landscape with a winding road. Below the header is a dark blue navigation bar with links: 'About Us', 'Maps & Publications', 'Geoscience', 'Natural Resources', and 'Data & Collections'. A light blue secondary navigation bar contains: 'Mission', 'Staff', 'Facilities & Services', 'News & Events', 'Site Overview', and 'Search'. Below this is a breadcrumb trail: 'Home > Geoscience > Geologic Hazards > Abandoned Mine Lands'. The main content area has a heading 'ABANDONED MINE LANDS (AML) PROJECT' followed by a paragraph: 'New Mexico's mineral wealth is among the richest of any state in the U.S. In 2015, New Mexico ranked 10th in coal production, 2nd in copper production, and 20th in total nonfuel minerals production (McLemore, 2017). Most of the

This screenshot shows a detailed view of the 'Abandoned Mine Lands' page. It includes the same sidebar and navigation bars as the previous screenshot. The breadcrumb trail is 'Home > Geoscience > Geologic Hazards > Abandoned Mine Lands'. Below the breadcrumb, there is a resource map reference: 'Resource Map 24, 65 p., scale 1:1,000,000.' Two bibliographic entries are listed: 'McLemore, V.T., Hoffman, G., Smith, M., Mansell, M., and Wilks, M., 2005a, Mining districts of New Mexico: New Mexico Bureau of Mines and Mineral Resources, OF-494, CD-ROM.' and 'McLemore, V.T., Krueger, C.B., Johnson, P., Raugust, J.S., Jones, G.E., Hoffman, G.K. and Wilks, M., 2005b, New Mexico Mines Database: Mining Engineering, February, p. 42-47.' A section titled 'OTHER RESOURCES' contains a link 'Historical mining records for Rosedale district' which is circled in red. Below this is a 'PHOTOS' section.



