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COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONME.  
Hazardous Materials and Waste Management Division

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Colorado Department  
of Public Health  
and Environment

## PRELIMINARY ASSESSMENT

CARBONERO MINE  
SAN MIGUEL COUNTY, COLORADO

COD # 0001916360

December 20, 1996  
Revised: December 16, 1997

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EPA APPROVAL: \_\_\_\_\_

APPROVAL DATE: 1/29/98

## TABLE OF CONTENTS

1.0	INTRODUCTION .....	1
2.0	SITE DESCRIPTION .....	1
2.1	Location .....	1
2.2	Site History .....	2
2.3	Site Characteristics .....	3
2.3.1	Surrounding Land Uses .....	3
2.3.2	Geology/Geography .....	4
2.3.3	Hydrogeology/Hydrology .....	5
2.3.4	Climate .....	5
3.0	PRELIMINARY PATHWAY ANALYSIS .....	6
3.1	Waste Characteristics .....	6
3.2	Soil Exposure Pathway .....	7
3.3	Air Migration Pathway .....	8
3.4	Ground Water Pathway Analysis .....	8
3.5	Surface Water Pathway Analysis .....	9
4.0	SUMMARY .....	11
5.0	REFERENCES .....	13

## FIGURES

FIGURE 1	SITE LOCATION MAP - TOPOGRAPHIC WITH 4-MILE RADIUS DELINEATION
FIGURE 2	OPHIR AREA SITE SKETCH
FIGURE 3a FIGURE 3b	SITE SKETCH MAP - CARBONERO MINE -Shoofly Level CARBONERO TAILINGS
FIGURE 4	15-MILE DOWNSTREAM SEGMENT MAP

## APPENDICES

APPENDIX 1	EPA PRELIMINARY ASSESSMENT FORM
APPENDIX 2	CERCLA ELIGIBILITY WORKSHEET
APPENDIX 3	PA WORKSHEET
APPENDIX 4	LATITUDE AND LONGITUDE CALCULATION WORKSHEET #2
APPENDIX 5	SITE PHOTOGRAPHS
APPENDIX 6	RECORD OF COMMUNICATION
APPENDIX 7	PREVIOUS INVESTIGATIONS
APPENDIX 8	CARBONERO HISTORY EXCERPT

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**SAN MIGUEL COUNTY, COLORADO**

**COD# 0001916360**

## **1.0 INTRODUCTION**

This Preliminary Assessment (PA) of the Carbonero Mine is located northeast of the town of Ophir, in San Miguel County, Colorado. The purpose of this PA is to satisfy the requirements as set forth in a cooperative agreement between the U.S. Environmental Protection Agency (EPA) and the Colorado Department of Health and Environment, Hazardous Materials and Waste Division (CDHE).

2.5 miles  
separated to  
the U.S.  
Public Health  
(CDHE).

This report is based on literature reviews, personal site visits performed on September 25 and October 7, 1996. The report describes the mine history, site characteristics and preliminary pathway.

site visits  
to the site

The objectives of this PA are to:

- Sources ?  
↓
- (1) identify and characterize potential on-site wastes;
  - (2) assess the potential for contaminant migration; and,
  - (3) determine potential impacts to public health and the environment.

## **2.0 SITE DESCRIPTION**

### **2.1 Site Location**

The Carbonero Mine is located approximately 2.5 miles northeast of the town of Ophir in San Miguel County, Colorado. Ophir is located approximately 365 miles southwest of Denver, 5 miles due south of Telluride, Colorado (Figure 1). The site consists of a draining adit at the "Shoofly" level, an associated waste rock pile adjacent thereto and a tailings pile located in the valley below. The Shoofly level occupies an area measuring 300 ft. long by 300 ft. wide, or approximately two acres. The tailings pile occupies an area measuring approximately 300 ft. by 150 ft. or 1 acre; the flume overflow/tailings spillage area measures approximately 300 feet by 100 feet, adding an additional .75 acres, for a total areal extent of 1.75 acres. The Carbonero Mine is part of the Ophir Mining District (figure 2), set in a high relief geographic basin encompassing approximately 15 square miles.

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**CARBONERO MINE**  
**SAN MIGUEL COUNTY, COLORADO**

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## **1.0 INTRODUCTION**

This Preliminary Assessment (PA) of the Carbonero Mine, located approximately 2.5 miles northeast of the town of Ophir, in San Miguel County, Colorado, has been prepared to satisfy the requirements as set forth in a cooperative agreement between the U.S. Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division (CDPHE).

This report is based on literature reviews, personal communications and a site visits performed on September 25 and October 7, 1996. Included in this report are the site history, site characteristics and preliminary pathway analyses.

The objectives of this PA are to:

- (1) identify and characterize potential on-site wastes;
- (2) assess the potential for contaminant migration; and,
- (3) determine potential impacts to public health and the environment.

## **2.0 SITE DESCRIPTION**

### **2.1 Site Location**

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The Shoofly level of the Carbonero Mine is located in the SE1/4 of Section 25; the Carbonero tailings are located in the SE1/4 of Section 35 and SW1/4 of Section 36, Township 42 North, Range 9 West of the New Mexico Principal Meridian. The site "reference point" was chosen as the Probable Point of Entry (PPE) of the Carbonero Mine drainage into the Howard Fork River, located at 37°46'9.38" North latitude, 107°48'32.15" West longitude. The Shoofly level of the Carbonero Mine is situated at an elevation approximately 11,500 ft. and the tailings are located approximately 9,800 ft. above mean sea level.

The tailings are located approximately .3 miles east of East Ophir, in the valley bottom, immediately north of the Howard Fork. The Shoofly level of the Carbonero Mine site is located approximately one mile northeast of East Ophir. The site can be accessed by turning east from Highway 145 to the road to Ophir. Ophir is located approximately 3 miles up this road. The tailings can be seen from East Ophir and are accessible by hiking through wetlands. To access the Shoofly level, continue on the Ophir Pass Road approximately .75 miles past East Ophir, turn north (left) onto a two-track, four-wheel-drive (4WD) road, located east of the iron bog. The 4WD road switches back for approximately one mile, up the south facing slope to the Carbonero Mine. (Figures 1 and 4).

The site is approximately 3 miles upstream of the Silver Bell Mine and Mill Tailings, for which a Site Investigation was conducted by CDPHE for EPA in 1995 (CDPHE, 1995).

## **2.2 Site History**

The town of Ophir was developed in 1878, by 17 prospectors exploring the region with Lt. Howard, after whom the Howard Fork of the San Miguel river was named. Ore from the mines around Ophir, producing gold, silver, lead zinc and tungsten, were shipped by burro-train over Ophir Pass to the Silverton Smelter. In 1882, a small smelter was built in Ames, 3 miles down valley, which was not successful and soon closed down. It was noted that in 1898, two cars of concentrates were shipped daily, year round. (Wolle, 1949).

The Shoofly level of the Carbonero Mine is located on the Full Moon Lode, Mineral Survey Number 20327, ownership having been recently transferred (July, 1996) from Fleet Resources to Glenn Pauls of Brighton, Utah (Hotchkiss Map Makers, 1935; San Miguel County Clerks Office, 1996).

The Carbonero Mine produced a total of 101,662 tons of ore containing an average of 0.24 ounce gold, 8.7 ounce silver, 6.99 percent lead, 4.7 percent zinc, and 0.16 percent copper, between 1907 and 1941 (U.S.G.S., 1959). Silver-lead mining at the Carbonero increased for about five years during the late 1920's, but falling metal prices forced the mine to shut down in 1931 (Collman, et. al., 1993).

The Carbonero had its own processing mill (North Star Millsite M.S. No. 20302, owned by Glenn Pauls) until 1931 when the mine shut down. The 50 ton per day mill used the froth-flotation process served by a two bucket aerial tramway from the Shoofly portal.

Small amounts of ore were extracted between 1934 and 1936. The last on and off cycle at the mine began in 1951 when the Silver Bell Mining Company purchased the mine and demolished the old mill and aerial tram. Ore was then hauled down the road to the Silver Bell Mine, at the Ophir Loop. All operations ceased at the Carbonero in 1954 (Collman, et. al., 1993). Appendix 8 presents more detail regarding the history of the Carbonero Mine.

The mill tailings are located approximately .3 miles downstream of the mill site, on either the Ferric Oxide Placer, M.S. 1661, owned by Randolph Belisle, or on an unpatented claim within the Uncompahgre National Forest (Hotchkiss Map Makers, 1935; San Miguel County Assessors Plats, 1996).

## **2.3 Site Characteristics**

### **2.3.1 Surrounding Land Uses**

The San Juan Mountains were extensively mined in the late 1800's to mid 1900's. The Idarado Mine in Telluride approximately 7 miles north of Ophir and on Red Mountain, approximately 10 miles east of Ophir, and the Sunnyside Mine in Silverton approximately 10 miles to the southeast, operated until the late 1970's. These same mines are now completing reclamation activities. The Alta Lake tailings, approximately 2.5 miles to the west, were reprocessed using cyanide heap-leaching technology in the 1980's and are now undergoing reclamation as well. Figures 1 and 2 illustrate the Carbonero Mine in relation to the extensive mining that occurred in the immediate vicinity.

The San Juans are frequently visited by mountain lovers, skiers, bicycle riders, automobile and motorcycle enthusiasts, etc. Tourism and recreation have replaced mining as the region's economic base. Much of the region is comprised of public lands managed by the U.S. Forest Service, or privately owned patented mining claims.

### 2.3.2 Geology/Geography

Ophir is located within the Howards Fork Basin, a relatively small watershed encompassing an area of approximately 15 square miles, as outlined in yellow on Figure 1.

The Ophir stock is a massive igneous formation and is the prominent geologic feature in the area. The Ophir stock is a granite-like rock which contains feldspar, quartz, hornblende, and mica. This stock is overlain by sedimentary and volcanic rocks, which were uplifted, tipped, and formed the Ophir Needles.

In this area the Morrison Formation has Brushy Basin Shale, a variegated red and green claystone and siltstone, a red thin blocky sandstone, a few conglomerate beds, and rare, thin limestone beds. It includes a thin top layer equivalent of the Burro Canyon Formation.

The Carbonero Mine is located on the north side of the Howard Fork valley across from Grants Peak. The mine drainage emanating from Shoofly level of the Carbonero Mine travels a distance of approximately one mile before it enters the Howard Fork. An iron bog is located along the northern bank of the Howard Fork, upstream of its confluence with the Carbonero Mine drainage. A tailings pile is located along the northern bank of the Howard Fork, approximately a third of a mile downstream from where the Carbonero Mine drainage enters the river.

Most of the veins on the north side of the valley of the Howard Fork trend within 10° of N. 65° E., or approximately east. The vein farthest north, the Carbonero vein, strikes between N. 50° E. and N. 85° E., averaging N. 75° E.; the average dip is 80° N. The vein is as much as 36 inches wide, averaging 12 inches, and consists of one to four stringers of sulfides in gangue or altered country rock. The sulfides, in the order of decreasing abundance, are pyrite, galena, sphalerite and chalcopyrite; the nonmetallic minerals are gypsum, quartz, calcite and, rarely, rhodochrosite. The next vein south, the Panama, has an average strike of about N. 55° E., and a steep dip to either the northwest or southeast. The Panama vein is considerably narrower than the Carbonero, being only 1 to 6 inches wide but consists of almost solid sulfides (sphalerite, galena, pyrite, and chalcopyrite, in order of abundance) with a sparse gangue of quartz and gypsum. Not much can be seen of the third vein in the Carbonero Mine, that at the portal, but a fault breccia cemented by limonite and containing some quartz and galena (U.S.G.S., 1959).

Landslides are common along the Illium Valley due to unstable volcanic rocks which often contain thick layers of poorly consolidated volcanic ash, the underlying and unstable Mancos Shale, valley walls over-steepened by glacial activity, and saturation of soil and underlying rocks from mountain storms and heavy snows, adding weight and reducing friction.



Three soil types are present in the area, including Cryorthents, Skisams-Cryoborolls, and the Quander family. The Cryorthents soils are a rubble land complex, generally found on mountain side slopes. They are shallow to deep, well drained, and derived from mixed sources. Skisams-Cryoborolls is a moderately deep complex found on benches and side slopes. It is shallow, well drained, and formed from limestone or sandstone derivatives. The Quander family soils are a Varden complex on mountain sides and alluvial fans. The soil is deep and well drained. It is an alluvium formed from rhyolite, tuff, and similar volcanic rocks. The water-holding capacity is moderate and the hazard of water erosion is moderate to high (Morrison Knudsen, 1994).

### 2.3.3 Hydrogeology/Hydrology

The site is located in a glacial valley east of the Illium Valley, where glaciers slowly eroded volcanic and metamorphosed rocks. The glacial valley (currently contains the Howard Fork) runs roughly east to west, while the Illium valley runs roughly north to south. The glacial valley is geologically more resistant to erosion than the Illium Valley.

The Howard Fork flows west through this valley and joins the South Fork in the Illium Valley. The South Fork flows north to join the San Miguel River (Figure 4).

Ground water is present in the alluvium which is associated with the Howard Fork and the South Fork. Depth to ground water in the alluvium ranges from 20 to 60 feet according to wells logged in the region. Ground water may also be present in joints and faults associated with the volcanic intrusion, though in limited quantity.

There are two aquifers within the valley fill material: the shallow unconfined aquifer, and a deep underlying confined aquifer.

Throughout the major portion of the valley, a 10-80 foot thick blue clay is the confining layer separating the aquifers. In the southwest portion of the valley, the blue clay is absent, and volcanic material acts as the confining layer. In parts of the valley, the potentiometric surface of the confined aquifer intersects the ground surface. The crystalline basement rock, ranging between 5,000 to 20,000 feet below the ground surface, bears essentially no water (Morrison Knudsen, 1994).

### 2.3.4 Climate

The Carbonero Mine is located in the San Juan mountains in the south western region of Colorado Rocky Mountains. Temperatures fluctuate from highs of 80°F in July to lows of 10°F in January. Average annual precipitation in the area is 16 inches and the average evaporation is 36 inches.

### **3.0 PRELIMINARY PATHWAY ANALYSIS**

#### **3.1 Waste Characteristics**

Byproducts of underground metal mining, commonly referred to as mine waste, generally fall into three categories: waste rock, generated from the extraction of ore; drainage of groundwater from mine workings; and, creation and deposition of mill tailings, i.e., remnants of crushed ore from which minerals of interest have been processed. Mine wastes may generate two major types of pollutants, including acid drainage, with corresponding high concentrations of heavy metals, and metal-laden sediments derived from erosion of waste rock and/or tailings piles. Mine drainage composition is a function of ore deposit geology, climate, and mining methods used. Factors controlling pH and dissolved metal concentration include the acid buffering capacity of the country rock and the abundance of acid-generating sulfide minerals.

Three potential sources were observed on site: a draining mine adit, its associated waste rock pile, and mine tailings located in the valley below.

Drainage from the Shoofly level of the mine was estimated to be approximately 300 gallons per minute. The cone-shaped waste rock pile measured approximately 100 feet by 50 feet on the top-surface. The outslope of the rock dump, at angle of repose of approximately 45°, measured approximately 150 feet in length, situated on a hillside approaching the same slope angle. The volume of the waste rock was calculated to be approximately 27,500 cubic yards.

The adit has been safeguarded by the Colorado Division of Minerals & Geology's Inactive Mine Reclamation Program with a grated culvert. The mine drainage flows along the toe of the waste rock dump for a distance of approximately 150 feet. Iron precipitates coat the channel along the entire distance of the flow path into the Howard Fork, with the initial 200 feet of flow exhibiting heavier orange coating, decreasing to yellow staining on the rocks in the channel below. No noticeable difference in the Howard Fork rock staining was observed between the upstream and downstream segments of the river relative to its confluence with the mine drainage.

The mine drainage has apparently caused severe erosion in the basin in which it flows. Exposed cut banks begin where the mine drainage flows into the watershed. A large fan of fractured rock has been deposited along the Carbonero Mine flow path, especially where the slope meets the valley bottom, prior to its confluence with the river.

A tailing pile, presumably resulting from the Carbonero Mill, was observed along the southern bank of the Howard Fork, approximately 1/3 of a mile below the confluence with the Carbonero drainage with the river. The tailing pile measured approximately 300 ft. by 150 ft. by 8 ft. deep, about 1 acre containing approximately 13,333 cubic yards of material.

The flume overflow/tailings spillage area measures approximately 300 ft. by 100 ft. by 2 ft. deep, adding an additional .75 acres and approximately 2,222 cubic yards of material. Thus the total areal extent of the tailings approaches 1.75 acres, and contains approximately 15,555 cubic yards of material. It is located approximately .3 miles upstream (east) of the new residential development constructed in East Ophir.

Three additional mine dumps, one associated with a draining adit (approximately 50 gallons per minute) were observed along the road ascending to the Carbonero Mine (on Iron Springs Placer, Mineral Survey Number 947). An iron-laden spring (shaft?) was observed emanating from the ground surface was located approximately 50 feet below one of the "dry" dumps. A draining mine northwest of the tailings pile (perhaps located on the Ferric Oxide Placer, M.S. Number 1661) flows into the wetlands northwest of the tailings pile, causing iron to precipitate therein.

### **3.2. Soil Exposure Pathway**

The site is not contained with respect to the soil exposure pathway. No known threatened or endangered species were observed on site. There are no residences or places of employment located on or within a 200 foot radius of the Site. Nearby residents were estimated from 1990 Census Bureau data as follows:

<u>Distance from Site</u> <u>(in miles)</u>	<u>Number of</u> <u>People</u>
onsite	0
0-1/4	0
1/4-1/2	0
1/2-1	75

There are no fences or other restrictions limiting access. Although the Shoofly level of the site is accessible by foot or by vehicle, it is a long steep hike or four-wheel drive journey.

There are no "terrestrial sensitive environments" located within the areas of potential contamination. There are no lands used for commercial agriculture, silviculture or livestock production or grazing located within the Site perimeter.

There are less than 100 people living within a 1-mile radius of the site.

### **3.3. Air Pathway**

The waste rock and tailings piles are not contained with respect to the air pathway. The piles contain fine particulate material which could become airborne. Targets within the 4-mile target radius include bald eagle habitat and campgrounds on the National Forest property, and wetlands located immediately north and west of the tailings pile. Private property and residences also occur within the 4-mile target radius.

### **3.4. Ground Water Pathway Analysis**

The sources are not contained with respect to the ground water migration pathway. The town of Ophir is located approximately .6 miles downstream of the PPE of the Carbonero Mine drainage (via surface water flow) into the Howard Fork, and approximately .3 miles downstream of the Carbonero tailings pile. The 75 residents of Ophir obtain their drinking water from a natural groundwater spring north of town (CDPHE, WQCD, 1996) (Figure 4). Water quality data of this drinking water source, maintained by the CDPHE Water Quality Control Division - Drinking Water Section, is provided in Appendix 7. Arsenic, barium, cadmium, chromium, fluoride, lead, mercury, selenium, silver and sodium were analyzed for in samples collected in 1985, 1990, 1991, 1993 and 1994; sampling conducted in 1993 and 1994 were analyzed for antimony, beryllium, cyanide, nickel, sulfate, and thallium. Samples taken from in-home taps in 1993, 1994, and 1995 were analyzed for lead and copper. In no instance did the concentration of any of the inorganic parameters measured exceed Maximum Contamination Levels (MCLs). VOCs were analyzed for in samples collected in 1991, and both regulated and unregulated Phase I/II/V Organics were analyzed for in 1995; none of these compounds were detected.

One family served by a well resides approximately 2 miles below the Carbonero site (GW-1) (Figure 4). Their well was considered the "background" well, sampled as part of the Silver Bell Site Investigation, in October, 1994 (CDPHE, 1994). Analytical results of sampling that well is presented in Appendix 7. The concentration of the inorganic parameters measured did not exceed Maximum Contamination Levels (MCLs). There are no drinking water benchmarks established for aluminum, cobalt, copper, iron, lead, silver and sodium, vanadium or zinc.

Given the lack of any groundwater containment system at the site, the disposal methods used at the site, and the proximity of the water-bearing alluvium of the Howard Fork, contaminants could migrate into groundwater at this site.

Ground water use within the 4-mile target distance limit was estimated as follows from well logs and 1990 Census Bureau data for people/household in San Miguel County:

<u>Distance from Site (miles)</u>	<u>Number of People Served</u>
0 - ¼	0
¼ - ½	0
½ - 1	75
1 - 2	4
2 - 3	4
3 - 4	29

### 3.5. Surface Water Pathway Analysis

The sources are not contained with respect to the surface water pathway. Drainage from the mine flows along, thereby eroding the toe of the adjacent waste rock pile, then directly into the Howard Fork. The Howard Fork then flows immediately south of the tailings pile. Erosion channels were observed on the surface and sides of the tailings pile. A perennial drainage from the wetland north of the pile was observed flowing over the tailings pile surface, transporting tailings directly into the Howard Fork (Appendix 5).

The San Miguel River corridor is one of the few unobstructed riverine systems left in the West, and many conservation agencies are trying to preserve its "natural" condition. Nine vegetative communities have been identified within the riparian zone along the San Miguel River. There are wetlands located intermittently along the San Miguel River corridor in the 15-mile downstream segment below the site.

The Carbonero Mine does not have a permit from the Water Quality Control Division of CDPHE to discharge into the Howard Fork (CDPHE, WQCD, 1996).

The 15-mile target distance limit follows the Howard Fork for a distance of 3 miles, then along the South Fork for a distance of 8 miles, then along the San Miguel River for approximately 4 miles, to a location approximately 1 mile east of Sawpit, Colorado (Figure 4). Both the San Miguel River and South Fork are fisheries. Sensitive environments within this segment include bald eagle and the river otter habitats, and The Nature Conservancy's San Miguel River Preserve, located approximately 3 miles downstream of the site. In addition, there are numerous campsites along the South Fork on National Forest property. Although not considered a sensitive environment, the active hydropower plant at Ames, approximately 3.5 miles downstream, is designated as a historic site. Willows and riparian habitats were observed immediately north and west of the tailings pile, and along the South Fork. Beaver ponds are located immediately west of the tailings pile.

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The Colorado Division of Minerals and Geology (DMG), in cooperation with the Colorado Department of Public Health and Environment, Water Quality Control Division, Non-Point Source Program (NPS), conducted high and low flow sampling events concentrated in the upper Howard Fork Basin, in June, 1994 and November of 1993, respectively. DMG collected aqueous samples which were analyzed for total and dissolved cadmium, copper, iron, lead, manganese and zinc at nineteen locations along the Howard Fork, its tributaries, as well as at eleven mine adits, including the Carbonero Mine and the two draining adits along the Carbonero access road. Various mine tailings, including the Carbonero mill tailings, were bracketed by the sampling site locations.

