

**MK007PR**

**SECTION 32**

**MINE**

**PRIOR RECLAMATION INSPECTION REPORT  
AND  
RECOMMENDATION FOR RELEASE OR PERMIT  
REQUIREMENT**

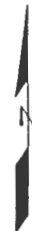
**Homestake Mining Company of California - Section 32 Mine**

**Submitted in Partial Fulfillment of New Mexico Mining Act  
Section 69-36-7 U, Prior Reclamation  
Protection of Water resources**

**New Mexico Energy, Minerals and Natural Resources Department  
Mining and Minerals Division  
Mining Act Reclamation Bureau**

**August 15, 1995**

• VENTILATION  
BOREHOLE  
ESCAPE SHAFT



STATE HIGHWAY 509

GRAVEL ROAD TO UNITED NUCLEAR MINES

DIRT ROAD TO QUIVERA MILL

30 29  
31 32

29  
32

• VENTILATION  
BOREHOLE

• VENTILATION  
BOREHOLE

• VENTILATION  
BOREHOLE

OFFICE  
CHANGE  
ROOM

SHAFT  
HOIST

TAILINGS  
POND

0 400  
SCALE IN FEET

RUNNOFF COLLECTION PONDS

FIGURE 1

SECTION 32 MINE  
T14N R10W

HOMESTAKE MINING COMPANY  
OF CALIFORNIA  
GRANTS PROJECT

SYSTEM	STRATIGRAPHIC UNIT		
CRETACEOUS	MANCOS SHALE		
	DAKOTA SANDSTONE		
JURASSIC	MORRISON FORMATION	BRUSHY BASIN MEMBER	
		WESTWATER CANYON MEMBER	"A" SANDSTONE
			"K" SHALE
			"B" SANDSTONE
			"K <sub>1</sub> " SHALE
			"C" SANDSTONE
			"K <sub>2</sub> " SHALE
			"D" SANDSTONE
			RECAPTURE MEMBER

Figure 2. Stratigraphic column of underlying formations (from Kelly, 1963)



*From middle of site facing west*



*From middle of site facing southeast*



*From east side of site facing west*





*From north side of site facing northwest  
(From left to right - Robert Young, Tacy Harling, Fred Craft)*



liter 7/17

#2 0/17  
cover

Letter 8/17

51

cover 6/17  
Litter 9/17

Transect 3

SPT / AGSM

1 AGSM

2 LIT

3 LIT

4 LIT

5 LIT

6 AGSM

7 AGSM

8 LIT

9 AGSM

10 AGSM

11 BARE

12 LIT

13 LIT

14 KOSIA

15 LIT

16 Bare

17 LIT

inc in  
rice grass

(SPAT, HOORHY,  
AGSM, BOGIR,  
HITA, ASTER)

State of New Mexico  
**ENERGY MINERALS and NATURAL RESOURCES DEPARTMENT**  
Santa Fe, New Mexico 87505



**BRUCE KING**  
GOVERNOR

**ANITA LOCKWOOD**  
CABINET SECRETARY

November 14, 1994

Mr. F.R. Craft  
Resident Manager  
Homestake Mining Co.  
Post Office Box 98  
Grants, NM 87020

**Re: Status of Section 32 Mine and Mac #1**

Dear Mr. Craft;

Pursuant to your October 24, 1994 letter we have made the corrections in our records, concerning the two sites mentioned above. Thank you for helping us with this update.

Sincerely,

A handwritten signature in dark ink, appearing to read "H. Shepherd".

HOLLAND SHEPHERD, Bureau Chief  
Mining Act Reclamation Bureau  
Mining and Minerals Division

HS/fg

---

**VILLAGRA BUILDING - 408 Galisteo**

Forestry and Resources Conservation Division  
P.O. Box 1948 87504-1948  
827-5830  
  
Park and Recreation Division  
P.O. Box 1147 87504-1147  
827-7465

---

**2040 South Pacheco**

Office of the Secretary  
827-5950  
  
Administrative Services  
827-5925  
  
Energy Conservation & Management  
827-5900  
  
Mining and Minerals  
827-5970

---

**LAND OFFICE BUILDING - 310 Old Santa Fe Trail**

Oil Conservation Division  
P.O. Box 2088 87504-2088  
827-5800

7/13/95

Section 32. - State land  
Fred Croft - Robert Young, TH, JD

Wet mine

Area Being Grazed

All ore removed

4.5" Topdressing Over waste rock

10" " " " "

16" " " " "

Spr Atca

Two photos

Boys China ① Topsoil depth check

It. ja GUSA Hole w/ 10" Topsoil

Agam

Hole ② Wasterock pile in

Orby fore ground w/ Quiver

Waste pile in

Back ground

Asker

③ Barrow area

Primrose

(4-6) Panoramic of Re

Curley Cup Gum wood Looking West - Quiver in

Tailings Pond land no Mine waste 8x9

only Mine Water - mine

Tailing Topdressing depth - 17" in tail's pond

New draining depression

Seeded Twice ; 1991 ; 92'

State of New Mexico  
**ENERGY, MINERALS and NATURAL RESOURCES DEPARTMENT**  
Santa Fe, New Mexico 87505



**BRUCE KING**  
GOVERNOR

December 14, 1994

**ANITA LOCKWOOD**  
CABINET SECRETARY

Mr. Fred Craft  
HomeStake Mining Co  
P. O. Box 98  
Grants, New Mexico 87020

**RE: Evaluation Guidelines for Prior Reclamation Sites.**

Dear Mr. Craft:

The Mining and Minerals Division (MMD) will be conducting inspections for the purposes of prior reclamation for the site(s) you have requested release. Based on Section 69-36-5 E. of the New Mexico Mining Act, the MMD has developed inventory of items to determine whether the completed reclamation satisfies the requirements of the New Mexico Mining Act and the substantive requirements for reclamation pursuant to the applicable regulatory standards.

This checklist is included for your use to determine if your site meets all of the ten criteria. Based on site-specific information, the MMD will be using this checklist to establish criterion based decisions to release the site from further responsibilities under the Act or not.

MMD will begin inspection of prior reclamation sites in early 1995 and will make a determination by September 30, 1995. If you have any questions regarding the checklist or questions regarding the inspection of your reclamation sites, please contact me or Joe DeAguero at 505\827-5970.

Sincerely,

A handwritten signature in dark ink, appearing to read "H. Shepherd".

Holland Shepherd  
Bureau Chief  
Mine Act Reclamation Bureau  
Mining and Minerals Division

VILLAGRA BUILDING - 408 Galisteo  
Forestry and Resources Conservation Division  
P.O. Box 1948 87504-1948  
827-5830

Park and Recreation Division  
P.O. Box 1147 87504-1147  
827-7465

2040 South Pacheco  
Office of the Secretary  
827-5950

Administrative Services  
827-5925

Energy Conservation & Management  
827-5900

Mining and Minerals  
827-5970

LAND OFFICE BUILDING - 310 Old Santa Fe Trail  
Oil Conservation Division  
P.O. Box 2088 87504-2088  
827-5800

# HOMESTAKE MINING COMPANY

P.O. BOX 98  
GRANTS, NEW MEXICO 87020  
(505) 287-4456

August 30, 1994



UPS TRACKING LABEL: 1078 5568 745

State of New Mexico  
Energy, Minerals and Natural  
Resources Department  
2040 South Pacheco Street  
Santa Fe, New Mexico 87505

Attn.: Mr. Holland W. Shepherd, Bureau Chief

Re: Prior Reclamation of Mine Sites

Dear Mr. Shepherd:

Enclosed are the five prior reclamation reports for Homestake Mining Company of California mines. The mines are Section 13, 15, 23, 25, all in Township 14 North, Range 10 West, and Section 32 in Township 14 North, Range 9 West. These reports comply with the New Mexico Mining Act to satisfy prior reclamation activities. Also enclosed is a check for \$1250 for fees at \$250 per mine site.

If you have any questions please contact me at the Grants office.

Sincerely,

HOMESTAKE MINING COMPANY

F. R. Craft  
Resident Manager

FRC:jg

Enclosures



**HOMESTAKE MINING COMPANY** 650 CALIFORNIA STREET, 11th FLOOR  
SAN FRANCISCO, CALIFORNIA 94108

No. 0008959

DATE: 25-AUG-94 CUST. ACCT. NO.

VENDOR NAME State of New Mexico VENDOR NO: 3096

INVOICE NO.	INVOICE DATE	DESCRIPTION	DISCOUNT AMOUNT	NET AMOUNT
Inspection	19-AUG-94		.00	1,250.00
<div>RECEIVED AUG 31 1994 MINING &amp; MINERALS DIVISION</div>				

PLEASE DETACH AND RETAIN THIS STATEMENT AS YOUR RECORD OF PAYMENT. *Thank You*

.00 1,250.00

**HOMESTAKE MINING COMPANY**

650 CALIFORNIA STREET, 11th FLOOR  
SAN FRANCISCO, CALIFORNIA 94108-2788

Drawn on  
Pittsburgh National Bank Jeannette, Pennsylvania  
in Cooperation With Wells Fargo Bank, N.A.  
#4759-008618 60-162/433

No. 0008959

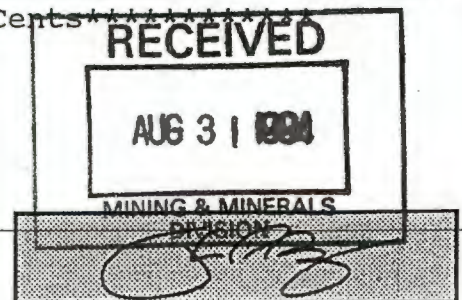
CHECK DATE	CHECK NUMBER	CHECK AMOUNT
25-AUG-94	8959	1,250.00

PAY One Thousand Two Hundred Fifty Dollars and No Cents\*\*\*\*\*

TO THE  
ORDER OF State of New Mexico  
Energy, Minerals & Natural Resource  
2040 South Pacheco Street  
Santa Fe NM 87505

BY

BY



**Prior Reclamation Study - Protection of Water Resources  
Homestake Mining Co., United Nuclear Corp.  
and Kerr-McGee Corp.**

**Submitted in Partial Fulfillment of New Mexico Mining Act  
Section 69-36-7 U, Prior Reclamation  
Protection of Water Resources**

**New Mexico Energy, Minerals, and Natural Resources Department  
Mining and Minerals Division  
Mining Act Reclamation Bureau**

## **Introduction**

### **Purpose of Study**

The purpose of this study is to determine if further measures are required to protect water resources from degradation following mining operations at Homestake Mining Company and United Nuclear Corporation Mines prior reclamation sites near Ambrosia Lake, New Mexico and Kerr-McGee Corporation sites near Church Rock, New Mexico. The sites are tabulated in Table I. These companies are applying for release from further obligations pursuant to Section 69-36-7 of the New Mexico Mining Act and Section 5.10 of the New Mexico Mining Act Rules.

According to Section 69-36-7 U of the New Mexico Mining Act and Section 5.10 of the New Mexico Mining Act Rules an operator may apply for release from further requirements of the Act if the director of the State of New Mexico Mining and Minerals Division determines that reclamation measures satisfy requirements of the Act and substantive requirements for reclamation pursuant to applicable regulatory standards. "Reclamation" is defined by the Act as "the employment during and after a mining operation of measures designed to mitigate disturbance of effected areas and permit areas and to the extent practicable, provide for the stabilization of a permit area following closure that will minimize future impacts to the environment from the mining operation and protect air and water resources."

### **Surface Water Resources**

There are no perennial or intermittent streams in the area of Ambrosia Lake. All surface runoff drains to ephemeral water courses and eventually into the San Mateo Drainage (Homestake, 1994). While uranium mines were operating in the area the San Mateo Creek, a tributary of the Rio San Jose, gained flow as a response of mine discharge. This water seldom reached the Rio San Jose because of seepage into the alluvium. The San Mateo Creek is now directly recharged from ground water (Brod, 1979). Before uranium mining the Puerco River was also an ephemeral stream. During mining operations the Puerco River flowed at rates as high as 10 cu ft/sec. The Puerco River is now perennial principally because of municipal effluent discharge (Stone *et al.*, 1983). Water from mine dewatering operations contained elevated levels of radiochemicals and toxic metals. However, there are no lasting impacts on surface water resources because of mine water discharge (Kaufmann *et al.*, 1976). The shallow alluvium in the Ambrosia Lake Area is separated from underlying sandstone units by the impermeable Mancos Shale (Stone, 1983).

Protection of surface water resources with respect to erosion and sediment was accomplished by regrading the area to a stable configuration and reestablishment of permanent vegetation. Post mining topography and vegetation were inspected by Mining and Minerals Division personnel July 13-14, 1995 and will be addressed in a separate report. There were no waste piles of radioactive material left on the surface with the potential to contaminate surface water.

**Table I**  
**Prior Reclamation Study Site**

Operator	Site	Wet Mine
Homestake Mining Company	Section 13 Mine	Dry
"	Section 15 Mine	Wet
"	Section 23 Mine	Wet
"	Section 25 Mine	Wet (Solution Mined)
"	Section 32 Mine	Wet
United Nuclear Corporation	Anna Lee Mine	Mostly Dry
"	John Bill Mine	Wet
"	Sandstone Mine (Section 34 Mine)	Wet
Kerr-McGee	Church Rock 1 Mine	Wet
"	Church Rock 1 East Mine	Wet
"	Church Rock 2 Mine	Wet

## **Groundwater Resources**

### **Regional Aquifer's**

Figure 1 (Stone *et al.*, 1983) shows the geologic section in the Raton Basin. The City of Gallup derives most of its drinking water from the Gallup Sandstone. The San Andres Limestone and Glorieta Sandstone combine to form a significant aquifer along the southern margin of the San Juan Basin between Grants and Gallup. The Cities of Grants and Milan obtain water from this Aquifer. The Village of San Mateo relies primarily on the Point Lookout Sandstone for its drinking water supply. The Morrison Formation, in which uranium mining took place, is the source of the public water supply for the Village of Crownpoint (Stone *et al.*, 1983).

### **Regional Groundwater Flow**

The geology of the San Juan Basin is characterized by alternating strata of high and low hydraulic conductivities and, therefore, the major component of ground water flow in the San Juan Basin is through the higher conductivity units. The amount of vertical movement between aquifers is difficult to determine using available data. However, differences between vertically adjacent aquifers suggest that leakage rates through intervening shale beds are very low in most areas (Stone *et al.*, 1983). The geologic section in Figure 1 shows the probable direction of flow through confining beds. Note that the flow direction of leakage from the Morrison Formation is downward.

