



RECLAMATION SERVICE - ORPHAN MINE

GRAND CANYON NATIONAL PARK, ARIZONA

INTRODUCTION

The Orphan Mine is located on the North Rim of the Grand Canyon approximately halfway between West Point and Hartsburg Point and near the Powell Memorial (Figure 1). This location is approximately 20 miles west of the Grand Canyon Village. The site was worked as a copper mine and has an extensive mine shaft system that extends over 1000 feet. Based on a profile log passed in 1952 and recent mine maps with information of this mine, the Bureau of Land Management (BLM) surveyed the mine in order to develop abandonment and reclamation plans.

RECLAMATION REPORT

ORPHAN MINE

GRAND CANYON NATIONAL PARK, ARIZONA

HISTORY

The Orphan Mine was patented to J. M. Powell in 1890. The mine was developed by Powell and his associates in the Grand Canyon area. The mine was worked as a copper mine from 1890 to 1953. The mine was abandoned in 1953. The mine was surveyed by the BLM in 1986. The mine is located on the North Rim of the Grand Canyon and is approximately 20 miles west of the Grand Canyon Village. The mine has a long history of mining and is one of the many mines in the Grand Canyon area. The mine was worked as a copper mine and has an extensive mine shaft system that extends over 1000 feet. Based on a profile log passed in 1952 and recent mine maps with information of this mine, the Bureau of Land Management (BLM) surveyed the mine in order to develop abandonment and reclamation plans.

by

Moon Hom
Mining Engineer

U.S. DEPARTMENT OF INTERIOR
Bureau of Land Management
Phoenix District Office
Division of Mineral Resources

June 1986

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RECLAMATION REPORT - ORPHAN MINE
GRAND CANYON NATIONAL PARK, ARIZONA

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INTRODUCTION

The Orphan Mine is located on the South Rim of the Grand Canyon approximately halfway between Hopi Point and Maricopa Point and near the Powell Memorial (Figure 1). This location is approximately two miles west of the Grand Canyon Village. The mine was worked as a copper mine and then as a uranium mine during different time periods since it was first patented. Based on a public law passed in 1962, the current mine site will be acquired by the National Park Service at the end of May 1987. In anticipation of this acquisition, personnel from the U.S. Bureau of Land Management (BLM) surveyed the mine site in order to develop abandonment and reclamation recommendations.

HISTORICAL BACKGROUND

The Orphan lode claim covering approximately 20.3 acres was patented in 1906 for copper mineralization contained in a breccia pipe structure situated approximately 1100 feet below the South Rim of the Grand Canyon National Park (Figure 2). The mining activities that occurred on the Orphan lode claim came to be known as the Orphan Mine. Copper mining occurred at the Orphan at various times during the period from 1906 to 1946. In 1953, after the discovery of uranium, the mineral rights were leased and later acquired (both estates) by a subsidiary of Western Gold and Uranium Inc., later renamed Western Equities, Inc.

Western Gold built in 1956 an aerial tramway from the adit area to the rim in order to facilitate the removal of uranium ore. From 1956 to 1959, production averaged 1000 tons per month of 1.00% U3O8 from mining faces at four different levels below the adit. In addition to the construction of the aerial tramway, the company constructed offices, storage buildings, and living quarters along with a water tank. The cabins and Grand Canyon Inn shown on Figure 2 were build by the previous claim owner.

Production was expanded in late 1959 by the construction of 2½ compartment shaft (two 5 foot by 5 foot hoisting compartments and a 3 foot by 5 foot manway). The shaft was collared with concrete and utilized steel sets and fireproof wooden lagging. The shaft was driven to a depth of approximately 1600 feet below the elevation of the rim. A 1200 foot horizontal drift was then driven from the 1500 foot level of the shaft to the 400 foot level of the existing workings in the adit area (Figure 3). The first ore was hoisted through the shaft in November 1959 and, shortly thereafter, the shaft became the primary haulage system of ore, men, and materials to and from the active mining area. Production in 1960 was at an average rate of approximately 6400 tons per month of 0.30% U3O8. Most of the ore was transported by truck to the Tuba City mill for further processing. Ore was also shipped by railroad to a uranium mill in Grants, NM.