Results from the June, 1994 NPS sampling of the Howard Fork below the Carbonero Mine drainage indicate elevated concentrations (i.e., concentrations 3x greater than the sample upstream of the probable point of entry (PPE) of total and dissolved cadmium, total iron, total manganese and total and dissolved zinc. Lead was measured above detection below the Carbonero Mine drainage PPE into the Howard Fork, whereas it was not detected at the sampling location upstream of the PPE. Low-flow analyses indicated that the Howard Fork below the PPE of the Carbonero Mine drainage was similar in concentrations to the immediate upstream sampling location for all metals analyzed. Metals concentrations in the Howard Fork downstream of the Carbonero tailings did not show any significant difference from the upstream sample location except for total lead during low flow analyses. A copy of the results are included in Appendix 7.

Comparison to the Superfund Chemical Data Matrix (SCDM) indicates that during low-flow, aquatic life benchmark concentrations were exceeded for: copper at all stations; zinc below the Carbonero drainage PPE; cadmium, lead and zinc below the Carbonero tailings PPE into the Howard Fork, as well as iron (seemingly from the iron spring draining adits). High flow analyses indicated that SCDMs freshwater aquatic life benchmarks were exceeded for: zinc at all stations; copper below the Carbonero PPE; and cadmium below the Carbonero tailings PPE (seemingly from the Iron Springs adits) (EPA, 1994).

#### 4.0 SUMMARY

The Carbonero Mine operated from 1907 until approximately 1941; its associated mill was operating until 1931, after which time ore was transported to and milled at the Silver Bell Mill, located at the Ophir Loop. Gold, silver, copper lead and zinc were extracted. The Shoofly level of the Carbonero Mine continues to drain approximately 300 gallons per minute of mineralized water; the mine drainage flows into the Howard Fork approximately 1 mile south of the adit. The tailings pile is located immediately north of the Howard Fork, occupying an area of approximately 1.75 acres, containing approximately 15,555 cubic yards of material.

There are no people living, working or attending schools within 200 feet of the site. The risk posed to human health and the environment by the on-site and air pathways is considered minimal, if any.

Heavy metals inherent in the mine drainage, waste rock and tailings at the site are likely to have been released to the shallow unconfined aquifer. As determined from analyses resulting from the October, 1994 Silver Bell Site Investigation, concentrations of parameters measured in the well closest to the site (2 miles downstream) did not exceed drinking water standards. Sampling conducted in the Ophir drinking water source, obtained from a natural groundwater spring north of town from 1985 through 1995, indicated that MCLs were not exceeded for any parameter analyzed. P65

The sources are not contained with respect to the surface water pathway. Drainage from the mine flows along, thereby eroding the toe of the adjacent waste rock pile, then directly into the Howard Fork. The Howard Fork then flows immediately adjacent to the tailings pile. Erosion channels on the surface and sides of the tailings pile indicate tailings transport into the Howard Fork. Drainage from the wetlands north of the tailings was observed flowing over the tailings and transporting tailings directly into the Howard Fork.

The 15-mile target distance limit follows the Howard Fork, then along the South Fork, then along the San Miguel River to a location approximately 1 mile east of Sawpit, Colorado. Both the San Miguel River and South Fork are fisheries. Sensitive environments within this segment include bald eagle and the river otter habitats, and The Nature Conservancy's San Miguel River Preserve. In addition, there are numerous campsites along the South Fork on National Forest property. Although not considered a sensitive environment, the active hydropower plant at Ames is designated as a historic site. Willows and riparian habitats were observed immediately north and west of the tailings pile, and along the South Fork.

Results of aqueous sampling by the DMG NPS program at high-flow (June, 1994) in the Howard Fork below the Carbonero Mine drainage indicate elevated concentrations, i.e., concentrations 3x greater than the sample upstream of the probable point of entry (PPE) of total and dissolved cadmium, total iron, total manganese and total and dissolved zinc. Lead was measured above detection below the Carbonero Mine drainage PPE into the Howard Fork, whereas it was not detected at the sampling location upstream of the PPE. Low-flow analyses of water only (November, 1993) indicated that the Howard Fork below the PPE of the Carbonero Mine drainage was similar in concentrations to the immediate upstream sampling location for all metals analyzed. Metals concentrations in the Howard Fork downstream of the Carbonero tailings did not show any significant difference from the upstream sample location except for total lead during low flow analyses. A copy of the results are included in Appendix 7.

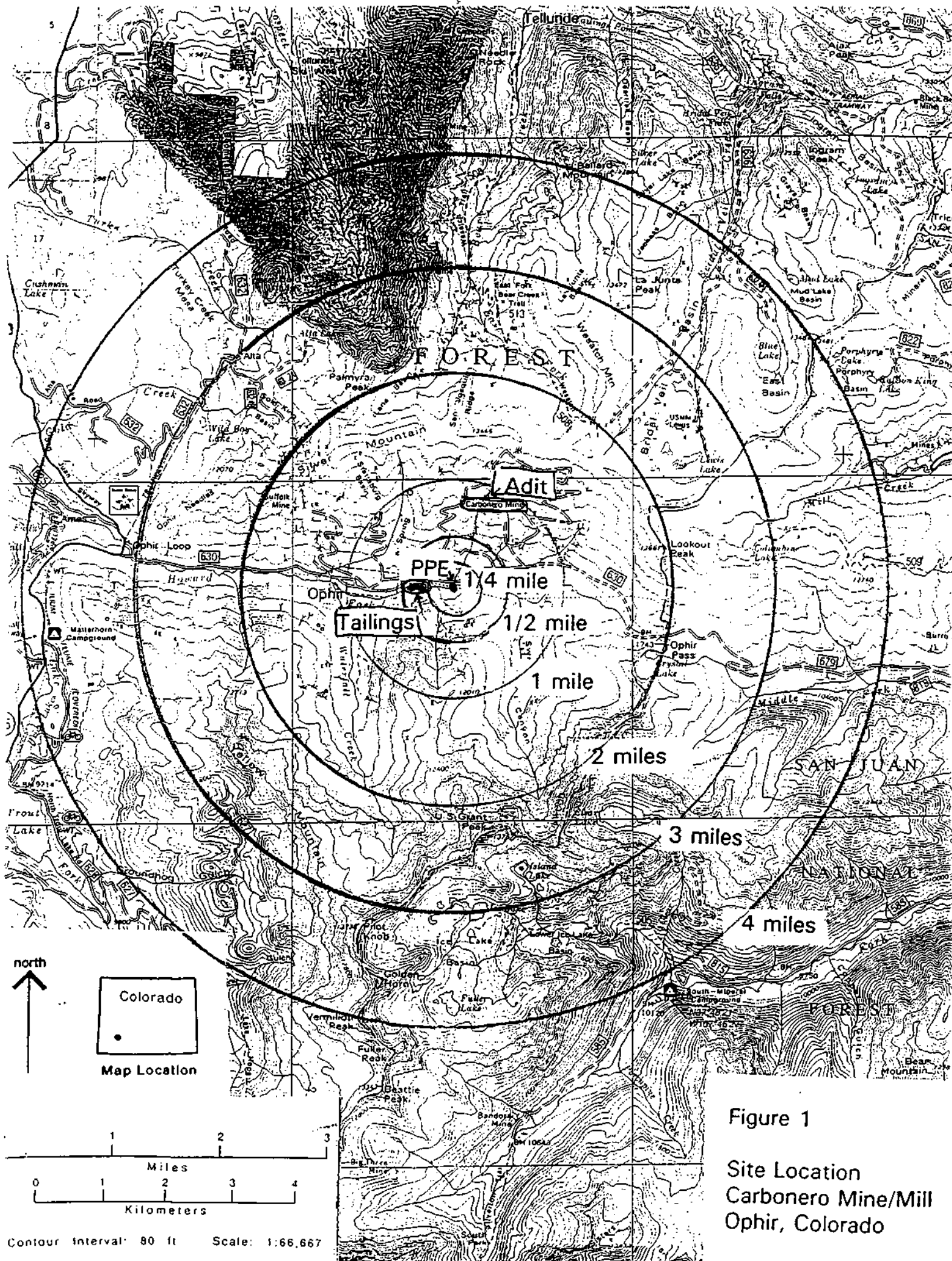
Comparison to the Superfund Chemical Data Matrix (SCDM) indicates that during low flow sampling, aquatic life benchmark concentrations were exceeded for: copper at all stations; zinc below the Carbonero drainage PPE; cadmium, lead and zinc below the Carbonero tailings PPE into the Howard Fork, as well as iron (seemingly from the iron spring draining adits). High flow analyses indicated that SCDMs freshwater aquatic life benchmarks were exceeded for: zinc at all stations; copper below the Carbonero PPE; and cadmium below the Carbonero tailings PPE (seemingly from the Iron Springs adits) (EPA, 1993).

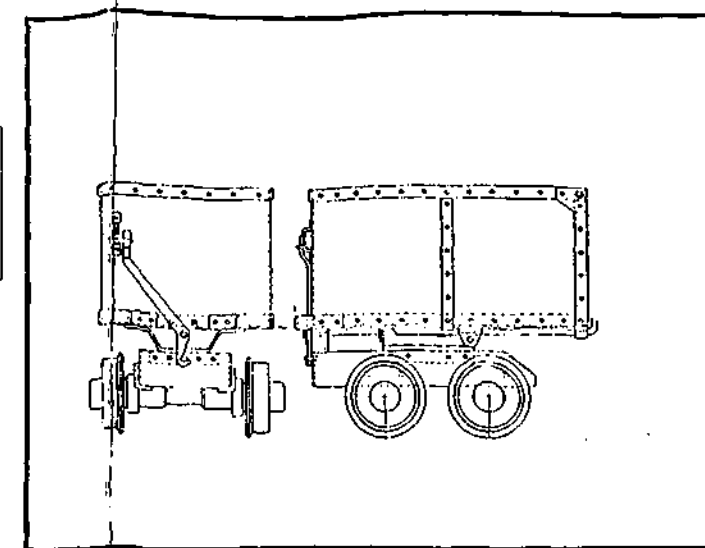
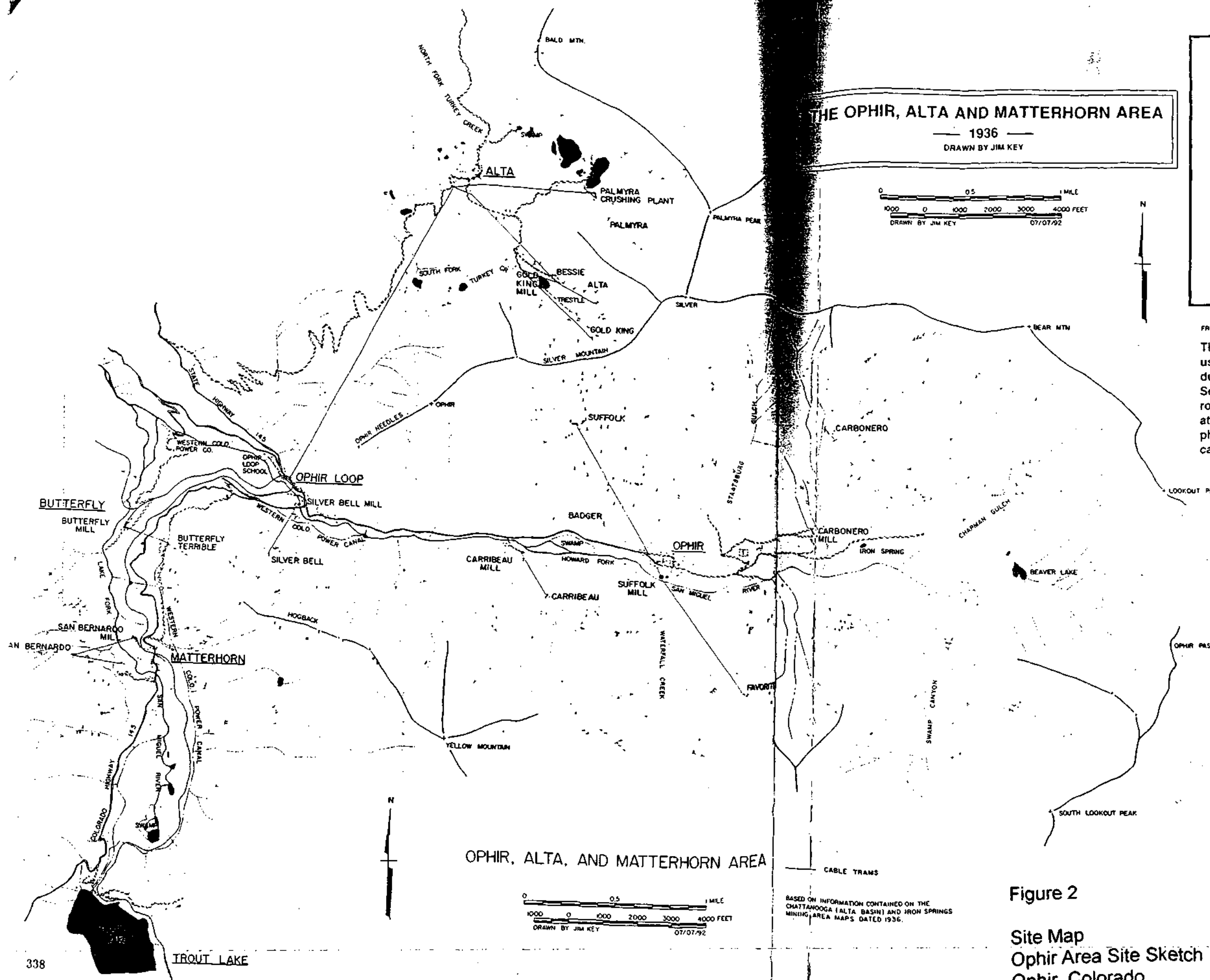


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## FIGURES





FROM THE "HANDBOOK FOR PROSPECTORS" - WILLIAM A. GRAVES COLLECTION

THIS MINE CAR was probably the best car of its type for use in mine tunnels. It is a four-wheel car with a rotary dumping mechanism, and it has a 1,600-pound capacity. Several improvements were made over the years, such as roller bearings for the axles and an automatic dumping attachment, which opens the end gate. The drawing and photograph on this page shows one of these cars, also called a "truck" or a "mine tram car."



WILLIAM A. GRAVES PHOTO

Figure 2

Site Map  
Ophir Area Site Sketch  
Ophir, Colorado



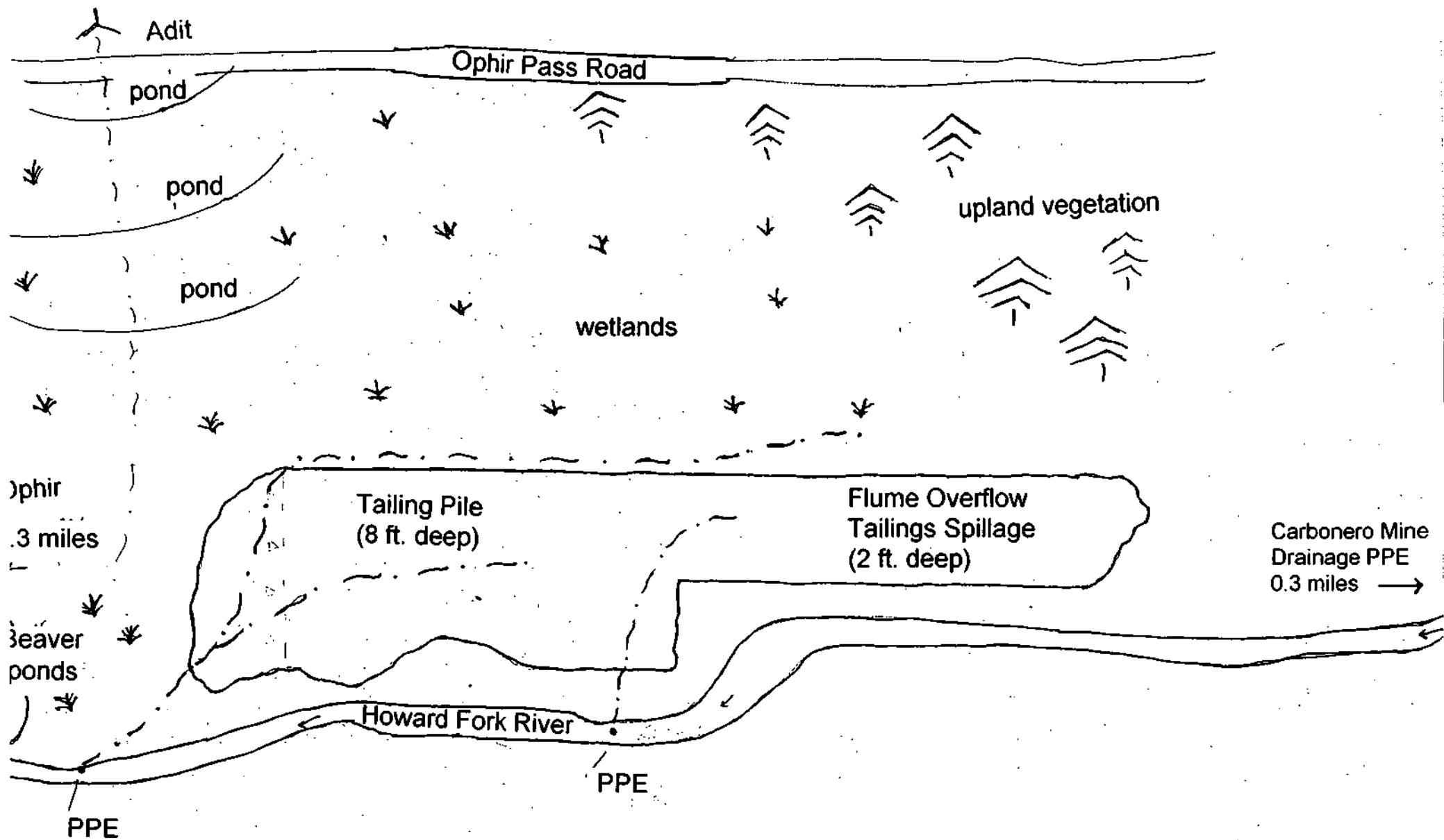
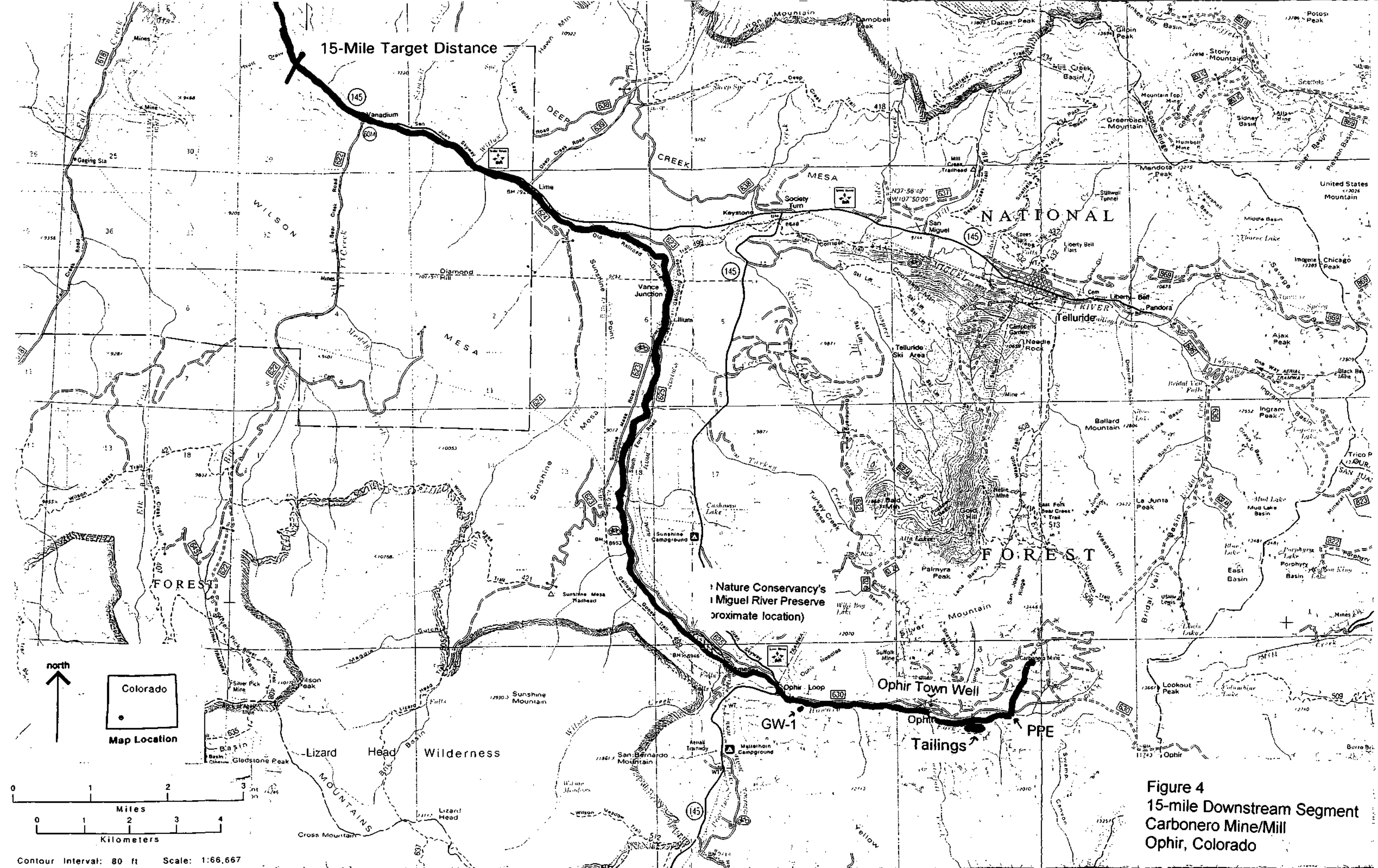