Generally, ground water flow within aquifers is from topographically high outcrop areas toward lower outcrop areas. Much of the recharge to aquifers in the basin occurs on the flanks of the Zuni, Chuska and Cebolleta Mountains. Also contributing to the regional flow systems is recharge from high areas along the northern and northeastern basin margins, including the San Juan Mountains in Colorado. The San Juan valley in the northwest part of the basin and tributaries of the Rio Grande such as the Rio Salado, Rio Puerco and Rio San Jose in the southeast parts of the basin are the main discharge areas for the basin. Less important in terms of volume of outflow is the Puerco River near Gallup. Ephemeral stream channels filled with alluvium are the principal sources of groundwater recharge at higher elevations and the principal locations of discharge at lower elevations. The alluvial cover usually conceals evidence of discharge. Occasionally, white salt or alkali deposits associated with small-yield springs reveal groundwater discharge. Most discharge to alluvial channels is lost by evapotranspiration. However, some also moves as subsurface flow (Stone *et al.*, 1983).

The stratigraphic units of the prior reclamation sites in the vicinity of Ambrosia Lake are shown in Figure 2 (Kelly, 1963). This figure shows the Cretaceous system of the Mancos Shale and Dakota Sandstone overlying the Jurassic System of the Morrison Formation. Uranium ore was found in the "A" through "D" units of the Westwater Canyon member of the Morrison Formation (Homestake, 1994). Figure 2 shows that the Gallup Sandstone and Point Lookout Sandstone Aquifers do not exist in the area of the Homestake and United Nuclear sites (except the northeast corner of United Nuclear's Section 28) and that the Mancos Shale Aquitard isolates the Morrison formation from overlying formations down dip.



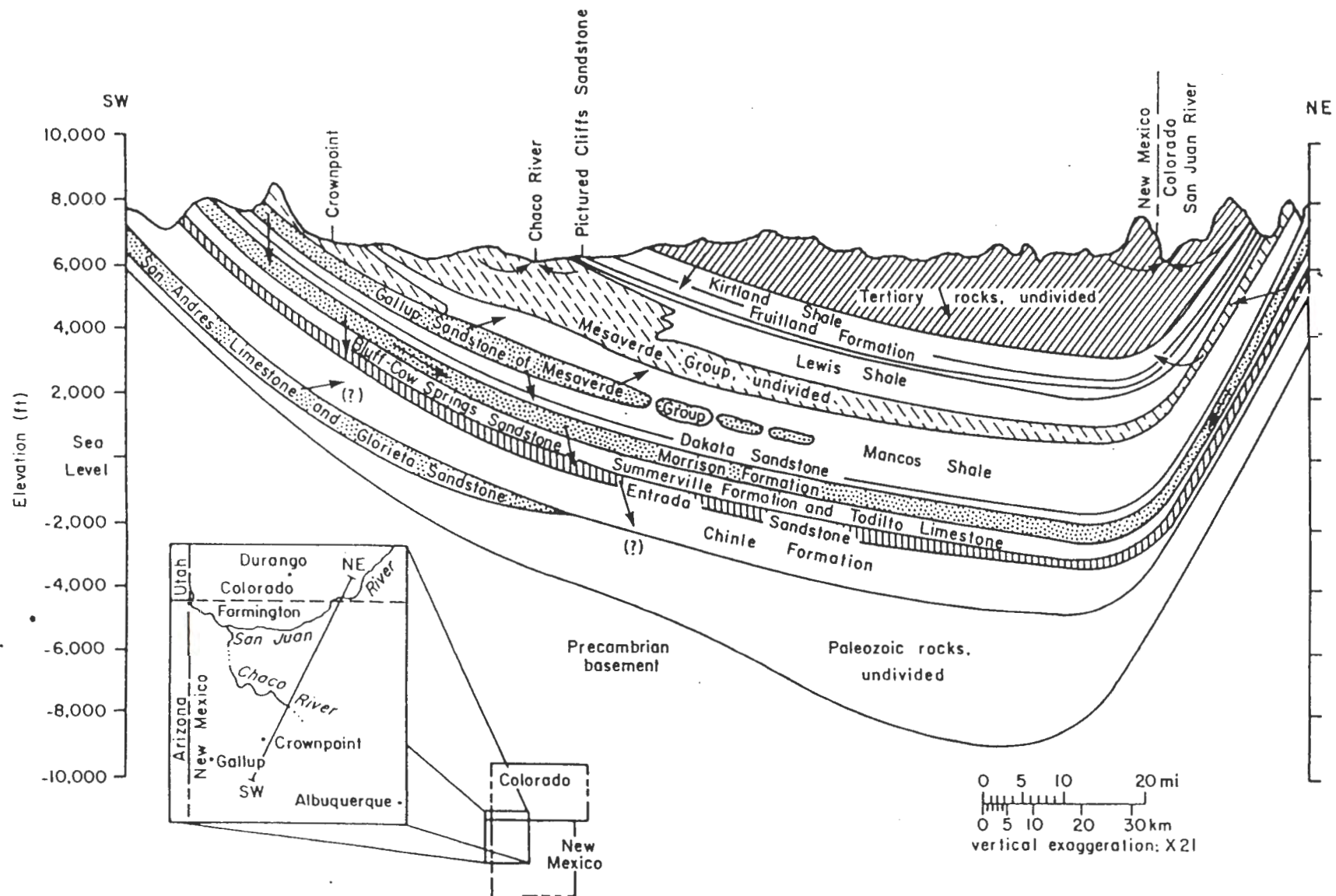


Figure 1 - Generalized Hydrologic Cross Section of San Juan Basin showing major aquifers (stipped), confining beds (blank), and directions of groundwater flow (arrows). From Stone et al., 1983



SYSTEM	STRATIGRAPHIC UNIT	
CRETACEOUS	MANCOS SHALE	
	DAKOTA SANDSTONE	
JURASSIC	MORRISON FORMATION	BRUSHY BASIN MEMBER
		"A" SANDSTONE
		"K" SHALE
		"B" SANDSTONE
		"K <sub>1</sub> " SHALE
		"C" SANDSTONE
		"K <sub>2</sub> " SHALE
		"D" SANDSTONE
		RECAPTURE MEMBER

Figure 2 - Divisions of Morrison Formation in the vicinity of Homestake Mining Company prior reclamation sites. From Kelly, 1963

Figure 3 (Stone *et al.*, 1983) shows the potentiometric surface for the Westwater Canyon member of the Morrison Formation. The Morrison Formation is the formation in which mining for uranium took place. This figure shows that the Westwater is recharged from the Nacimiento Mountains to the northeast and the Zuni Mountains to the southwest. Figure 4 (Stone *et al.*, 1983) depicts transmissivity within the Morrison Formation. From Figures 3 and 4 it is intuitive that groundwater within the Morrison Formation in the area of Ambrosia Lake flows primarily to the Rio Puerco discharge area in the southeast, away from Crownpoint. Groundwater within the Morrison Formation in the Church Rock Area flows north, away from Crownpoint, where it discharges into the San Juan River.

Figure 5 (Stone *et al.*, 1983) delineates elevations of the top of the overlying Dakota Sandstone. Figures 3 and Figure 5, show that the potentiometric surface in the Ambrosia Lake and Church Rock areas is well below the top of the Dakota Sandstone. Potentially contaminated water from the Morrison Formation, therefore, lacks potential to migrate to aquifers above. Also, according to Bill Ganus (1995) water levels within the Morrison Formation appeared to be stabilizing at an elevation of approximately 6600 feet (below the top of the Dakota Sandstone) after the cessation of mining operations in the Church Rock Area. In addition, if one considers the thickness and impermeability of the Mancos Shale that overlies both the Morrison Formation and the Dakota Sandstone it becomes obvious that water within the Morrison Formation is confined to the Morrison Formation.

### **Mining Impacts on Ground Water Quality**

Regional impacts of uranium mining on groundwater were associated with mine discharge, tailings pond effluent, solution mining and collapse of underground workings. Water quality was altered near mining operations because oxidation at the mine face makes some radionuclides soluble. As water levels in the mines return to their original levels it is expected that oxidation of uranium will cease and that water quality will return to pre-mining levels. The mines in which mining occurred in zones of saturated ground are indicated in Table I. All prior reclamation site vertical shafts were backfilled and capped with concrete to prevent contamination of groundwater by surface drainage. The Gallup Sandstone was sealed from the shaft at the Kerr-McGee sites near Church Rock (Ganus, 1995).

Mine discharge from mine dewatering operations was sometimes injected underground as well as discharged in surface drainages. Water pumped from mines often contained elevated levels of radiochemicals and toxic metals (Kaufmann *et al.*, 1976). Although some water pumped from the mines was used for milling, much of the water was injected underground, used for other purposes, or discharged into arroyos. The quality of mine water discharged underground has been monitored by the U.S. Environmental Agency and the New Mexico Environment Department for impacts to groundwater resources since 1977. However, natural groundwater flowing into mine workings and which reenters the ground by gravity flow is exempt from WQCC discharge plan requirements.

Water discharged with mill tailings contained high levels of radioactive and other chemicals added or mobilized during the extraction process. The quality of discharged process water was monitored by the U.S. Environmental Protection Agency and the New Mexico Environment Department for adherence to National Pollutant Discharge Elimination System and the New Mexico Water Quality

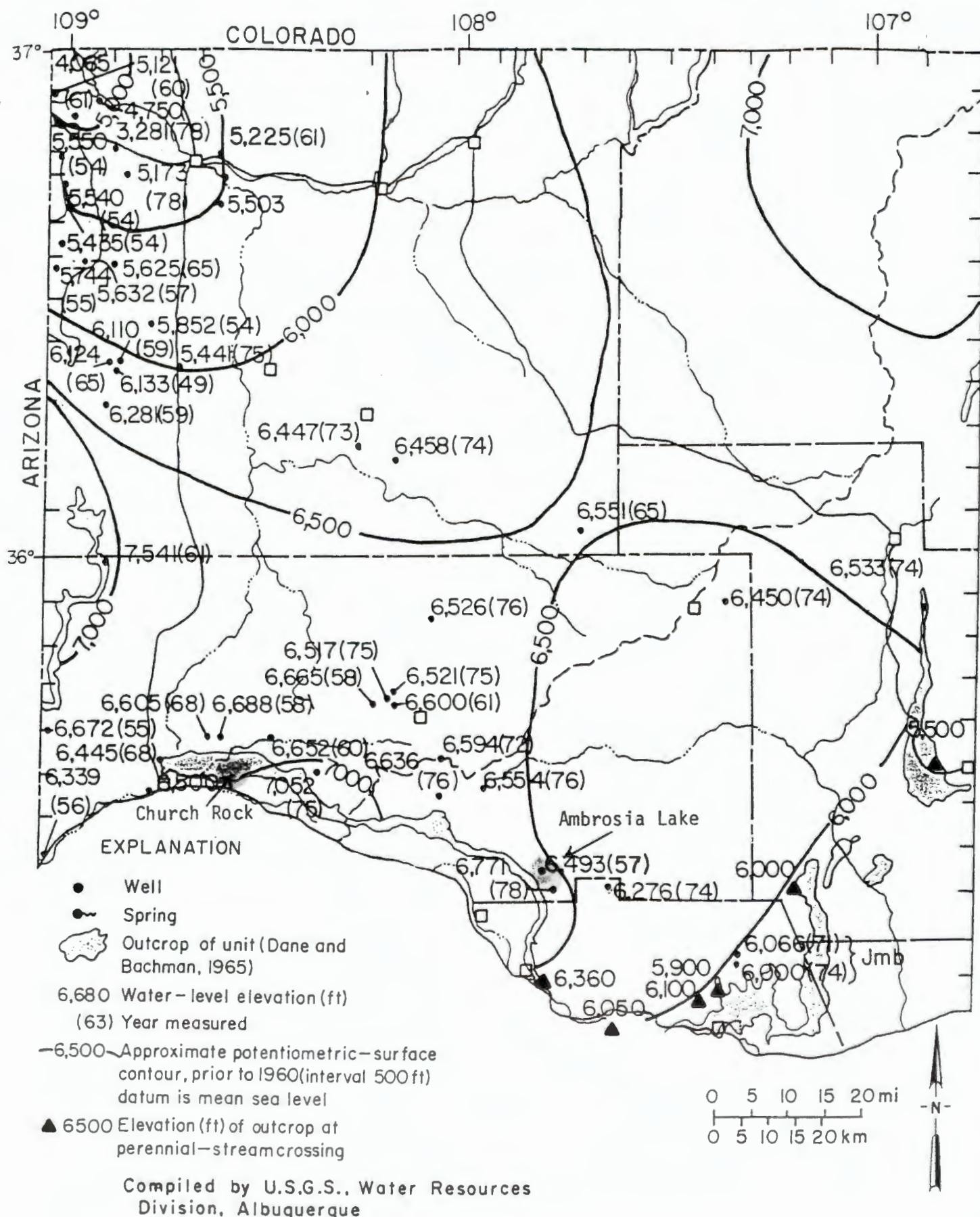


Figure 3 - Water level altitudes and potentiometric surface for Westwater Canyon Member of Morrison Formation. From Stone, et al., 1983



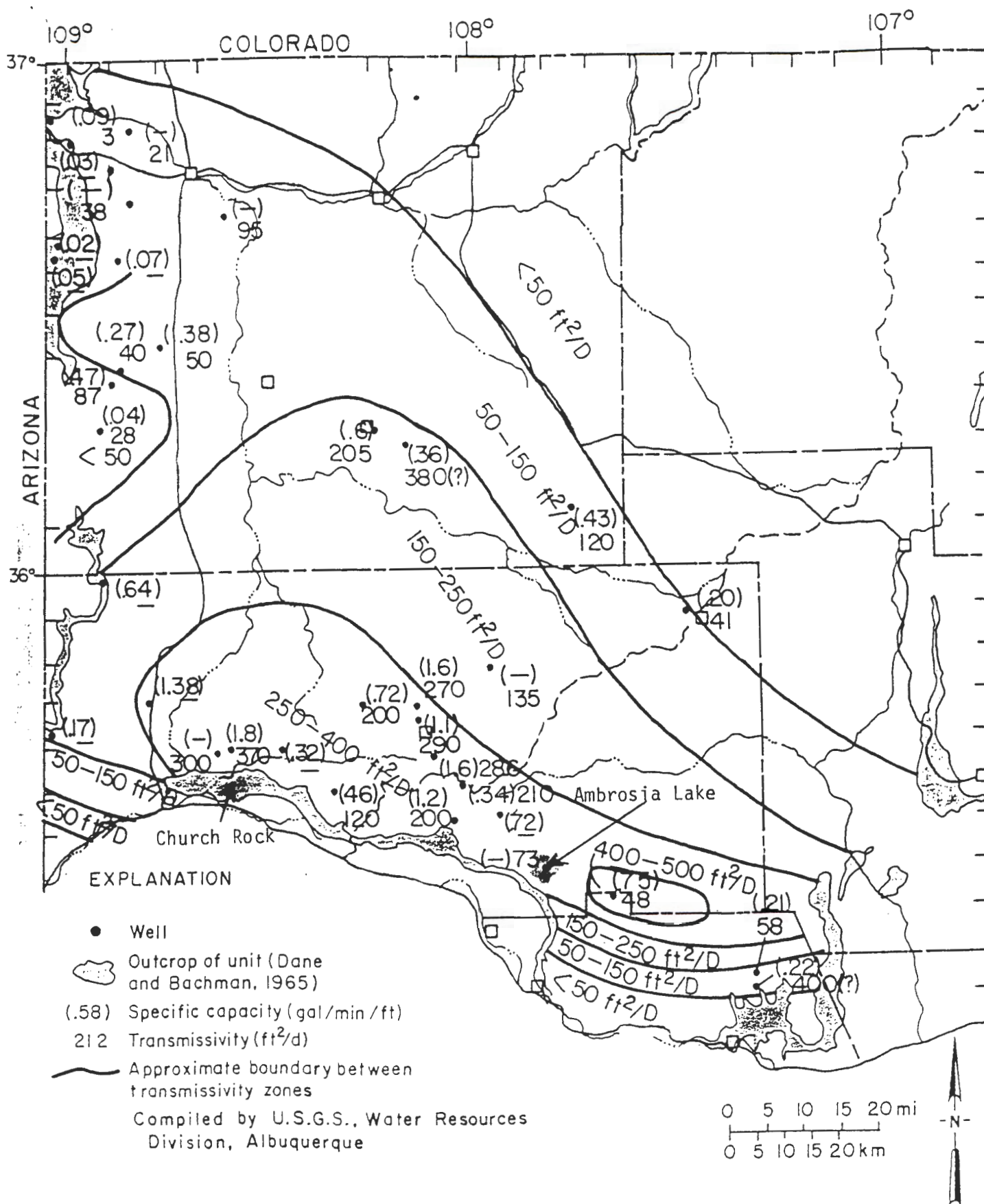


Figure 4 - Transmissivity and Specific Capacity of wells in Morrison Formation. Frone Stone, et al., 1983