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FIGURE 1

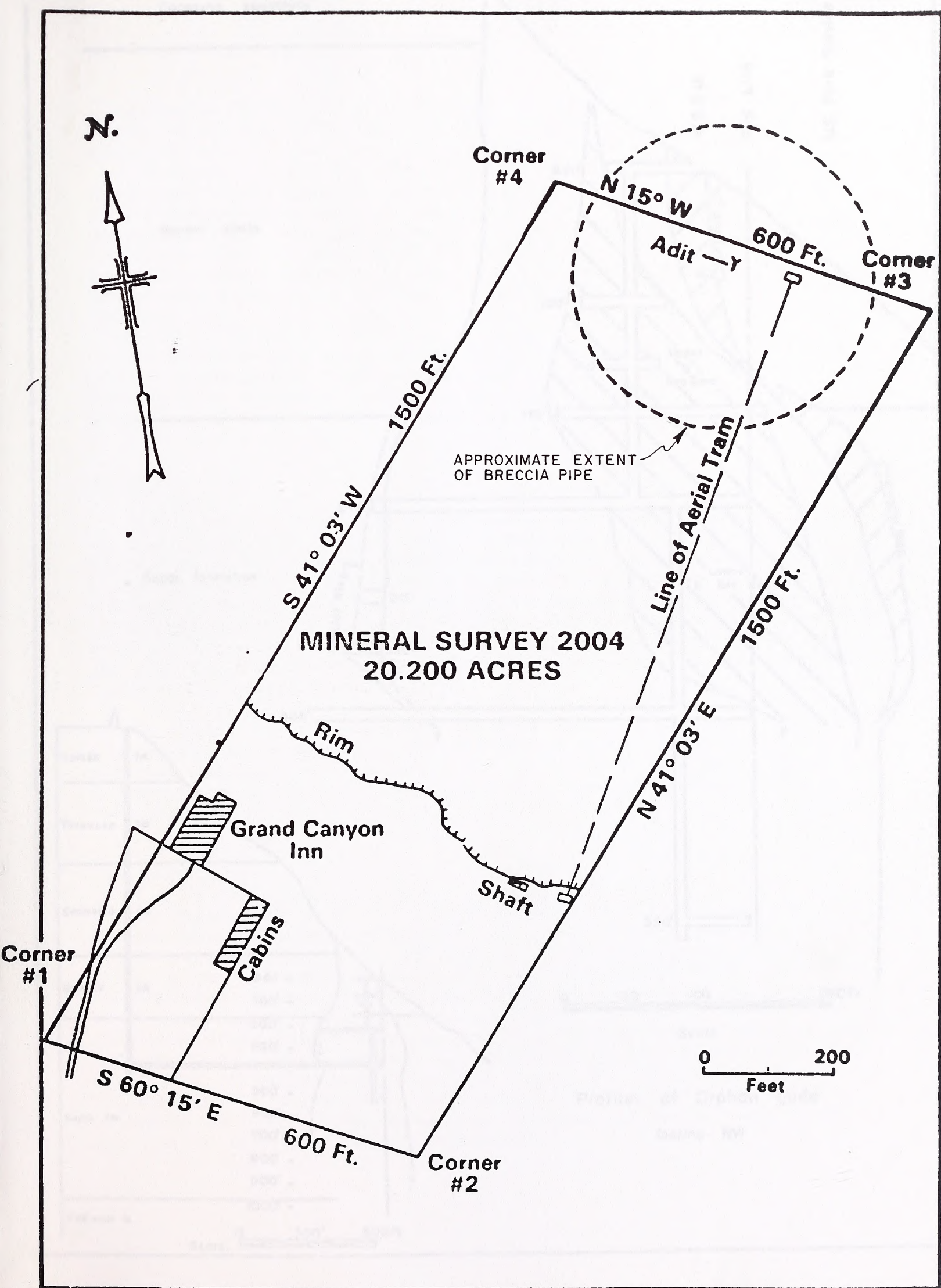


FIGURE 2 Orphan lode claim map

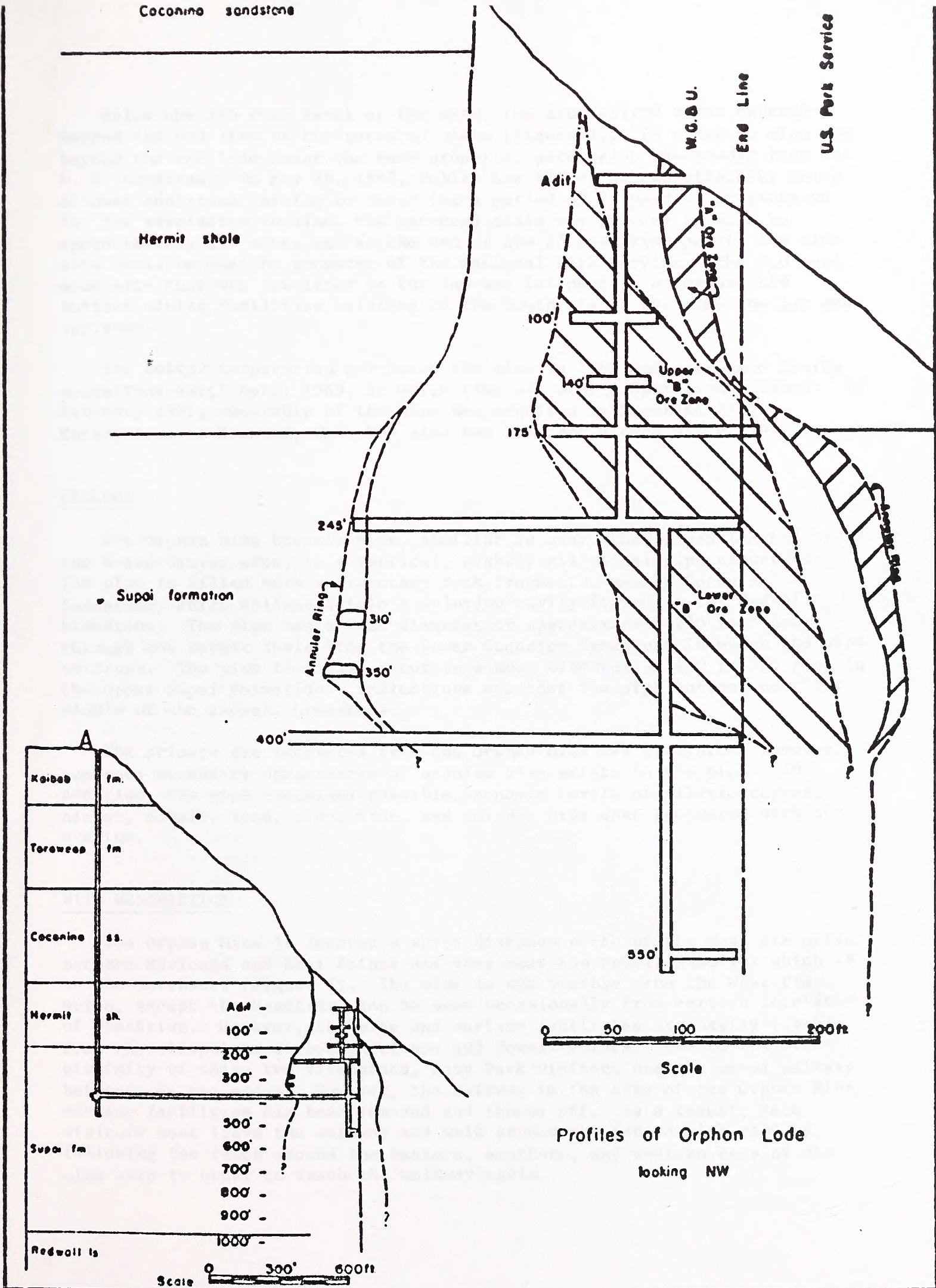


Figure 3 Orphan Lode Coconino County, Arizona

Below the 175 foot level of the mine, the mineralized zones extends beyond the end line of the patented claim (Figure 3). In order to mine ore beyond the end line under the Park property, permission was needed from the U. S. Congress. On May 28, 1962, Public Law 87-457 became effective which allowed additional mining to occur for a period of 25 years. In exchange for the permission to mine, the patented claim was reduced in size to approximately 3.0 acres and at the end of the 25 year time period the mine site would become the property of the National Park Service. The 3.0 acre mine site that was specified in the law was intended to encompass the surface mining facilities existing on the South Rim at the time the law was approved.