Figure 3b

Site Sketch Map  
Carbonero Tailings  
Ophir, Colorado



## APPENDIX 1

### EPA PRELIMINARY ASSESSMENT FORM



<b>Potential Hazardous Waste Site Preliminary Assessment Form</b>		<b>Identification</b>	
		State: <u>CO</u>	CERCLIS Number: <u>CO00001316360</u>
		CERCLIS Discovery Date:	
<b>1. General Site Information</b>			
Name: <u>Carbonero Mine</u>		Street Address:	
City: <u>Ophir</u>	State: <u>CO</u>	Zip Code: <u>81426</u>	County: <u>San Miguel</u>
Latitude: <u>37° 46' 4.38" N</u>	Longitude: <u>107° 48' 32.15" W</u>	Approximate Area of Site: <u>1.75</u> Acres <u>76,230</u> Square Ft	Status of Site: <input type="checkbox"/> Active <input type="checkbox"/> Not Specified <input checked="" type="checkbox"/> Inactive <input type="checkbox"/> NA (GW plume, etc.)
<b>2. Owner/Operator Information</b>			
Owner: <u>Glenn Kauls (North Star; MS# 20327)</u>		Operator: <u>N/A - Inactive</u>	
Street Address: <u>Star Route 1, Silver Fork</u>		Street Address:	
City: <u>Brighton</u>	City:		
State: <u>UT</u>	Zip Code: <u>84121</u>	Telephone: <u>(801) 645-8511</u>	
Type of Ownership: <input checked="" type="checkbox"/> Private <input type="checkbox"/> Federal Agency Name: _____ <input type="checkbox"/> State <input type="checkbox"/> Indian		How Initially Identified: <input type="checkbox"/> Citizen Complaint <input type="checkbox"/> PA Petition <input type="checkbox"/> State/Local Program <input type="checkbox"/> RCRA/CERCLA Notification	
		<input type="checkbox"/> County <input type="checkbox"/> Municipal <input type="checkbox"/> Not Specified <input type="checkbox"/> Other _____	
		<input type="checkbox"/> Federal Program <input type="checkbox"/> Incidental <input type="checkbox"/> Not Specified <input type="checkbox"/> Other _____	
<b>3. Site Evaluator Information</b>			
Name of Evaluator: <u>Camille Farrell</u>		Agency/Organization: <u>CDPHE</u>	
Date Prepared: <u>10/18/96</u>			
Street Address: <u>P.O. Box 2927</u>		City: <u>Telluride</u>	State: <u>CO</u>
Name of EPA or State Agency Contact: <u>Pat Smith</u>		Street Address: <u>994 18th St.; 8-EPR-SA</u>	
City: <u>Denver</u>	State: <u>CO</u>	Telephone: <u>(303) 312 6082</u>	
<b>4. Site Disposition (for EPA use only)</b>			
Emergency Response/Removal Assessment Recommendation: <input type="checkbox"/> Yes <input type="checkbox"/> No Date: _____		CERCLIS Recommendation: <input type="checkbox"/> Higher Priority SI <input type="checkbox"/> Lower Priority SI <input type="checkbox"/> NFRAP <input type="checkbox"/> RCRA <input type="checkbox"/> Other _____ Date: _____	
Signature: _____ Name (typed): _____ Position: _____			



Potential Hazardous Waste Site  
Preliminary Assessment Form - Page 2 of 4

CERCLIS Number:

### 5. General Site Characteristics

Prevalent Land Uses Within 1 Mile of Site (check all that apply):

- ☐ Industrial ☐ Agriculture ☐ DOI  
☐ Commercial ☒ Mining ☐ Other Federal Facility  
☒ Residential ☐ DOD  
☒ Forest/Fields ☐ DOE ☐ Other \_\_\_\_\_

Site Setting:

- ☐ Urban  
☐ Suburban  
☒ Rural

Years of Operation:

Beginning Year 1967

Ending Year 1941

☐ Unknown

Type of Site Operations (check all that apply):

☐ Manufacturing (must check subcategory)

- ☐ Lumber and Wood Products  
☐ Inorganic Chemicals  
☐ Plastic and/or Rubber Products  
☐ Paints, Varnishes  
☐ Industrial Organic Chemicals  
☐ Agricultural Chemicals  
(e.g., pesticides, fertilizers)  
☐ Miscellaneous Chemical Products  
(e.g., adhesives, explosives, ink)  
☐ Primary Metals  
☐ Metal Coating, Plating, Engraving  
☐ Metal Forging, Stamping  
☐ Fabricated Structural Metal Products  
☐ Electronic Equipment  
☐ Other Manufacturing  
☒ Mining  
☒ Metals  
☐ Coal  
☐ Oil and Gas  
☐ Non-metallic Minerals

☐ Retail

- ☐ Recycling  
☐ Junk/Salvage Yard  
☐ Municipal Landfill  
☐ Other Landfill \_\_\_\_\_  
☐ DOD  
☐ DOE  
☐ DOI  
☐ Other Federal Facility \_\_\_\_\_  
☐ RCRA

☐ Treatment, Storage, or Disposal

☐ Large Quantity Generator

☐ Small Quantity Generator

☐ Subtitle D

☐ Municipal

☐ Industrial

☐ "Converter"

☐ "Protective Filter"

☐ "Non- or Late Filter"

☐ Not Specified

☐ Other \_\_\_\_\_

Waste Generated:

- ☐ Onsite  
☐ Offsite  
☒ Onsite and Offsite

Waste Deposition Authorized By:

- ☐ Present Owner  
☐ Former Owner  
☐ Present & Former Owner  
☐ Unauthorized  
☒ Unknown

Waste Accessible to the Public:

- ☒ Yes  
☐ No

Distance to Nearest Dwelling,  
School, or Workplace:

1320 Feet

### 6. Waste Characteristics Information

Source Type:  
(check all that apply)

- ☐ Landfill  
☐ Surface Impoundment  
☐ Drums  
☐ Tanks and Non-Drum Containers  
☐ Chemical Waste Pile  
☐ Scrap Metal or Junk Pile  
☒ Tailings Pile  
☐ Trash Pile (open dump)  
☐ Land Treatment  
☐ Contaminated Ground Water Plume  
(unidentified source)  
☐ Contaminated Surface Water/Sediment  
(unidentified source)  
☐ Contaminated Soil  
☒ Other mine waste  
☐ No Sources

Source Waste Quantity:  
(include units)

15,555 yd<sup>3</sup>

27,500 yd<sup>3</sup>

Tier \*

V

V

General Types of Waste (check all that apply)

- ☒ Metals ☐ Pesticides/Herbicides  
☐ Organics ☐ Acids/Bases  
☐ Inorganics ☐ Oily Waste  
☐ Solvents ☐ Municipal Waste  
☐ Paints/Pigments ☒ Mining Waste  
☐ Laboratory/Hospital Waste ☐ Explosives  
☐ Radioactive Waste ☐ Other \_\_\_\_\_  
☐ Construction/Demolition Waste

Physical State of Waste as Deposited (check all that apply):

- ☒ Solid ☐ Sludge ☐ Powder  
☐ Liquid ☐ Gas

\* C = Constituent, W = Wastestream, V = Volume, A = Area

## APPENDIX 2

### CERCLA ELIGIBILITY WORKSHEET

### CERCLA Eligibility Worksheet

Site Name Carbonero Mine

City Ophir State Colorado

EPA ID Number \_\_\_\_\_

Note: The site is automatically CERCLA eligible if it is a Federally owned or operated RCRA site.

#### I. CERCLA Eligibility

Did the facility cease operations prior to November 19, 1980? Yes

If YES, then STOP. The facility is probably a CERCLA site.

If NO, continue to Part II.

#### II. RCRA Deferral Factors

Did the facility file a RCRA Part A application? \_\_\_\_\_

If YES:

1. Does the facility currently have interim status? \_\_\_\_\_
2. Did the facility withdraw its Part A application? \_\_\_\_\_
3. Is the facility a known or possible protective filer? \_\_\_\_\_  
(filed in error)
4. Does the facility have a RCRA operating or post-closure permit? \_\_\_\_\_
5. Is the facility a late (after 11/19/80) or non-filer that has been identified by the EPA or the State? (facility did not know it needed to file under RCRA). \_\_\_\_\_

**PA GUIDANCE  
EPA Region VIII  
August 1993**

**Type of facility:**

Generator \_\_\_\_ Transporter \_\_\_\_ Recycler \_\_\_\_  
TSD (Treatment/Storage/Disposal) \_\_\_\_

**If all answers to questions 1, 2, and 3 are NO, STOP. The facility is a CERCLA eligible site.**

**If answer to #2 or #3 is YES, STOP. The facility is a CERCLA eligible site.**

**If answer to #2 and #3 are NO and any other answer is YES, site is RCRA, continue to Part III.**

**III. RCRA Sites Eligible for the NPL**

**Has the facility owner filed for bankruptcy under Federal or State laws? \_\_\_\_\_**

**Has the facility lost RCRA authorization to operate or shown probable unwillingness to carry out corrective action? \_\_\_\_\_**

**Is the facility a TSD that converted to a generator, transporter or recycler facility after November 19, 1980? \_\_\_\_\_**

**IV. Exempted substances:**

**Does the release involve hazardous substances other than petroleum? \_\_\_\_\_**

**PA Guidance  
EPA Region VIII  
August 1993**

**V. Other programs:** The site may never reach the NPL or be a candidate for removal. We need to be able to refer it to any other programs in EPA or state agencies which may have jurisdiction, and thus be able to effect a cleanup. Responses should summarize available information pertaining to the question. Include information in existing files in these programs as part of the PA. Answer all that apply.

**Is there an owner or operator?**

Yes. The Shoofly level of the Carbonero mine is located on the Full Mood Lode, MS# 2037, owned by Glenn Pauls, of Brighton, Utah. The mill tailings are located on either the Ferric Oxide Placer, MS# 1661, owned by Randy Belisle, or on an unpatented claim within the Uncompahgre National Forest.

**NPDES-CWA: Is there a discharge water containing pollutants with surface water through a point source (pipe, ditch, channel, conduit, etc.)?**

Yes, mine drainage from the Shoofly level of the Carbonero Mine.

**CWA (404): Have fill or dredged material been deposited in a wetland or on the banks of a stream? Is there evidence of heavy equipment operating in ponds, streams or wetlands?**

Yes, tailings deposited on the valley floor. There is currently no equipment on site.

**UIC-SDWA: Are fluids being disposed of to the subsurface through a well, cesspool, septic system, pit, etc.?**

No.

**TSCA: Is it suspected that there are PCB's on the site which came from a source with greater than 50 ppm PCB's such as oil from electrical transformers or capacitors?**

No.

**FIFRA: Is there a suspected release of pesticides from a pesticide storage site? Are there pesticide containers on site?**

No.

**PA Guidance  
EPA Region VIII  
August 1993**

**RCRA (D) Is there an owner or operator who is obligated to manage solid waste storage or disposal units under State solid waste or ground water protection regulations?**

**No.**

**UST: Is it suspected that there is a leaking underground storage tank containing a product which is a hazardous substance or petroleum?**

**No.**

## Appendix 3

### PA WORKSHEET

Site Name Carbonero Mine City, State Ophir, Colorado

CERCLIS # \_\_\_\_\_

Reported by Camille Farrell, CO Dept. of Public Health & Environment Date: December 20, 1996  
Revised Date: December 16, 1997



## HIGHLIGHTS

- A.) IS THERE QUALITATIVE OR QUANTITATIVE EVIDENCE OF A RELEASE TO AIR, SURFACE WATER, GROUND WATER, OR SURFACE SOIL? DESCRIBE BRIEFLY.  
More detail in items GW-1 (for GW), SW-5 (for SW), A-1 (for air), and SE-1 (for soil exposure pathway).

Yes. The draining "Shoofly" adit of the Carbonero mine flows directly into the Howard Fork River. The Carbonero tailings, located immediately north of the Howard Fork, was observed to have overland flow transporting entrained tailings materials into the river. Additionally, the tailings are located in a wetland, likely affecting the ground water. Sampling conducted by the Division of Minerals and Geology in 1993 and 1994 indicated elevated concentrations of metals in surface water below the PPE of the draining adit during high flow and the PPE of overland flow across the tailings pile into the Howard Fork for lead only during low flow. Analyses of an artesian spring used by the town of Ophir, located approximately 0.6 miles below the site, indicate that metals analyzed all met drinking water standards; Organic parameters analyzed for were not detected.

- B.) IS THERE EVIDENCE OF AN IMPACTED TARGET POPULATION? DESCRIBE.

PATHWAY	TARGET	none/target size	BRIEF DESCRIPTION	MORE DISCUSSION IN
Ground Water	public drinking water supply	<del>75 people</del> Ø	Ophir town well tested below MCLs and/or detection limits.	text; see page 8.
	domestic drinking water supply	<del>4 people</del> Ø	Nearest well tested below MCLs and/or detection limits.	text, page 8.
Surface Water	drinking water	N/A		
	fishery	<del>yes</del> ?	Moderate fishery from 3 to 9 miles downstream in the S. Fork of the San Miguel River and good fishery from 9 to 15 miles downstream in the mainstem of the San Miguel River	Water quality sampled by the DMG NPS program; see page 10.
	sens. env.	<del>intermittent wetlands</del>	wetlands intermittent in 15-mi. downstream segment	
Soil Exposure	people w/in 200'	no		
	terrestrial sens. env.	no		
Air	population	no		

text did not support  
identification of Level I or II affected  
receptors. under the HRS. RBS

## **SITE INFORMATION**

### **G-1. Directions to the site (from nearest easily recognized point.)**

The tailings are located approximately .3 miles east of East Ophir, in the valley bottom, immediately north of the Howard Fork. The Shoofly level of the Carbonero Mine site is located approximately one mile northeast of East Ophir. The site can be accessed by turning east from Highway 145 to the road to Ophir. Ophir is located approximately 3 miles up this road. The tailings can be seen from East Ophir and are accessible by hiking through wetlands. To access the Shoofly level, continue on the Ophir Pass Road approximately .75 miles past East Ophir, turn north (left) onto a two-track, four-wheel-drive (4WD) road, located east of the iron bog. The 4WD road switches back for approximately one mile, up the south facing slope to the Carbonero Mine. (Figures 1 and 4).

### **G-2. Are there other potential sources in the neighborhood to be aware of as the site is evaluated? e.g., Is the site in an industrial area, near a railroad, along a highway? Are sources with similar contaminants to this site in the vicinity?**

Yes. The area around Ophir is known as the Ophir Mining district. There are other draining mines and associated waste rock piles both upstream and downstream of Ophir, and additional mill tailings downstream of Ophir. A watershed based Site Investigation would provide a more descriptive characterization of the site and potential impacts than numerous individual Site Investigations.

## **Background/Operating History**

### **G-3. Describe the operating history of the site.**

The town of Ophir was developed in 1878, by 17 prospectors exploring the region with Lt. Howard, after whom the Howard Fork of the San Miguel river was named. Ore from the mines around Ophir, producing gold, silver, lead zinc and tungsten, were shipped by burro-train over Ophir Pass to the Silverton Smelter. In 1882, a small smelter was built in Ames, 3 miles down valley, which was not successful and soon closed down. It was noted that in 1898, two cars of concentrates were shipped daily, year round. (Wolle, 1949).

The Shoofly level of the Carbonero Mine is located on the Full Moon Lode, Mineral Survey Number 20327, ownership having been recently transferred (July, 1996) from Fleet Resources to Glenn Pauls of Brighton, Utah (Hotchkiss Map Makers, 1935; San Miguel County Clerks Office, 1996).

The Carbonero Mine produced a total of 101,662 tons of ore containing a average of 0.24 ounce gold, 8.7 ounce silver, 6.99 percent lead, 4.7 percent zinc, and 0.16 percent copper, between 1907 and 1941 (U.S.G.S., 1959). Silver-lead mining at the Carbonero increased for about five years during the late 1920's, but falling metal prices forced the mine to shut down in 1931 (Collman, et. al., 1993).

The Carbonero had its own processing mill (North Star Millsite M.S. No. 20302, owned by Glenn Pauls) until 1931 when the mine shut down. The 50 ton per day mill used the froth-flotation process served by a two bucket aerial tramway from the Shoofly portal.

Small amounts of ore were extracted between 1934 and 1936. The last on and off cycle at the mine began in 1951 when the Silver Bell Mining Company purchased the mine and demolished the old mill and aerial tram. Ore was then hauled down the road to the Silver Bell Mine, at the Ophir Loop. All operations ceased at the Carbonero in 1954 (Collman, et. al., 1993). Appendix 8 presents more detail regarding the history of the Carbonero Mine.

The mill tailings are located approximately .3 miles downstream of the mill site, on either the Ferric Oxide Placer, M.S. 1661, owned by Randolph Belisle, or on an unpatented claim within the Uncompahgre National Forest (Hotchkiss Map Makers, 1935; San Miguel County Assessors Plats, 1996).

**Source of information:**

Collman, Russ, McCoy, Dell A., and Graves, William A., 1993. *The R.G.S. Story - Rio Grande Southern - Volume III: Over the Bridges...Vance Junction to Ophir*. Sundance Publications Limited, Denver, Colorado.

Hotchkiss Map Makers, 1935. *Map of the San Juan Triangle*.

San Miguel County Clerks Office, 1996. Land ownership records.

Wolle, Muriel Vincent, 1949. *Stampede to Timberline*. Porter Lithographing Company, Denver, Colorado.

**G-4. Describe site and nature of operations (property size, manufacturing, waste disposal, storage etc.):**

The Carbonero Mine operated from 1907 until approximately 1941; its associated mill was operating until 1931, after which time ore was transported to and milled at the Silver Bell Mill, located at the Ophir Loop. Gold, silver, copper lead and zinc were extracted. The Shoo-fly level of the Carbonero Mine continues to drain approximately 300 gallons per minute of mineralized water; the mine drainage flows into the Howard Fork approximately 1 mile south of the adit. The tailings pile is located immediately north of the Howard Fork, occupying an area of approximately 1.75 acres, containing approximately 15,555 cubic yards of material.

**Source of information:**

Collman, Russ, McCoy, Dell A., and Graves, William A., 1993. *The R.G.S. Story - Rio Grande Southern - Volume III: Over the Bridges...Vance Junction to Ophir*. Sundance Publications Limited, Denver, Colorado.

**G-5. Describe any emergency or remedial actions that have occurred at the site:**

N/A

**Source of information:**

**G-6. Are there records or knowledge of accidents or spills involving site wastes? Are there Emergency Response Notification (ERNs) reports for this location?**

No

**Source of information:**

**G-7. Describe existing sampling data and briefly summarize data quality (e.g. sample objective, age/comparability, analytical methods, detection limits, QA/QC validity):**

The Colorado Division of Minerals and Geology (DMG), in cooperation with the Colorado Department of Public Health and Environment, Water Quality Control Division, Non-Point Source Program (NPS), conducted high and low flow sampling events concentrated in the upper Howard Fork Basin, in June, 1994 and November of 1993, respectively. DMG collected aqueous samples which were analyzed for total and dissolved cadmium, copper, iron, lead, manganese and zinc at nineteen locations along the Howard Fork, its tributaries, as well as at eleven mine adits, including the Carbonero Mine and the two draining adits along the Carbonero access road. Various mine tailings, including the Carbonero mill tailings, were bracketed by the sampling site locations.

Results from the June, 1994 NPS sampling of the Howard Fork below the Carbonero Mine drainage indicate elevated concentrations (i.e., concentrations 3x greater than the sample upstream of the probable point of entry (PPE)) of total and dissolved cadmium, total iron, total manganese and total and dissolved zinc. Lead was measured above detection below the Carbonero Mine drainage PPE into the Howard Fork, whereas it was not detected at the sampling location upstream of the PPE. Low-flow analyses indicated that the Howard Fork below the PPE of the Carbonero Mine drainage was similar in concentrations to the immediate upstream sampling location for all metals analyzed. Metals concentrations in the Howard Fork downstream of the Carbonero tailings did not show any significant difference from the upstream sample location except for total lead during low flow analyses. A copy of the results are included in Appendix 7.

Comparison to the Superfund Chemical Data Matrix (SCDM) indicates that during low-flow, aquatic life benchmark concentrations were exceeded for: copper at all stations; zinc below the Carbonero drainage PPE; cadmium, lead and zinc below the Carbonero tailings PPE into the Howard Fork, as well as iron (seemingly from the iron spring draining adits). High flow analyses indicated that SCDMs freshwater aquatic life benchmarks were exceeded for: zinc at all stations; copper below the Carbonero PPE; and cadmium below the Carbonero tailings PPE (seemingly from the Iron Springs adits) (EPA, 1994).

The sources are not contained with respect to the ground water migration pathway. The town of Ophir is located approximately .6 miles downstream of the PPE of the Carbonero Mine drainage (via surface water flow) into the Howard Fork, and approximately .3 miles downstream of the Carbonero tailings pile. The 75 residents of Ophir obtain their drinking water from a natural groundwater spring north of town (CDPHE, WQCD, 1996). Water quality data of this drinking water source, maintained by the CDPHE Water Quality Control Division - Drinking Water Section, is provided in Appendix 7. Arsenic, barium, cadmium, chromium, fluoride, lead, mercury, selenium, silver and sodium were analyzed for in samples collected in 1985, 1990, 1991, 1993 and 1994; samples collected in 1993 and 1994 were analyzed for antimony, beryllium, cyanide, nickel, sulfate, and thallium. Samples taken from in-home taps in 1993, 1994, and 1995 were analyzed for lead and copper. In no instance did the concentration of any of the inorganic parameters measured exceed Maximum Contamination Levels (MCLs). VOCs were analyzed for in samples collected in 1991, and both regulated and unregulated Phase I/II/IV Organics were analyzed for in 1995; none of these compounds were detected.

One family served by a well resides approximately 2 miles below the Carbonero site (GW-1). Their well was considered the "background" well, sampled as part of the Silver Bell Site Investigation, in October, 1994 (CDPHE, 1994). Analytical results of sampling that well is presented in Appendix 7. The concentration of the inorganic parameters measured did not exceed Maximum Contamination Levels (MCLs). There are no drinking water benchmarks established for aluminum, cobalt, copper, iron, lead, silver and sodium, vanadium or zinc.

Given the lack of any groundwater containment system at the site, the disposal methods used at the site, and the proximity of the water-bearing alluvium of the Howard Fork, contaminants could migrate into groundwater at this site.

**Source of information:**

See page 8 of the text.

**G-8. Is there any other local, state, or federal regulatory involvement? Describe. Include permits, and names of contact individuals within each government organization.**

AGENCY	PROGRAM	CONTACT	PHONE	PERMIT
DMG	NPS Program	Jim Herron	(303) 866-3567	NA
DMG	Inactive Mine Program	Dave Bucknam	(303) 866-3567	NA

**G-9. Attach site sketch or schematic. Include all pertinent features including wells, storage areas, underground storage tanks, source areas**

See Figures 1-3 of the PA.

#### **SOURCE CHARACTERIZATION**

**WC-1. Describe each source at the site, on Table 1, in terms of source type, containment, size/area/volume/quantity, and substances present. See HRS Tables 2-5 and 5-2 for source descriptions, Tables 3-2, 4-2, 4-8, 5-6, 6-3, and 6-9 for containment.**

See Table 1 of Worksheet.

**WC-2. Briefly describe how waste quantity was estimated (eg. historical records or manifests, permit applications, air photo measurements, etc.):**

Site visit: paced perimeter of piles, estimated depth and calculated volumes.

**Source of information:**

**WC-3. Describe any restrictions or barriers to accessibility of onsite sources.**

None.

**Source of information:**

## **GROUND WATER CHARACTERISTICS**

**GW-1. Any positive or circumstantial evidence of a release to ground water? Describe.**

Tailings are located in a wetland. It would appear that any leaching through the tailings would drain directly into the groundwater table, which is at the ground surface.

**Source of information:**

**GW-2. Any positive or circumstantial evidence of a release to drinking water users? Describe analytes, detection limits, background, hits, number of users, locations, QA/QC.**

Data reported under the SWDA indicates nothing greater than the MCL's in the Ophir Drinking water source, a spring located about 0.3 miles downstream of the tailings pile, and approximately 0.6 miles downstream of the mine drainage PPE into the Howard Fork. Data collected as part of the Silverbell Site Investigation also reported nothing greater than the MCLs in a nearby domestic well, located approximately 2 miles downstream of the site.