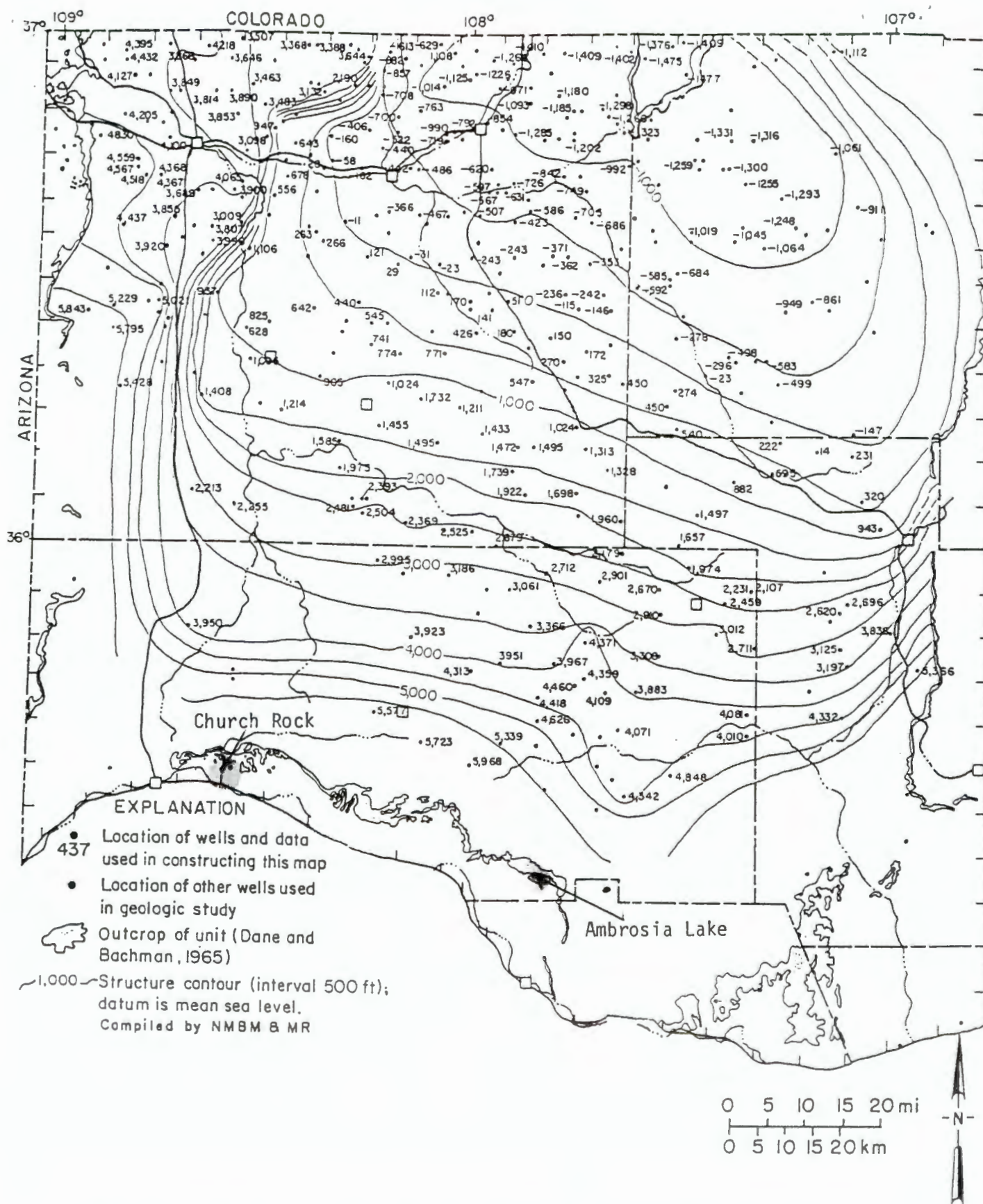


Figure 5 - Elevation of top of Dakota Sandstone structure. From Stone, From Stone, et al., 1983

Control Commission discharge regulations after 1977. Water used in the milling process and discharged with the mill tailings either evaporated or infiltrated to recharge shallow aquifers. Kaufman et al. (1976) said that about 30% of the tailings water in the Ambrosia Lake area infiltrated causing high levels of selenium in shallow groundwater near the tailings piles. Groundwater contamination associated with tailings dams is regulated by the Nuclear Regulatory Commission and is, therefore, beyond the scope of this study.

Collapse of underground workings has probably caused some deterioration of water quality in the Morrison Formation near Ambrosia Lake by providing a connection to the overlying Dakota Sandstone. In the Ambrosia Lake Area the Dakota Sandstone contains higher concentrations of dissolved solids than the Morrison (Cooper and John, 1968). There nothing mine operators can do to prevent further collapse of underground workings. However, sandstone has an especially high swell factor of 66 percent (Caterpillar, 1991). Consequently, it is unlikely that subsurface subsidence will extend to aquifers above the Dakota Sandstone.

At the Homestake Section 23 Mine uranium was extracted by in situ leaching. Although this method eliminated many water resource impacts associated with conventional mining, it caused some new ones, such as control of the leaching fluid and cleanup of the Morrison Aquifer after leaching ceased. Impacts on groundwater by solution mining are regulated via groundwater discharge plans by the New Mexico Environment Department.

Continental Oil Company personnel, after conducting a literature search on the mobility of radium in groundwater systems, concluded that dispersion, ion exchange, and radioactive decay prevents extensive migration of excessive radium concentrations that might persist in the immediate area of a mine (Jensen W.M., 1978). These geochemical processes, by which uranium minerals were deposited in the first place, probably limit migration of uranium as well as other toxic substances.

### **Mining Impacts to Ground Water Quantity**

During mining operations a large quantity of freshwater was pumped to keep the mines dewatered. Much of the water needed for uranium mining and milling was provided by mine water discharge. In addition water for milling was produced from wells completed in the Glorieta Sandstone - San Andres Limestone near Grants and wells tapping the Morrison Formation north of Laguna. Dewatering caused large declines in water levels in the Morrison Formation (Lyford *et al.*, 1980). Pumpage of water for uranium exploration drilling also caused water-level declines in the Gallup Sandstone. It is expected, however, that water levels will return to premining levels with the cessation of mining operations.



## **Summary and Conclusions**

Protection of surface water resources with respect to erosion and sediment was accomplished by regrading the area to a stable configuration and reestablishment of permanent vegetation. Post mining topography and vegetation were inspected by Mining and Minerals Division personnel July 13-14, 1995 and will be addressed in a separate report. There are no waste piles of radioactive material left on the surface with the potential to contaminate surface water.

Uranium mining took place within the Morrison Formation and the Morrison Formation is the source of the public water supply for the Village of Crownpoint. However, water within the Morrison potentially contaminated by mining operations would most likely be confined to the Morrison Formation. The flow of groundwater within the Morrison Formation in the area of Ambrosia Lake is to the southeast and in the area of Church Rock to the north, away from the community of Crownpoint.

The quality of water discharged into surface arroyos has been regulated by the U.S. Environmental Protection Agency and the New Mexico Environment Department for adherence to National Pollutant Discharge Elimination System and the New Mexico Water Quality Control Commission discharge regulations after 1977. The quality of water discharged underground has been regulated since 1977 by the New Mexico Environment Department according to respective groundwater discharge plans. Mine dewatering has caused large declines in water levels in the Morrison Formation and the Gallup Sandstone. It is expected, however, that water levels will return to premining levels with the cessation of mining operations.

It is expected that oxidation of uranium minerals will cease and water will return to premining quality as groundwater recovers to premining levels. Geochemical processes such as dispersion, ion exchange, and radioactive decay may prevent extensive migration of excessive radium concentrations that might persist and limit migration of other toxic substances.

No further reclamation measures, that fall within the regulatory authority of the New Mexico Mining Act, are required to protect water resources from degradation following uranium mining at Homestake Mining Company and United Nuclear Corporation Mines prior reclamation sites near Ambrosia Lake, New Mexico and Kerr-McGee Corporation sites near Church Rock, New Mexico.

## References

- Brod, R.C. 1979, Hydrogeology and Water Resources of the Ambrosia lake - San Mateo Area, McKinley and Valencia Counties, New Mexico: M.S. thesis, New Mexico Institute of Mining and Technology.
- Caterpillar (Caterpillar Inc.) 1991, Caterpillar Performance Handbook, Caterpillar Inc., Peoria, Illinois.
- Cooper, J. B. and John, E.C. 1968, Geology and Groundwater Occurrence in Southeastern McKinley County, New Mexico: New Mexico State Engineer, Technical Report 35.
- Homestake (Homestake Mining Company of California) 1994, Reclamation Report, Section 23 Mine.
- Jensen, W.M. 1978, Continental Oil Company, Personal Communication
- Kaufman et al. (R.F., Eadie G.G. and Russell, C.R. 1976, Effects of Uranium Mining and Milling on Ground Water in the Grants Mineral Belt, New Mexico and Colorado: New Mexico Geological Society, Guidebook 28th Field Conference.
- Kelly Vincent C. 1963, Geology and Technology of the Grants Uranium Region, New Mexico Bureau of Mines and Mineral Resources, Memoir 15.
- Ganus, B. 1995, Hydrologist, Kerr-McGee Corporation, Personal Communication.
- Lyford and Stone (Lyford, F.P. and Stone, W.J.) 1978, Groundwater Resources of Northwestern New Mexico, Geological Society of America, Abstracts with Programs, Volume 10, Number 5.
- Stone et al. (Stone, W.J., Lyford, F.P., Frenzel, P.F., Mizell, N.H. and Padgett, E.T.) 1983, Hydrology and Water Resources of the San Juan Basin, New Mexico, New Mexico Bureau of Mines and Mineral Resources, Hydrologic Report 6.

# HOMESTAKE MINING COMPANY

P.O. BOX 98  
GRANTS, NEW MEXICO 87020  
(505) 287-4456

July 25, 1994



State of New Mexico  
Energy, Minerals and Natural  
Resources Department  
2040 South Pacheco Street  
Santa Fe, New Mexico 87505

Attn.: Mr. Holland W. Shepherd, Bureau Chief

Re: Prior Reclamation of Mine Sites

Dear Mr. Shepherd:

Homestake Mining Company of California is preparing to submit, by August 31, 1994, prior reclamation status for the following mine sites: Section 13, Section 15, Section 23, Section 25 and Section 32. The prior reclamation status reports will consist of the following elements: Introduction, History of Operation, Climatology, Ecology, Geology, Topography, Hydrology, Mine Operation Description, Reclamation, Reclamation Procedures, Achievement of Reclamation Requirements, and Reclamation Seed Mixture. I believe the outline will complete the prior reclamation requirements.

I reviewed the list of mine sites listed under Homestake Mining Company of California and found the following listings need to be removed: UN-HP Section 23, UNC Section 15, UNC Section 25, UNC Section 32, UN-HP Section 13, and Section 25 T12N Wayne Jacke R10W. ?

It was good to see you again and I'm looking forward to working with you.

Sincerely,

HOMESTAKE MINING COMPANY

A handwritten signature in cursive script, appearing to read "F. R. Craft".

F. R. Craft (FRC)  
Resident Manager

FRC:jg

September 29, 1995

Mr. Fred Craft, Resident Manager  
Homestake Mining Company of California  
P.O. Box 98  
Grants, NM 87020

**RE: Prior Reclamation Release, Section 13, 15, 23, 25 and 32 Mines, McKinley County, New Mexico**

Dear Mr. Craft:

The Mining and Minerals Division (MMD) has completed the inspection of reclamation measures at the following mines as requested by Homestake Mining Company of California (HMC):

Section 13 T14N R10W  
Section 15 T14N R10W  
Section 25 T14N R10W  
Section 32 T14N R9W


Based on findings in the enclosed inspection reports, reclamation measures at the above mines satisfy the requirements of the New Mexico Mining Act (NMMA) and the substantive requirements for reclamation pursuant to the NMMA Rules. Therefore, HMC is hereby released from further requirements of the NMMA on the mines listed above. However, the Section 25 Mine was identified by staff as having one maintenance item which will need to be addressed. The release for this site will be conditional on Homestake performing the work discussed in the Section 25 report and meeting the deadline provided in the report.

The enclosed prior reclamation inspection report details the findings of the inspection but does not include the photos/slides contained in the MMD file copy.

The Section 23 Mine was identified by staff as having insufficient cover to meet release. However, since Homestake has completed most reclamation measures at the mine, Homestake may apply for a variance from the provisions of the NMMA Rules pursuant to Rule 10. Otherwise Homestake must apply for a permit under the provisions of Rule 5.10.B.

MMD appreciates HMC's efforts to comply with the NMMA and commends them for their safeguarding and reclamation efforts. If you have any questions please contact Holland Shepherd of the Mining Act Bureau, (505) 827-5971.

Sincerely,

A handwritten signature in black ink, appearing to read 'K. Garland', with a long, sweeping horizontal line extending to the right.