# LOCATION AND HISTORY OF THE ROSEDALE DISTRICT, SOCORRO COUNTY, NEW MEXICO

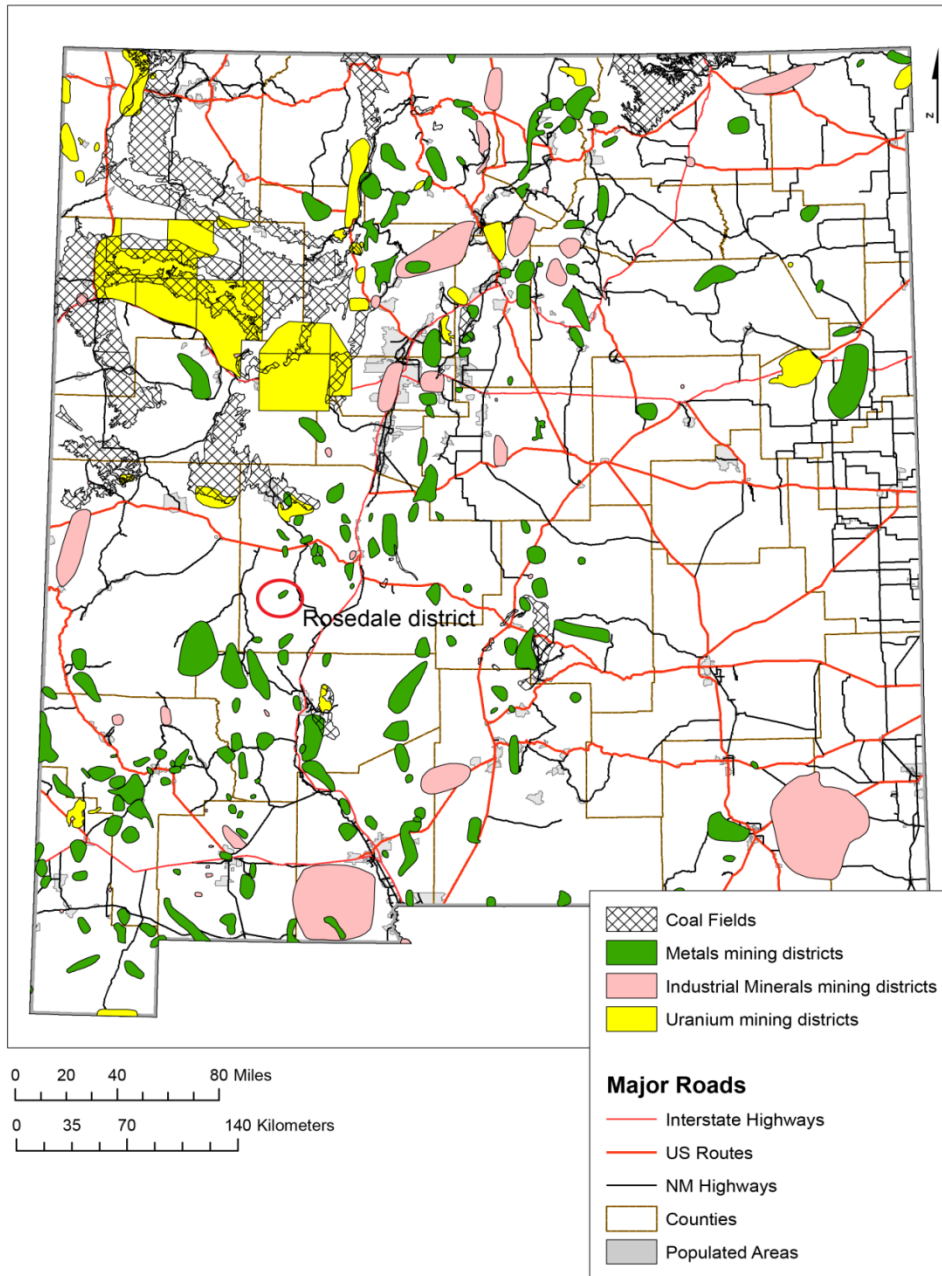


Looking E in White Cap Canyon  
(Lane workings, 2017).



Looking N at Big Rosa  
Canyon, 2017.





Rosedale  
district is in  
western  
Socorro  
County



# HISTORY

---

- ✘ December 15, 1882, Jack W. Richardson discovers property
- ✘ July, 1891, 10-stamp mill completed, first run in August
- ✘ February 1, 1899, Cyanide plant is completed
- ✘ March, 1901, Assay office burns, mine and mill records lost
- ✘ July 27, 1901, 13 levels completed
- ✘ November 2, 1901, Rosedale closes, Golden Bell finishing plans for a stamp mill
- ✘ September, 1903, Rosedale mill reopened

# HISTORY—CONTINUED

---

- ✘ August 12, 1910 20-stamp mill and cyanide plant burns
- ✘ 1913, Property reopens
- ✘ 1916, Fire destroys mill and surface plant
- ✘ 1942-1957, Inactive
- ✘ Final estimated production 1882-1981
  - + 28,000 oz Au
  - + 10,000 oz Ag



# MINE INVENTORY

---

# STEPS

---

- ✘ Inventory the mines and mine features
  - + History of the site (production, commodities, mine methods, processing facilities)
- ✘ Preliminary characterization
  - + Paste pH, mineralogy, chemistry
- ✘ Prioritize mine features
- ✘ Detailed characterization
  - + Detailed mineralogy and chemistry
  - + ABA/NAG tests
  - + Particle size analyses
  - + Shear tests



# Available Data

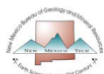
- Location (= GIS, point and polygon data, QA/QC)
- Production, reserves, resource potential  
significant deposits, drillhole data
- Geologic
- Geochemical (rock, water, etc.)
- Environmental
- Water well data
- Historical and recent photographs
- Mining methods, maps
- Ownership
- Other data

# Environmental Data

- Commodities produced and present
- Potential hazardous materials
- Evidence of potential acid drainage
- Hydrology
- Receiving stream
- Reclamation
- Mitigation status
- Sensitive environments
- Chemical data (both solids and water)