**Source of information:** Text page 8.

**GW-3. Briefly describe the geologic setting.**

Ophir is located within the Howards Fork Basin, a relatively small watershed encompassing an area of approximately 15 square miles, as outlined in yellow on Figure 1.

The Ophir stock is a massive igneous formation and is the prominent geologic feature in the area. The Ophir stock is a granite-like rock which contains feldspar, quartz, hornblende, and mica. This stock is overlain by sedimentary and volcanic rocks, which were uplifted, tipped, and formed the Ophir Needles.

In this area the Morrison Formation has Brushy Basin Shale, a variegated red and green claystone and siltstone, a red thin blocky sandstone, a few conglomerate beds, and rare, thin limestone beds. It includes a thin top layer equivalent of the Burro Canyon Formation.

Three soil types are present in the area, including Cryorthents, Skisams-Cryoborolls, and the Quander family. The Cryorthents soils are a rubble land complex, generally found on mountain side slopes. They are shallow to deep, well drained, and derived from mixed sources. Skisams-Cryoborolls is a moderately deep complex found on benches and side slopes. It is shallow, well drained, and formed from limestone or sandstone derivatives. The Quander family soils are a Varden complex on mountain sides and alluvial fans. The soil is deep and well drained. It is an alluvium formed from rhyolite, tuff, and similar volcanic rocks. The water-holding capacity is moderate and the hazard of water erosion is moderate to high (Morrison Knudsen, 1994).

See pages 3 and 4 of the text for a detailed description.

**GW-4. Describe geologic/hydrogeologic units on Table 2. Give names, descriptions, and characteristics of consolidated and unconsolidated zones beneath the site.**

OK. See Table 2.

**GW-5. Is the site in an area of karst terrain or a karst aquifer?**

No.

**GW-6. Net Precipitation (per HRS section 3.1.2.2).**

Mean Annual Precipitation = 16 inches

Annual Lake Evaporation = 36 inches

### **SURFACE WATER CHARACTERISTICS**

**SW-1. Mean annual precipitation (per HRS section 4.0.2) = 16 inches. If less than 20", then count intermittent channels as surface water.**

**SW-2. Discuss the probable surface water flow pattern from the site to surface waters:**

The sources are not contained with respect to the surface water pathway. Drainage from the mine flows along, thereby eroding the toe of the adjacent waste rock pile, then directly into the Howard Fork. The Howard Fork then flows immediately south of the tailings pile. Erosion channels were observed on the surface and sides of the tailings pile. A perennial drainage from the wetland north of the pile were observed flowing over the tailings pile surface, transporting tailings directly into the Howard Fork (Appendix 5).

**Source of information:**

**SW-3. If surface water exists within 2 miles of the site, describe surface water segments within the 15-mile distance limit.**

Segment Name	River/Lake/ type	Fresh/Salt Water	Start (mi.)	End (mi.)	flow in cfs
Howard Fork	River	fresh	1	3	
South Fork	River	fresh	3	11	
San Miguel River	River	fresh	11	15	

**Ground water to surface distance 0 ft. Angle 0**

**SW-4. Provide a schematic diagram or simple figure which describes surface water segments, locates targets, identifies flow direction, PPE(s), etc. Refer to figure(s) submitted with text of report if appropriate.**

See Figure 4 of the PA.

**SW-5. Any positive or circumstantial evidence of a release to surface water? Evidence of a release by direct observation? Is the source located in surface water? Describe.**

Please refer to Section 3.5 of the PA, pages 9-10.

**Source of information:**

**SW-6. Any positive or circumstantial evidence of a release to surface water target populations? Describe analytes, detection limits, background, hits, number of users, locations, QA/QC.**

No

**Source of information:**

**SW-8. Is the site or portions thereof located in surface water?**

Is the site located in the 1 - <10 yr floodplain?      yes, the tailings site

>10-100 yr?

>100-500 yr?

>500 yr?

**SW-9. Two-year 24-hour rainfall 2 inches.**

## **TARGETS**

**T-1. Discuss ground water usage within four mile of the site:**

Please refer to Section 3.4 of the PA, pages 8-9 of the text.

**Source of information:**

**T-2. Summarize the drinking water population served via Ground Water within 4 miles of the site:**

Ground water use within the 4-mile target distance limit was estimated as follows from well logs and 1990 Census Bureau data for people/household in San Miguel County:

<u>Distance from Site (miles)</u>	<u>Number of People Served</u>
0 - ¼	0
¼ - ½	0
½ - 1	75
1 - 2	4
2 - 3	4
3 - 4	29



Attach calculations for population apportionment in blended systems.

T-3. Identify and locate any of the following surface water targets within 15 miles of the site: drinking water population(s) served by intakes, fisheries, sensitive environments described in Table 4-23 of the HRS, and wetlands as defined in the Federal Register.

Targets	dist. from site	SW body	flow in cfs	population served/size (incl. units)	contamination known/suspected
Fisheries	3 miles	South Fork	192.05 (6/94); 11.58 (11/94)*		heavy metals
Fisheries	11 miles	San Miguel River			heavy metals
Wetlands	1-15 miles	Howard Fork, South fork and San Miguel Rivers			heavy metals
			*obtained from NPS studies, not 5-yr average...		

T-4. Summarize the population within a four-mile radius of the site:

	<u>Total Pop.</u>	<u>worker pop.</u>
onsite	<u>0</u>	<u>0</u>
0 - 1/4 mi	<u>0</u>	
1/4 - 1/2 mi	<u>0</u>	
1/2 - 1 mi	<u>75</u>	
1 - 2 mi	<u>4</u>	
2 - 3 mi	<u>4</u>	
3 - 4 mi	<u>29</u>	

T-5. Identify and locate any terrestrial sensitive environments described in Table 5-5 of the HRS.

N/A

**T-6. Describe any positive or circumstantial evidence of a release to air target populations? Of a release by direct observation where target population exists within 1/4 mile of the site? Describe analytes, detection limits, background, hits, number of users, locations, QA/QC.**

N/A

**T-7. Identify and locate any potential or known resident soil exposure populations, if present. Describe conditions which lead the researcher to suspect contaminated soil within 200' of residences, if this condition exists.**

N/A

TABLE 1

WASTE CONTAINMENT AND HAZARDOUS SUBSTANCE IDENTIFICATION<sup>1</sup>

SOURCE TYPE	SIZE (Volume/Area)	ESTIMATED WASTE QUANTITY	SPECIFIC COMPOUNDS	CONTAINMENT <sup>2</sup>	SOURCES OF INFORMATION
Shoofly adit		300 gallons per minute	heavy metals	None	Site Visit
Shoofly waste rock pile	500 sq. ft.; 27,500 cu. yds.	pacing/volume calculations	heavy metals	None	Site Visit
Carbonero Tailings	1.75 acres; 15,555 cu. yds.	pacing/ volume calculations	heavy metals	None	Site Visit

<sup>1</sup> Use additional sheets if necessary

<sup>2</sup> Evaluate containment of each source from the perspective of each migration pathway (e.g., ground water pathway - non-existent, natural or synthetic liner, corroding underground storage tank; surface water - inadequate freeboard, corroding bulk tanks; air - unstabilized slag piles, leaking drums, etc.).

**TABLE 2**  
**HYDROGEOLOGIC INFORMATION<sup>1</sup>**

STRATA NAME/DESCRIPTION	THICKNESS (ft.)	HYDRAULIC CONDUCTIVITY (cm/sec)	TYPE OF DISCONTINUITY <sup>2</sup>	SOURCE OF INFORMATION
Alluvium	60 ft.	unknown	surrounding mountain uplifts	MK, 1994
Morrison formation	0-500 ft.	unknown	surrounding mountain uplifts	MK, 1994

<sup>1</sup> Use additional sheets if necessary

<sup>2</sup> Identify the type of aquifer discontinuity within four miles from the site (e.g., river, strata "pinches out," etc.)

## APPENDIX 4

### LATITUDE AND LONGITUDE CALCULATION WORKSHEET #2

**LATITUDE AND LONGITUDE CALCULATION WORKSHEET #2**  
**LI USING ENGINEER'S SCALE (1/60)**

SITE NAME: Carbonero Mine CERCLIS #: \_\_\_\_\_

AKA: \_\_\_\_\_ SSID: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY: Ophir STATE: Colorado ZIP CODE: 81426

SITE REFERENCE POINT: Carbonero Mine Drainage PPE into Howards Fork

USGS QUAD MAP NAME: Ophir Quadrangle TOWNSHIP: 42NS RANGE: 9 EW

SCALE: 1:24,000 MAP DATE: 1955 SECTION: SE 1/4 NE 1/4 SW 1/4 36

MAP DATUM: (1927) 1983 (CIRCLE ONE) MERIDIAN: New Mexican

COORDINATES FROM LOWER RIGHT (SOUTHEAST) CORNER OF 7.5' MAP (attach photocopy):

LONGITUDE: 107° 45' \_\_\_\_ LATITUDE: 37° 45' \_\_\_\_

COORDINATES FROM LOWER RIGHT (SOUTHEAST) CORNER OF 2.5' GRID CELL:

LONGITUDE: 107° 47' 30" LATITUDE: 37° 50' \_\_\_\_

CALCULATIONS: LATITUDE (7.5' QUADRANGLE MAP)

A) NUMBER OF RULER GRADUATIONS FROM LATITUDE GRID LINE TO SITE REF POINT: 210

B) MULTIPLY (A) BY 0.3304 TO CONVERT TO SECONDS:

$$A \times 0.3304 = \underline{69.38"}$$

C) EXPRESS IN MINUTES AND SECONDS (1' = 60") : 1° 9' 38"

D) ADD TO STARTING LATITUDE: 37° 45' \_\_\_\_ + 1° 9' 38" =

SITE LATITUDE: 37° 46' 9.38"

CALCULATIONS: LONGITUDE (7.5' QUADRANGLE MAP) (2.5 min = 350 ruler graduations  
 $150 \div 350 = 0.4286$ )

A) NUMBER OF RULER GRADUATIONS FROM RIGHT LONGITUDE LINE TO SITE REF POINT: 145

B) MULTIPLY (A) BY 0.3304 TO CONVERT TO SECONDS:

$$A \times 0.3304 = \underline{62.15"}$$

C) EXPRESS IN MINUTES AND SECONDS (1' = 60") : 1° 2' 15"

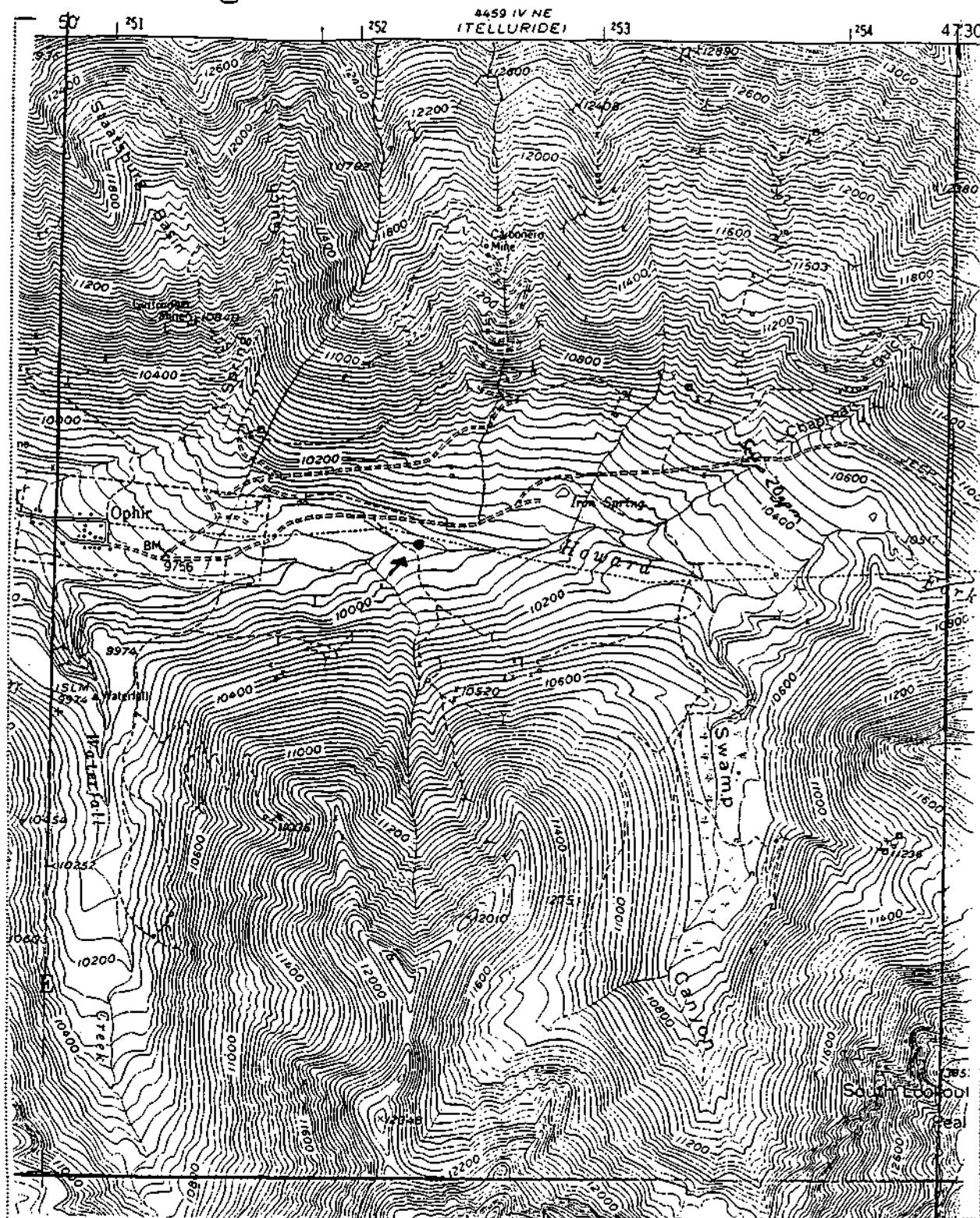
D) ADD TO STARTING LONGITUDE: 107° 47' 30" + 1° 2' 15" =

SITE LONGITUDE: 107° 48' 32.15"

INVESTIGATOR: Camille Parrell DATE: 10/18/96

SITE NAME: Carbonero Mine

NUMBER: \_\_\_\_\_



TOPOGRAPHIC MAP QUADRANGLE NAME: Ophir Quadrangle

SCALE: 1:24,000

COORDINATES OF LOWER RIGHT-HAND CORNER OF 2.5-MINUTE GRID:

LATITUDE: 47° 30' LONGITUDE: 37° 50'

**APPENDIX 5**  
**SITE PHOTOGRAPHS**



# Color Photo(s)

The following pages  
contain color that does  
not appear in the  
scanned images.

To view the actual images, please  
contact the Superfund Records  
Center at (303) 312-6473.

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Shallow level of the Carbonero Mine; mine drainage flowing toward the Howard Fork.

Date: September 25, 1996 Time: 1230

Direction facing: North (35mm film)



Description of Photo: Carbonero Mine drainage flowing toward the Howard Fork.

Date: September 25, 1996 Time: 1230

Direction facing: Northeast (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Carbonero Mine drainage flowing into the Howard Fork.

Date: September 25, 1998 Time: 1230

Direction facing: East (35mm film)

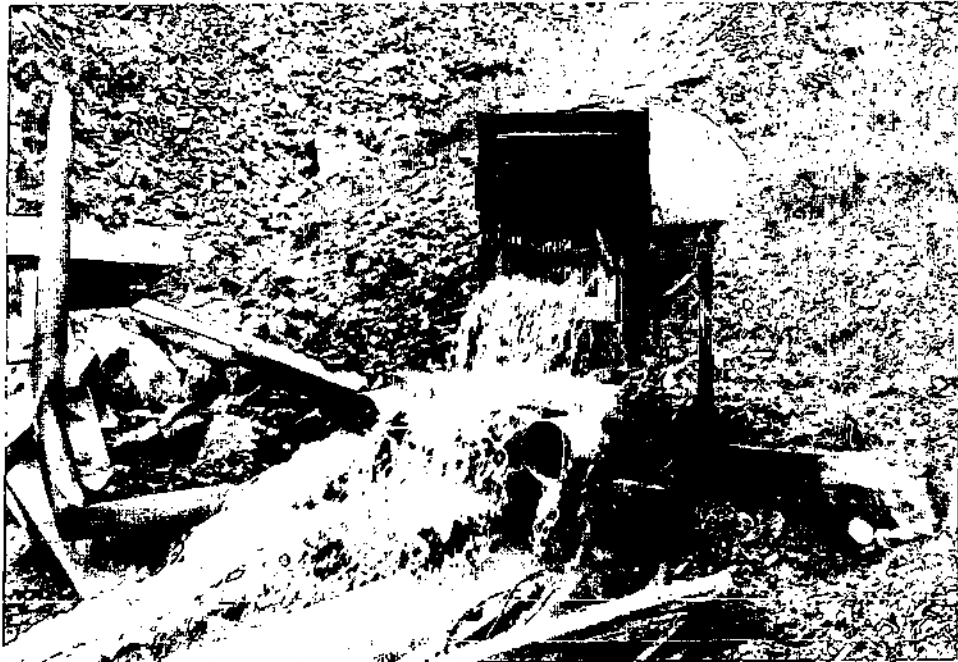


Description of Photo: Carbonero Mine drainage flowing into the Howard Fork.

Date: September 25, 1998 Time: 1230

Direction facing: Southwest (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Draining edit at the Shoofty level of the Carbonero Mine.

Date: September 25, 1990 Time: 1330

Direction facing: East (35mm film)



Description of Photo: Draining edit at the Shoofty level of the Carbonero Mine.

Date: September 25, 1990 Time: 1330

Direction facing: East (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Draining adit at the Shooty level of the Carbonero Mine.

Date: September 25, 1988 Time: 1330

Direction facing: East (35mm film)



Description of Photo: Draining adit flowing along toe of waste rock pile at the Shooty level of the Carbonero.

Date: September 25, 1988 Time: 1330

Direction facing: West (35mm film)

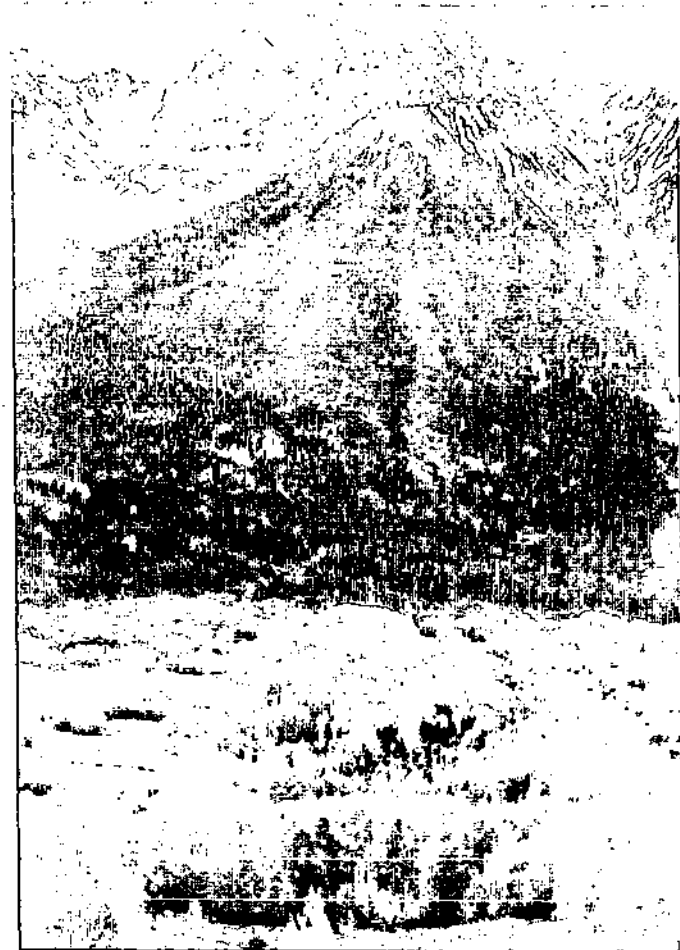
OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Carbonero Mine drainage into the Howard Fork.

Date: September 25, 1998 Time: 1330

Direction facing: South (35mm film)

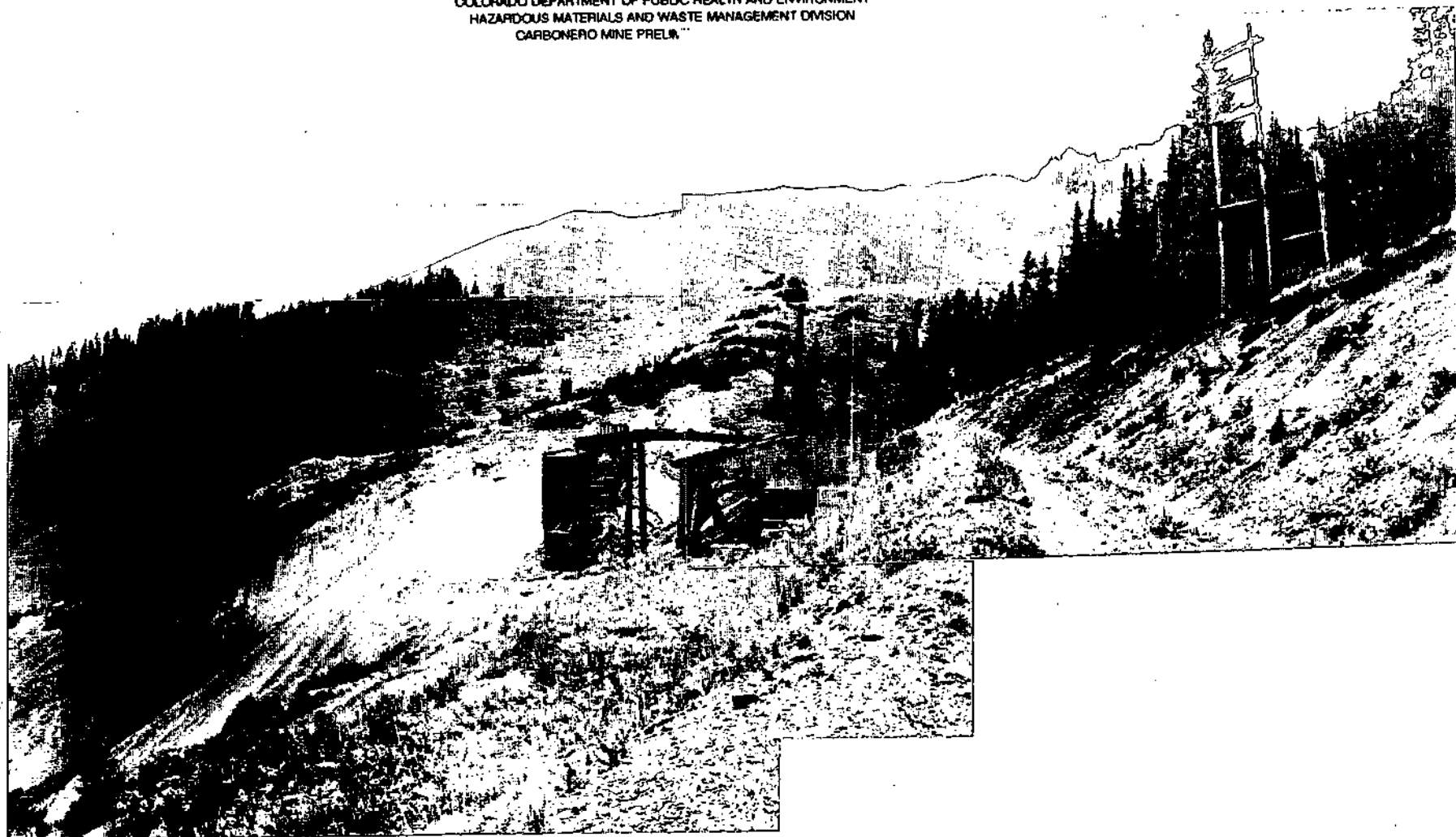


Description of Photo: Iron bog upstream of the Carbonero Mine drainage flowing into the Howard Fork.