The Cotter Corporation purchased the mine in 1967 and continued mining operations until April 1969, at which time all mining operations ceased. In February 1981, ownership of the mine was acquired by Republic Mining Enterprises of Redmond, WA. The mine has remained closed since 1969.

GEOLOGY

The Orphan Mine breccia pipe, similiar to many other pipes located in the Grand Canyon area, is a vertical, sightly elliptical pipe structure. The pipe is filled with sedimentary rock fragments, mainly Coconino Sandstone, which collapsed into a solution cavity formed in the Redwall Limestone. The pipe has a mean diameter of approximately 230 feet down through the Hermit Shale from the lower Coconino Sandstone in which the pipe outcrops. The pipe then flares out to a mean diameter of 400 to 500 feet in the upper Supai Formation. Indications are that the pipe bottoms near the middle of the Redwall Limestone.

The primary ore recovered from the Orphan Mine was uraninite, however, numerous secondary occurrences of uranium also exists in the pipe. In addition, the pipe contained possible economic levels of silver, copper, nickel, cobalt, lead, zinc, iron, and sulphur ores when recovered with the uranium.

SITE DESCRIPTION

The Orphan Mine is located a short distance north of the West Rim Drive between Maricopa and Hopi Points and very near the Powell Memorial which is to the northwest (Figure 1). The mine is not visible from the West Rim Drive, except the headframe can be seen occasionally from certain locations of the Drive. However, the mine and surface facilities are easily visible from the viewpoints at both Maricopa and Powell Points. Due to the close proximity of these two viewpoints, many Park visitors use the paved walkway between the two areas. However, the walkway in the area of the Orphan Mine surface facilities has been removed and fenced off. As a result, Park visitors must leave the walkway and walk around the fenced mine yard by following the fence around the eastern, southern, and western ends of the mine yard in order to reach the walkway again.

The 6 foot chain link fence delineates the 3.0 acre area reserved to the patented claim holder as required by Public Law 87-457. The northern extent of the reserved area lies beyond the edge of the South Rim, however, because of the rugged terrain below the rim the northern boundary was never fenced. Apparently, over the years as a result of curious Park visitors, a short section of the fence adjacent to the main gate leading into the mine yard has had its anchor bolts removed from one support post and, therefore, many Park visitors have entered onto the private property by stepping over the chain link fence.

The mine yard contained all of the support facilities for the mining operation. The headframe stands as the most prominent structure at the mine. The approximately 80 foot tall structure is located near the foundation of the original aerial tramway near the northeast corner of the fenced area. In addition to the headframe, the support facilities currently consists of 7 corrugated metal buildings, numerous foundations of previously standing buildings, water and septic tanks, ore storage pads, and various concrete and asphalt pads. The metal buildings had been used for such purposes as housing the mine hoist, the mine air compressor, maintenance shops, supplies and material storage, and offices. The mine yard appears to have been backfilled with some material from the mine in order to have a level working area.

A large water tank is located outside of the fenced area adjacent to the dirt road leading to the main gate from the West Rim Drive and a smaller secondary tank is located just off the edge of the rim near the northwest corner of the mine yard. The concrete septic tanks are located off the edge of the rim near the aerial tramway foundation. It also appears that two underground fuel storage tanks may still be located near the center of the mine yard.

After the mine was shutdown in April 1969, the Cotter Corporation removed all useable equipment and materials. The remaining equipment is either too large, such as the hoist drum and motors, to be easily removed or may be unuseable without extensive overhaul, such as the compressor. In addition, other miscellaneous equipment and materials still remain at the mine site today. These items, such as old mine ventilation ducts and electrical transformers, apparently have very little residual value.

The surface disturbance in the area of the breccia pipe is confined to an area that is smaller than the mine yard. The most prominent feature in this area is the open hole, approximately 30 feet in diameter and 200 to 300 feet in depth, that resulted when the surface subsided into the old underground mine workings. The adit is located on the western edge of the opening. The open hole appears to be getting larger at the surface. This is due to the fact that loose unconsolidated material that surrounds the hole on the down slope is being washed into the opening or material is sloughing off the slope of the opening into the hole at other times.

Other features located in the adit area include two small wooden bunkhouses (approximately 10 feet by 12 feet in size each) and the remains of a third wooden structure, the wooden foundation of the aerial tramway, a

small waste dump, mine workings, and a small amount of discarded mining equipment and debris.

The mine workings consists of a covered raise leading into the underground mine workings very near the open hole and three adits with one being adjacent to the covered raise. Two other adits are situated near the bunkhouses which are approximately 150 feet higher in elevation than the open hole. These two adits have been driven into the contact between the Coconino Sandstone and the Hermit Shale. The first of the two adit has had the bottom half bulkheaded off. As a result, a pool has been formed by the seepage of water through the sandstone. The remains of a piping system leading to the underground mine workings is apparent and the pool was probably a water source for the mine. The other adit, approximately 3 feet in height, is open and has a small amount of water seepage on the floor. No attempt was made to determine the length of either adit. A small diameter pipe, approximately 1.5 inches in size, protruding about 1 foot from the sandstone between the two adits was dripping water. A water sample was taken and analyzed to determine water quality. The results are discussed in Recommendation Number 6 and shown in Tables 2 and 3.

Finally, the structures that remain are the two intermediate support towers for the aerial tramway that had been put in place in order for the tramway to accommodate the terrain. The towers are constructed with wooden beams and are cantilevered out into the Canyon at locations where the terrain changes sharply. The upper of the two towers is located at the top of the Coconino Sandstone and the second tower is located approximately halfway down the Coconino Sandstone. The condition of these towers, which are anchored with concrete into the sandstone, could not be determined without a closer inspection. The steel tramway cable is still strung from just below the rim to the return tower at the adit area.

ABANDONMENT AND RECLAMATION RECOMMENDATIONS

As the deadline approaches for the National Park Service to receive control of the Orphan Mine property, thought must be given to what remedial action must be taken to minimize or mitigate any residual impacts from past mining activities. Due to the type of mineralization that was mined at the Orphan, the main impact to the local mine site area is the radiological contamination. In addition, the safety and visual impacts from the deteriorating condition of the mine facilities and structures must be taken into account. Therefore, proper abandonment and reclamation of the mine and mine yard is necessary in order to limit any hazardous situations to future Park visitors.