# INVENTORY SHEETS



## Mine Entry

NM Bureau of Geology and Mineral Resources

Mine ID \_\_\_\_\_ Mine Name \_\_\_\_\_

District id \_\_\_\_\_ District \_\_\_\_\_

Active Location: \_\_\_\_\_  Too Dangerous to Approach \_\_\_\_\_

Historic/legacy location: \_\_\_\_\_  Aggregate mine \_\_\_\_\_

Latest year of information \_\_\_\_\_

### LOCATION

County \_\_\_\_\_ USGS Quadrangle \_\_\_\_\_

Location Assurance \_\_\_\_\_ Location Reference \_\_\_\_\_

Latitude \_\_\_\_\_ Longitude \_\_\_\_\_ Coordinate system \_\_\_\_\_

Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_ Subsection \_\_\_\_\_

UTM Northing \_\_\_\_\_ UTM Easting \_\_\_\_\_ UTM zone \_\_\_\_\_

Elevation \_\_\_\_\_ Elev. Source \_\_\_\_\_

Location Notes \_\_\_\_\_

### GENERAL MINE HISTORY

Commodity Category \_\_\_\_\_ Production Category \_\_\_\_\_

Year of Initial Production \_\_\_\_\_ Year of Last Production \_\_\_\_\_ Year of Discovery \_\_\_\_\_

Commodities Produced \_\_\_\_\_ Commodities Present Not Produced \_\_\_\_\_

### FEATURE DESCRIPTION

Development \_\_\_\_\_

Access \_\_\_\_\_ Visibility \_\_\_\_\_ Known Multiple Entrances \_\_\_\_\_

Depth \_\_\_\_\_ Length/height \_\_\_\_\_ Width: \_\_\_\_\_

Disturbed acres \_\_\_\_\_ Reclaimed acres \_\_\_\_\_ Mining Methods \_\_\_\_\_

Condition Mine Feature \_\_\_\_\_ General Slope \_\_\_\_\_

Aspect (trending direction)/ slope of feature \_\_\_\_\_

Surface Land Status \_\_\_\_\_ Minerals Land Status \_\_\_\_\_ Ownership \_\_\_\_\_

**CULTURAL SIGNIFICANCE** Note UTM for sites in field notes! They get entered into another database.

Cultural resources \_\_\_\_\_ Description of features \_\_\_\_\_

Archeology site no.: \_\_\_\_\_

### GEOLOGY

Host Formation: \_\_\_\_\_

Geology: \_\_\_\_\_

Stability: \_\_\_\_\_ Rock type: \_\_\_\_\_

Mineralogy: \_\_\_\_\_

Nonore mineralogy: \_\_\_\_\_

Type of deposit: \_\_\_\_\_ Size of deposit: \_\_\_\_\_

Alteration: \_\_\_\_\_ Soils: \_\_\_\_\_

### TERRAIN

Type of terrain: \_\_\_\_\_ Land use: \_\_\_\_\_

Mine: \_\_\_\_\_ District: \_\_\_\_\_

5/28/2017



## Mine Entry

NM Bureau of Geology and Mineral Resources

Is water present?  Is waste rock present?  Subsidence?  Maintenance Required?

Recent Human Use: \_\_\_\_\_

Sensitive environments: \_\_\_\_\_

Erosion: \_\_\_\_\_

### HYDROLOGY

Hydrology: \_\_\_\_\_ Receiving Stream: \_\_\_\_\_

Water drainage: \_\_\_\_\_ Floodplain: \_\_\_\_\_ Aquatic Life: \_\_\_\_\_ Color of Water: \_\_\_\_\_

Evidence of potential acid drainage: \_\_\_\_\_

### Ecosystem

Vegetation: \_\_\_\_\_ Vegetation density: \_\_\_\_\_ Vegetation type: \_\_\_\_\_

Animals: \_\_\_\_\_ Animal rating: \_\_\_\_\_  Are bats present?  Are owls present?

### ENVIRONMENTAL DATA AND POTENTIAL HAZARDS

Radiation readings: \_\_\_\_\_

Air quality/condition: \_\_\_\_\_ Mitigation Status: \_\_\_\_\_

Reclamation: \_\_\_\_\_  Trash In Mine?