Date: September 25, 1998 Time: 1330

Direction facing: South (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIM



Description of Photo: Shutoff level of the Carbonero Mine; ore bin/loadout and waste rock pile.

Date: September 25, 1996 Time: 1400

Direction facing: Northwest (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



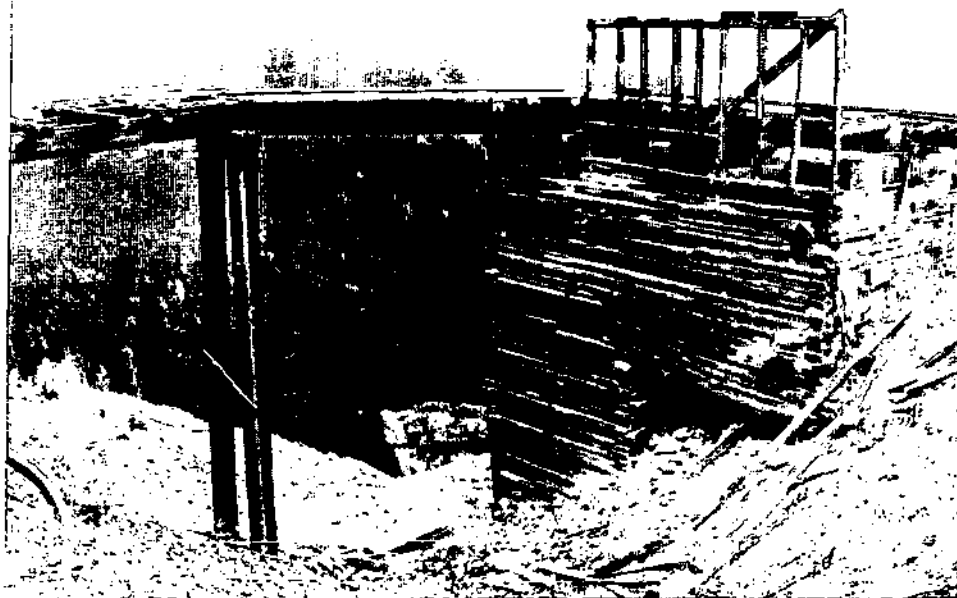
Description of Photo: Shoooby level of the Carbonero Mine: ore bin/roadcut and waste rock pile.

Date: September 25, 1988 Time: 1400

Direction facing: Northwest (35mm film)



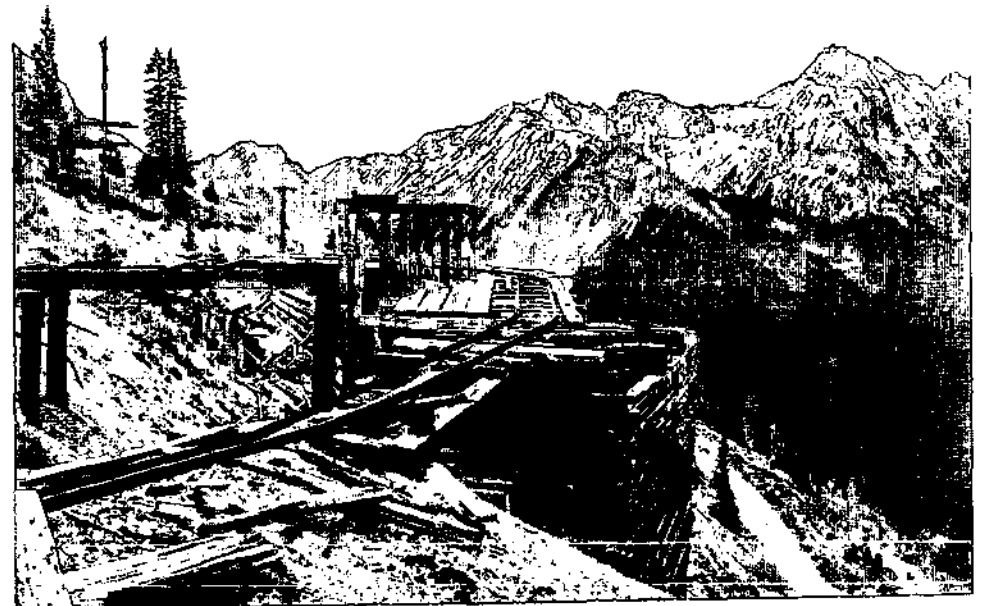
OFFICIAL PHOTOGRAPHS  
 COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
 HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
 CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Carbonero Mine ore bin/loadout structure.

Date: September 25, 1998 Time: 1400

Direction facing: Southwest (35mm film)



Description of Photo: Carbonero Mine ore bin/loadout structure.

Date: September 25, 1998 Time: 1400

Direction facing: SE (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: "Dry" waste rock pile above iron-spring on road ascending to the Carbonero Mine.

Date: September 25, 1998 Time: 1420

Direction facing: Southwest (35mm film)



Description of Photo: "Dry" waste rock pile above iron-spring on the road ascending to the Carbonero Mine.

Date: September 25, 1998 Time: 1420

Direction facing: North (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Iron-spring (shaft?) on road ascending to the Carbonero Mine.

Date: September 25, 1996 Time: 1420

Direction facing: North (35mm film)



Description of Photo: Iron-spring (shaft?) on the road ascending to the Carbonero Mine.

Date: September 25, 1996 Time: 1420

Direction facing: North (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Draining mine on road ascending to the Carbonero Mine.

Date: September 25, 1988 Time: 1430

Direction facing: Northwest (35mm film)

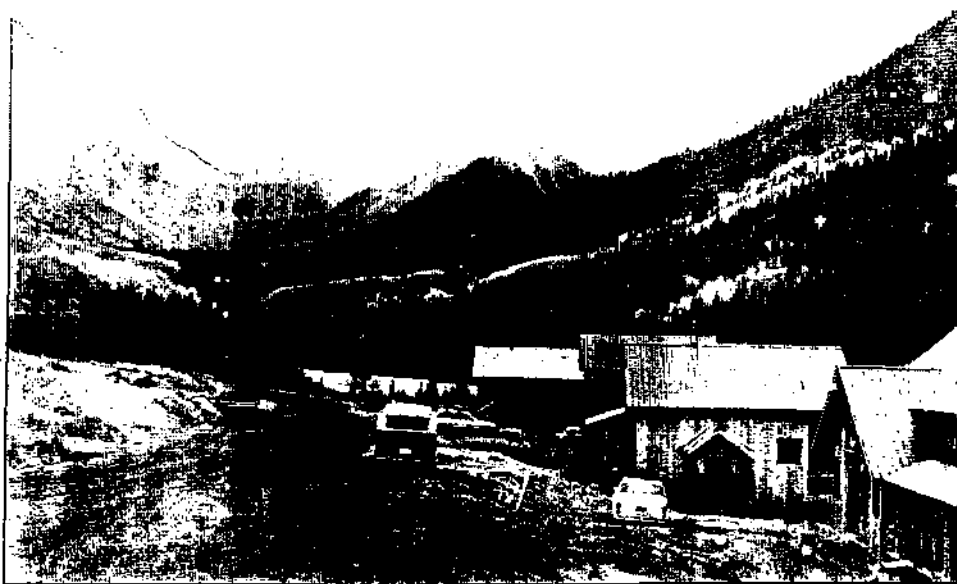


Description of Photo: Carbonero Mill tailings downstream of Carbonero mine drainage flowing into the Howard Fork.

Date: September 25, 1988 Time: 1330

Direction facing: Southwest (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Carbonero mill tailings upstream of "East Ophir".

Date: September 25, 1998 Time: 1445

Direction facing: Southeast (35mm film)



Description of Photo: Carbonero mill tailings (note wetlands north and west of pile).

Date: September 25, 1998 Time: 1445

Direction facing: Southeast (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Carbonero mill tailings (note wetlands and ponds west of pile).

Date: October 8, 1988 Time: 1200

Direction facing: Southeast (35mm film)



Description of Photo: Draining silt on "Fertile Oxide" placer.

Date: October 8, 1988 Time: 1200

Direction facing: Northwest (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Carbonero Mill tailings (note erosion channels on surface)

Date: October 6, 1990 Time: 1230

Direction facing: Northwest (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Carbonero mill tailings (east end flume overflow/tailings spillage area).

Date: October 6, 1996 Time: 1200

Direction facing: East (35mm film)



Description of Photo: Flume overflow/tailings spillage area on east end of Carbonero mill tailings.

Date: October 6, 1996 Time: 1200

Direction facing: Northeast (35mm film)



OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Wetlands draining onto Carbonero tailings.

Date: October 8, 1996 Time: 1200

Direction facing: South (35mm film)



Description of Photo: Entailed tailings resulting from wetlands draining over Carbonero tailings.

Date: October 8, 1996 Time: 1200

Direction facing: North (35mm film)

OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Overland flow path stop Carbonero tailings.

Date: October 8, 1996 Time: 1200

Direction facing: South (35mm film)



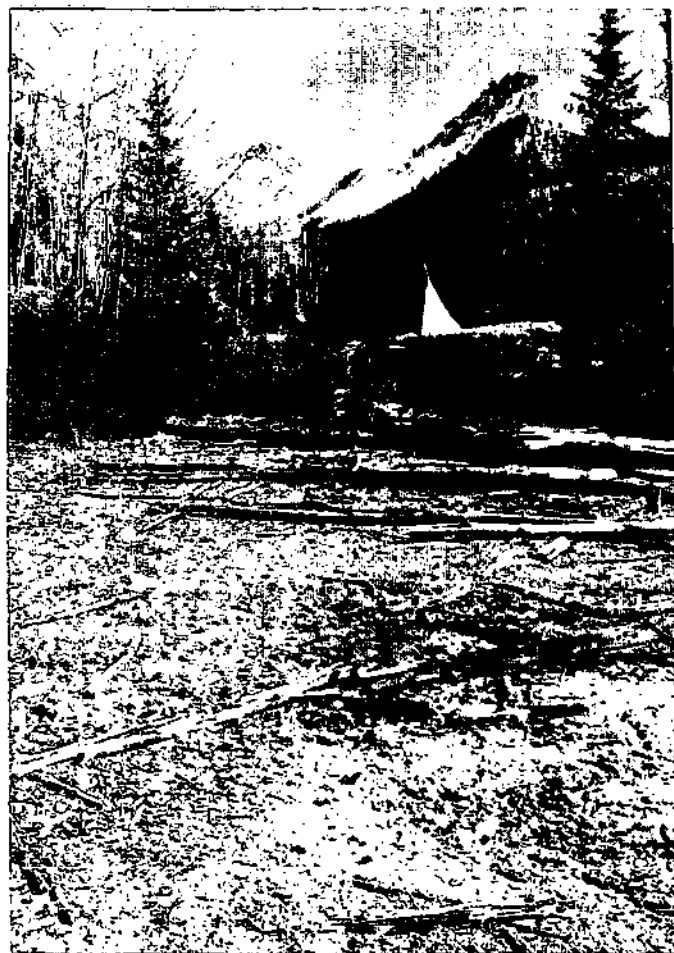
Description of Photo: PPE of Carbonero tailings into the Howard Fork.

Date: October 8, 1996 Time: 1200

Direction facing: North (35mm film)



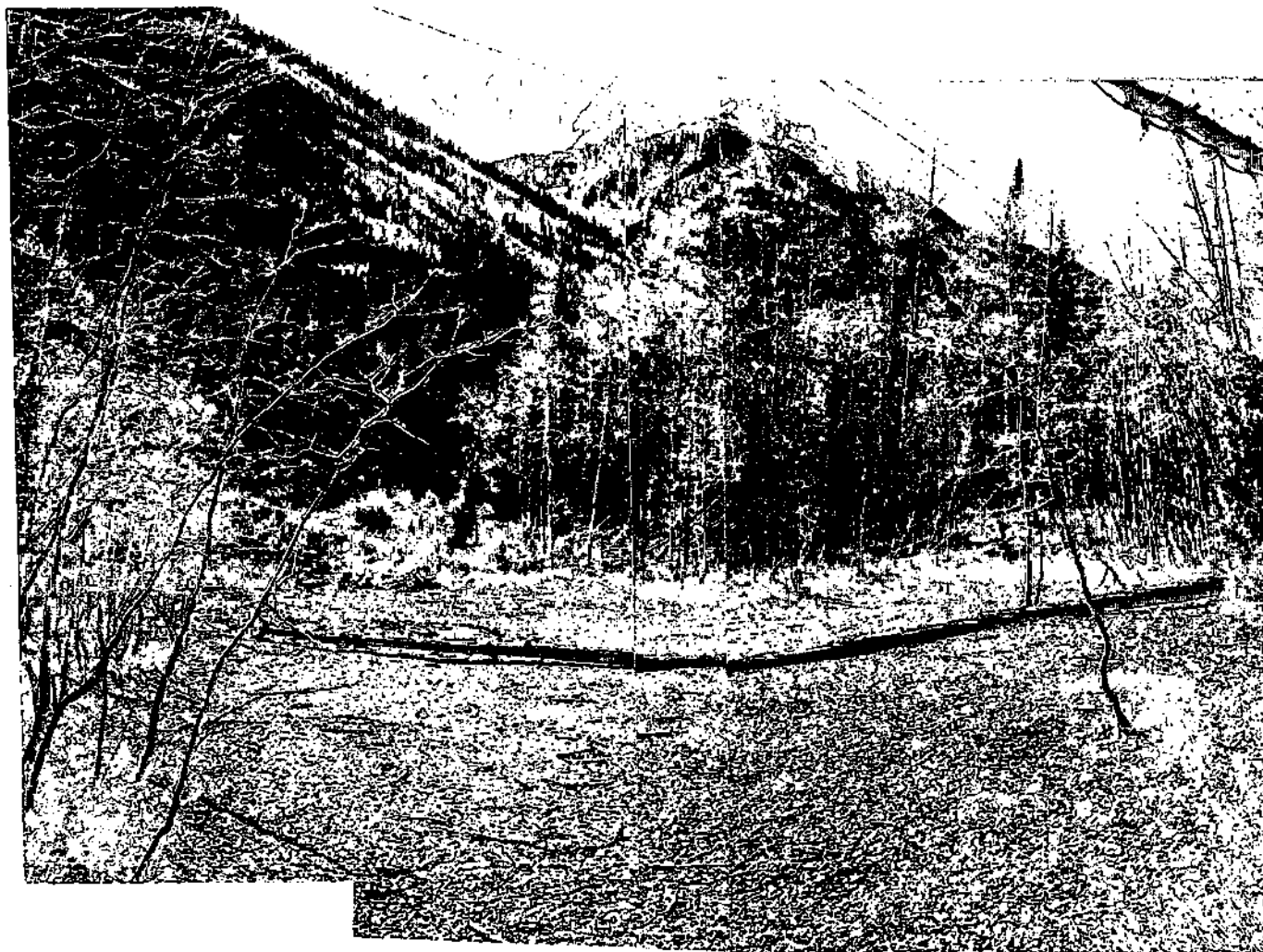
OFFICIAL PHOTOGRAPHS  
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION  
CARBONERO MINE PRELIMINARY ASSESSMENT



Description of Photo: Tailings spillage along flume line 500' east of tailings pile.

Date: October 8, 1996 Time: 1230

Direction facing: Southeast (35mm film)



Description of Photo: Tailings spillage along flume line 500' east of the tailings pile.

Date: October 8, 1996 Time: 1200

Direction facing: Southeast (35mm film)

**APPENDIX 6**  
**RECORD OF COMMUNICATION**

## RECORD OF COMMUNICATION

PHONE CALL TO: April Montgomery, San Miguel County Planning Office  
(O) (970) 728-4396

FROM: Camille M. Farrell

DATE: September 26, 1996

TIME: 3:55 p.m.

SUBJECT: Ophir/East Ophir Drinking Water Source

### SUMMARY OF COMMUNICATION:

Ms. Montgomery related the following information:

Ophir utilizes an underground spring immediately north of the town for drinking water. The town has recently improved this system. The town formerly used a system in Waterfall Canyon, on the south side of the valley. The town will maintain the Waterfall water system as a backup.

Ms. Montgomery did not know if East Ophir is hooked into the Ophir water system, and suggested calling Nick Kennedy, East Ophir resident.

**RECORD OF COMMUNICATION**

**PHONE CALL TO:** Bob Shukle, CDPHE, WQCD  
(O) (303) 692-3500

**FROM:** Camille M. Farrell

**DATE:** September 27, 1996

**TIME:** 3:55 p.m.

**SUBJECT:** Carbonero CDPES Permit Status

**SUMMARY OF COMMUNICATION:**

Mr. Shukle related the following information:

The Carbonero mine is not listed as having a CDPES permit. Mr. Shukle remembers the Carbonero is an adit that "blows out" every few years.

## **RECORD OF COMMUNICATION**

**PHONE CALL TO:** Heather Holmes, CDPHE, WQCD  
(O) (303) 692-3500

**FROM:** Camille M. Farrell

**DATE:** September 27, 1996

**TIME:** 1:55 p.m.

**SUBJECT:** Ophir Drinking Water Supply

### **SUMMARY OF COMMUNICATION:**

Ms. Holmes related the following information:

Ophir has a natural ground water spring serving a population of 75 people. Ms. Holmes FAXED a "Water Quality Report" detailing well monitoring data, included in Appendix 8 of the Carbonero Mine Preliminary Assessment Report.

**APPENDIX 7**  
**PREVIOUS INVESTIGATIONS**



DMG NPS Sampling  
High Flow - June 1994

Concentrations in ug/L (ppb)

Site	pH	Cd (T)	Cd (D)	Cu (T)	Cu (D)	Fe (T)	Fe (D)	Pb (T)	Pb (D)	Mn (T)	Mn (D)	Zn (T)	Zn (D)
5 above Carbonero	6.8	U .25	U .25	8	6	200	32	U <5	U <5	100	96	33	33
12 Carbonero drainage	6.0	20	19	280	130	11000	4100	85	U <5	5900	5900	4900	4800
6 below Carbonero	6.9	.96	1.1	13*	7	700	66	7	U <5	340	290	230*	220
16 adit below Carbonero above tailings	6.8	U .25	4.2	U <8	U <8	6900	7000	U <5	U <5	1300	1400	53	56
17 adit below Carbonero above tailings	6.2	4.3	.96	160	100	5600	2500	8	U <5	2600	2500	1000	1000
18 below tailings	6.6	1.1*	U .25	10	5	370	28	U <5	U <5	310	300	270*	240
SCDMS SW fish Bench-marks		1.1		12		1000		3.2		-		110	

Highlighted numbers indicate concentrations 3 times that of upstream measurements.

Concentrations annotated with (\*) indicate concentrations exceeding SCDMS surface water fresh water aquatic life benchmark.

DMG NPS Sampling Low Flow - November 1993												
Site	Cd (T)	Cd (D)	Cu (T)	Cu (D)	Fe (T)	Fe (D)	Pb (T)	Pb (D)	Mn (T)	Mn (D)	Zn (T)	Zn (D)
5 above Carbonero	.72	.68	29*	14	800	67	U <5	U <5	260	260	90	83
12 Carbonero drainage	5	5	23	U <4	3400	1200	11	U <5	2200	2200	1300	1100
6 below Carbonero	.99	.86	30*	10	760	52	U <5	U <5	340	330	150*	130
16 adit below Carbonero above tailings	U .25	U .25	U <4	U <4	5500	4600	U <5	U <5	1200	1200	35	33
17 adit below Carbonero above tailings	2.1	1.9	46	15	2600	1600	U <5	U <5	1600	1600	490	490
18 below tailings	1.3*	.62	33*	4	2100*	45	38*	U <5	360	170	290*	120
SCDMS SW fish Bench- marks	1.1		12		1000		3.2		-		110	

Highlighted numbers indicate concentrations 3 times that of upstream measurements.

Concentrations annotated with (\*) indicate concentrations exceeding SCDMS surface water fresh water aquatic life benchmark.