In order to develop recommendations for the proper abandonment and reclamation of the Orphan Mine site, representatives of the Bureau of Land Management with experience in mining and the reclamation of uranium mines, have inspected the area on a number of occasions during the past year and a half. The inspections were conducted for the purpose of gathering information on the current condition of the mine and to inventory equipment

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and facilities. The inspections also included radiological surveys of both the mine yard area and the lower adit area.

Based on the information gathered, the following recommendations are made in order to properly abandon and reclaim the Orphan Mine site:

1. HEADFRAME AND HOIST. If the decision is made by Park Service officials to remove the headframe, it may be possible to offer the headframe and related hoisting equipment to a mining company, free of charge, on the condition that the mining company dismantles and removes the headframe and hoist at its own expense and within a specific time. This recommendation is made because it is felt by the BLM that the headframe and hoist has definite salvage value even during a period where the mining economy is depressed which the country is experiencing now. Any implementation of this recommendation should be done under close Park supervision to ensure timely removal.

However, if this recommendation proves to be impractical or unfeasible, it is recommended that the headframe be either dismantled and properly disposed of by burial, disposed of as scrap metal, or retained by the Park for future internal use as structural steel. Before the second and third options can be considered for implementation, the structure will need to be checked for any radiological contamination.

2. STRUCTURES. All corrugated metal structures should be dismantled and properly disposed of at an authorized burial site. Here again, in order to minimize the cost of removal to the Park Service, it may be possible to offer the corrugated metal to a scrap dealer if he would dismantle and remove the material at his own expense and if the material is not contaminated. The wooden frames, a concrete block wall, and a small concrete block addition to one of the buildings will have no salvage value and, therefore, will still have to be disposed of by burial.

Other structures, such as the water tanks and septic tanks, should be dismantled and properly disposed of at an authorized burial site. Miscellaneous structures, such as the fence and power poles, should also be dismantled and properly disposed of. These miscellaneous structures may have enough salvage value to entice a scrap dealer to remove the structures or may be useful to the Park for internal use. Miscellaneous structures and equipment located just off the edge of the rim should also be removed and properly disposed of by burial. The fence should remain in place until the site work recommended in Number 4 is ready to begin.

The structures, including the bunkhouses and the return tramway tower, located in the adit area have no salvage value because of their remote location and should be dismantled and disposed of by depositing into the open subsidence hole. This recommendation would be more cost effective than transferring the material by

helicopter to the South Rim before disposing the material at a burial site. There would be no impact to the Park from this recommendation because of the depth of the open subsidence hole.

3. **EQUIPMENT AND MATERIAL.** Equipment, other than the hoist discussed under Recommendation Number 1, should be removed and properly buried. One possible exception would be the compressor which may have some residual salvage value. This particular piece of equipment could also be offered, as part of any agreement for removing the headframe, as an additional incentive. No other equipment appears to have any salvage value.

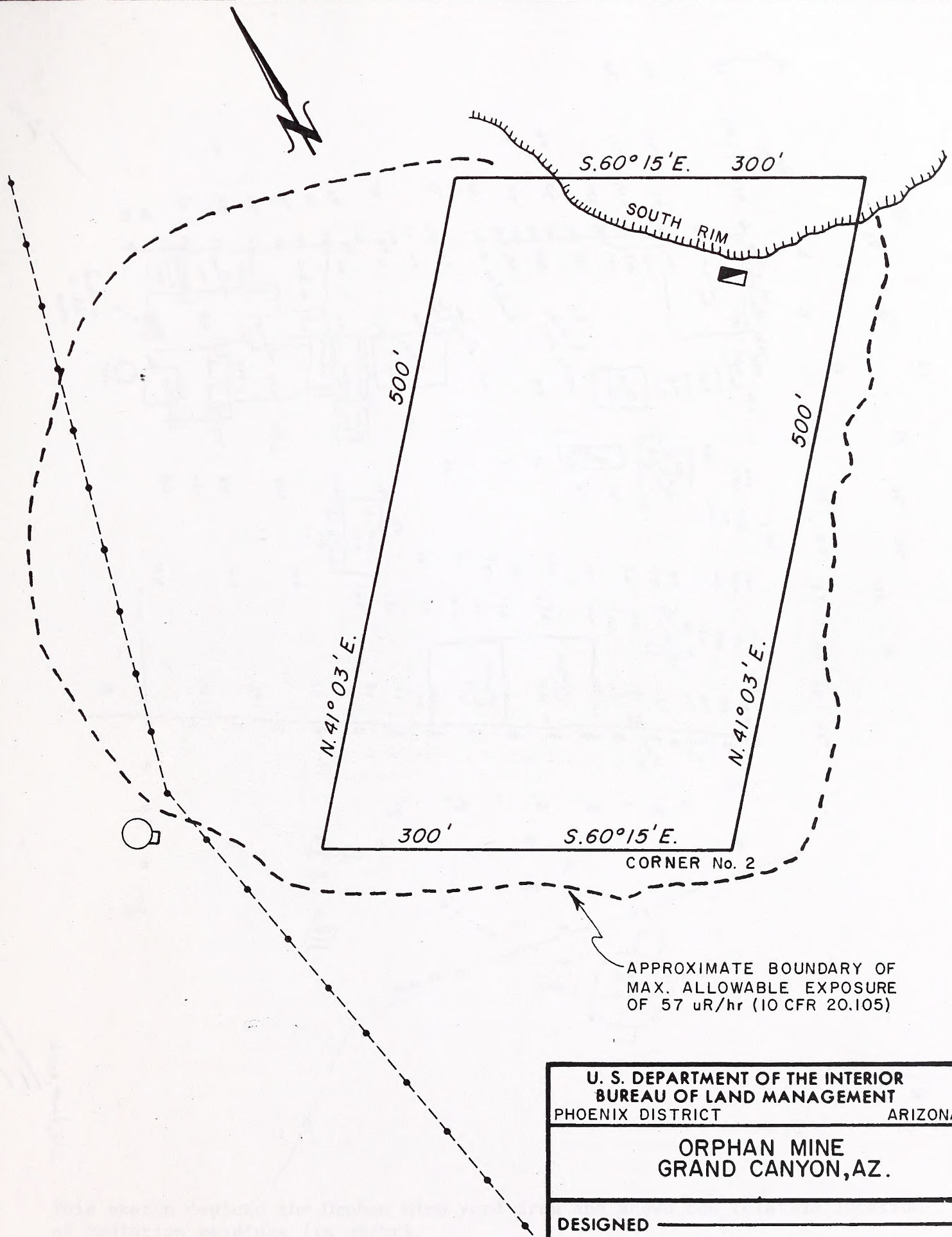
However, because of the approximate age of the electrical transformers identified earlier, it is recommended that they be checked to determine if any of them may contain the hazardous chemical PCB (polychlorinated biphenyl) which was used as an electrical insulator. If underground fuel tanks still exist within the mine yard, their location should be accurately determined prior to any work commencing under Recommendation Number 4. The tanks will need to be uncovered and removed to a proper disposal site after verifying that the tanks no longer contain fuel. Other than these special precautions, the disposing of all other equipment should pose no special handling problems.