### Circle the number or value that is correct!

BLM Danger Level	0	remediated
1	None	no danger level
2	Low	sites located more than a quarter mile
3	Medium	sites near historic mining towns, historic schools, recreation areas, parks, camps, or trails
4	High	sites near homes or school, within a quarter mile of one or more AML sites
5	Extreme	extreme danger level
6	Unknown	unknown danger level, not visited
7	active mining	active mining, reclamation planned or underway

NOAMI	A	highest class, deep unprotected openings to surface, Hazardous openings on surface, crown pillars, waste rock piles with ARD and radioactive
B	deep unprotected openings to surface such as shafts, raises and open stope. Hazardous openings on surface, crown pillars, waste rock piles with	
C	hazardous openings to surface, waste rock piles and possible dilapidated structures associated with the mine openings, no tailings or tailings are	
D	minor surface features only such as trenches, test pits and stripping, no tailings	
O	no information	

**Are lead or sulfide minerals present? Note here also.**

Potential hazardous materials: \_\_\_\_\_

Comments: \_\_\_\_\_

Recommendations: \_\_\_\_\_

Remediated? **Data Reliability** Data reliability: \_\_\_\_\_ Inspected by: \_\_\_\_\_ Date inspected: \_\_\_\_\_

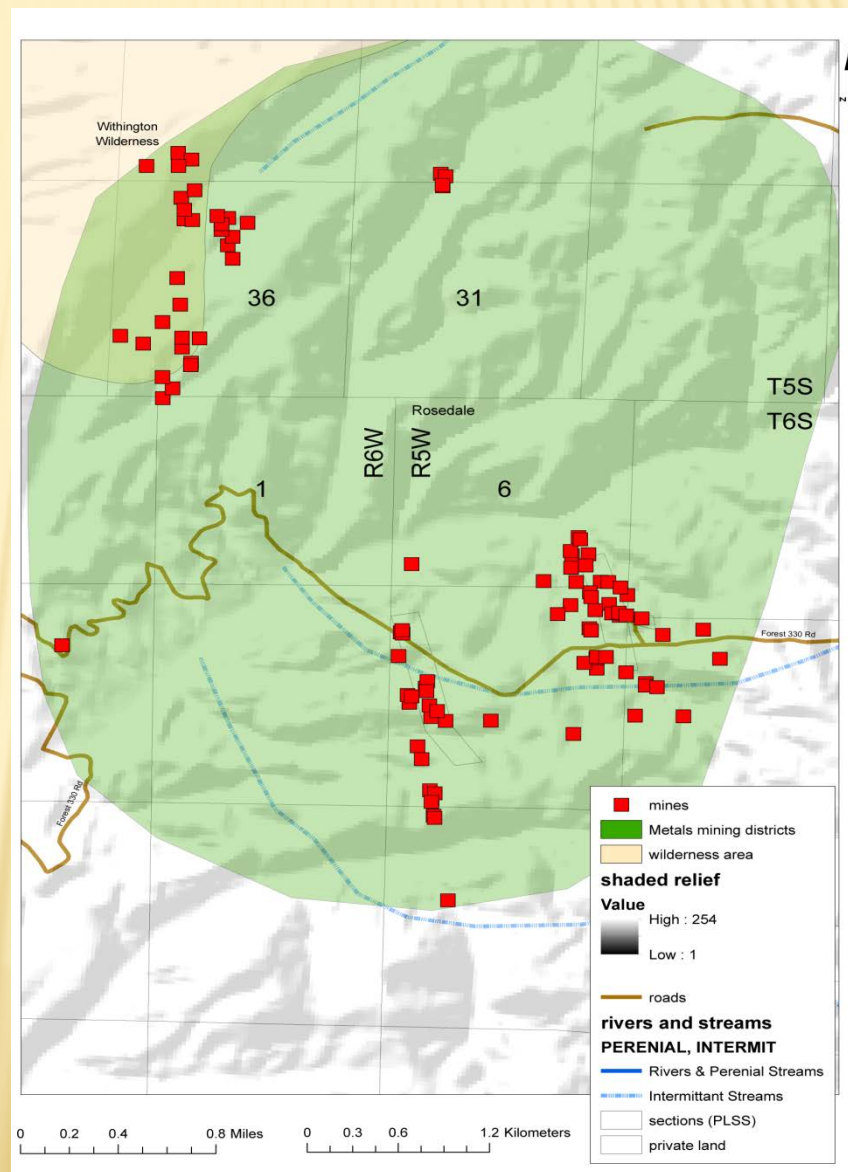
Verified by: \_\_\_\_\_ Date last modified: \_\_\_\_\_