# SILVER BELL MINE/MILL

**TABLE III**  
**INORGANIC ANALYTICAL RESULTS**  
**GROUNDWATER AND AQUEOUS SOURCE**  
**CHACTERIZATION SAMPLES**  
 Concentrations in micrograms per liter ( $\mu\text{g/L}$ )

Sample Location Sample Number Designation  Parameter	GW-1 MHBY21 background	GW-2 MHBY22 Lake Fort deep well	GW-3 MHBY23 Lake Fort shallow well	SO-1 MHBY24 mine tunnel discharge
Aluminum	37.8 U	37.8 U	37.8 U	37.8 U
Antimony	25.3 U	25.3 U	25.3 U	36.2 J
Arsenic	4.9 UJ	7.3 UJ	12.2 UJ	9.4 UJ
Barium	22.3 J	16.5 J	8.2 J	7.5 J
Beryllium	1.5 U	1.5 U	1.5 U	1.5 U
Cadmium	2.2 U	2.2 U	2.2 U	2.2 U
Calcium	127000	124000	219000	134000
Chromium	2.5 U	2.5 U	2.9 J	2.5 U
Cobalt	10.4 U	10.4 U	10.4 U	10.4 U
Copper	67.3	8.3 UJ	16.3 J	20.1 J
Iron	92.3 J	1940	93.4 J	334
Lead	1.2 U	2.5 J	1.2 U	1.8 J
Magnesium	5530	7820	12000	16300
Manganese	3.0 J	243	221	316
Mercury	0.20 U	0.20	0.20 U	0.20 U
Nickel	13.6 U	13.6 U	13.6 U	13.6 U
Potassium	654 UJ	1060 UJ	2050 UJ	1760 UJ
Selenium	3.1 J	4.8 UJ	6.1 UJ	3.5 UJ
Silver	1.6 U	1.6 U	1.9 J	1.6 U
Sodium	3630 J	7550 J	23100 J	5809 J
Thallium	2.9 U	2.9 U	2.9 U	2.9 U
Vanadium	4.2 U	4.2 U	4.2 U	4.9 UJ
Zinc	153	40.1	77.5	73.8
Cyanide	5.0 U	5.0 U	5.0 U	5.0 U

U - parameter not detected in sample; value shown is sample detection limit

J - value is estimated because quality control criteria were not met

UJ - parameter not detected in sample; sample detection limit is estimated because quality control criteria were not met

DAVID Black

DATE COLLECTED	DATE RECEIVED	DATE COMPLETED	SAMPLE CODE
02/03/94	02/11/94	02/21/94	9620319

CUSTOMER ADDRESS	
JOHN FAUSCH P.O. BOX 1194 TELLURIDE, CO 81435-	

DEALER ADDRESS	
LAKE FORK JCT Home Owners WELL #2	



## DRINKING WATER ANALYSIS RESULTS

NOTE: "\*" indicates that the MCL (Maximum Contaminant Level) has been exceeded, or in the case of pH is either too high OR too low.  
 "ND" indicates that none of this contaminant has been detected at or above our detection level.  
 "\*\*\*" Result may be invalid due to lack of "Time Collected" or because the sample has exceeded the 30-hour time frame.  
 "BD" Bacteria destroyed due to lack of collection information or because the sample has exceeded the 48 hour time frame.  
 TNTC-Too Numerous To Count      NBS-No Bacteria Submitted

Analysis performed	MCL (mg/l)	Detection Level	Level Detected
--------------------	------------	-----------------	----------------

### Microbiological:

Total coliform (organism/100ml)	0	0	NBS
---------------------------------	---	---	-----

### Inorganic chemicals - metals:

Aluminum	0.2	0.1	ND
Arsenic	0.05	0.010	ND
Barium	2.0	0.30	ND
Cadmium	0.005	0.002	ND
Chromium	0.1	0.004	ND
Copper	1.3	0.004	0.041
Iron	0.3	0.020	0.021
Lead	0.013	0.002	ND
Manganese	0.05	0.004	0.20*
Mercury	0.002	0.001	ND
Nickel	0.1	0.02	N
Selenium	0.05	0.002	ND
Silver	0.1	0.002	ND
Sodium	---	1.0	22
Zinc	5.0	0.004	0.025

### Inorganic chemicals - other, and physical factors:

Alkalinity (Total as CaCO3)	---	10.0	100
Chloride	250	5.0	13
Fluoride	4.0	0.5	ND
Nitrate as N	10	0.5	ND
Nitrite as N	1.0	0.5	ND
Sulfate	250	5.0	580*
Hardness (suggested limit = 100)	---	10.0	660*
pH (Standard Units)	6.5-8.5	---	7.5
Total Dissolved Solids	500	20.0	941*
Turbidity (Turbidity Units)	1.0	0.1	ND

**RECEIVED**  
FEB 23 1995  
HAZARDOUS MATERIALS  
AND WASTE MANAGEMENT

DATE COMPLETED	SAMPLE CODE
02/11/94	02/21/94
	9620310



**WATERCHECK** / NATIONAL  
TESTING  
LABORATORIES INC  
6555 Wilson Mills Road  
Cleveland, OH 44143  
(216) 449-2323

**CUSTOMER ADDRESS**

JOHN FAUSCH  
P.O. BOX 1194  
TELLURIDE, CO 81435-

**DEALER ADDRESS**

LAKE FORK JCT  
WELL #1

# DRINKING WATER ANALYSIS RESULTS

NOTE: "\*" indicates that the MCL (Maximum Contaminant Level) has been exceeded, or in the case of pH is either too high OR too low.  
 "ND" indicates that none of this contaminant has been detected at or above our detection level.  
 "\*\*\*" Result may be invalid due to lack of "Time Collected" or because the sample has exceeded the 30-hour time frame.  
 "OD" Bacteria destroyed due to lack of collection information or because the sample has exceeded the 48-hour time frame.  
 TNTC-Too Numerous To Count      NBS-No Bacteria Submitted

Analysis performed	MCL (mg/l)	Detection Level	Level Detected
--------------------	---------------	--------------------	-------------------

**Microbiological:**

Total coliform (organism/100ml)	0	0	NBS
---------------------------------	---	---	-----

**Inorganic chemicals - metals:**

Aluminum	0.2	0.1	ND
Arsenic	0.05	0.010	ND
Barium	2.0	0.30	ND
Cadmium	0.005	0.002	ND
Chromium	0.1	0.004	ND
Copper	1.3	0.004	0.014
Iron	0.3	0.020	0.070
Lead	0.015	0.002	ND
Manganese	0.05	0.004	0.17*
Mercury	0.002	0.001	ND
Nickel	0.1	0.02	ND
Selenium	0.05	0.002	ND
Silver	0.1	0.002	ND
Sodium	---	1.0	6.6
Zinc	5.0	0.004	0.027

**Inorganic chemicals - other, and physical factors:**

Alkalinity (Total as CaCO3)	---	10.0	80
Chloride	250	5.0	ND
Fluoride	4.0	0.5	ND
Nitrate as N	10	0.5	ND
Nitrite as N	1.0	0.5	ND
Sulfate	250	5.0	309*
Hardness (suggested limit = 100)		10.0	380*
pH (Standard Units)	6.5-8.5	---	7.5
Total Dissolved Solids	500	20.0	516*
Turbidity (Turbidity Units)	1.0	0.1	0.2

**RECEIVED**  
FEB 23 1995  
HAZARDOUS MATERIALS  
AND WASTE MANAGEMENT

Report Date: 09/27/96

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
WCED - DRINKING WATER SECTION

Note: Computer data is always subject to error. If data appears unusual or questionable,  
please confirm the validity with the Drinking Water Section at (303) 692-3500.

WATER QUALITY DATA FOR ID 157600 - Ophir, Town of  
ATTN: Paul Machado  
Box 683  
Ophir, CO 81426

Contact: Machado, Paul  
Contact Phone: (970)728-4519  
Operator: Wolfe, Doug Wtr comm  
Operator Phone: (970)728-3735  
Resident Population: 75  
Non-Transient Population: 0  
Transient Population: 0  
Service Connections: 36

County: San Miguel  
Active Status: Active  
Activation Date: 0/  
System Begin Date: 0/  
System Type: Community  
System Source Type: Ground Water  
Open Year Around

Disinfection Waiver ? No  
Bacts Required: 1  
Bact Cycle: Monthly  
Nitrate Schedule: 2nd Quarter  
Chemical Schedule Group: 3  
Inorganic Schedule: 2nd Quarter  
Radiological Schedule: 2nd Quarter  
Organic Schedule: Routine - 4 Quarters

\*\*\*\*\* SOURCE INFORMATION \*\*\*\*\*

se_id	srcnum	src	se_rec_type	se_code	avail	sampoint	seller_id	totaldepth	aquifer
001	GWTP01	Ophir WTP	P	T	P	.T.			Has SW contamination
002	Srf01	Waterfall Creek-DISCONTINUED	S	S	Z	.F.			
003	Spg01	Spring #1	S	G	P	.F.			

\*\*\*\*\* RECENT BACTERIOLOGICAL \*\*\*\*\*

\*\*\* S = Safe \*\*\* U = Unsafe \*\*\* N = Invalid \*\*\*

samp\_date type testmeth quantity tc\_pres fa\_pres invalid

07/25/95	r	m	1 s			
08/15/95	r	m	1 s			
09/26/95	r	m	1 s			
10/26/95	r	m	1 s			
11/29/95	r	m	1 s			
12/26/95	r	m	1 s			
01/23/96	r	m	1 s			
02/05/96	r	m	1 s			
03/25/96	r	m	1 U	s		
04/08/96	r	m	1 N		0	
04/11/96	S	m	1 s			
04/24/96	r	m	1 s			
04/29/96	r	m	2 s			
04/30/96	r	m	2 s			
05/09/96	r	m	1 s			
06/10/96	r	m	1 s			
07/17/96	r	m	1 s			
08/13/96	r	m	1 s			

\*\*\*\*\* ORIGINAL INORGANICS \*\*\*\*\*

\*\*\*\*\* all results and MCLs expressed in mg/l or ppm \*\*\*\*\*

\*\* MCLs are 0.05 2 0.005 0.1 4.0 na 0.002 0.05 na na

SAMPLEDATE	ARSENIC	BARIUM	CADMIUM	CHROMIUM	FLUORIDE	LEAD	MERCURY	SELENIUM	SILVER	SODIUM	SE_ID_1	SE_ID_2	SE_ID_3	SE_ID_4	SE_ID_5
07/30/85	0.000	0.000	0.00000	0.0000	0.000	0.0000	0.00000	0.000	0.0000	0	001				
09/14/90	0.000	0.000	0.00000	0.0000	0.950	0.0000	0.00000	0.000	0.0000	0	001				

	As	Ba	Cd	Cr	Fe	Pb	Hg	Se	Ag	Na
09/14/90	0.000	0.000	0.00000	0.0000	0.430	0.0000	0.00000	0.000	0.0000	0 001
06/28/91	<0.001	<1.0	<0.005	<0.02	0.56	<0.02	<0.001	<0.001	<0.010	3.2 001
06/28/91	<0.001	<1.0	<0.005	<0.02	0.14	<0.02	<0.001	<0.001	0	1.1 001
12/29/93	<0.001	0.010	<0.00025	<0.010	0.51	<0.005	<0.0002	<0.001	NT	6.3 001
06/30/94	<0.001	0.01	<0.00025	<0.01	0.55	<0.005	<0.0002	<0.001	NT	3.8 001

# \*\*\*\*\* NEW INORGANIC PARAMETERS \*\*\*\*\*

\*\*\*\*\* all results expressed in mg/l or ppm \*\*\*\*\*

\*\*\*\*\* TESTING BEGAN JAN 1, 1993 \*\*\*\*\*

\*\* MCLs are 0.006 0.004 0.2 0.1 na 0.002

SAMPLEDATE ANTIMONY BERYLLIUM CYANIDE NICKEL SULFATE THALLIUM COMPOSITED SE\_ID\_1 SE\_ID\_2 SE\_ID\_3 SE\_ID\_4 SE\_ID\_5

12/29/93 <0.001 <0.001 NT <0.020 420 <0.001 .F. 001

06/30/94 <0.001 <0.001 NT <0.02 360 <0.001 .F. 001

# \*\*\*\*\* NITRATE/NITRITE \*\*\*\*\*

\*\*\*\*\* all results expressed in mg/l or ppm \*\*\*\*\*

\*\* MCLs are 10.0 1.0 10.0

sampledate nitrate\_n nitrite\_n no3\_no2\_n se\_id\_1 se\_id\_2 se\_id\_3 se\_id\_4 se\_id\_5

07/30/85 0.00 001

09/14/90 0.00 001

09/14/90 0.00 001

06/28/91 <0.04 001

06/28/91 0.12 001

06/30/94 NT NT <0.5 001

03/27/95 NT NT <0.5 003

06/27/95 001

06/27/95 NT NT <0.5 001

# \*\*\*\*\* LEAD/COPPER TAP MONITORING DATA \*\*\*\*\*

\*\*\*\*\* levels are 90th percentile levels expressed in mg/l \*\*\*\*\*

beg\_compl end\_compl pb\_90th cu\_90th

07/01/93 12/31/93 0.005 0.30

01/01/94 06/30/94 0.005 0.23

01/01/95 12/31/95 0.002 0.70

01/01/97 12/31/97

mcl .015 1.3

# \*\*\*\*\* RADIOLOGICAL \*\*\*\*\*

\*\*\*\*\* all results expressed in pCi/l, except TS in mg/l \*\*\*\*\*

PLANTNUMBR SAMPLEDATE SANTYPE ALPHA ADJ\_ALPHA BETA RA226 RA228 RA226\_228 URANIUM TS RADON\_222

1 04/01/84 R 0.0 0.0 0.0 0.00 0.00 0.00 0.0 0

1 03/15/89 G 0.0 0.0 0.0 0.00 0.00 0.00 0.0 460

1 09/14/90 G 2.0 0.0 0.0 0.00 0.00 0.00 0.0 310

1 09/14/90 G 4.0 0.0 2.0 0.00 0.00 0.00 0.0 740

WTP01 08/09/94 <3 NT <3 NT NT NT NT 670 NT

WTP01 12/31/94 3.0 NT <3 NT NT NT NT 780 NT

SPG01 03/27/95 HS NT HS <1 <1 NT <2 860 NT

GWTP01 06/27/95 HS NT HS <1.0 NT NT NT <2.0 NT

# \*\*\*\*\* CORROSIVITY \*\*\*\*\*

\*\*\*\*\* all units are mg/l except Langlier, pH, and temp \*\*\*\*\*

sampledate langlier tot\_alk ea\_hard ph tds water\_temp chloride sulfate

09/14/90 .33 72H 460 8.2 670 42

09/14/90 -0.13 56H 180 8.2 250 46

06/28/91 0.60 73 224 7.98 785

06/28/91 -0.93 32 25.2 7.64 100

12/29/93 NT NT NT NT 690 NT NT NT

\*\*\* There was no trihalomethane data found. Required for community systems serving 10,000 or more only. \*\*\*

\*\*\*\*\* Phase I VOC'S \*\*\*\*\*

Note: Included as part of Phase II/V organics as of 1/1/93.  
Refer to file for information on detects.

plantnumber plantname sampleddate detected  
1 Ophir, Town of 03/12/91 No voc's detected.

\*\*\*\*\* REGULATED PHASE I/II/V ORGANICS \*\*\*\*\*

Sources: 001 03/23/95 Compositid: F

\*\*\* There were no regulated detects in this sample. \*\*\*

\*\*\*\*\* UNREGULATED PHASE I/II/V ORGANICS \*\*\*\*\*

Note: Detections of Trihalomethanes are not printed.  
Monitoring is required. No standards have been set.

Sources: 001 03/23/95 Compositid: F

\*\*\* There were no unregulated detects in this sample. \*\*\*

\*\*\* There were no chemical check sample tracking records found. \*\*\*

\*\*\*\*\* VIOLATIONS - ( Bact and Turbidity ) \*\*\*\*\*

BEG_COMPLI	END_COMPLI	VIOL_TYPE	CONTAMINAT	REBSAMPLES	VALID_SAM	RESULT	NCL_VIOLAT	ENF_DATE	TYPE_LETR	EPA_CODE
04/01/86	04/30/86		3000	0	0	7.50000000	1.00000000	05/29/86	1	A
10/01/86	10/30/86		3000	0	0	4.00000000	1.00000000	12/10/86	2	E
04/01/87	04/30/87		3000	0	0	4.00000000	1.00000000	/ /	P	E
10/01/88	10/31/88	03	0100	1	0	0.00000000	0.00000000	/ /		6
11/01/88	11/30/88	03	0100	1	0	0.00000000	0.00000000	/ /		6
12/01/88	12/31/88	03	0100	1	0	0.00000000	0.00000000	/ /		6
01/01/89	01/31/89	03	0100	1	0	0.00000000	0.00000000	/ /		6
02/01/89	02/28/89	03	0100	1	0	0.00000000	0.00000000	/ /		6
03/01/89	03/31/89	03	0100	1	0	0.00000000	0.00000000	/ /		6
04/01/89	04/30/89	03	0100	1	0	0.00000000	0.00000000	/ /		6
05/01/89	05/31/89	03	0100	1	0	0.00000000	0.00000000	/ /		6
06/01/89	06/30/89	03	0100	1	0	0.00000000	0.00000000	/ /		6
07/01/89	07/31/89	03	0100	1	0	0.00000000	0.00000000	/ /		6
08/01/89	08/30/89	02	3000	0	0	6.20000000	1.00000000	10/30/89	1	EA
08/01/89	08/31/89	03	0100	1	0	0.00000000	0.00000000	/ /		6
09/01/89	09/30/89	03	0100	1	0	0.00000000	0.00000000	/ /		6
10/01/89	10/31/89	03	0100	1	0	0.00000000	0.00000000	/ /		6
11/01/89	11/30/89	02	3000	0	0	2.00000000	1.00000000	02/05/90	2	EA
11/01/89	11/30/89	03	0100	1	0	0.00000000	0.00000000	/ /		6
12/01/89	12/31/89	03	0100	1	0	0.00000000	0.00000000	/ /		6
01/01/90	01/31/90	03	0100	1	0	0.00000000	0.00000000	/ /		6
02/01/90	02/28/90	03	0100	1	0	0.00000000	0.00000000	/ /		L
03/01/90	03/01/90	03	0100	1	0	0.00000000	0.00000000	/ /		L
04/01/90	04/30/90	02	3000	0	0	5.50000000	1.00000000	05/24/90	P	JEL
04/01/90	04/30/90	03	0100	1	0	0.00000000	0.00000000	/ /		JEL
05/01/90	05/31/90	03	0100	1	0	0.00000000	0.00000000	/ /		JEL
06/01/90	06/30/90	03	0100	1	0	0.00000000	0.00000000	/ /		JEL
07/01/90	07/31/90	03	0100	1	0	0.00000000	0.00000000	/ /		JEL
08/01/90	08/31/90	03	0100	1	0	0.00000000	0.00000000	/ /		JEL
09/01/90	09/30/90	03	0100	1	0	0.00000000	0.00000000	/ /		JEL
10/01/90	10/31/90	02	3000	0	0	8.00000000	1.00000000	12/04/90	P	JEL
10/01/90	10/31/90	03	0100	1	0	0.00000000	0.00000000	/ /		JEL
11/01/90	11/30/90	03	0100	1	0	0.00000000	0.00000000	/ /		JEL
12/01/90	12/31/90	02	3000	0	0	2.00000000	1.00000000	01/25/91	P	JEL



beg_date	end_date	viol_type	contaminant	reqsamples	valid_sam	result	mcl_violat	enf_date	type	letr	epa_code	delete
12/01/90	12/31/90	03	0100	1	0	0.00000000	0.00000000	/ /			JEL	
01/01/91	01/31/91	03	0100	1	0	0.00000000	0.00000000	/ /			JEL	
02/01/91	02/28/91	03	0100	1	0	0.00000000	0.00000000	/ /			JEL	
03/01/91	03/31/91	03	0100	1	0	0.00000000	0.00000000	/ /			JEL	
04/01/91	04/30/91	03	3000	1	0	0.00000000	0.00000000	06/01/91	P		JEL	
04/01/91	04/30/91	03	0100	1	0	0.00000000	0.00000000	/ /	P		JEL	
05/01/91	05/31/91	25	3100	4	0	0.00000000	0.00000000	/ /	1		AEF	
05/01/91	05/31/91	03	0100	1	0	0.00000000	0.00000000	/ /	P		JEL	
06/01/91	06/30/91	22	3100	0	0	0.00000000	0.00000000	10/08/91	P		JEL	
06/01/91	06/30/91	03	0100	1	0	0.00000000	0.00000000	/ /				
07/01/91	07/31/91	24	3100	5	2	0.00000000	0.00000000	11/01/91	1		JE	
07/01/91	07/31/91	21	3100	0	0	0.00000000	0.00000000	10/08/91	1		JE	
07/01/91	07/31/91	03	0100	1	0	0.00000000	0.00000000	/ /			LE	
08/01/91	08/31/91	24	3100	4	2	0.00000000	0.00000000	11/29/91	1		JE	
08/01/91	08/31/91	03	0100	1	0	0.00000000	0.00000000	/ /			LE	
09/01/91	09/30/91	03	0100	1	0	0.00000000	0.00000000	/ /			LE	
03/01/96	03/31/96	23	3100	1	0			04/15/96	1		SFJ	

\*\*\*\*\* CHEMICAL VIOLATIONS \*\*\*\*\*

beg_compli	end_compli	viol_type	contaminant	reqsamples	valid_sam	result	mcl_violat	enf_date	type	letr	epa_code	delete
01/01/93	12/31/93	03	1040	1	0	0.00000000	0.00000000	03/06/95	1		S06	

\*\*\*\*\* ENFORCEMENT ACTIONS for CHEMS \*\*\*\*\*

\*\*\* SFJ = violation letter - SCX = now in compliance \*\*\*

enf\_date epa\_code type letr comments

06/30/96 SCX Nitrate SCX/FTM 1993

\*\*\* There were no state monitoring violations found. \*\*\*

\*\*\* There are no outstanding enforcement orders. \*\*\*

Please Note:

- NT = Not Tested
- ND = None Detected
- BDL = Below Detection Limit
- < symbol for less than
- na = Not Applicable

- GW = ground water
- SW = surface water
- GWISW = ground water under the influence of surface water
- MCL = maximum contaminant level
- VOC = volatile organic chemical
- SVTR = surface water treatment rule

# STATE OF COLORADO

COLORADO DEPT OF PUBLIC HEALTH & ENVIRONMENT  
WATER QUALITY CONTROL DIVISION  
4300 CHERRY CREEK DRIVE SOUTH  
DENVER, CO 80222-1530

303/692-3500  
FAX: 303/782-0390

DELIVER TO: Camillie Jarrell FAX# 1-970-728-341  
COMPANY/AGENCY: CDPHE - Env. Materials Waste Mgmt D.  
FROM: Heather Holmes CDPHE-WQCD PHONE # 303-692-3547  
NUMBER OF PAGES TO FOLLOW: 4

## **APPENDIX 8**

### **CARBONERO MINE HISTORY EXCERPT**

# THE R • G • S STORY

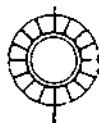
## RIO GRANDE SOUTHERN

### VOLUME III

## Over the Bridges...

### VANCE JUNCTION TO OPHIR

RUSS COLLMAN • DELL A. MCCOY  
AND  
WILLIAM A. GRAVES



**SUNDANCE** PUBLICATIONS *Limited*

250 BROADWAY • DENVER, COLORADO 80203

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## *Mile By Mile... Station By Station...*

THE R • G • S STORY allows you — the reader — to cover the entire route of the legendary Rio Grande Southern Railroad, beginning at Ridgway, Colorado, the lonely northern terminal of this little narrow-gauge line. Over time and space, the volumes of this detailed chronicle will lead you over every mile and past every station of the RGS — over the high mountains of the San Juan Region and across the spindly timber bridges to Durango, Colorado, the bustling southern terminal of this enchanting railroad.

DONALD G. HILLS PHOTO

### FRONT COVER — *"Galloping Goose" No. 4...*

Railbus No. 4 of the Rio Grande Southern was about to head up the Telluride Branch in this scene. She was photographed just prior to departing from Vance Junction on May 23, 1950. Called the "M-4" by RGS employees (meaning "Motor 4"), this "Galloping Goose" was one of four similar railbuses in service on the railroad at this time, Numbers 3, 4, 5 and 7 — not counting No. 6, the "work Goose" equipped with a flatbed. The old coach body originally served as the Vance Junction depot, while the two-story building behind the Galloping Goose was the section house.