Kathleen A. Garland, Director  
Mining and Minerals Division

cc: Ms. Maxine Goad, New Mexico Environment Department  
Mr. Mark Schmidt, State Land Office  
Mr. Jerry Elkins, Surface Owner

Enclosures

**PRIOR RECLAMATION INSPECTION REPORT  
AND  
RECOMMENDATION FOR RELEASE OR PERMIT REQUIREMENT**

**Homestake Mining Company -- California**

**Section 13, (T 14N R 10W), Section 15 (T 14N, R 10W), Section 23 (T 14N, R 10W),  
Section 25 (T 14N, R 10W) and Section 32 (T 14N, R 10W) Mines**

**Submitted in Partial Fulfillment of the New Mexico Mining Act  
Section 69-36-7 U., Prior Reclamation**

**New Mexico Energy, Minerals and Natural Resources Department  
Mining and Minerals Division  
Mining Act Reclamation Bureau**

**September 26, 1995**



## Introduction

The purpose of these inspections was to determine if reclamation measures at Homestake Mining Company's Section 13, Section 15, Section 23, Section 25, and Section 32 Mines satisfy the requirements of the New Mexico Mining Act (Section 69-36-7, Prior Reclamation) and other substantive requirements for prior reclamation pursuant to the New Mexico Mining Act Rules. The sites, their locations, and dates of inspections by the New Mexico Mining and Minerals Division are presented in Table 1.

**Table 1.** Homestake Mining Company's Prior Reclamation Sites.

Name of Mine	Location	Date of Inspection
Section 13	T 14N, R 10W	July 13, 1995
Section 15	T 14N, R 10W	July 13, 1995
Section 23	T 14N, R 10W	June 28, 1995
Section 25	T 14N, R 10W	June 28, 1995
Section 32	T 14N, R 10W	July 13, 1995

## Inspection Procedures

Inspections by the Mining and Minerals Division of prior reclamation sites were conducted on the following mine sites: Section 13 (T 14N, R 10W), Section 15 (T 14N, R 10W), Section 23 (T 14N, R 10W), Section 25 (T 14N, R 10W), and Section 32 (T 14N, R 10W). All inspections were conducted and completed on June 28 and July 13, 1995. Persons present during the June 28, 1995 inspections of the Section 23 and Section 25 mines included: Mr. Joe DeAgüero, Mr. Robert Garcia, Ms. Tacy Harling, and Ms. Robyn Tierney of the New Mexico Mining and Minerals Division; and Mr. Fred Craft, representing Homestake Mining Company (HMC). Persons present during the July 13, 1995 inspection of the Section 13, Section 15, and Section 32 mines included: Mr. Fred Craft, representing Homestake Mining Company; and Ms. Tacy Harling, and Mr. Robert Young of the New Mexico Mining and Minerals Division (MMD). The authors of this inspection report were Ms. Robyn Tierney and Mr. Robert Young.

Inspections of each mine site consisted of a review of information submitted by the mine operator, subsequent discussion with the operator pertaining to mining and reclamation at each site, inspection of the condition of the reclaimed mine sites, line-intercept sampling for estimates of vegetative cover, compilation of plant species lists, measurement of reclaimed soil depths, and photo-documentation. Each of the mine sites was visually inspected for erosion features and hydrologic stability. During a walkover of each site, all slopes and areas of water concentration (ponds, diversions and areas where disturbed areas enter undisturbed lands) were visually inspected for stability. Topsoil placement and distribution were evaluated at each site. Sampling for topsoil depth consisted of randomly digging a series of holes to identify the depth of topsoil and the presence or absence of potentially toxic wasterock at rooting depth. Grading of all wasterock piles and

borrow areas was visually inspected. Placement and closure of portals and vent shafts were verified in the field.

The establishment and relative percent cover of reseeded and native plant species were evaluated in randomly placed transects. Fifty foot transects were evaluated at each mine site using the line intercept method (Bonham 1989). These transects were used to estimate the relative percent cover of each plant species intercepted at 3' intervals along a transect. Seventeen points per transect were recorded. In addition, a list of species present within a 50' X 6' belt transect adjacent to each transect was compiled. These sampling procedures, however, do not meet sample adequacy. Rather, these procedures were conducted to estimate the relative percent cover and to evaluate the diversity of species present at each of the eight mine sites. Additional resources would be needed to fully evaluate the vegetation of these prior reclamation sites to a level of sample adequacy and would require at least 24 additional man-hours of inspection time per site.

## **Results and Discussion**

Maps and reports describing the conditions at the five mine sites were submitted by Homestake in 1994. The detail in these reports and maps is sufficient to describe conditions and facilities that were present on each site prior to reclamation and provide information on the reclamation of each site. Details of the reclamation activities at each site were further verified in discussions with Mr. Craft of Homestake Mining Company and by the on-site inspections conducted on June 29 and July 13, 1995.

### **Section 13, T 14N, R 10W**

The present owner of the surface rights to Section 13 is Mr. Jerry Elkins. The owner of the mineral rights is Cerrillos Land Company (Santa Fe Pacific Railroad). Homestake-Sapin Partners began operation of the HMC Section 13 Mine in October 1977 as United Nuclear-Homestake Partners under a lease from Santa Fe Pacific Railroad. The partnership was dissolved February 1981 with Homestake Mining Company-Grants remaining as the operator. The company was later renamed Homestake Mining Company of California.

The Section 13 Mine lies within the Ambrosia Lake valley. Appendix A (Kelly 1963) depicts the stratigraphic column underlying the formations at this and the four other mine sites (Section 15, Section 23, Section 25, and Section 32) discussed in this report. Uranium ore was found in the "A" through "D" sandstone units of the Westwater Canyon member of the Morrison Formation (HMC, 1994). This mine was a dry mine (Craft, 1995). There are no surface water features in the section. Surface drainage is to an unnamed tributary of Arroyo del Puerto that, in turn, drains into San Mateo Creek. Structures which existed at the Section 13 Mine while it was in operation included an access road, a vertical shaft, a ventilation shaft, an equipment storage area, two waste rock piles, a compressor building and a office/hoist/compressor building. Homestake regraded and topsoiled the site in early 1992 and reseeded in June of the same year. The seed mixture used in the reclamation of the Section 13 Mine and the other mine sites is shown in Appendix B. Photographs of reclamation activities were provided in the request for prior reclamation inspection (HMC, 1994).

A barbed wire fence surrounded the site. All structures, trash or junk had been removed from the site. There were no visible piles or accumulations of toxic or waste material on the site. There were no apparent hazards

or erosion features that could affect public health and safety. The slopes of the reclaimed waste rock piles appeared stable with respect to erosion and mass movement. The reclaimed waste rock piles blended in with the surrounding terrain and provided topographic diversity. Shaft boreholes were backfilled with nontoxic mine waste material and capped with concrete slabs that were, in turn, covered with a foot of soil (HMC, 1994). Top soil depths across the site ranged from 5 to 14 inches. There was some evidence of grazing by wildlife. Perennial species identified on the site included blue grama, galleta, snakeweed, western wheatgrass, alkali sacaton and globemallow (Table 2). The area had had little precipitation during the course of the summer and vegetation was drought stressed. Line-intercept transects (Table 3) indicated that there was approximately 18 percent perennial vegetative cover and 30 percent litter cover (DeAguero, 1995).

**Table 2.** List of Species at Homestake's Section 13 Mine

COMMON NAME	<i>Genus &amp; species<sup>1</sup></i>
Alkali sacaton	<i>Sporobolus airoides</i>
Western wheatgrass	<i>Agropyron smithii</i>
Crested wheatgrass	<i>Agropyron cristatum</i>
Blue grama grass	<i>Bouteloua gracilis</i>
Galleta	<i>Hilaria jamesii</i>
Ragweed	<i>Kochia scoparium</i>
Daisy fleabane	<i>Erigeron sp.</i>
Scarlet globemallow	<i>Sphaeralcea coccinea</i>
Yellow snakeweed	<i>Gutierrezia sarothrae</i>

	Value (%)
Perennial Cover:	6
Litter Cover	53
Rock Cover	0
Bare Ground	35
Number of perennial species present in belt transect	5
Transect #2	Value (%)
Perennial Cover:	24

Litter Cover	12
Rock Cover	0
Bare Ground	65
Number of perennial species present in belt transect	4
<b>Transect #3</b>	<b>Value (%)</b>
Perennial Cover:	24
Litter Cover	24
Rock Cover	6
Bare Ground	47
Number of perennial species present in belt transect	7

**Maintenance Items:**

None

**Photographs of HMC's Section 13 Mine**

1. This photograph is of the stockpile area following reclamation.
2. Photograph #2 documents the characteristic wasterock material found at the Section 13 mine site.
3. These two photographs (#3 and #4) are panoramic views of the borrow area.

**Section 15, T 14N, R 10W**

The Section 15 Mine prior reclamation site is located in the Ambrosia Lake valley, 27 miles northwest of Grants, New Mexico. Approximately 40 acres of Section 15 (where the headframe existed) were disturbed. The rest of the mine was restricted to underground workings. Homestake, however, has asked for release of the entire section and mine site from further requirements of the Act (Craft, 1995). The owner of the surface estate is Mr. Jerry Elkins. Mineral rights are owned by Cerrillos Land Company (Santa Fe Pacific Railroad).

Operation of the HMC Section 15 Mine was initiated by Homestake-Sapin Partners in February 1958 under a lease from Santa Fe Pacific Railroad. In 1968 Homestake-Sapin Partners became United Nuclear-Homestake Partners. This partnership was dissolved in February 1981 and Homestake Mining Company, later renamed Homestake Mining Company of California, became the operator. The Section 15 mine closed in 1981



(HMC, 1994). The mine was wet and water was pumped from the mine into a pond (Craft, 1995). There are no surface water features in the section. As in the case of Homestake's Section 13 Mine, surface drainage is to an unnamed tributary of Arroyo del Puerto which, in turn, drains into San Mateo Creek. Structures which existed while the Section 15 Mine was in operation included vertical shafts, a declined shaft, 3 ventilation boreholes, 2 waste rock piles, a dewatering pond and a office/hoist building. Homestake reclaimed this site in early 1992 and reseeded (Appendix B) it in June 1992. Photographs of the reclamation activities at this site are provided in the HMC report (1994).

The entire section and mine site have been fenced with barbed wire. All structures, trash, and debris have been removed from the mine site. There were no apparent accumulations of waste materials or hazards that could affect public health or safety on the site. The reclaimed wasterock piles were stable with no erosion or rill formation. These piles also blended in with the surrounding terrain and provided topographic relief. The mine and air shafts were backfilled with nontoxic mine waste materials, capped with concrete slabs, then covered with a foot of soil (HMC, 1994). Topsoil depths across the site ranged from 4.5 to 10 inches. There was some evidence of grazing by domenstic cattle and wildlife. The vegetation (Table 4) also showed signs of drought stress. Litter cover and perennial vegetative cover (Table 5) were approximately 29 percent and 31 percent, respectively (DeAgüero, 1995).

**Table 4.** List of Species at Homestake's Section 15 Mine

COMMON NAME	Genus & species <sup>1</sup>
Alkali sacaton	<i>Sporobolus airoides</i>
Sand dropseed	<i>Sporobolus cryptandrus</i>
Western wheatgrass	<i>Agropyron smithii</i>
Blue grama grass	<i>Bouteloua gracilis</i>
Indian ricegrass	<i>Oryzopsis hymenoides</i>
Galleta	<i>Hilaria jamesii</i>
Foxtail barley	<i>Hordeum jubatum</i>
Yellow snakeweed	<i>Gutierrezia sarothrae</i>

<sup>1</sup> Nomenclature after: Martin, W. C. and C. R. Hutchins. 1980. *A Flora of New Mexico*. J. Cramer, Vaduz, Germany; Welsh, S.L., *et al.* 1987. *A Utah Flora*. Great Basin Naturalist Memoir No. 9.

**Table 5.** Summary of Relative Cover Data at Homestake's Section 15 Mine.

Transect #1	Value (%)
Perennial Cover:	32
Litter Cover	29
Rock Cover	0

Bare Ground	32
Number of perennial species present in belt transect	5
<b>Transect #2</b>	<b>Value (%)</b>
Perennial Cover:	29
Litter Cover	29
Rock Cover	0
Bare Ground	35
Number of perennial species present in belt transect	8

**Maintenance Items:**

None.

**Photographs of Homestake's Section 15 Mine**

The photographs on the following page were taken during site inspection of the Section 15 Mine on July 13, 1995.

**Section 23, (T 14N, R 10W)**

This section was reclaimed in June of 1994. The seed mixture used in the reclamation of the Section 23 Mine is presented in Appendix A of this document. Most of the reclaimed mine site is covered with the annual weeds ragweed (*Kochia scoparium*) and Russian thistle (*Salsola kali*). The following table (Table 4) contains a list of all species identified on the reclaimed Section 23 mine site. This list is not inclusive of all the plant species that may be present on this site at other times of the year.

**Table 6.** List of Species at Homestake's Section 23 Mine

COMMON NAME	<i>Genus &amp; species'</i>
Alkali sacaton	<i>Sporobolus airoides</i>
Sand dropseed	<i>Sporobolus cryptandrus</i>
Crested wheatgrass	<i>Agropyron cristatum</i>

COMMON NAME	Genus & species <sup>1</sup>
Western wheatgrass	<i>Agropyron smithii</i>
Blue grama grass	<i>Bouteloua gracilis</i>
Indian ricegrass	<i>Oryzopsis hymenoides</i>
Galleta	<i>Hilaria jamesii</i>
Foxtail barley	<i>Hordeum jubatum</i>
Mountain brome	<i>Bromus mollis</i>
Cheatgrass	<i>Bromus tectorum</i>
Scarlet globemallow	<i>Sphaeralcea coccinea</i>
Winterfat	<i>Ceratoides lanata</i>
Mexican hat	<i>Ratibida columnifera</i>
Dock sp.	<i>Rumex sp.</i>
Fourwing saltbush	<i>Atriplex canescens</i>
Yellow snakeweed	<i>Gutierrezia sarothrae</i>

Nomenclature after: Martin, W. C. and C. R. Hutchins. 1980. A Flora of New Mexico. J. Cramer, Vaduz, Germany.  
Welsh, S.L. et al. 1987. A Utah Flora. Great Basin Naturalist Memoir No. 9.

**Table 7.** Summary of Relative Cover Data at Homestake's Section 23 Mine.

Transect #1	Value (%)
Perennial Cover	0
Litter Cover	0
Rock Cover	0
Bare Ground	29
Number of perennial present in belt transect	0



### Maintenance Items:

Homestake may need to consider reseeding this site or wait to see if an adequate cover can be achieved in another season or two of growth.

### Photographs of Homestake's Section 23 Mine

The following photographs were taken during the site inspection on June 28, 1995 to document conditions at the Section 23 Mine. These represent a panoramic view of the mine.