Mine: \_\_\_\_\_ District: \_\_\_\_\_

5/28/2017

# MINES IN ROSEDALE DISTRICT

- ✘ When we started in October 2016, we had 26 mine features in the NM Mines Database
- ✘ When we finished our file search and field inventory, we had 99 mine features





Mine area	Number of Mine features	Mine Features	Depth of workings (ft)
Rosedale	28	Shafts (14 levels), pits, adit, tailings, mill foundations, trenches	2- ≥732
Bell	16	Tailings, shafts, adit, mill foundations, pits	2 - >50
Bell South	7	Adit, shafts, pits	3 - >10
Big Rosa Canyon	33	Shafts, adit, pits, trenches	2 - >30
Robb Prospect	10	Adit, shaft	3 - 20
Lane Prospect	4	Shafts, pits, trenches	2 - >30
Oak Spring	1	Drillholes	

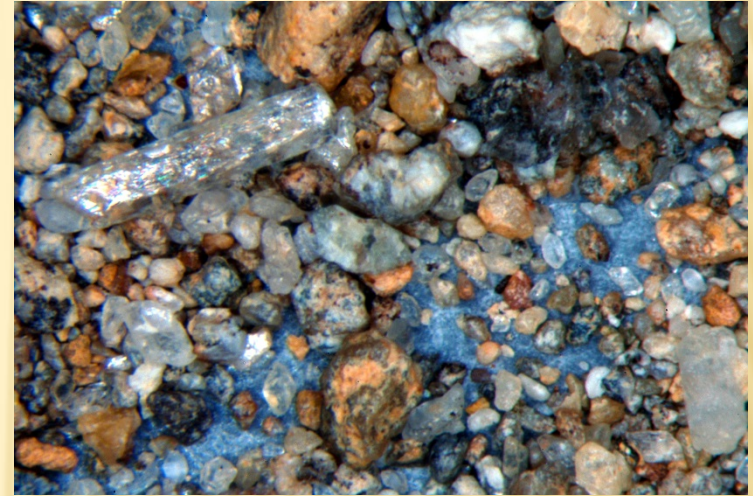
# MINERALOGY AND CHEMISTRY

---

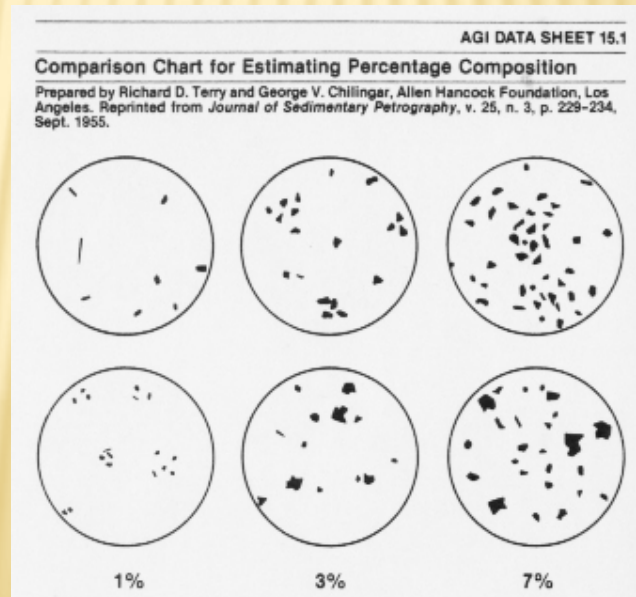
- × Petrography
- × Whole rock geochemistry
- × Paste pH
- × Mineralogy
  - + XRD
  - + Electron microprobe
  - + Chemical analyses of minerals, esp. pyrite