Mine related materials, such as the ventilation ducts and water pipes, have no salvage value and should be removed and properly buried. The bulk of the miscellaneous material consists of trash and debris and should have no special handling problems or precautions to be aware of.

The equipment and material, including debris, located in and around the lower adit area should be disposed of by depositing into the open subsidence hole which will be more cost effective than the use of a helicopter to remove the items.

4. **SHAFT AND CONTAMINATED MATERIALS.** Based upon the BLM radiological survey, the area in and around the mine yard is emitting low levels of radiation. Two explanations of the source of the low level radiation would be that material from the mine was used as fill when the mine yard site was being prepared and/or the random scattering of uranium ore by men and equipment during the active mining periods. In addition, it appears that low level radioactive material was transported by wind and water action to the Park lands adjacent to the fenced mine yard. Please refer to Figure 4 which shows the area, approximately 5.6 acres in size, where contamination has occurred. Figure 5 is a sketch copy of the mine yard area which shows the readings taken during the radiological survey.

In order to minimize the exposure from this hazard, it is recommended that the area showing radiation levels greater than the amount specified by Part 20 of Title 10 of the Code of Federal



APPROXIMATE BOUNDARY OF
MAX. ALLOWABLE EXPOSURE
OF 57 uR/hr (10 CFR 20.105)

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
PHOENIX DISTRICT ARIZONA

ORPHAN MINE
GRAND CANYON, AZ.

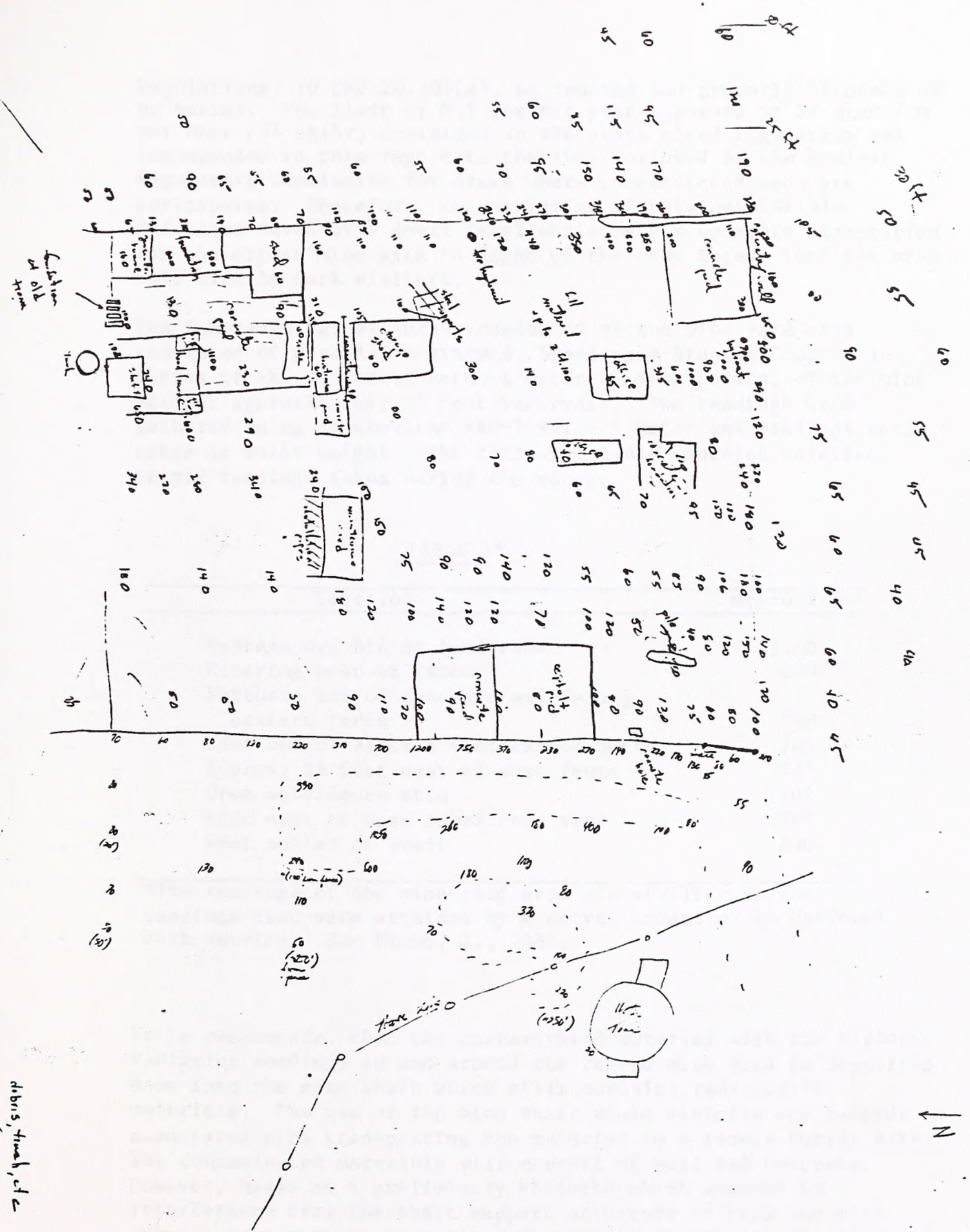
DESIGNED _____
REVIEWED _____
APPROVED _____

DRAWN R.G.F.	SCALE 1"=100'
DATE APRIL 1986	SHEET 1 OF 1

DRAWING NO. _____

FIGURE - 4

Not to Scale



This sketch depicts the Orphan Mine yard area and shows the relative location of radiation readings (in uR/hr).