### Section 25, T 14N, R 10W

Inspection of the Section 25 Mine reclaimed by Homestake Mining Company began on June 28, 1995, and concluded (due to inclement weather) on July 13, 1995. Persons present during both portions of the inspection included: Mr. Fred Craft representing Homestake; the lead inspector for this prior reclamation inspection was Joe DeAgüero. Other inspectors representing MMD included: Ms. Robyn Tierney, Mr. Robert Garcia, Mr. Robert Young, and Ms. Tacy Harling.

The Section 25 Mine sits on an a flat area southwest of the New Mexico highway 509 spur. A prior reclamation report submitted by Homestake in 1994 for the Section 25 mine, describes the reclamation activities completed at the mine. Included in the report are maps of the reclaimed features (photos and field surveys), a discussion of the geology, ecology, topography and hydrology, detailed description of the reclamation conducted at the site and a description of achievement of Reclamation Requirements. The prior reclamation report submitted by HMC is a comprehensive summary of the reclamation conducted at the site. There is sufficient detail contained in the report to describe conditions and facilities that occurred at the site prior to reclamation and where these facilities were located. Further, the details of the reclamation conducted on site were verified on site during the inspections.

Table 8 lists of all plant species identified on the reclaimed site. This list is not inclusive of all species that may be present at other times of the year. Many of the forb species are dormant during the drought season.

**Table 8.** List of Species at Homestake's Section 25 Mine

COMMON NAME	Genus & species <sup>1</sup>
Alkali sacaton	<i>Sporobolus airoides</i>
Sand dropseed	<i>Sporobolus cryptandrus</i>
Western wheatgrass	<i>Agropyron smithii</i>
Blue grama grass	<i>Bouteloua gracilis</i>
Indian ricegrass	<i>Oryzopsis hymenoides</i>

COMMON NAME	Genus & species <sup>1</sup>
Tumblegrass	<i>Schedonardus paniculatus</i>
Galleta	<i>Hilaria jamesii</i>
Curlycup gumweed	<i>Grindelia squarosa</i>
Bigelow's aster	<i>Aster bigelovii</i>
Scarlet globemallow	<i>Sphaeralcea coccinea</i>
Milkweed	<i>Aesclepias</i> sp.
Winterfat	<i>Ceratoides lanata</i>
Yellow snakeweed	<i>Gutierrezia sarothrae</i>

<sup>1</sup> Nomenclature after: Martin, W. C. and C. R. Hutchins. 1980. *A Flora of New Mexico*. J. Cramer, Vaduz, Germany.  
Welsh, S.L. et al. 1987. *A Utah Flora*. Great Basin Naturalist Memoir No. 9.

The entire site was surveyed for erosion features. During a walkover of the mine site, slopes and areas of water concentration (ponds, diversions and areas where disturbed areas enter undisturbed lands) were evaluated for erosion. Most of the site appeared to be stable with little potential for development of erosion features. Disturbed portions of the section were graded and slopes were configured to minimize soil. This site, however, is largely flat with small, irregular undulations. The entire reclaimed area ties in well with the surrounding undisturbed landscape. Contoured slopes of the wasterock dumps have been designed, constructed and topsoiled. The south edge of the first (closest to highway 509) of two wasterock piles has some wind erosion damage. This area was regraded to reduce the slope and was re-topsoiled with alluvial soils from a local borrow area. The above mentioned disturbance will need to be reseeded in the fall of 1995 (see maintenance item #1). Sufficient topsoil for the establishment of vegetation has been borrowed and redistributed over the entire reclaimed area. A series of random and systematic sampling was conducted to identify the soil depth and the potential for any rooting or establishment problems. Random sampling of soil depth was done by digging soil pits approximately 18" deep to determine the depth of topsoil material acquired from a borrow site and distributed on the reclaimed site. Average topsoil depth was approximately 12 inches.

There are no perennial or intermittent streams near the site. All surface runoff drains to ephemeral drainages near the reclaimed site. Although the mine was situated in a geological strata that contained water, there should be no adverse effects to the hydrologic stability of the site. Concerns about surfacewater quality have been addressed by topsoiling, seeding and mulching the reclaimed shaft, stockpile and waste areas. With the exception of the retopsoiled area as discussed above, all of these areas are well covered with vegetation (Table 9), have achieved stability, and are configured to minimize erosion.

**Table 9.** Summary of Relative Cover Data at Homestake's Section 25 Mine.

Transect #1	Value (%)
Perennial Cover:	12
Litter Cover	29
Rock Cover	0
Bare Ground	59
Number of perennial species present in belt transect	9
Transect #2	Value (%)
Perennial Cover:	12
Litter Cover	41
Rock Cover	0
Bare Ground	47
Number of perennial species present in belt transect	7
Transect #3	Value (%)
Perennial Cover:	18
Litter Cover	18
Rock Cover	0
Bare Ground	65
Number of perennial species present in belt transect	7

**Maintenance Item(s):**

1. Reseed south portion of regraded and re-topsoiled wasterock pile (No. 1) no later than October 31, 1995. Please provide to the Director of the MMD, photographs and a description of work performed onsite, no later than November 15, 1995.

**Photographs of Homestake's Section 25 Mine**

No photographs were taken at this site.

## Section 32, T 14N R10W

The Section 32 Mine prior reclamation site is located in the Ambrosia Lake valley, approximately 22 miles northwest of the City of Grants, New Mexico. The actual mine site consists of only 60 acres where the head frame existed -- the remaining mine workings were underground. Homestake, however, has asked for release of the entire mine site from further requirements of the Act (Craft, 1995). The owner of the surface estate and mineral rights is the State of New Mexico. Homestake operated and reclaimed the mine under a lease agreement with the State of New Mexico. The New Mexico Land Commission has officially terminated HMC's lease pending approval of reclamation by the Mining and Minerals Division (HMC, 1994).

Homestake-Sapin Partners began operation of the HMC Section 32 Mine November 1961. In 1968 this partnership became United Nuclear-Homestake partners. This partnership was, in turn, dissolved February 1981 and Homestake Mining Company-Grants (later renamed Homestake Mining Company of California) became the operator in February 1981. The mine was in operation from 1958 to 1979. The mine was wet and water was pumped from the mine into ponds (Craft, 1995). There are no surface water features in the section. Surface drainage is to an unnamed tributary of Arroyo del Puerto that, in turn, drains into San Mateo Creek. Structures which existed at the Section 32 Mine when it was in operation include an access road, vertical shaft, ventilation borehole, hoist house, office and change room building and a dewatering pond. Reclamation activities took place in August 1991 by independent contractors (HMC, 1994). Since then the site has been grazed as required by a lease agreement with the State of New Mexico (Craft, 1995).

This site was inspected for stability and the presence of permanent vegetation (Table 10). Although grazing has had a significant impact on the vegetation (Table 11) at this mine, the reclaimed areas are sufficiently stable with adequate vegetative cover.

**Table 10.** List of Species at Homestake's Section 32 Mine

COMMON NAME	<i>Genus and species<sup>1</sup></i>
Alkali sacaton	<i>Sporobolus airoides</i>
Sand dropseed	<i>Sporobolus cryptandrus</i>
Western wheatgrass	<i>Agropyron smithii</i>
Blue grama	<i>Bouteloua gracilis</i>
Galleta	<i>Hilaria jamesii</i>
Scarlet globemallow	<i>Sphaeralcea coccinea</i>
Ragweed	<i>Kochia scoparium</i>
Snakeweed	<i>Gutierrezia sarothrae</i>

<sup>1</sup> Nomenclature after: Martin, W. C. and C. R. Hutchins. 1980. *A Flora of New Mexico*. J. Cramer, Vaduz, Germany.  
Welsh, S.L. et al. 1987. *A Utah Flora*. Great Basin Naturalist Memoir No. 9.

**Table 11.** Summary of Relative Cover Data at Homestake's Section 32 Mine

Transect #1	Value (%)
Perennial Cover:	12
Litter Cover	41
Rock Cover	0
Bare Ground	41
Number of perennial species present in belt transect	6
Transect #2	Value (%)
Perennial Cover:	0
Litter Cover	47
Rock Cover	0
Bare Ground	53
Number of perennial species present in belt transect	5

**Maintenance Item(s):**

None.

**Photographs of Homestake's Section 32 Mine**

The photographs on the following pages are panoramic views of the Section 32 Mine.



## Summary and Conclusions

Based on the inspection of these sites, review of inspection information with Mining and Minerals Division staff and MMD's resources to conduct these inspections, staff recommends that the Section 15, Section 17, Section 25, and Section 32 mine sites operated by Homestake Mining Company (Homestake) be released from further requirements of the New Mexico Mining Act. These sites have perennial vegetation that is clearly becoming established. It is staff's conclusion that these sites meet the environmental conditions that allow for the reestablishment of a 'self-sustaining ecosystem' as defined in Rule 1 and put forth in Rule 5.7A of the New Mexico Mining Act.

Based on the outcome of these inspections, staff does not recommend the release of the Section 23 site. The vegetation at this site was too sparse to provide adequate information needed in making the determination that the site has been reclaimed to a condition that allows for a self-sustaining ecosystem. Staff recommends waiting to make this determination until the plant community onsite has become better established.

## Literature Cited

Bonham, C. D. 1989. *Measurement of Terrestrial Vegetation*. Wiley-Interscience. 338 pp.

Craft, Fred. 1995. Resident Manager, Homestake Mining Company. Personal Communication

DeAgüero, Joseph C. 1995. Reclamation Specialist, Mining and Minerals Division. Field Notes

Homestake Mining Company (HMC) 1994. Reclamation Reports, Section 13 Mine, Section 15 Mine, Section 23 Mine, Section 25 Mine, Section 32 Mine.

Kelly, V. C. 1963. *Geology and Technology of the Grants Uranium Region*, Memoir 15, New Mexico Bureau of Mines and Minerals Resources, Socorro, New Mexico.

Martin, P. C., and C. R. Hutchins. 1980. *A Flora of New Mexico*. J. Cramer Press, Vaduz, Germany. 2591 pp.

Welsh, S. L. et al. 1989. *A Utah Flora*. Great Basin Naturalist Memoir No. 9. Brigham Young University Press. 898 pp.

## **Appendix A**

Stratigraphy of the Ambrosia Lake District (Kelly 1963).



## Appendix B

### Reclamation Seed Mixture (HMC, 1994)

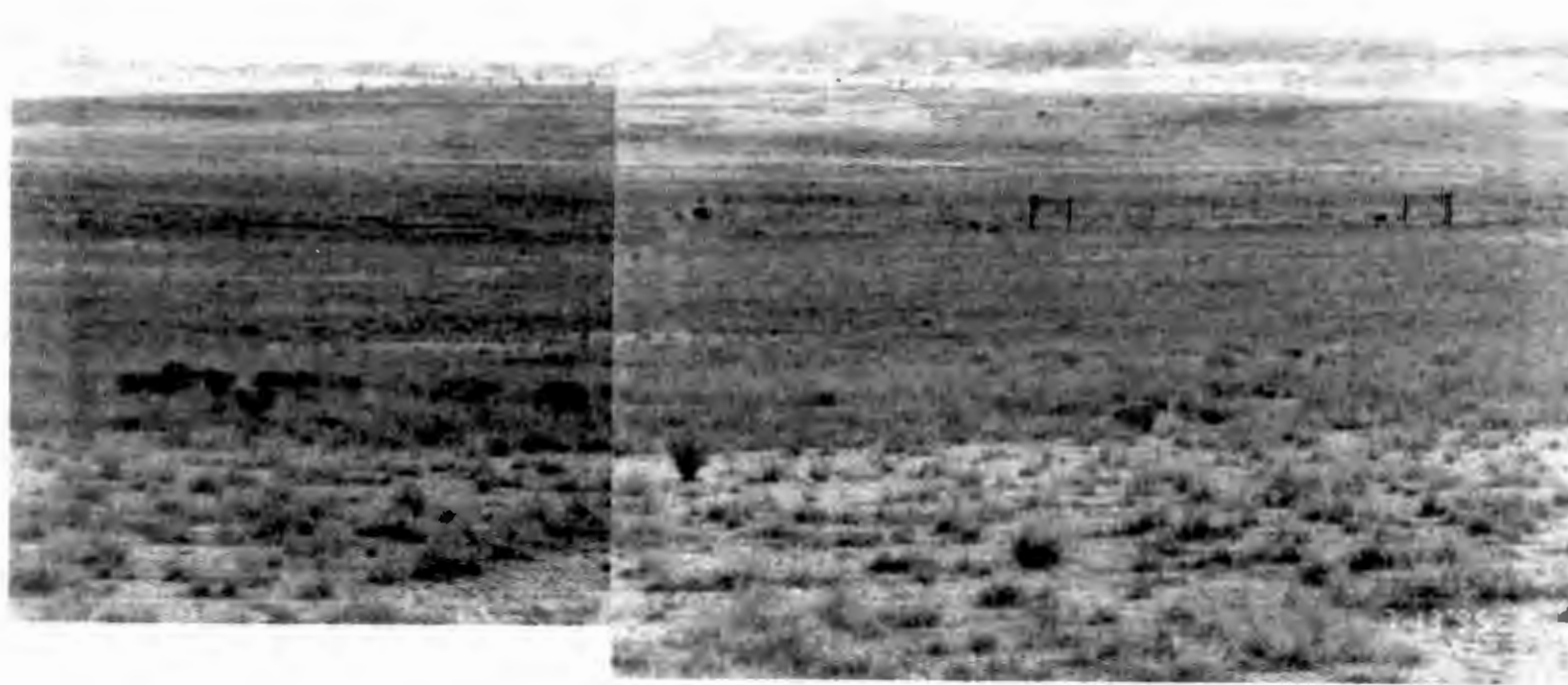
Common Name	Variety	Pounds Pure Live Seed per Acre
Western Wheatgrass	Arribu	3.2
Blue Grama	Lovington	0.5
Sand Dropseed		1.0
Galleta	Caryopsis	0.5
Galleta	Florets	1.2
Alkali Sacaton	Salado	1.5
	Total	7.9



Section 13, T14N, R10W  
From middle of site looking southwest



Section 13, T14N, R10W  
from south side of site looking west



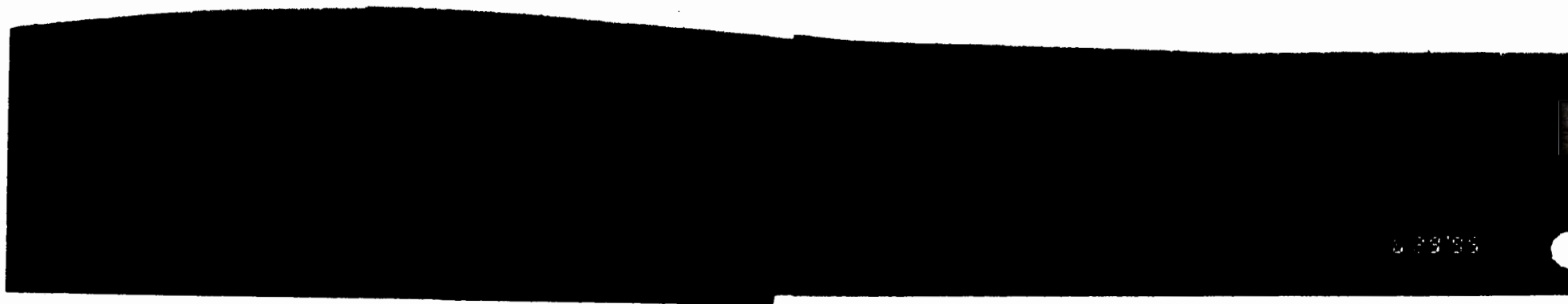
Section 13, T14N, R10W  
From middle of site looking northeast