# SOIL PETROGRAPHY—FIRST STEP IN DETERMINING MINERALOGY



2 mm





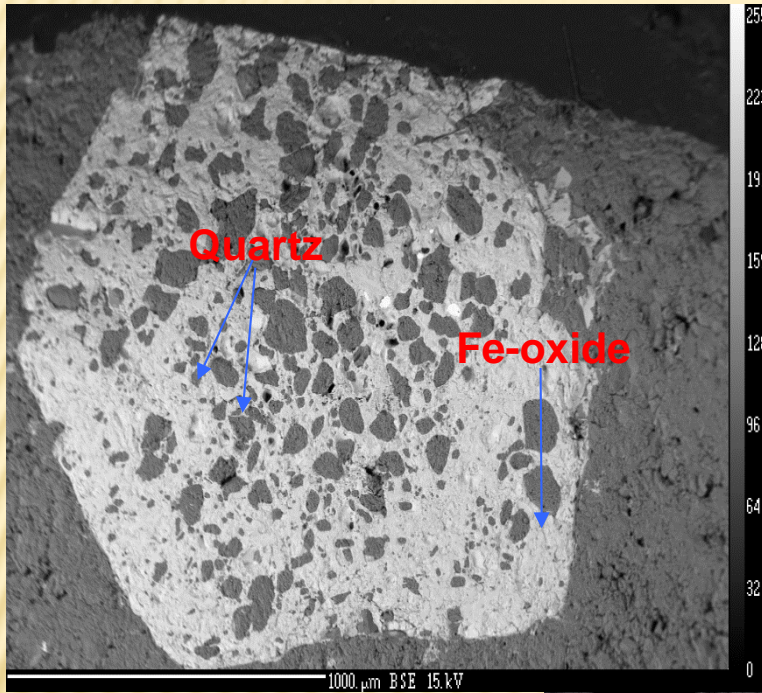
# Pyrite characterization

Evaluate the distribution, form, size, amount, surface area of pyrite in the rock piles