FIGURE 5

Orphan Mine
5-15-85

Regulations, 10 CFR 20.105(a), be removed and properly disposed of by burial. The limit of 0.5 rem per year exposure or 57 microrem per hour (57 uR/hr) contained in the above cited regulation and recommended in this report is the limit allowed by the Nuclear Regulatory Commission for areas where unrestricted uses are anticipated. Therefore, the achieving of this permissible radiation level or a lower level would be a reasonable expectation for the Orphan Mine site in light of the easy access into the mine yard area by Park visitors.

The BLM radiological survey conducted of the mine yard area consisted of parallel traverses, based upon Brunton Compass and pacing of the distances between meter reading points, of the mine yard at approximately 25 foot intervals. The readings were gathered using an Eberline PRM-7 Micro R meter and readings were taken at waist height. The following table contains selected sample readings taken during the survey.

TABLE 1*

Location	Micro R/hr.
Eastern ore bin at headframe	1100
Clearing west of fence	800
Northern end of concrete wall along eastern fence	380
East end of stacked ventilation ducts	240
Approx. 25 feet east of east fence	115
Open subsidence area	1100
Adit next to open subsidence area	3200
West collar of shaft	650

*The readings of the mine yard area are similar to the readings that were obtained by a survey conducted by National Park Service. See Fiano, J., 1982.

It is recommended that the contaminated material with the highest radiation readings in and around the fenced mine yard be deposited down into the mine shaft which still contains radioactive materials. The use of the mine shaft would minimize any hazards associated with transporting the material to a remote burial site. The contaminated materials will consist of soil and concrete. However, based on a preliminary estimate which assumes no interference from the shaft support structure or from any mine support equipment such as air and water lines, the total volume of contaminated material will exceed the volume of the mine shaft by 100 to 200%. Therefore, the material with lower radiation readings will either have to be transported to a remote burial site or buried on site. Contaminated material located off the edge of the rim should also be recovered but may be difficult to reach with

mechanical equipment and may have to be left in place if the volume is small or the amount of disturbance outweighs the benefits.

The work of gathering the contaminated materials would be accomplished by a combined dozer and frontend loader operation. It is recommended that dust control measures (water spray) be used during the removal of contaminated materials, so that additional radioactive material is not transported by the wind to adjacent Park lands. In order to minimize the amount of uncontaminated material that is removed with the contaminated material, it is recommended that radiation readings or soil samples be taken as the work progresses. Due to the shallow depth of the contaminated material in some locations, the monitoring of the work must be done on a continuous basis and not on an intermittent basis. Therefore, properly trained personnel with the necessary radiation and/or soil sampling equipment should be onsite at all times during the removal operation.

Once the shaft has been filled to within six feet of the surface with contaminated material, the shaft should be sealed with a 4 foot concrete cap and then 2 feet of top soil. The concrete cap should be so designed that it is anchored into the sides of the shaft so that future settling of the contaminated material will not cause the cap to settle. In addition to isolating the contaminated material, the capping of the shaft will prevent further escape of radon gas which is also a health hazard.

After the mine yard site has had all of the contaminated materials removed, it is recommended that the site be backfilled with topsoil and contoured into the natural terrain. A suitable vegetative cover should be established in order to minimize erosion of the site.

5. **SUBSIDENCE AREA.** Due to the remoteness and size of the open hole that was created when the surface subsided into the old underground mine workings, the only practical recommendation to reclaim the area would be to construct a heavy duty chain link fence so that wildlife and hikers would be kept a safe distance from the subsidence hole. The location of the fence must take into account that the top of the hole has not yet completely stabilized. Danger and radiation warning signs should be posted on the fence to warn Park visitors who may venture into the area of the dangerous situation.
6. **ADITS AND RAISES.** All adits and raises should be sealed to prevent entry into the underground mine workings. Sealing these mine entries can be accomplished by either the construction of a concrete seal or the use of an explosive charge to blast in the sides of the entry. This recommendation includes the adit at the open subsidence hole even though it will be located within the fenced off area identified in Recommendation Number 5. The sealing of this adit is necessary because it would prevent someone from

climbing over the fence and entering the underground mine workings.

The adit that has been partially bulkheaded off should be blasted shut in order to prevent the buildup of water in the adit. Since the water is naturally occurring in the Coconino Sandstone, the destruction of the bulkhead will allow the water to seep down and dissipate over the naturally occurring outslope of the Hermit Shale at that location. The quality of the water is within acceptable standards except for the detectable levels of dissolved uranium, radium-26, and radon-222. Results of the water sample taken from the pool are shown in Tables 2 and 3, however, additional sampling of the water will be needed to determine any health impacts to consumption by humans and wildlife. It may be unwise to completely seal off the adit because of the possibility of the seal failing at a future date.

7. TRAMWAY. Due to the type of construction materials used on the tramway towers, natural deterioration will eventually cause the towers to collapse. Access to the intermediate tramway towers will be more difficult than the lower adit area. For this reason, it will be cost effective to leave the intermediate towers in place.

However, the decision can be made to remove the tramway towers. This option will require extensive helicopter support and a large labor force to dismantle and remove the intermediate tramway towers and to gather up the cable which will probably have to be cut into shorter lengths in order to be handled by the helicopter. The structural material of the towers, after dismantling, and the cable may either be airlifted to the South Rim for disposal at a remote site or to the lower adit area for disposal in the open subsidence hole. The final method of disposal can only be determined after an evaluation of the ability of the helicopter to safely deposit the material directly into the open subsidence hole or adjacent to the hole. Such factors as wind conditions or steepness of the terrain will have to be taken into account.

The concrete foundations of the tramway towers should be left in place because of the effort that will be needed and the disturbance that may be caused in order to remove the imbedded concrete. These foundations would have no impact to the Park if they were left in place.

CONCLUSION

The abandonment and reclamation of the Orphan Mine site should be implemented by the National Park Service in order to minimize the residual hazards to Park visitors from the mining operation. However, the reclamation of the mine need not be the highest priority of the Park Service because of the short exposure time experienced by Park visitors. The reclamation recommendations should be implemented as the Park Service budget and resources will allow without disrupting the normal operation of the Park.