Homestake Section 15 T14N R10W

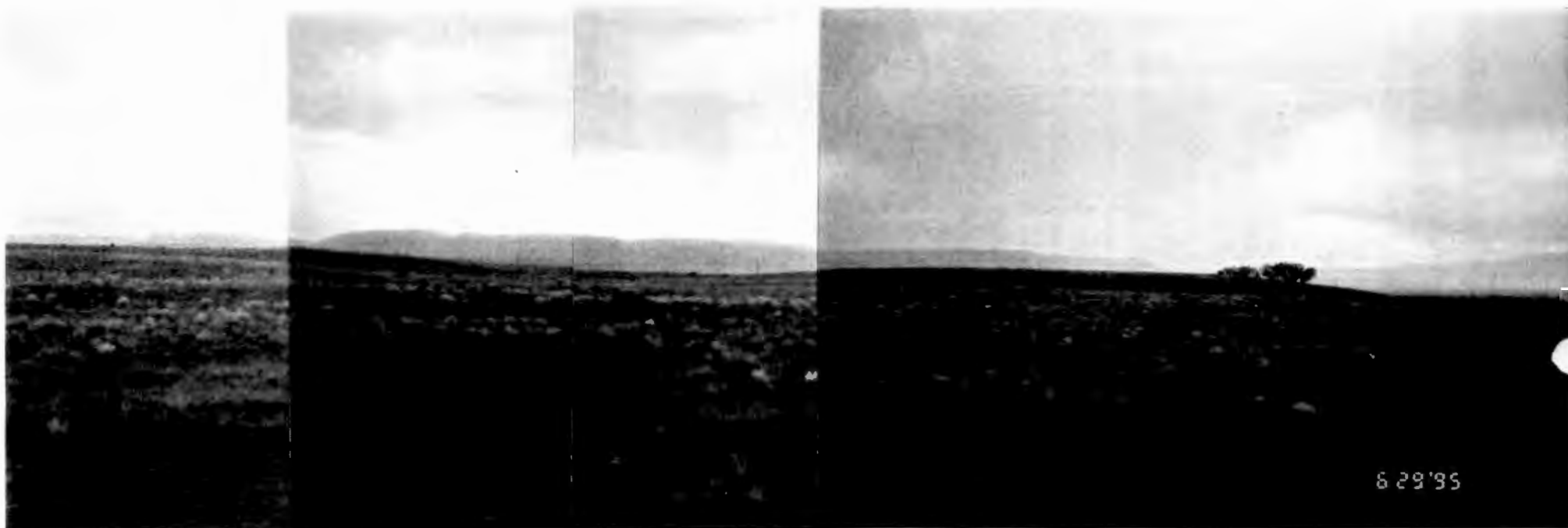


Homestake Section 15 T14N R10W



*Homestake Section 23 Mine (T14N, R10W)*  
*From east side of site looking west*





Homestake's Section 23 Mine (T 14N, R 10W).  
Panoramic view. June 28, 1995.  
Joe DeAguero Photographer



*Section 32, T14N, R10W  
From middle of site facing southeast*



*Section 32, T14N, R10W  
From east side of site facing west*



*Section 32, T14N, R10W*

*From north side of site facing northwest*

*(From left to right - Robert Young, Tacy Harling, Fred Craft)*



7-12-95



32, T14N, R10W  
file of site facing west



# HOMESTAKE MINING COMPANY

P.O. BOX 98  
GRANTS, NEW MEXICO 87020  
(505) 287-4456

July 25, 1994



State of New Mexico  
Energy, Minerals and Natural  
Resources Department  
2040 South Pacheco Street  
Santa Fe, New Mexico 87505

Attn.: Mr. Holland W. Shepherd, Bureau Chief

Re: Prior Reclamation of Mine Sites

Dear Mr. Shepherd:

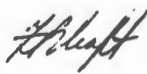
Homestake Mining Company of California is preparing to submit, by August 31, 1994, prior reclamation status for the following mine sites: Section 13, Section 15, Section 23, Section 25 and Section 32. The prior reclamation status reports will consist of the following elements: Introduction, History of Operation, Climatology, Ecology, Geology, Topography, Hydrology, Mine Operation Description, Reclamation, Reclamation Procedures, Achievement of Reclamation Requirements, and Reclamation Seed Mixture. I believe the outline will complete the prior reclamation requirements.

I reviewed the list of mine sites listed under Homestake Mining Company of California and found the following listings need to be removed: UN-HP Section 23, UNC Section 15, UNC Section 25, UNC Section 32, UN-HP Section 13, and Section 25 T12N Wayne Jacke R10W. ?

It was good to see you again and I'm looking forward to working with you.

Sincerely,

HOMESTAKE MINING COMPANY

  
F. R. Craft (Fred)  
Resident Manager

FRC:jg

rec. 13, 15, 23, 25

*An Equal Opportunity Employer*

# HOMESTAKE MINING COMPANY

P.O. BOX 98  
GRANTS, NEW MEXICO 87020  
(505) 287-4456

August 30, 1994



UPS TRACKING LABEL: 1078 5568 745

State of New Mexico  
Energy, Minerals and Natural  
Resources Department  
2040 South Pacheco Street  
Santa Fe, New Mexico 87505

Attn.: Mr. Holland W. Shepherd, Bureau Chief

Re: Prior Reclamation of Mine Sites

Dear Mr. Shepherd:

Enclosed are the five prior reclamation reports for Homestake Mining Company of California mines. The mines are Section 13, 15, 23, 25, all in Township 14 North, Range 10 West, and Section 32 in Township 14 North, Range 9 West. These reports comply with the New Mexico Mining Act to satisfy prior reclamation activities. Also enclosed is a check for \$1250 for fees at \$250 per mine site.

If you have any questions please contact me at the Grants office.

Sincerely,

HOMESTAKE MINING COMPANY

F. R. Craft  
Resident Manager

FRC:jg

Enclosures

**HOMESTAKE MINING COMPANY**650 CALIFORNIA STREET, 11th FLOOR  
SAN FRANCISCO, CALIFORNIA 94108

No. 0008959

DATE: 25-AUG-94 CUST. ACCT. NO.

VENDOR NAME State of New Mexico VENDOR NO: 3096

INVOICE NO.	INVOICE DATE	DESCRIPTION	DISCOUNT AMOUNT	NET AMOUNT
Inspection	19-AUG-94		.00	1,250.00
<div>RECEIVED AUG 31 1994 MINING &amp; MINERALS DIVISION</div>				
PLEASE DETACH AND RETAIN THIS STATEMENT AS YOUR RECORD OF PAYMENT. <i>Thank You</i>			.00	1,250.00

**HOMESTAKE MINING COMPANY**650 CALIFORNIA STREET, 11th FLOOR  
SAN FRANCISCO, CALIFORNIA 94108-2788Drawn on  
Pittsburgh National Bank Jeannette, Pennsylvania  
in Cooperation With Wells Fargo Bank, N.A.  
#4759-008618 60-162/433

No. 0008959

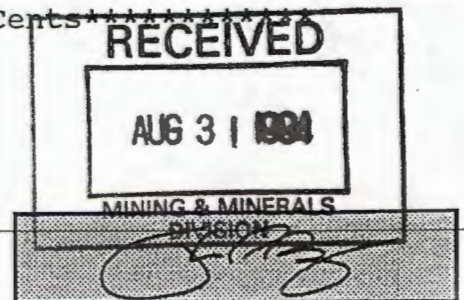
CHECK DATE	CHECK NUMBER	CHECK AMOUNT
25-AUG-94	8959	1,250.00

PAY One Thousand Two Hundred Fifty Dollars and No Cents\*\*\*\*\*

TO THE  
ORDER OFState of New Mexico  
Energy, Minerals & Natural Resource  
2040 South Pacheco Street  
Santa Fe NM 87505

BY \_\_\_\_\_

BY \_\_\_\_\_



*Hal*

**HOMESTAKE MINING COMPANY**

P.O. BOX 98  
GRANTS, NEW MEXICO 87020  
(505) 287-4456

December 19, 1995

20

Ms. Kathleen A. Garland, Director  
Mining and Minerals Division  
of New Mexico Energy, Minerals and Natural  
Resources Department  
P.O. Box 6429  
Santa Fe, New Mexico 87505-6429

Re: Prior Reclamation Release, Sections 13, 15, 23, 25 and 32 Mines, McKinley  
County

Dear Ms. Garland:

I received your Prior Reclamation Release letter dated September 29, 1995 on  
November 16, 1995. In this letter I found some areas that need clarification or  
changed to match the recorded documents already in the file. The following is a  
list of the corrections:

Page	Paragraph	Comment
2	1st under Inspection Procedures	Inspections occurred on June 29 and July 13, 1995 not June 28
3	1st under Section 13, T14N, R10W	United Nuclear-Homestake Partners began operation of Section 13 Mine in October, 1977
5	1st under Section 15, T14N, R10W	Section 15 Mine had approximately 30 acres disturbed
7	1st under Section 23 (T14N, R10W)	This section was reclaimed in June of 1992
9	1st under Photograph of Homestake's Section 23 Mine	Site inspection on June 29, 1995
9	1st under Section 25, T14N, R10W	Inspection began on June 29, 1995
11	1st under Maintenance Item(s)	I did not receive report until November 16, 1995. A report will be sent to Director of MMD 60 days from November 16, 1995

Ms. Kathleen A. Garland, Director

December 19, 1995

Page 2

14	1st under Summary and Conclusion	Staff recommends that Section 15, Section 13, Section 25 and Section 32 mine sites be released from further requirements of the New Mexico Mining Act.
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Should you have any questions please contact me at (505) 287-4456.

Sincerely,



F. R. Craft  
Resident Manager

FRC:jg

**MK007PR**

**SECTION 32**

**MINE**



**RECLAMATION REPORT**  
**SECTION 32 MINE**  
**HOMESTAKE MINING COMPANY OF CALIFORNIA**

**SUBMITTED TO**  
  
**MINING AND MINERALS DIVISION**  
**ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT**  
**STATE OF NEW MEXICO**

**AUGUST 29, 1994**

**COMPILED BY**  
**AK GeoConsult, Inc.**

**REPORT OF RECLAMATION OF AN EXISTING MINE PRIOR TO JUNE 18, 1994**  
**HOMESTAKE MINING COMPANY OF CALIFORNIA**  
**SECTION 32 MINE**

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**1.0 INTRODUCTION**

Homestake Mining Company of California (HMC) submits the following information on the closure of their Section 32 mine located in McKinley County, New Mexico (Figure 1). This information is provided to comply with Section 69-36-1B(3) of the New Mexico Mining Act and Section 5.10 of the new New Mexico Mining Rules and Regulations. The Section 32 mine is considered an "Existing Mining Operation" because it produced marketable minerals (uranium) for a total of at least two years between January 1, 1970 and the effective date of the act.

HMC Section 32 mine is located in the Ambrosia Lake valley in T14N, R9W as shown on Figure 1. The owner of the surface estate and mineral rights is the State of New Mexico. The mine was in operation from 1958 to 1979. The New Mexico Land Commission has officially terminated HMC's lease, pending approval of reclamation by the Mining and Minerals Division.

**1.1 History of Operation**

The HMC Section 32 mine went into operation in November 1961 by the Homestake-Sapin Partners under a lease from the State of New Mexico. In 1968 this partnership became United Nuclear-Homestake Partners, which was subsequently dissolved in February 1981 and the operator became Homestake Mining Company - Grants, later renamed Homestake Mining Company of California.

**1.2 Mine Site Description**

**1.2.1 Climatology**

The climate is typical of High Sonoran Desert areas with average precipitation of about 9 to 10 inches at elevations of less than 6000 feet to more than 12 inches at elevations above 7000 feet. Annual air temperature range is about 54 degrees F at lower elevations and about 47 degrees F at higher elevations and the average frost-free period is 115 to 145 days. The prevailing wind is from the southwest. The rainy season is in the summer. About half of the annual precipitation falls during the period July through September, mostly during brief thunder storms (SCS, 1993).

### **1.2.2 Ecology**

The soil and vegetation in and surrounding Section 32 were mapped and classified by the local Soil Conservation Service (SCS, 1994). Three basic soil complexes are within the site and surrounding areas. These are:

- A. Penistaja - Tintero complex, 1 to 10 percent slopes
- B. Sparank-San Mateo - Zia complex, 0 to 5 percent slopes
- C. Hagerman - Bond fine sandy loams, 1 to 8 percent slopes

These soil complexes are found at elevations of 6200-7100 feet on dip slopes of cuestras, fan terraces, valley sides, flood plains and drainage ways. The vegetation communities consist mainly of blue grama, western wheatgrass, sand dropseed and alkali sacaton, bottlebrush squirreltail, fourwing saltbush and indian ricegrass. The soil and vegetation types are favorable for livestock grazing and wildlife habitat (SCS, 1994). The wildlife in the area is limited to species of small mammals and bird species typical of grassland/desert shrub communities.

### **1.2.3 Geology**

Section 32 is located in the Ambrosia Lake District of northwestern New Mexico. This district occupies a portion of the southern limb of the San Juan Basin, called the Chaco Slope (Figure 2), and is bordered on the south by the Zuni uplift and on the east by the Mt. Taylor Volcanic Plateau.

The stratigraphic unit underlying Section 32 is shown on Figure 3 (Kelley, 1963). This shows the Cretaceous system of Mancos shale and Dakota sandstone overlying the Jurassic System of the Morrison Formation. Uranium ore is found in the A through D sandstone units of the Westwater Canyon member of the Morrison Formation.

Two distinctly different types of ore occur in Section 32. These are the coffinite and uraninite minerals of which coffinite represents 99 percent of the ore. The primary ore bodies consist of uraniferous blankets of humic organic matter which fills the intergranular space in the host rock. The blanket occurs along several trends, like beads on a string.

#### **1.2.4 Topography**

The topography in Section 32 consists of very gentle natural slopes of up to 0.5 percent. These gentle slopes have not been altered due to mining or recontouring and borrow soil removal for reclamation purposes.

#### **1.2.5 Hydrology**

There are no perennial or intermittent streams in the mine area. All surface runoff drains to ephemeral water courses. Drainage in the area flows southeast to the San Mateo Drainage.