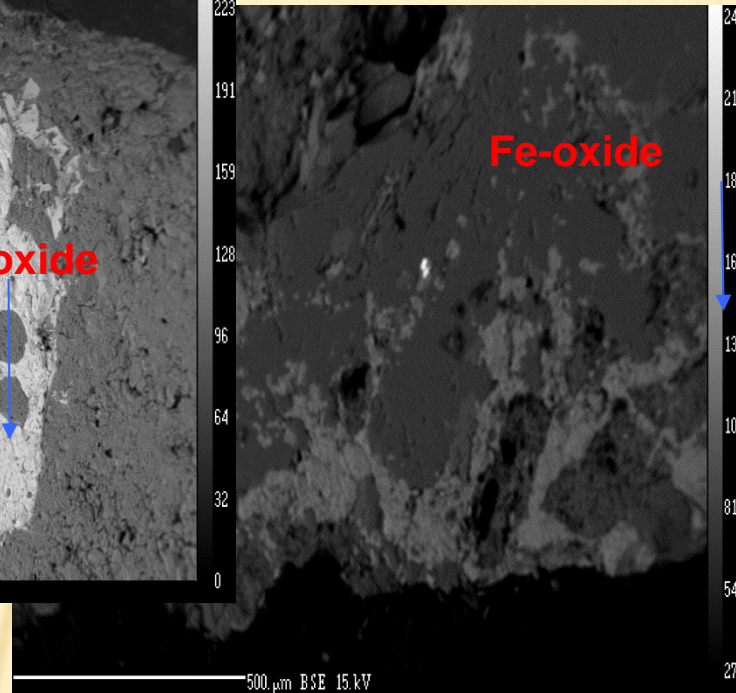




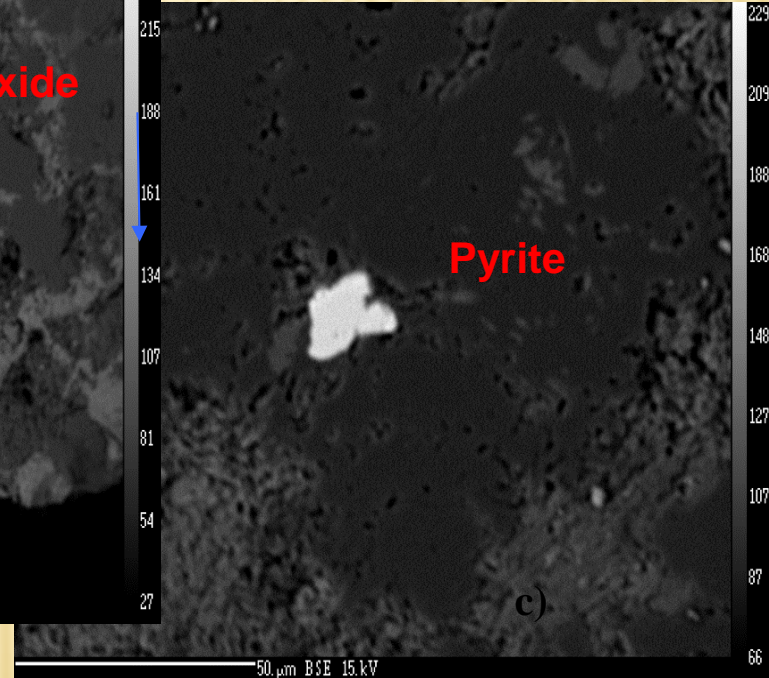
# MICROPROBE ANALYSIS (BSE) IMAGES



a)



b)



c)

a) Backscattered electron images of quartz grain replacing Fe-oxide in sample Jic410. This is likely supergene replacement.

b) Backscattered electron images of Fe grain in sample Jic412. Note how altered and pitted the grain is.

c) Backscattered electron images of pyrite grain in sample Jic412 c. Note how pristine the pyrite grain is.





# HAZZARD RANKING

National Orphaned/Abandoned Mines, Canada,  
[http://www.noami.org/intro\\_e.php?language=English](http://www.noami.org/intro_e.php?language=English)

NOAMI Class	Description
A	A site with potential to cause environmental, public health and public safety concerns
B	A site with limited potential to cause environmental concerns but with potential for public health and safety concerns
C	A site with public safety concerns but little or no public health or environmental concerns
D	A site with no expected environmental, public health or public safety concerns
O	Information is not available
R	Remediated