ORGANIC CHEMICAL ANALYSIS REPORTING FORM

Personnel from the Bureau of Land Management will be available to discuss any aspect of this report prior to the finalization of the Orphan Mine reclamation plan by the National Park Service.

ARIZONA TESTING LABORATORIES

675 West Washington Street
Phoenix, Arizona 85001

DATE: 2/20/89

ORDER NO. 11

Color: Clear
Turbid:
Other (specify):

WATER SOURCE: Well
Gulf of California
Other (specify):

ANALYTE CODE	ANALYTE METHOD	TEST RANGE	ANALYTE RANGE TO LIMIT	REMARKS
1	1.0	Asbestos	0.001	
2	1.0	Boron	1	
3	1.0	Carbonate	0.001	
4	1.0	Chromium	0.001	
5	1.0	Cyanide	11.8-2.0	
6	1.0	Fluoride	10.00	
7	1.0	Mercury	10.00	
8	1.0	Nitrate (N)	10.0	
9	1.0	Selenium	10.00	
10	1.0	Silver	1.00	
11	1.0	Sulfate		
12	1.0	Vanadium		
13	1.0	Chloride		
14	1.0	Copper	0.05	
15	1.0	Iron		
16	1.0	Magnesium		
17	1.0	Manganese		
18	1.0	Zinc		
19	1.0	Ammonia		
20	1.0	Phosphate		
21	1.0	Calcium		
22	1.0	Sodium		
23	1.0	Potassium		
24	1.0	Total Solids		
25	1.0	Specific Gravity		
26	1.0	Temperature		
27	1.0	Dissolved Oxygen		
28	1.0	Electrical Conductivity		
29	1.0	Acidity/Alkalinity		
30	1.0	Oil and Grease		
31	1.0	Heavy Metals		
32	1.0	Organic Compounds		
33	1.0	Trace Elements		
34	1.0	Other		

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 JUN 24 1989
 ARIZONA TESTING LABORATORIES

DRINKING WATER QUALITY INORGANIC CHEMICAL ANALYSIS REPORTING FORM

206500
SPECIMEN NO

Before completing, please read instructions on reverse side.

5-16-85
DATE REC'D

NOTE: WATER SYSTEM MUST COMPLETE ALL BLANKS INSIDE THIS BOX

PWS ID NO.				
0	4			
1-7				

<p>LAB NAME AND ADDRESS</p> <p style="text-align: center;">Steven B. Hankins, Director ARIZONA TESTING LABORATORIES 817 West Madison Street Phoenix, AZ 85007 (602) 254-6181</p>	<p>LAB ID NO</p> <table border="1" style="margin: 0 auto;"> <tr> <td style="width: 20px;">0</td> <td style="width: 20px;">0</td> <td style="width: 20px;">0</td> <td style="width: 20px;">0</td> <td style="width: 20px;">2</td> </tr> </table> <p style="font-size: x-small; margin-top: 5px;">42-46</p>	0	0	0	0	2
0	0	0	0	2		

SAMPLE DATE		
Mo.	Day	Yr.
31-36		

SAMPLE	
Type	Time (Hrs.)
37 38-41	

WATER SYSTEM NAME

SAMPLING POINT—WELL NO. OR EXACT LOCATION
Orphan #2

MAILING NAME AND ADDRESS
U.S. Bureau of Land Management Mr. Moon Hom 2015 West Deer Valley Road Phoenix, Arizona 85027

SAMPLE APPEARANCE	
	Clear
	Turbid
	Other (comment)

WATER SUPPLY SOURCE	
	Well
	Surface
SAMPLE TYPE CODES C - Check Sample D - Regular Distribution Sample P - Plant Tap Sample R - Raw Water Sample S - Special Sample	

SAMPLER'S COMMENTS OR INSTRUCTIONS

CONTAMINANT CODE	ANALYSIS METHOD	CONTAMINANT NAME (MCL)	ANALYSIS RESULTS (mg/l)	EXCEEDS
1 0 0 5	1 0 1	Arsenic (0.05)	0 . 09	
1 0 1 0	1 0 1	Barium (1.)	< 0 . 5	
1 0 1 5	1 0 1	Cadmium (0.010)	< 0 . 005	
1 0 2 0	1 0 1	Chromium (0.05)	< 0 . 01	
1 0 2 5	1 0 7	Fluoride (1.4-2.0)		
1 0 3 0	1 0 1	Lead (0.05)	< 0 . 02	
1 0 3 5	1 0 3	Mercury (.002)	< 0 . 001	
1 0 4 0	1 0 9	Nitrates (N) (10.)	0 . 6	
1 0 4 5	1 0 1	Selenium (0.01)	< 0 . 005	
1 0 5 0	1 0 1	Silver (0.05)	< 0 . 02	
1 9 2 7	1 4 9	Alkalinity		
1 0 1 6	1 0 1	Calcium		
1 0 1 7	1 4 9	Chloride		
1 0 2 2	1 0 1	Copper	< 0 . 05	
1 9 1 5	1 4 1	Hardness		
1 0 2 8	1 0 1	Iron	< 0 . 1	
1 0 3 1	1 0 1	Magnesium		
1 0 3 2	1 0 1	Manganese	< 0 . 05	
1 9 2 5	1 3 5	pH		
1 0 5 2	1 0 1	Sodium		
1 0 5 5	1 3 7	Sulfate		
1 9 3 0	1 3 9	TDS		
1 0 9 5	1 0 1	Zinc	< 0 . 05	

Pursuant to R9-8-223 check samples are REQUIRED for ANY and ALL contaminant(s) checked in the exceeds column.

LOCATION CODE	
28-30	

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BLM, PHOENIX DIST. OFF.
PHOENIX, ARIZONA
JUN 24 1985
AM 7:8 9 10 11 12 1 2 3 4 5 6 PM

COMMENTS	TABLE 2
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ANALYSIS DATE		
Mo.	Day	Yr.
0	6	2
1	8	5
22-27		

SA

ANALYST



Controls for Environmental Pollution, Inc.

P.O. BOX 5351

OUT OF STATE 800/545-2188

LAB # 85-05-443

PAGE 1

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CEP, Inc.