### **2.0 MINING OPERATION DESCRIPTION**

The Section 32 mine was a typical underground mine (Figure 4) which used the modified room and pillar method to recover the primary and redistributed ore. The mine began operation in 1958 and ceased in 1979. In addition to the modified room and pillar method it was common to blast an opening in the lower part of the ore body which left it unsupported. When the ore fell to the bottom of the opening or stope it was removed by the miner using a machine called a slusher. This ore then was transferred by rail car to the main shaft for transport to the surface.

To support the underground mining operation, several support facilities were constructed on the surface. These included the hoist, headframe, administrative building, parking lot and various other small facilities. A layout of these facilities is shown on Figure 5. All these support facilities were removed during reclamation as discussed in Section 3.0.

### **3.0 RECLAMATION**

HMC reclamation of Section 32 consisted of three phases conducted by independent contractors which included:

1. Removal of buildings, headframes, and equipment; shaft and borehole sealing; and pond closure.
2. Earthwork for site and waste pile recontouring.
3. Revegetation.

### **3.1 Reclamation Procedures**

Reclamation procedures began in August 1991 by Homestake personnel and included the following activities, some of which are shown in photos 32A-32D:

1. removal of office and change room buildings
2. removal of hoist and compressor building
3. demolition and scrapping of headframe and related equipment
4. removal of hoist and hoisting equipment
5. vertical shaft sealing
6. borehole sealing
7. scrap/trash removal

All buildings were removed down to the concrete foundations. All building material and equipment was buried on site, removed from the site for disposal in approved land fill, or salvaged by HMC. Any trash on the site was also buried or removed.

Boreholes were backfilled to within five (5) feet of the surface and the casing cut off 4-8 feet below the original ground surface. With one exception, each borehole has a 2.0 foot thick, reinforced concrete cap (Figure 6). On the one exception, a steel plate was welded to the top of the casing. The vertical shaft was backfilled to within two (2) feet of the surface and capped with a reinforced concrete cap (Figure 7).

The piping and valves of the ponds were removed and either disposed of on site or salvaged. The containment berms were pushed into the pond to fill the basin, and the fill surface was graded to create a smooth surface. This work was completed in approximately four weeks after start-up.

The earthwork phase for the reconfiguration and cover of the waste piles consisted of waste pile reshaping, placement of top soil from borrow area and recontouring for natural drainage.

The third and final phase of reclamation was reseeding 60 acres in the disturbed area of the site. Reseeding was performed in 1991 and again in July 1992. The area was reseeded using a drill seeder and mulched at 1000 pounds per acre with the mulch crimped into the soil. The seed mixture used is shown on Table 1. The reseeded area was fenced to prevent livestock entry and enhance the reclamation process. The post-reclamation conditions of the site are shown in photographs 32E-32H taken in June 1994. Additional color slides showing the reclamation procedures are available for the Division's review at HMC's Grants office.

The reclamation procedures described above have removed or sealed mine-related features that might pose hazards to the public health and safety. The shaft and borehole plugging was successful and in the time period since sealing there is no evidence of any subsidence. There are no known environmental impacts associated with ground or surface water from the reclamation procedures. The reseeding has established a vegetation cover that appears to be similar to that on surrounding undisturbed ground. The anticipated post-mining land use is grazing and wildlife habitat.

There are no other permits, licenses, or other regulatory requirements that affect this mine site.

HMC will continue to monitor the revegetation success until release by the MMD Director as outlined in Section 5.10 of the Rules.

### **3.2 Achievement of Reclamation Requirements**

Through the procedures described above, HMC has substantially achieved the reclamation requirements as outlined in Section 69-36-11B(3) of the New Mexico Act. In the earthwork area southwest of state route 509, the reseeded grasses did not germinate sufficiently to compete with weeds, which have taken over during the past two years. HMC will clear the weeds from this area and reseed it with grasses (Table 1).

In accordance with the provisions of 5.10, Prior Reclamation, of the Rules, HMC is requesting an inspection of the reclaimed area by the Division during the second or third quarter of 1995..



## **REFERENCES**

Kelley, V.C., 1963; "Geology and Technology of the Grants Uranium Region", Memoir 15, New Mexico  
Bureau of Mines and Mineral Resources

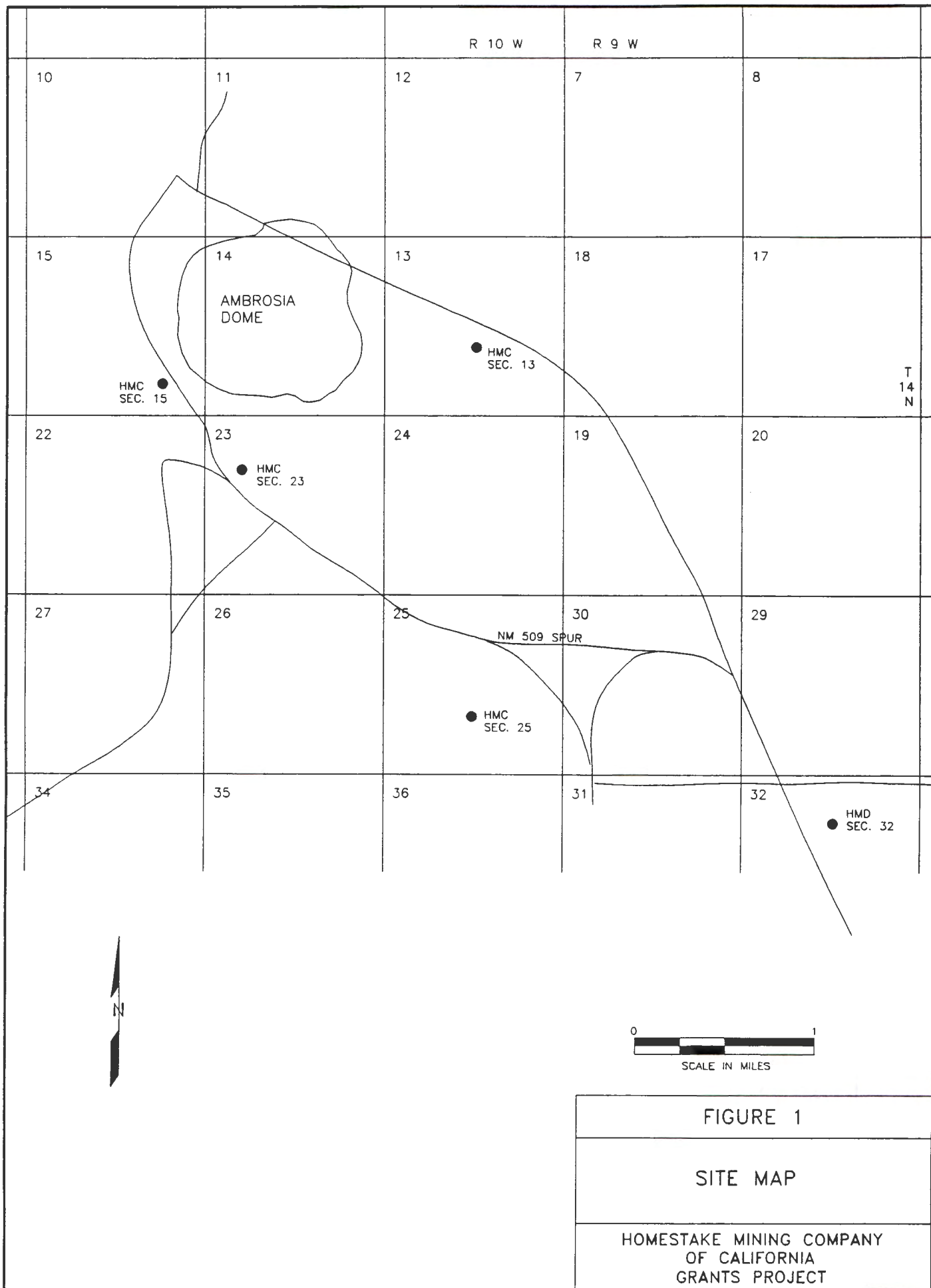
Soil Conservation Service, 1993; "Soil Survey, McKinley County, New Mexico", Grants, New Mexico

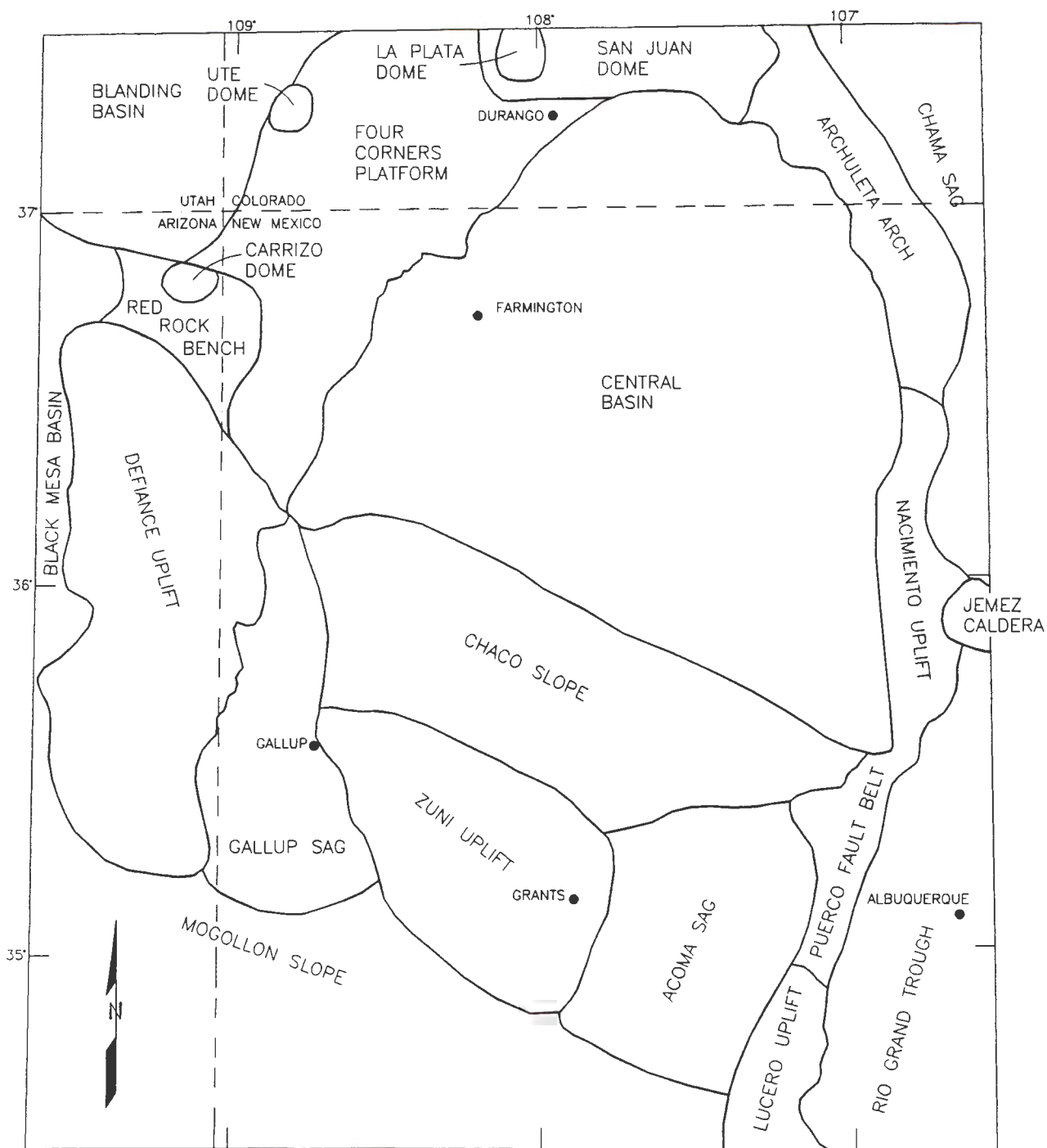
Soil Conservation Service, 1994; oral communication with W.E.Jenkins

**TABLE 1**  
**RECLAMATION SEED MIXTURE**

Common Name	Variety	Pounds Pure Live Seed/Acre
Western Wheatgrass	Arribu	3.2
Blue Grama	Lovington	0.5
Sand Dropseed		1.0
Galleta	Caryopsis	0.5
Galleta	Florets	1.2
Alkali Sacaton	Salado	1.5
	Total	7.9

Seed obtained from Curtis & Curtis, Clovis, New Mexico.





(from Kelly, et al, 1963)



FIGURE 2

TECTONIC MAP OF  
SAN JUAN BASIN  
AND ADJACENT AREAS

HOMESTAKE MINING COMPANY  
OF CALIFORNIA  
GRANTS PROJECT

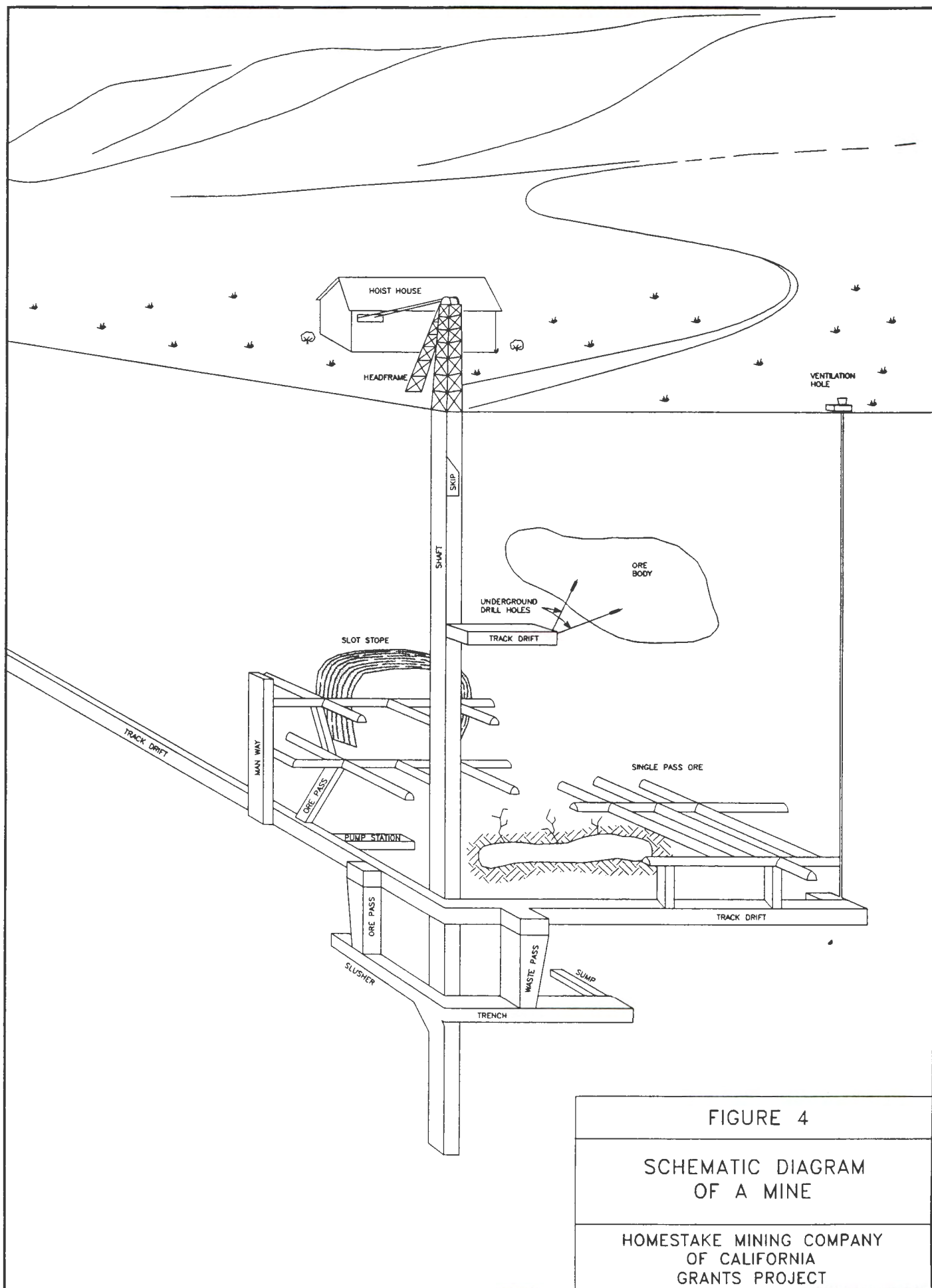
SYSTEM	STRATIGRAPHIC UNIT	
CRETACEOUS	MANCOS SHALE	
	DAKOTA SANDSTONE	
JURASSIC	MORRISON FORMATION	BRUSHY BASIN MEMBER
		WESTWATER CANYON MEMBER
		"A" SANDSTONE
		"K" SHALE
		"B" SANDSTONE
		"K <sub>1</sub> " SHALE
		"C" SANDSTONE
		"K <sub>2</sub> " SHALE
		"D" SANDSTONE
		RECAPTURE MEMBER