# STUDENT PRESENTATIONS

---



# LESSONS LEARNED

---

# CAUSES OF UNDESIRABLE IMPACTS FROM AML SITES

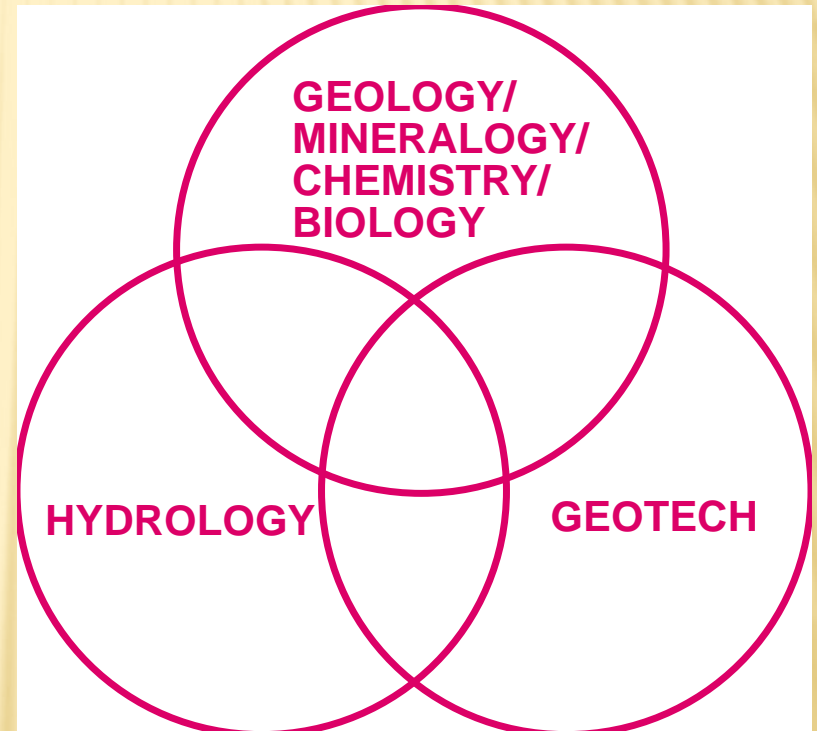
---

- × Erosion
- × Too much water
  - + Results in weathering of the rock and soil
  - + Can create unstable features and acid drainage
- × Need to control water into the mine workings, rock pile, tailings, heap leach, and foundation materials
- × Poor foundation conditions
  - + Weak materials like clay, altered, fractured rock
- × Poor understanding of effects of weathering on the degradation of materials
- × **Every site is different and must be specifically characterized**



# HOW CAN THESE IMPACTS BE MANAGED OR PREVENTED?

- ✘ Need to inventory mines
- ✘ Every site should be characterized
- ✘ Reclamation
- ✘ In some areas, develop monitoring programs to examine changes in the future
- ✘ Continue research on processes and improved technologies



# MISSING FROM THE REPORT—TO BE ADDED

---

- ✘ Inventory sheets, photos, sketches, volumes of waste rock piles
- ✘ More photos showing the terrain
- ✘ Archaeological features descriptions
- ✘ Water analyses and interpretation
- ✘ Particle size analyses
- ✘ Data (XRD, electron microprobe, chemistry, water chemistry, water features)



# QUESTIONS/ISSUES

---

- ✘ What else does AML want/need in the report?
- ✘ Is there a better hazard ranking system?
- ✘ Add polygon info on tailings and larger mine features?
- ✘ Does AML want more detailed volume calculations of waste rock piles?

# SCHEDULE

---



<u>Task Name</u>	<u>Start Date</u>	<u>End Date</u>	<u>Duration (days)</u>	<u>Personnel Assigned to Task</u>	<u>Status</u>
Field work: Jicarilla	6/30/2017	4/30/2018	20	McLemore, Mojtabai, 6 students	On schedule, 5 days left (estimated)
Field work: North Magdalena	6/30/2017	4/30/2018	10	McLemore, Mojtabai, 6 students	On schedule, 15 days left (estimated)
Field work: Rosedale	6/30/2017	4/30/2018	3	McLemore, Mojtabai, 6 students	Completed (see note below)
contacting land owners	6/30/2017	3/30/2018	273	Mojtabai, 3 students	On schedule, some land owners have responded
Lab testing	6/30/2017	5/30/2018	334	McLemore, 6 students	On schedule
Compiling historical data Jicarilla, North Magdalena	6/30/2017	5/30/2018	334	Trivitt, McLemore, students	On schedule
Progress report 4	6/30/2017	9/15/2017	77	McLemore, Mojtabai	Completed
Progress report 5	9/15/2017	12/21/2017	97	McLemore, Mojtabai	This report

<u>Task Name</u>	<u>Start Date</u>	<u>End Date</u>	<u>Duration (days)</u>	<u>Personnel Assigned to Task</u>	<u>Status</u>
Progress report 6	12/21/2017	3/21/2018	90	McLemore, Mojtabai	
Final report	6/30/2017	6/30/2018	365	McLemore, Mojtabai	
Draft report Rosedale	6/30/2017	10/30/2017	122	McLemore, Mojtabai	Submitted on December 1, 2017
Draft report Jicarilla	10/1/2007	12/30/2017	3743	McLemore, Mojtabai	On schedule
Draft report North Magdalena	1/1/2018	4/30/2018	119	McLemore, Mojtabai	On schedule
Final report Rosedale	6/30/2017	6/30/2018	365	McLemore, Mojtabai	On schedule
Final report Jicarilla	10/1/2017	6/30/2018	272	McLemore, Mojtabai	On schedule
Final report North Magdalena	1/1/2018	6/30/2018	180	McLemore, Mojtabai	On schedule
Presentations to AML	to be determined			McLemore, Mojtabai	First one is scheduled 12/12/17



# FOR MORE INFORMATION

---

- × <http://geoinfo.nmt.edu/geoscience/hazards/mines/aml/home.html>
- × <http://geoinfo.nmt.edu/staff/mclemore/projects/environment/home.html>