### BACK COVER — *Lizard Head Peak in the Distance...*

The unusual rock formation called Lizard Head — chosen for the Rio Grande Southern Railroad's original emblem, or herald — appears in this view. Beautiful Alta Lakes, located high above the Ophir Loop, catch winter's runoff water in this alpine basin near timberline. The Rio Grande Southern headed south from the Ophir Loop, climbing up past the gem called Trout Lake to Lizard Head Pass and on south through the beautiful scenery in this part of the San Juan Region of southwestern Colorado — to be portrayed in Volume IV of THE R • G • S STORY.

DELL A. MCCOY PHOTO

## *The Mines in the Ophir Loop Area*

By William A. Graves



*No.* **6**

**THE PROSPECTS** of rich revenue generated by freight and ore shipments to and from gold and silver mines was the reason that the Rio Grande Southern Railroad was built. Otto Mears loved to gamble, and his mining investments and his investments in the Rio Grande Southern were his ultimate gambles. The success or failure of the Rio Grande Southern depended on the success or failure of the precious-minerals mines it served. In turn, many mines could never have been profitably worked without the relatively cheap and efficient transportation of the Rio Grande Southern.

When the Rio Grande Southern was constructed in 1890 and 1891, there were a great number of mines in the Ophir Loop area, southwest of Telluride. *The San Miguel Examiner*, the weekly newspaper of the local county, reported on over 75 mines by name in the Ophir Loop area at the turn of the century. However, many of these mines were worked very little, only enough to satisfy the annual \$100 worth of improvements required to maintain a claim.

This chapter of Volume III describes eight mines located on or above the Ophir Loop, which were highly developed and produced considerable amounts of ore.

These eight mines were all within four miles of the Ophir station, and each had its own processing mill. Rich ore, known as high-grade or first-class ore, was not milled before it was shipped to a smelter. However, second-class ore was milled, and the concentrates produced from the milling process were shipped to smelters. Milling usually reduced five tons of ore to one ton, and this reduction greatly lowered the transportation costs and made it profitable to mine and mill low-grade ore. At different times, ore from the Ophir Loop area went to smelters in Durango, Denver, Pueblo, Salida and Leadville. Gold bars produced by amalgamation at some of the mills were shipped via the Rio Grande Southern and the Denver & Rio Grande railroads to the U.S. Mint in Denver.

The span of years that these mines were active was from about 1877 to 1968. However, it

**MINING PRODUCTION IN THE OPHIR LOOP AREA OF COLORADO**  
— 1901-1968 —

MINE	GOLD, oz.	SILVER, oz.	COPPER, lbs.	LEAD, lbs.	ZINC, lbs.	VALUE - \$
<b>ALTA</b>						
Quantity	74,976	2,745,160	1,547,939	17,577,886	—	
Value	\$ 2,017,047	1,968,759	213,158	906,980	—	5,105,944
<b>BUTTERFLY</b>						
Quantity	41,064	542,157	217,570	1,423,166	—	
Value	\$ 900,343	366,630	24,222	71,987	—	1,363,182
<b>CARBONERO</b>						
Quantity	2,314	1,259,864	523,622	21,557,385	238,711	
Value	\$ 59,086	821,629	91,451	1,480,174	29,401	2,481,741
<b>CARRIBEAU</b>						
Quantity	3,545	666,653	64,527	1,601,978	—	
Value	\$ 75,547	402,310	9,489	76,172	—	563,518
<b>SAN BERNARDO</b>						
Quantity	1,582	620,068	210,664	2,798,266	8,700	
Value	\$ 33,751	446,613	31,355	180,361	1,213	693,293
<b>SILVER BELL</b>						
Quantity	17,418	659,443	353,437	1,890,092	—	
Value	\$ 457,472	554,378	76,867	246,081	—	1,334,798
<b>TOTAL VALUE WHEN MINED</b>	\$ 3,543,246	4,560,319	446,542	2,961,755	30,614	11,542,476
<b>PERCENTAGE OF TOTAL VALUE</b>	30.7	39.5	3.9	25.7	0.2	
<b>TOTAL VALUE IN 1993 DOLLARS</b>	\$ 45,975,343	23,122,801	2,792,295	14,991,607	123,705	87,005,751

IT IS WORTH NOTING from the last line in the above chart how much metal values have become inflated since these mines were active. The same quantities of ore that had a value of \$11,542,476 when produced would have a value of \$87,055,751 in 1993. It is also interesting to notice how *little* the ore was worth — even in 1993 dollars. Today's values would be divided as: 53-percent gold, 27-percent silver, 3-percent copper and 17-percent lead.

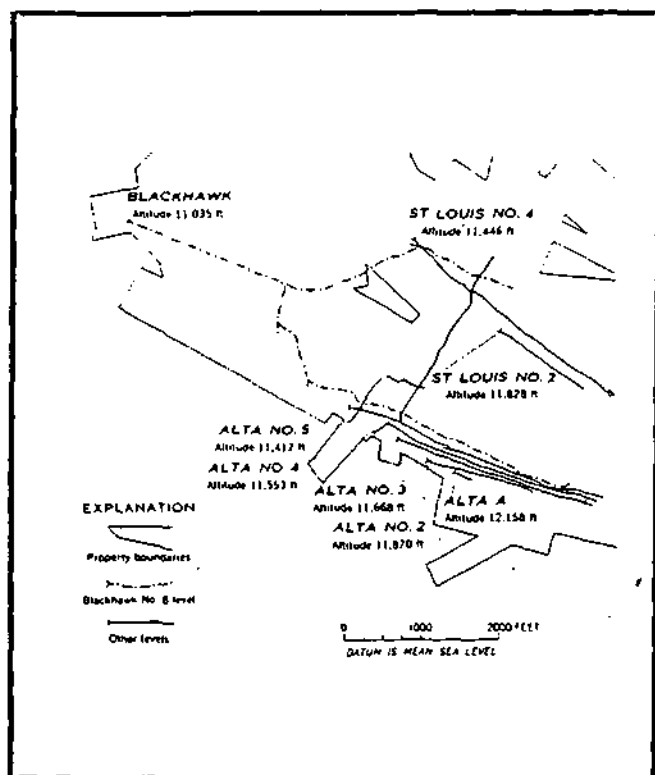
should be pointed out that no single mine operated all of those years. The typical mine in this historic account operated for about 50 years on an intermittent basis. Most of the mining activity was during the years that the Rio Grande Southern Railroad was in operation, from 1890 until 1951.

Income for these eight mines depended on the recovery of four metals: gold, silver, copper and lead. Small amounts of zinc and molybdenum were also recovered. From mine production data submitted to the U.S. Bureau of Mines and furnished through the courtesy of the mine owners and the Bureau of Mines, the total value of metals produced by six of these mines from 1901 until 1968 can be calculated as \$11,542,

476'. Thirty-nine percent of the value was in silver, 31 percent was in gold, 26 percent in lead and four percent in copper.

Production prior to 1901 cannot be determined because there are no production records for the years before 1901, the year that the Bureau of Mines was created. Two of the eight mines in this account are not included in the above value, or in the table above, because most of their production appears to have been prior to 1901. The Mining Production table provides more detailed information about quantities and values of each mine's production.

It is worth noting that two of the most productive mines, the Alta and the Butterfly, produced more value in gold than they did in silver.



USGS BULLETIN NO. 1112-G - WILLIAM A. GRAVES COLLECTION

AS THE MAJOR MINES in the Ophir Loop area were developed, they were worked on many different levels. Work began at the surface at a promising location, and when the excavation or mine shaft was 100 to 200 feet deep, a lower tunnel was usually drilled to facilitate the removal of ore. If the mine was profitable, this procedure was repeated over and over. The little map above of the Alta Mine shows a good example of this type of development. The highest level was called the Alta "A" and is at an altitude of 12,158 feet above sea level. The lowest level is the Blackhawk Tunnel, at 11,035 feet. Levels were usually about 150 feet apart, but only the most promising levels were developed. At the Alta Mine five levels were developed in Gold King Basin; however, Levels 6 and 7 were never drilled out. The many levels of the mines is one reason that elevations differed from one publication to another. It should be noted that there was a distance of a little more than one mile from the highest workings of the mine to the lowest tunnel portal at the Alta. For this reason, the exact published location of a mine such as the Alta may easily cause confusion.

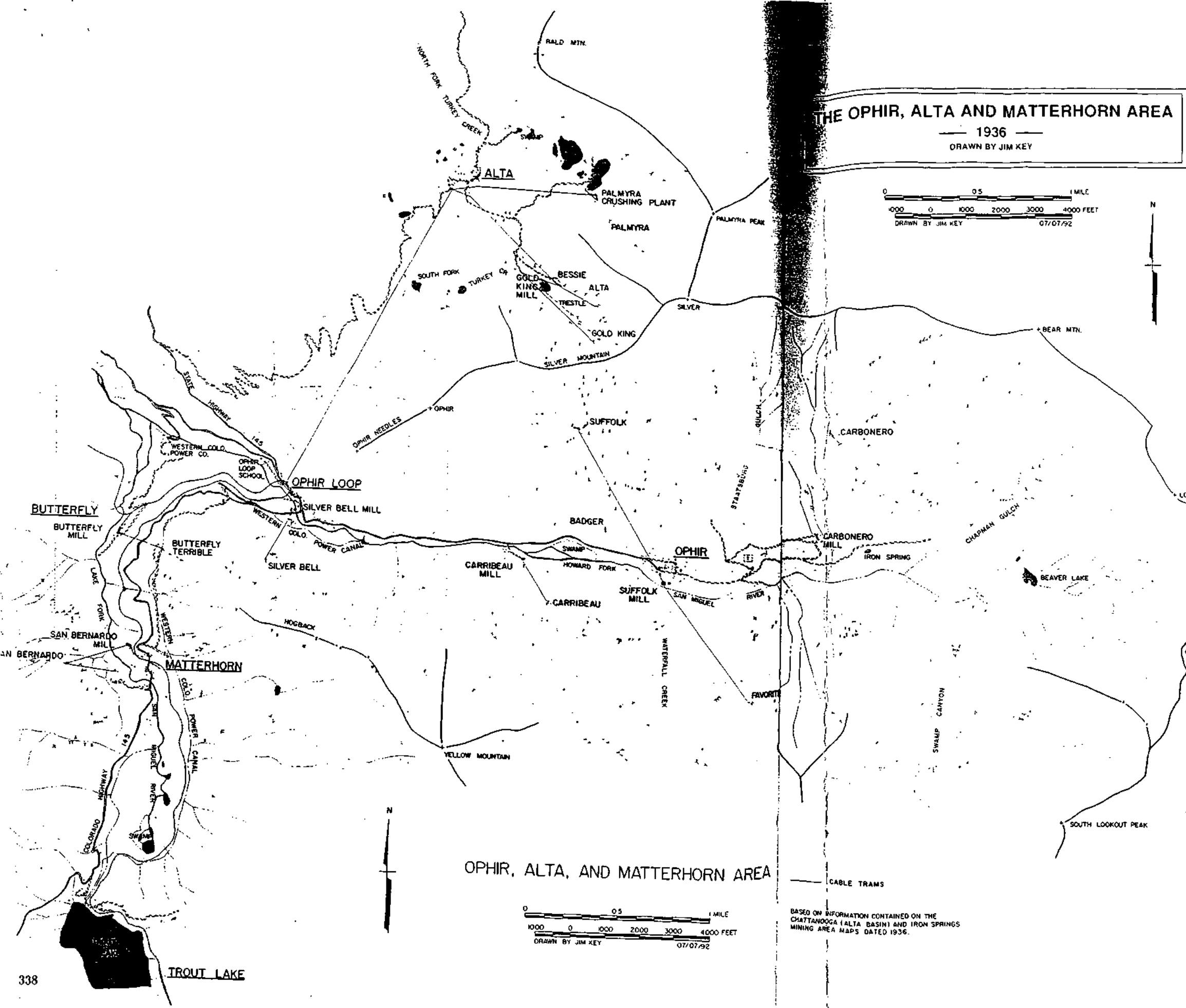
OPHIR AREA MILL DATES		
MILL	FIRST YEAR	LAST YEAR
ALTA		
No. 1	ca. 1902	ca. 1918
No. 2	ca. 1918	1929
No. 3	1938	1948
BUTTERFLY		
No. 1	1898	1927
No. 2	1927	1940
CARBONERO		
No. 1	1924	1950
CARRIBEAU		
No. 1	1896	unknown
GOLD KING		
No. 1	1882	unknown
SAN BERNARDO-MATTERHORN		
No. 1	ca. 1890	1909
No. 2	1920	standing 1993
SILVER BELL		
No. 1	1901	standing 1993
SUFFOLK		
No. 1	ca. 1895	1937

This was not unusual. Gold production in the Telluride and Ophir areas has often been overlooked because the region has been commonly referred to as "the Silver San Juans." However, the value of gold shipped from San Miguel County far exceeded the value of silver. Charles W. Henderson, in U.S. Geological Survey professional paper No. 138, states that gold produced in San Miguel County between 1875 and 1923 had a value of \$59,450,591, as compared with a silver-production value of \$31,599,544.

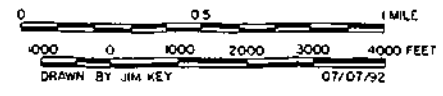
The mines relied on the Rio Grande Southern, and the RGS depended on the mines. When the RGS was blockaded by snow, ice, mud or floods, the mines could not ship their ore, and they were often forced to shut down. And as the mines finally closed down, one by one, the Rio Grande Southern died a slow death.

This chapter is a detailed history of these eight mines, presented in alphabetical order, or nearly so, in the basins that they occupied beginning with Gold King Basin, in the scenic Alta Lakes area — east of the Ophir Loop.

(Continued on Page 340)

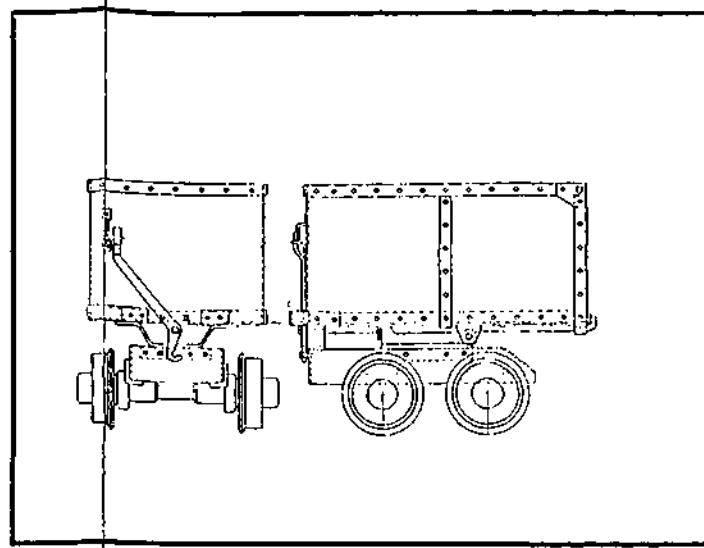


THE OPHIR, ALTA AND MATTERHORN AREA  
— 1936 —  
DRAWN BY JIM KEY



FROM THE "HANDBOOK FOR PROSPECTORS" - WILLIAM A. GRAVES COLLECTION

THIS MINE CAR was probably the best car of its type for use in mine tunnels. It is a four-wheel car with a rotary dumping mechanism, and it has a 1,600-pound capacity. Several improvements were made over the years, such as roller bearings for the axles and an automatic dumping attachment, which opens the end gate. The drawing and photograph on this page shows one of these cars, also called a "truck" or a "mine tram car."

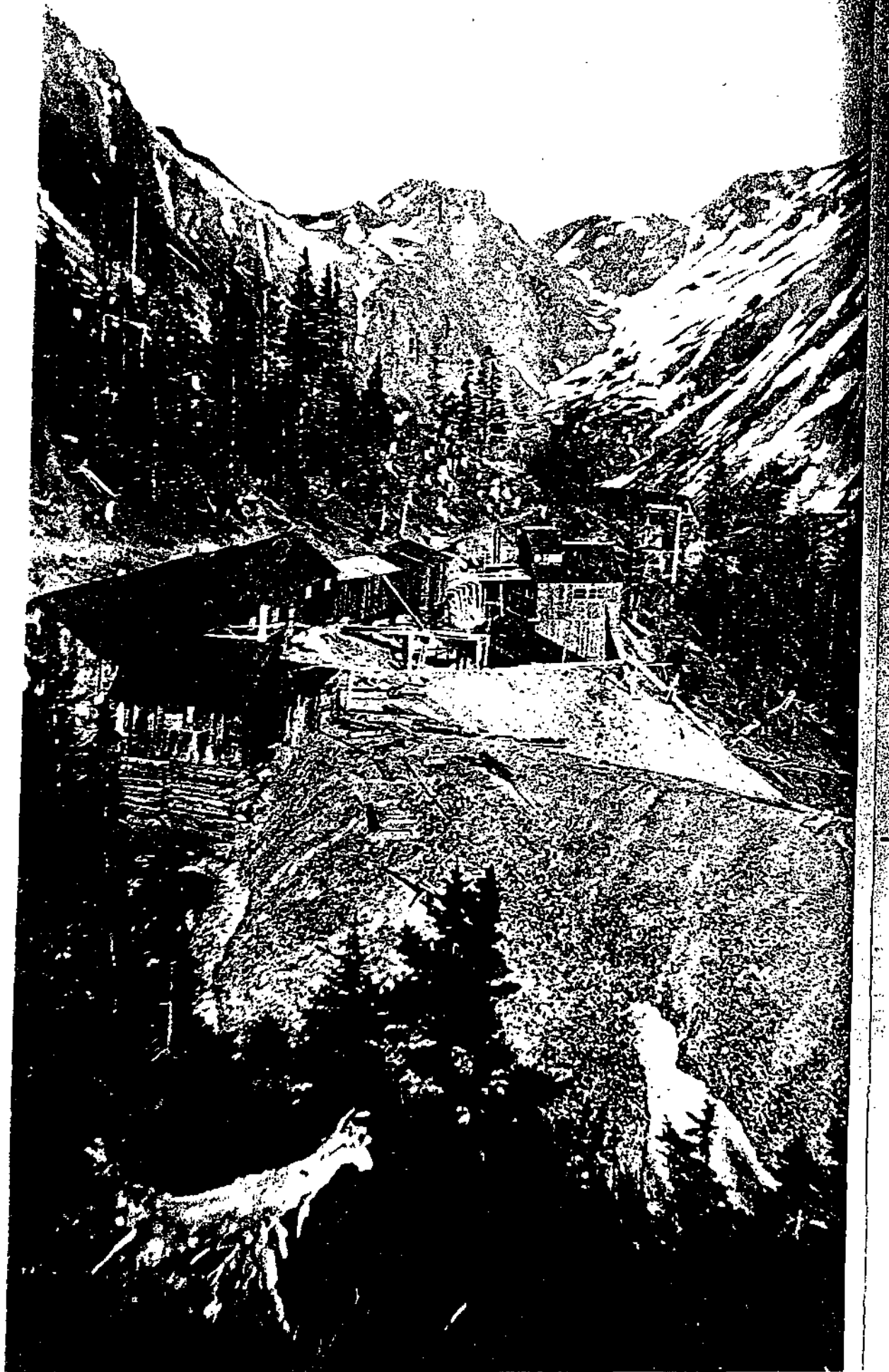


WILLIAM A. GRAVES PHOTO

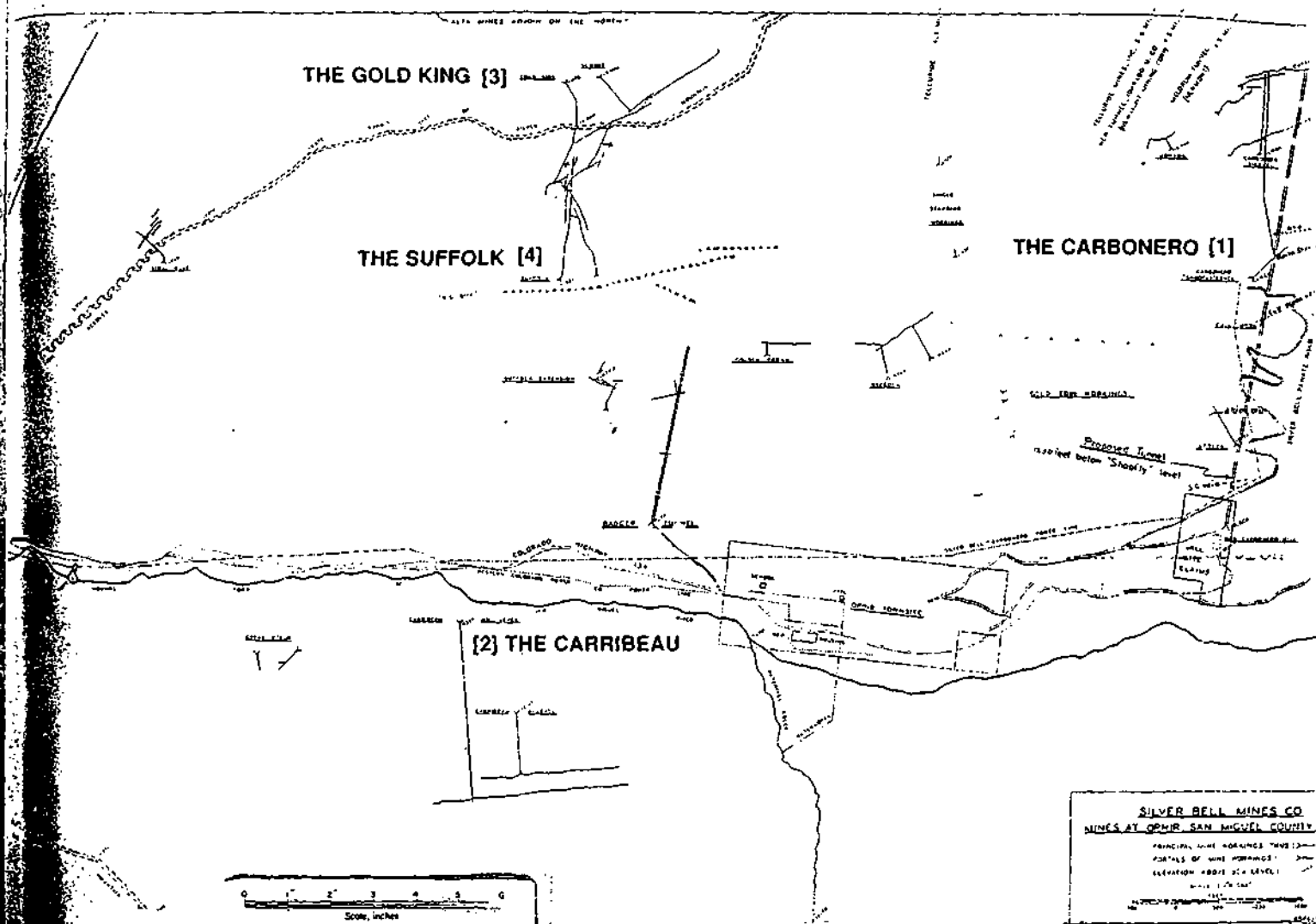


GRACE AND HAROLD BREWER  
COLLECTION

**THE CARBONERO**  
Mine was located  
high on the side of  
Silver Mountain.  
These buildings  
were at the en-  
trance to the mine's  
Shoofly Tunnel. The  
Shoofly was at  
Level 8 — and at  
11,480 feet in ele-  
vation, it was the  
Carbonero Mine's  
lowest level!