FIGURE 3

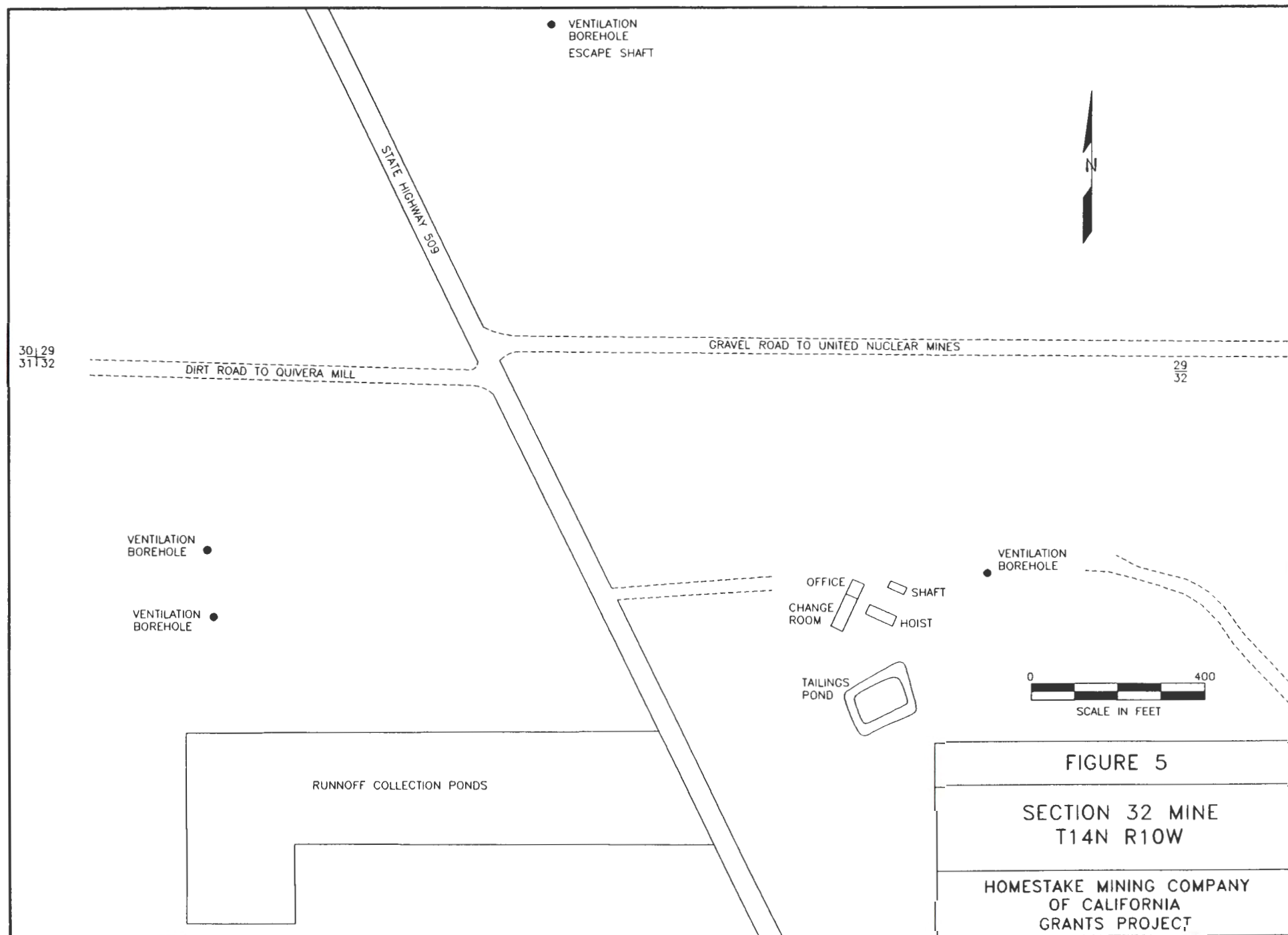
DIVISIONS OF  
WESTWATER CANYON MEMBER

HOMESTAKE MINING COMPANY  
OF CALIFORNIA  
GRANTS PROJECT

(from Kelly, et al, 1963)







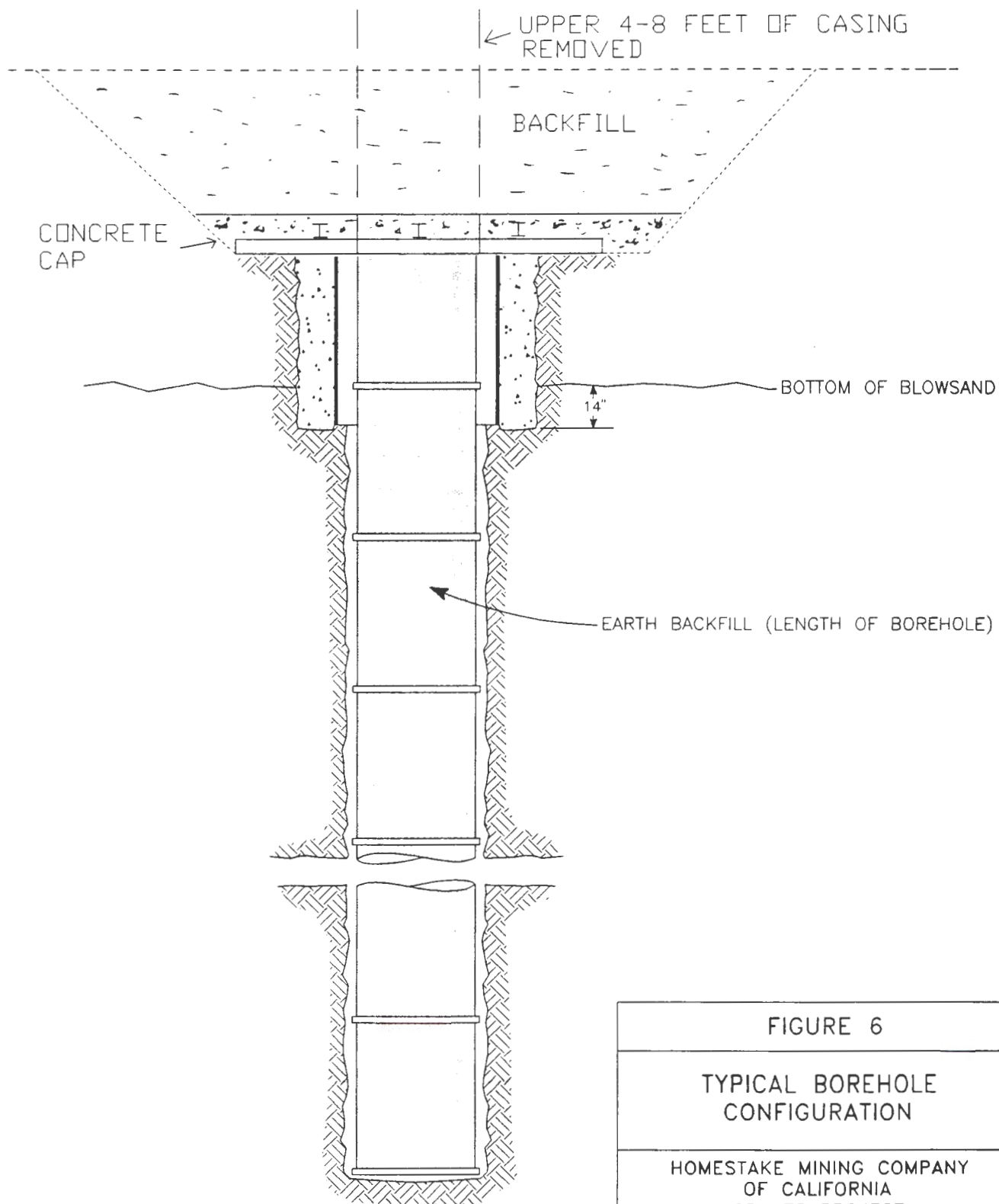


FIGURE 6

TYPICAL BOREHOLE  
CONFIGURATION

HOMESTAKE MINING COMPANY  
OF CALIFORNIA  
GRANTS PROJECT

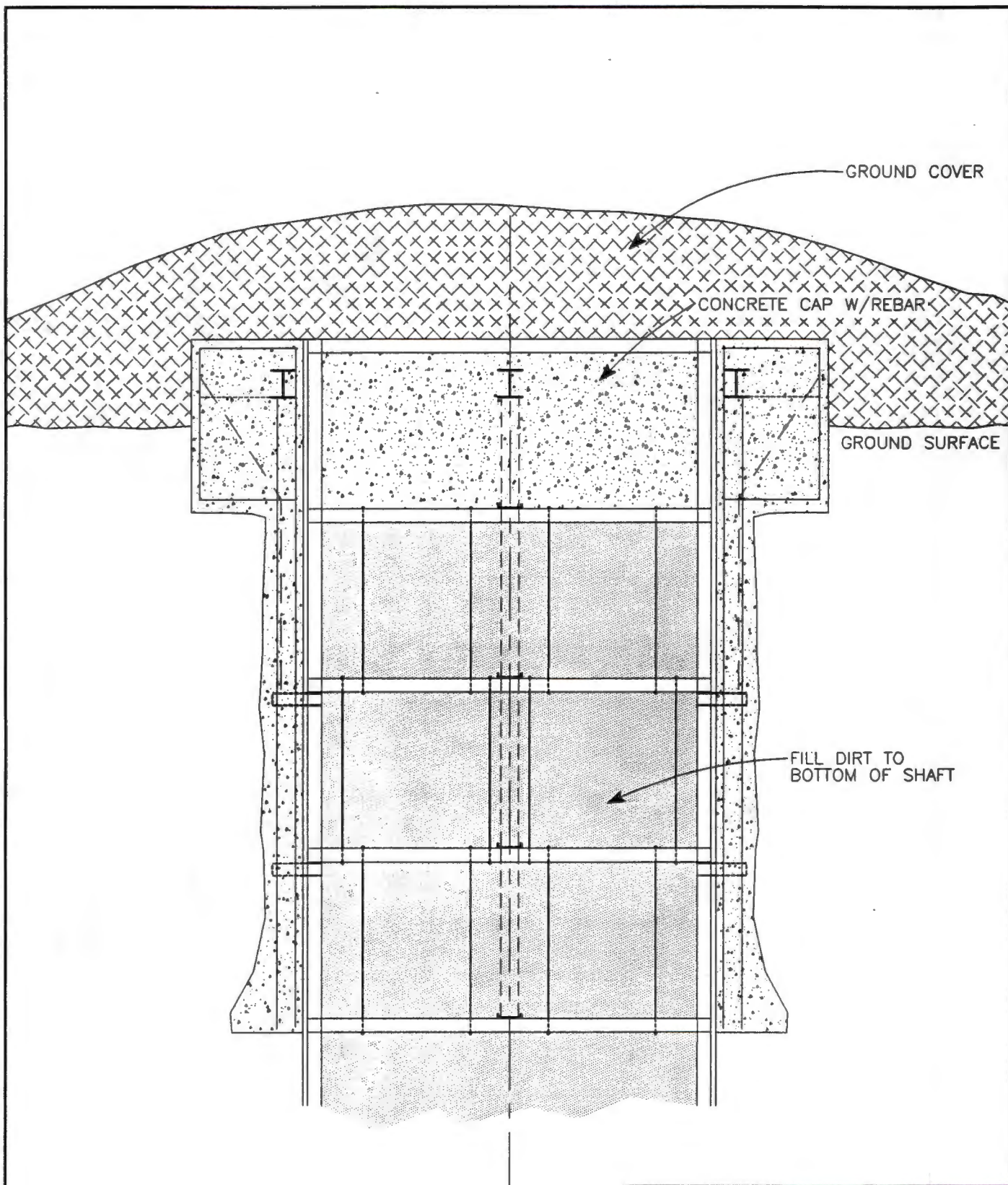


FIGURE 7

TYPICAL SHAFT  
CONFIGURATION

HOMESTAKE MINING COMPANY  
OF CALIFORNIA  
GRANTS PROJECT

## **PHOTO LOG - SECTION 32 MINE RECLAMATION**

- 32A: Aerial view of the mine site during early stages of reclamation.
- 32B: Vent borehole with mine waste backfill.
- 32C: View across mine site during placement of soil cover prior to reseeding.
- 32D: Reseeding operations viewed north across mine site.
- 32E: View of reclaimed mine site looking north toward old Phillips mill.
- 32F: View of reclaimed mine site looking south.
- 32G: View looking west across mine site and stockpile area after reclamation.
- 32H: View looking north across mine site and ore pads two years after reclamation.



PHOTO 32A



PHOTO 32B





PHOTO 32C



PHOTO 32D





PHOTO 32E



PHOTO 32F



PHOTO 32G



PHOTO 32H