REPORT

06/14/85 16:59:12

REPORT Bureau of Land Management
TO 2015 W. Deer Valley Road
Phoenix, AZ 85027

PREPARED Controls for Environmental
BY Pollution, Inc.
1925 Rosina Street
Santa Fe, NM 87502

[Signature]
CERTIFIED BY

ATTEN Moon Hom

ATTEN (505) 982-9841

CONTACT GAIL

CLIENT BUREAU LAND SAMPLES 1
COMPANY Bureau of Land Management
FACILITY Phoenix District Office

WORK ID Environmental
TAKEN
TRANS Mail
TYPE Water
P.O. # A-17643-MC
INVOICE under separate cover

SAMPLE IDENTIFICATION

01 Orphan #1

CEP, Inc. TEST CODES and NAMES used on this report

FU 1 Total Uranium
RA226W Radium-226
RADON1 Radon-222



Controls for Environmental Pollution, Inc.

P.O. BOX 5351 • Santa Fe, New Mexico 87502

IN STATE 505/982-9841

OUT OF STATE 800/545-2188

LAB # 85-05-443

PAGE 2

REPORT OF ANALYSIS

SAMPLE IDENTIFICATION

Orphan #1

DATE COLLECTED

not specified

TYPE OF ANALYSIS

Total Uranium
Radium-226
Radon-222

mq/liter

0.620

17.9±2.0 (pCi/liter)
1.19±0.40 (pCi/liter)

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PHOTO #1: The view of the Orphan Mine facilities located on the South Rim of the Grand Canyon. The photo is taken from the Powell Memorial.

5-15-85



PHOTO #2: A view of the Orphan Mine facilities located on the South Rim. The photo was taken from the mine yard gate and is looking to the North.



PHOTO #3: Another view of the Orphan Mine facilities on the South Rim. This was taken, looking to the south, from the foundation of the aerial tramway.



PHOTO #4: This photo show the lower adit area which includes the open subsidence hole and the lower aerial tramway tower.

5-14-85

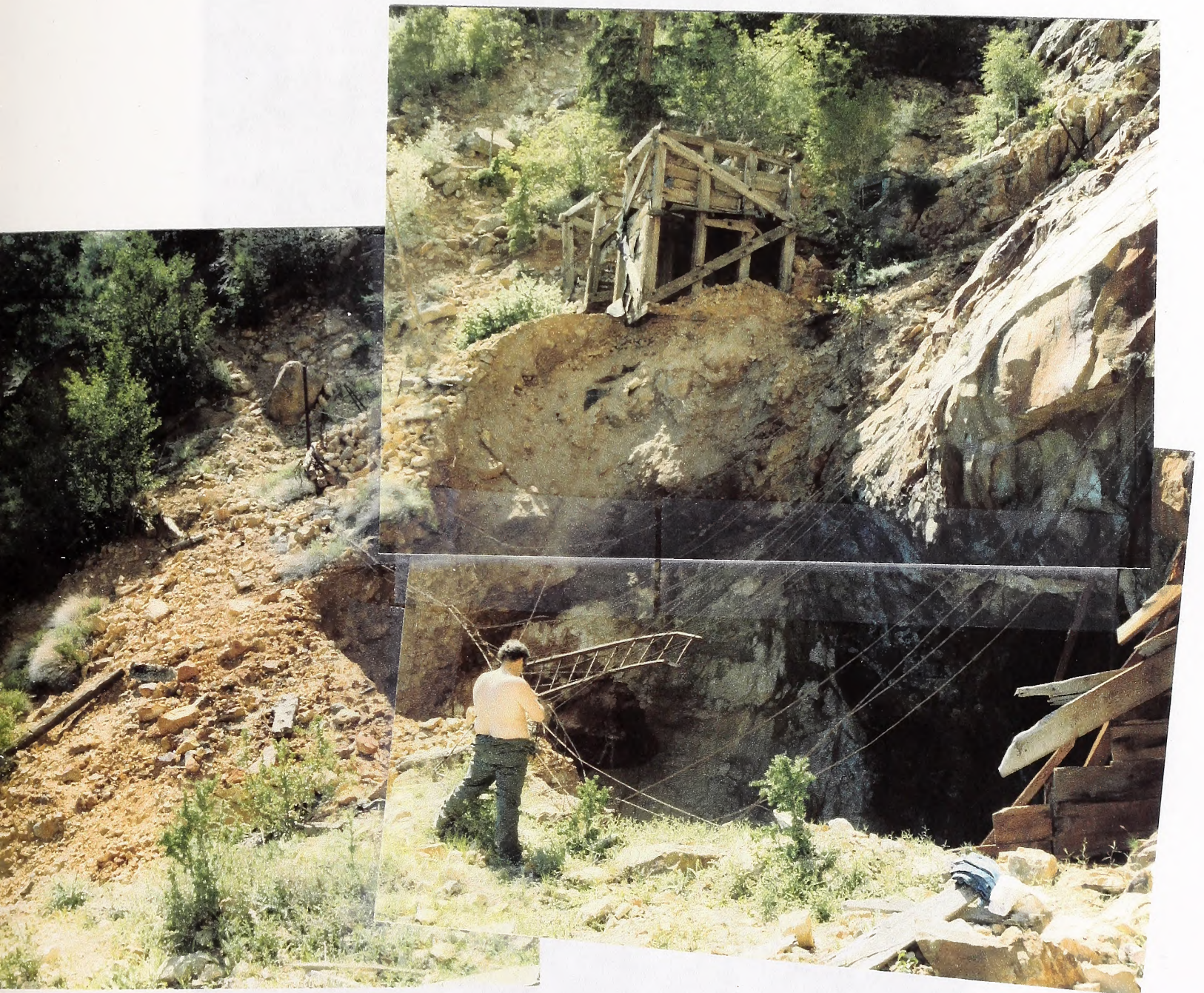


PHOTO #5: This photo is a closeup view of the open subsidence hole and low aerial tramway tower shown in Photo #4. The cables and wooden planks were an apparent attempt to isolate the open hole from men and equipment in the area.

5-14-85



PHOTO #6: A view of the bunkhouses located at the lower adit area of the Orphan Mine. The ledge that these structures sit on is located at the left of top center of Photo #4.



PHOTO #7: This photo is looking back to the area where Photo #6 was taken. Two adits, with the near one partially bulkheaded, are seen in this photo.

5-14-85



PHOTO #8: A closer view of the partially bulkheaded adit seen in Photo #7.



PHOTO #9: A view of the two intermediate aerial tramway towers from the lower adit area.