# SILVER BELL MINES COMPANY MINES AT OPHIR, SAN MIGUEL COUNTY



MAP COURTESY OF FLEET RESOURCES - U.S. BUREAU OF MINES COLLECTION

THE MINING TOWN of Ophir was actually located in the lower lefthand corner of the Ophir Townsite rectangle that is shown on this map produced during the early 1950's. Four of the mines that appear on this map have their histories documented elsewhere in this volume. The four mines are: [1] the Carbonero, [2] the

CarribEAU, [3] the Gold King and [4] the Suffolk. The Suffolk Mine's ore-processing mill had burned down before this map was drawn; however, it was in the lower lefthand corner of the townsite rectangle, near the confluence of the Howard Fork of the San Miguel and Waterfall Creek.

## The CARBONERO and TIDAL WAVE MINES

THE CARBONERO MINE was about a mile and a half from Ophir, on the south side of Silver Mountain, above timberline, at an elevation of 12,500 feet. It was located by a local prospector named Jerry Cole and was first worked by George

Pickett about 1897. Pickett held a major interest in the mine, but he shared its ownership with three other Colorado Springs investors.

George Pickett first came to the Ophir area from Colorado Springs in 1883, as a 16-year-old high-school boy looking for a summer job. He was hired to collect toll fees on the the newly-completed Ophir Pass toll road. Pickett liked the

However, Pickett did not have the money to build a mill to concentrate the ore before shipping it to a smelter. And that was a major handicap. Ore had to be hand-sorted, and only ore that had good silver values went to the smelter. The ore was sacked at the mine and carried by pack animals to the Rio Grande Southern's Ophir station. The ore then went to the Ohio & Colorado Smelting & Refining plant in Salida. Each sack of ore in this crude state was worth \$3.00 to \$4.00, and during some months, production reached 1,000 sacks. A typical production for a year was worth about \$25,000.

In 1903 and 1904, two additional claims were acquired, the North Star and the Mohawk. These claims were needed to work the mine at lower levels. A new crosscut tunnel was started in 1906.

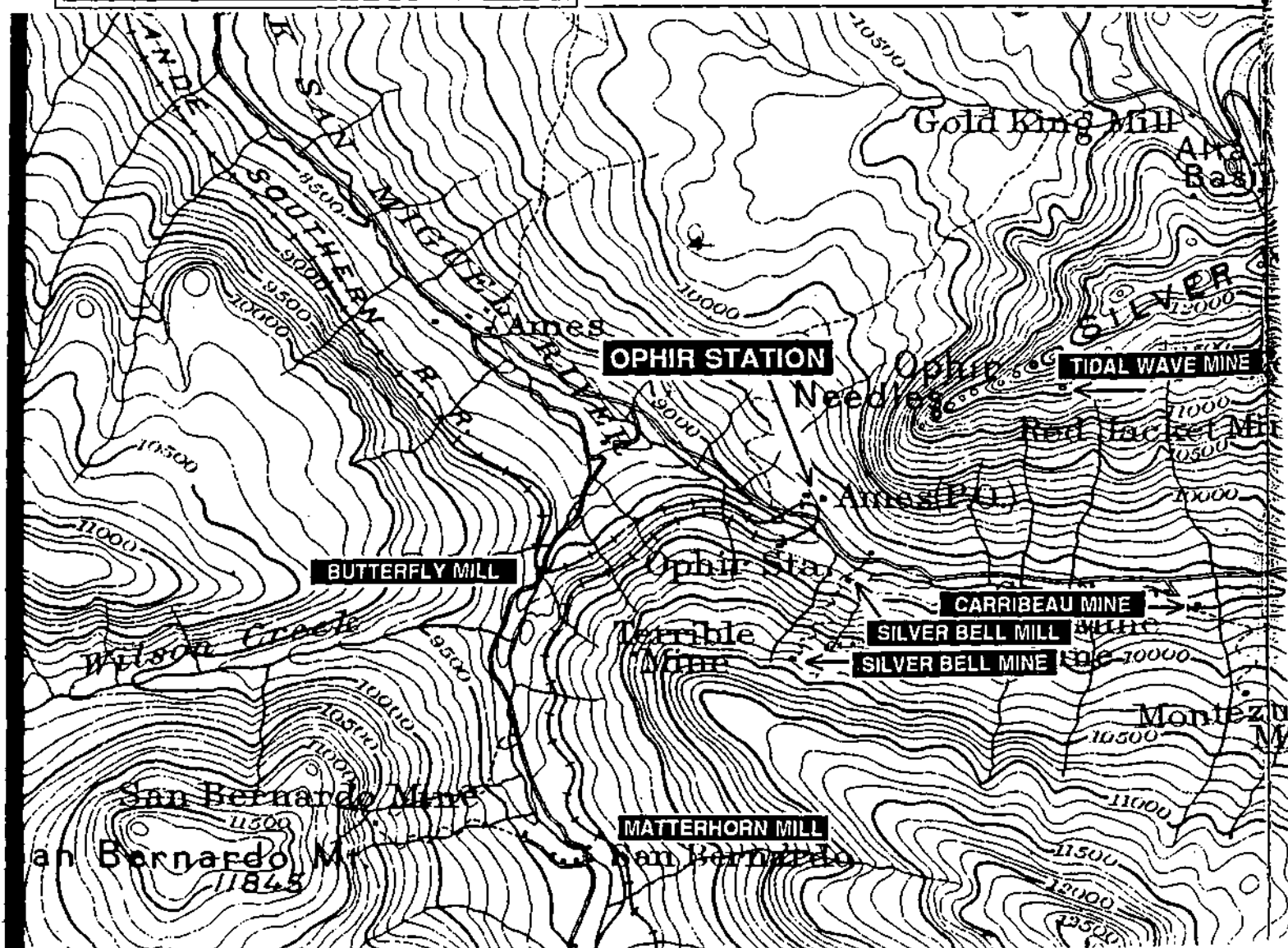
**MAP SHOWING THE POSITIONS OF MINES AND MILLS IN CONNECTION WITH OPHIR AND THE RIO GRANDE SOUTHERN RAILROAD**

USGS MAP - 1904 EDITION - COURTESY OF RON RUHOFF

It reached the Carbonero vein during November of 1907. Production dropped in 1907, while most of the miners were tunneling, but it bounced back in 1908. Employment during the early years was about 10 to 12 men; however, it gradually increased to about 15 to 20 by 1910. The mine was worked on three different levels.

George Pickett broadened the Carbonero's financial base in 1909, by forming and incorporating the Carbonero Mines & Reduction Company in Colorado Springs. This company kept ownership of the Carbonero for the next 40 years, but it often leased parts of the mine to others.

During 1910, Pickett obtained an interest in the nearby Suffolk mine and mill, and the operation of the Carbonero was turned-over to lessees. Ore-production was good in 1912, 1913 and 1914, but dropped to zero in 1916. The Carbonero had a bad year in 1916. A snowslide in January killed four Carbonero men, who were





KATE MULVEY PHOTO - WILLIAM A. GRAVES COLLECTION

**THE BUILDINGS** at the Carbonero's Shoofly Tunnel were photographed during 1929 or 1930. About 30 to 40 men were employed in the mine at that time. A row

of workers' houses can be seen a short distance from the mill buildings, and a boarding house for single men was up on the hill. Ophir Pass is in the distance.

Leases on the Carbonero Mine ran out in 1917, and the Carbonero Mines & Reduction Company took back operation of the mine. The firm realized good production for two years and then leased the mine to someone else again. The new lessee was the Ruutilla-Brown Leasing Company, a Colorado company. This company operated the mine for four years and boosted annual ore-production to \$75,000; however, the mine was really handicapped without a mill.

The Carbonero Mine needed a mill to profitably mine the low-grade ore at the Shoofly level. A mill could concentrate the ore and greatly reduce transportation costs. During 1923, the Tejon Investment Company of Colorado Springs, headed by former Governor Oliver Shoup, leased the Carbonero. In the following year, they constructed a new 50-ton-per-day mill and a new bunkhouse. The mill used the froth-flotation process, which was popular at that time. It was served by a

*(Continued on Page 417)*



WILLIAM A. GRAVES COLLECTION

THIS PLAYFUL snowy view helps you to better understand how Carbonero families adjusted to a harsh, high-altitude environment. These shacks provided homes for miners at the Carbonero's Shoofly Tunnel, near timberline.



GRACE AND HAROLD BREWER COLLECTION

THIS AIR COMPRESSOR was on a sled in front of the general mercantile store at the Ophir station. It was probably brought-in by the Rio Grande Southern, and the sled appears to be headed up the Howard Fork Valley. None of the mines in the Howard Fork area were very active during the 1920's or 1930's, except the Carbonero Mine. The Carbonero interests upgraded their mine and built a mill to process their ore in 1924, so it seems likely that this compressor was going to the Carbonero Mine.

DELL A. MCCOY PHOTO

OVERLEAF: This panoramic scene shows off the Howard Fork Valley. The photographer was about one and a half miles from Ophir, which appears as a tiny cluster of buildings, near the center of this view. Three summits of Yellow Mountain are at the left, the Mount Wilson group of peaks is on the skyline to the left of center, the Ophir Loop was down at the foot of the jagged Ophir Needles, and Silver Mountain forms a long ridge on the right skyline. The Carbonero worked the area adjacent to the mine dumps at upper right.



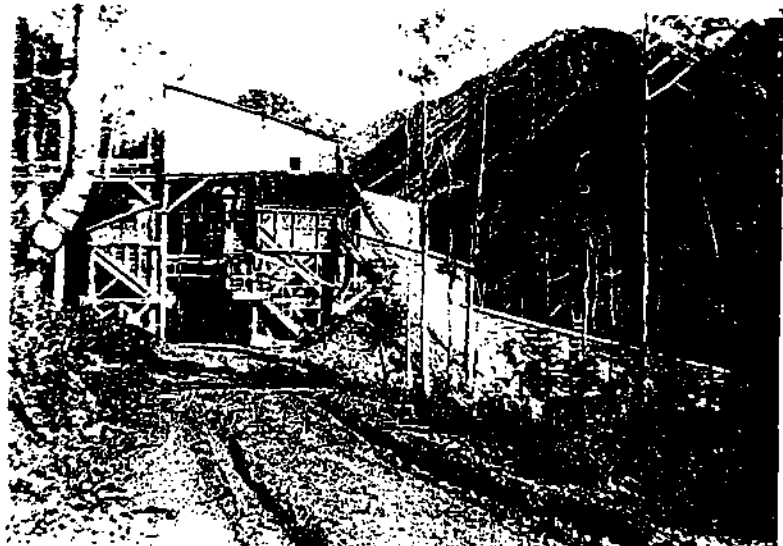
KATE MULVEY PHOTO - WILLIAM A. GRAVES COLLECTION

THIS PHOTOGRAPH of the Carbonero mill was taken in 1929 or 1930. Ore production was good for about five years during the late 1920's. However, about two-

thirds of the ore's value was in lead, and when lead prices dropped to less than four cents a pound during the Great Depression, the Carbonero closed down.

RUTH HOCKIN PHOTO

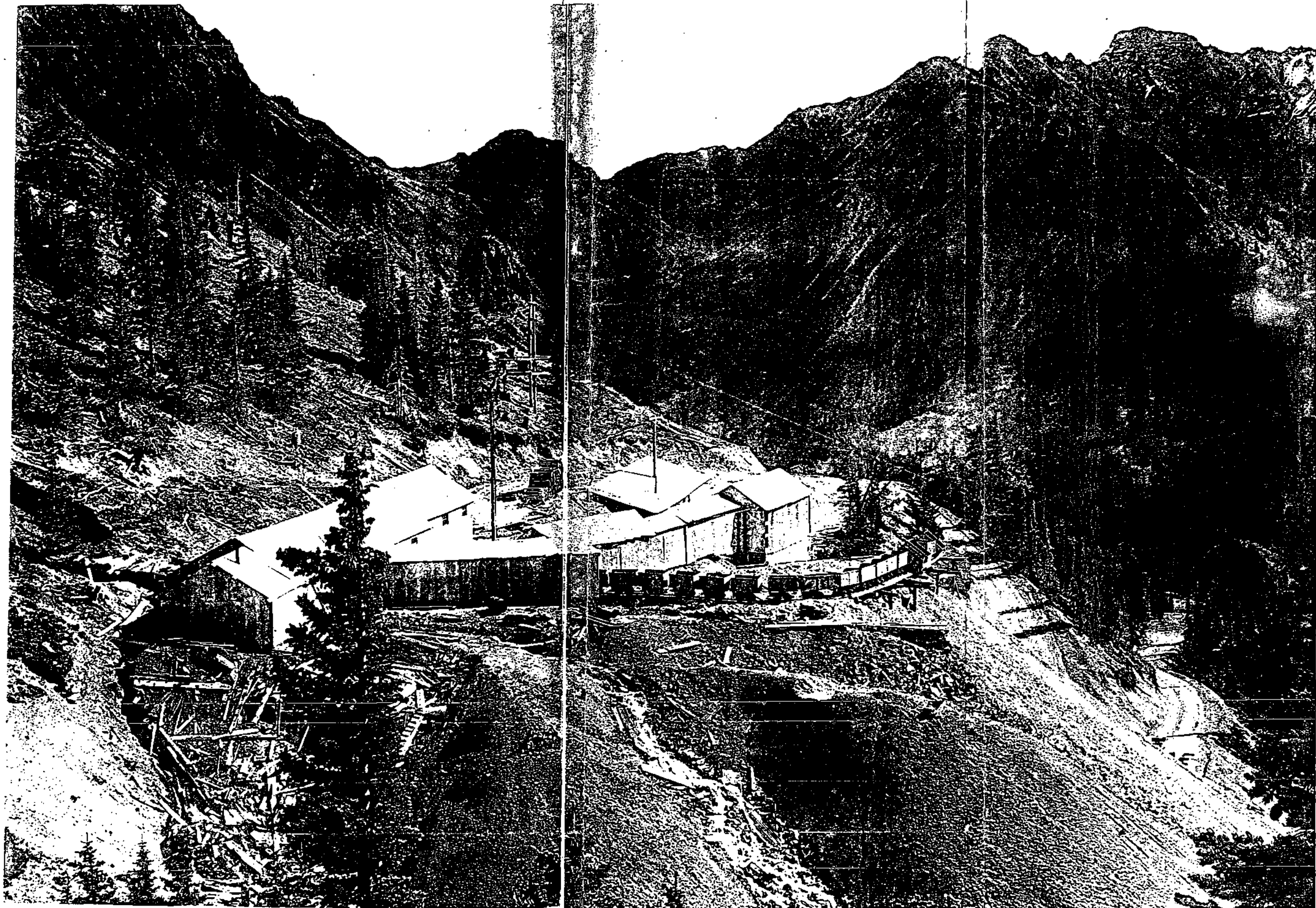
THE 1923 CARBONERO MILL was a type known as a Ruth-rod mill. This mill used the froth-flotation process, which was widely used at that time. It was served by an aerial tramway from the ore bins at the Shoofly Tunnel. The cable line was about 3,300 feet long.

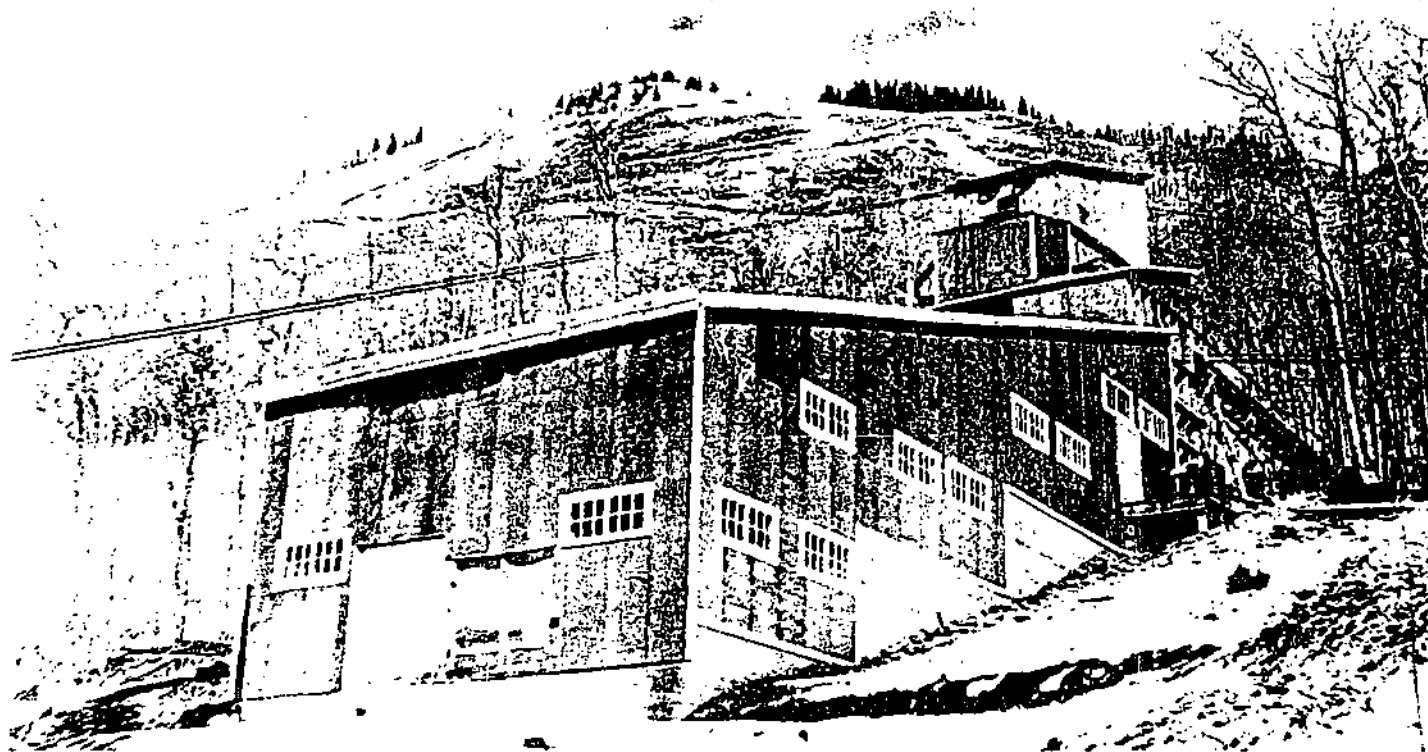




MELVIN CARLSON PHOTO -  
WILLIAM A. GRAVES COLLECTION

THIS BEAUTIFUL VIEW was taken in 1953. It shows the Carbonero's Shoofly tunnel portal, when the mine was still being worked by the Silver Bell Mining Company of Milwaukee, Wisconsin. According to reports submitted to the Bureau of Mines, the mine produced about \$150,000 worth of silver / lead ore annually for several years during this period of time (after World War II). The ore was trucked down a new road (seen at the lower right) to the Silver Bell mill at the Ophir Loop. However, the price of lead dropped, and the Carbonero closed down during late 1954.





UNIVERSITY PUBLIC LIBRARY, WESTERN HISTORY DEPARTMENT

**DURING ITS EARLY YEARS**, the Carbonero Mine was greatly handicapped by not having a mill to process its ore. In 1923, the Carbonero was leased by the Tejon Investment Company of Colorado Springs. This firm built a new 50-ton-per-day mill, which is seen in this photograph when it was new.

two-bucket aerial tramway from the Shootly portal. The cableway was 3,300 feet long and had a 1,300-foot drop. The new operation was a success. Annual production doubled to \$160,676 in 1925 and climbed to \$187,708 in 1926. In spite of the success, Shoup lost interest in the Carbonero and went to Arizona to pursue other investments. Some people believe that Shoup was given bad advice by engineers at the Carbonero about the future prospects of the mine. Others believe that Shoup was discouraged by management problems and bad working conditions at the mine.

The Carbonero Mine was leased to Carlo Girardi and Martin Anderson. Girardi was from Telluride, and Anderson had been a mining inspector for the State of Colorado. For the three years of operation under Girardi and Anderson, production rose to over \$700,000. Two-thirds of the values were lead, and most of the remainder was silver. This production was the greatest in the Carbonero's history. About 30 to 40 men were employed at the mine at this time. Anderson withdrew from the partnership, and Girardi shut the mine down in 1931, when the price of

lead dropped to less than four cents a pound. At that time, Girardi had paid \$80,000 of a purchase price of \$100,000, but he could not continue payments, and the mine was returned to its owner, the Carbonero Mines & Reduction Company.

No production was reported at the Carbonero for the next 10 years, except for very small amounts in 1934 and 1936. During 1936, the lessee was Matt Ruutilla, who had leased the mine in the early 1920's. Four or five miners, including Randy Belisle, produced several carloads of lead-silver ore. Randy remembers that "Peanuts" became a problem. Ruutilla rented a burro by the month and stabled him near the mine portal. The burro's name was "Peanuts." When Ruutilla prepared monthly business-expense statements, instead of listing a burro rental for the month, he just listed "Peanuts." One of Matt's associates, after noting this item for several months, said, "Matt, how in h— can four or five guys eat \$15 worth of peanuts every month?" Another lessee, Western Mines, Inc., leased the Carbonero in 1942, but they did not work it.

*(Continued on Page 423)*





WILLIAM A. GRAVES PHOTO

AN OLD FOOT TRAIL on Silver Mountain led to the Shoofly Tunnel of the Carbonero Mine. The tunnel portal was caved-in, and the buildings that were constructed in 1950 were also demolished.

The last on-and-off cycle at the Carbonero began in 1951, when the Silver Bell Mining Company of Milwaukee, Wisconsin, purchased the mine from the old Carbonero Mines & Reduction Company. The Silver Bell firm demolished the old mill and aerial tramway, and burned the old buildings at the mine. At a cost of \$11,000, they built a new road to the Shoofly portal. This rocky road was about two miles long, and it had to utilize switchbacks to reach the mine. Ore was hauled down the road in a four-wheel-drive truck to the Silver Bell mill, near Ophir station. (See "The Silver Bell Mine" later in this chapter.) A large ore bin and other buildings were constructed

at the Shoofly, at an elevation of 11,480 feet. The portal was re-timbered for a distance of 400 feet. At the same time, a mine locomotive and 20 ore cars were purchased, and 12 men were

Over \$450,000 of lead-silver ore was produced in three years, three-fourths of which was lead. During these three years, the price of lead dropped from 17 to 13 cents a pound, and the Silver Bell stopped all operations at the Carbonero in 1954.

All the buildings have since been demolished at the Shoofly portal, and the portal has caved-in. The property has been owned since 1980 by a Colorado investor.

(Continued on Page 428)

