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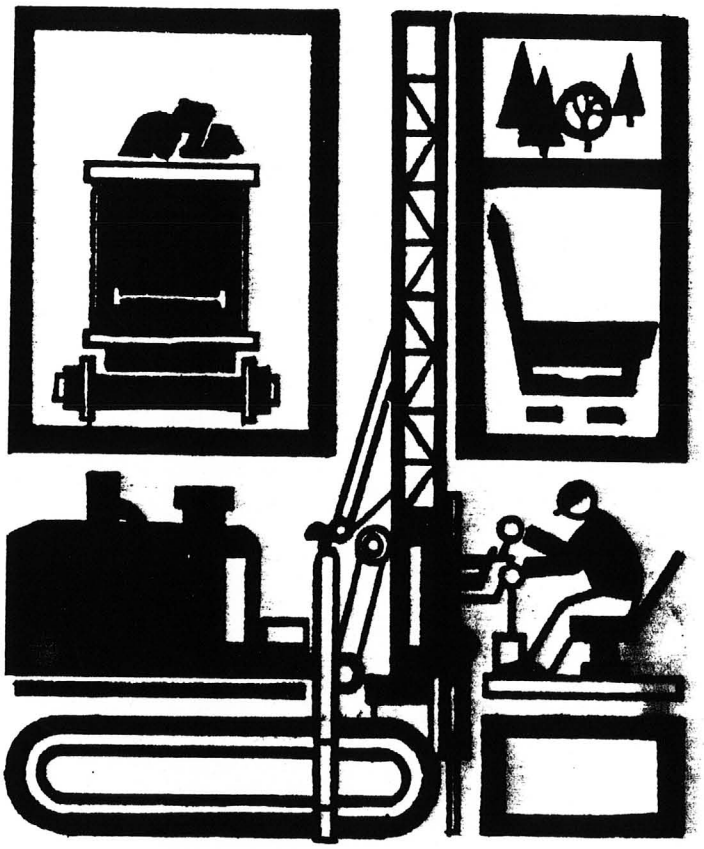

EA No. AZ-010-86-015

The Pinenut Project

ENVIRONMENTAL ASSESSMENT

A Major Modification to the Site No. 156
Plan of Operations for
Uranium Production/AS-010-86-10P

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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ENVIRONMENTAL ASSESSMENT

A Major Modification to the Pinenut Project
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I. INTRODUCTION

Energy Fuels Nuclear, Inc. (EFNI) has submitted a major modification to the Pinenut Project (AS-010-84-75P, Site No. 156), an existing plan of operations. The purpose of the modification (plan of operations) is to allow EFNI to expand the nature and duration of activities that are presently authorized under the existing plan of operations pursuant to 43 CFR 3809 regulations.

The existing exploration plan of operations was submitted on July 27, 1984 pursuant to 43 CFR 3802 regulations. The Bureau prepared an Environmental Assessment (E.A.) and sent it out for public review on February 7, 1986. After review of the public comments this E.A. was modified.

Until the decision is made on this proposal, work at the site will be in conformance with the approved plan of operations, which has been amended to conform with 43 CFR 3809 regulations. If this modification is approved, the existing plan of operations will be superceeded in all respects.

To date, twenty two holes have been drilled, two mud pits have been constructed resulting in six acres of disturbance. Only minor road maintenance has been allowed on drainage channels and on portions of the road that have been badly weathered. Two small trailers are on site.

II. PURPOSE AND SCOPE OF ENVIRONMENTAL ASSESSMENT (EA)

The purpose of this EA is to assess the potential environmental impacts of the modification and to identify any feasible/reasonable alternatives to the proposed modification to reduce or eliminate those impacts. In addition, mitigation will be proposed when suitable and necessary to prevent undue or unnecessary degradation pursuant to 43 CFR 3809 regulations and BLM 3809 Manual (26,52).

* Footnote (No.) with numbers correspond to referrence sources used in the bibliography.

III. PROPOSED ACTION AND ALTERNATIVES

A. Proposed Action

In accordance with 43 CFR Section 3809 and pursuant to consultation with the Bureau of Land Management, EFNI has submitted the following Plan of Operations (53).

Claimant: Energy Fuels Ltd. (EFL)
One Tabor Center
1200 Seventeenth Street
Suite 2500
Denver, CO 80202

Operators: Energy Fuels Nuclear, Inc. (EFNI)
P. O. Box 36
Fredonia, AZ 86022

Location: T36N R4W Sec. 21 (see Plate 1, Appendix)

Lode Claims (5): Pinyon 593-597, Pinyon 639-640, Unpatented, AMC:151890-151892, AMC:153242-153243

The following planned operations are those submitted by EFNI.

Planned Operations: It is the objective of EFNI to recover by underground mining methods, a uranium ore deposit occurring within the project area. The ore body was discovered pursuant to an approved exploration plan of operations (AS-010-84-78P) and its commercial value assessed in October 1985.

During the next 10 years, it is EFNI's plan to further define and delineate and then mine the deposit in two distinct phases of operations. Phase I of the operations is the sinking of a mine shaft and the delineation of the ore body. Phase II involves the production of ore and reclamation of disturbed areas resultant from mining activities.

Phase I-General: Access to the deposit will be by a conventional two and one half compartment vertical shaft located immediately south of the deposit (see Plate 2, Appendix). During this phase, the shaft will be sunk approximately 1,300 feet below the surface. After the shaft has been sunk, laterals will be drilled at various levels toward the deposit. Thereafter, two to four drilling chambers will be excavated in or near the deposit. From these chambers, drilling will be undertaken to further define and deliniate the extent of the deposit. The proposed plan of access, surface facilities, shaft and waste rock disposal areas to be utilized are also identified in Plate 2 (Appendix).

During Phase I, employment will range between 12 to 22 personnel, depending on the specific work schedule to be used. Generally shaft sinking is conducted on a three shift, seven day per week basis, but mine construction and underground drilling activities are likely to be implemented on a two shift, five day per week schedule. The majority of employees will be transfers from other nearby mines operated by EFNI.

Phase II-General: Once the ore body has been fully delineated, the shaft will extend to the lower elevation of the ore body (53). Horizontal workings will then be driven below the deposit to a point just outside the furthest extent of the ore reserves.

At this point a vertical shaft will be upreamed to the surface. This ventilation shaft will be drilled utilizing a pilot hole drilled from the surface to intersect the lowest workings. Thereafter, an 8-foot diameter reaming bit will be attached to the bottom of the drill pipe and the vertical ventilation shaft will be drilled upward to the surface. This second ventilation shaft is to accommodate adequate air flow throughout the mine in addition to providing a secondary escapeway from the mine in the event of an emergency.

Raises or vertical workings within the mine will connect the various mining levels within and near the deposit. At various elevations from these raises, sub-level workings will then be driven to extract ore from the deposit.

The broken ore will be dropped down these raises, designed for such use, to draw points on a lower level. The ore will then be hauled to the shaft at which point the material will be transferred to skips and then hoisted to the surface.

Barren waste rock generated during the development of the mine will be removed and disposed of on the surface in waste disposal areas, to the extent that such material cannot be utilized for construction of the mine yard or upgrading of the existing access. All ore grade material will be stockpiled on the surface, near the shaft until shipment to a mill takes place.

After the above development work is completed (approximately 2 years after commencement of Phase I), the mine will be operated at an average production rate of 300 tons per day for approximately 5 years. Carefully planned underground extraction is expected to extend the operations life by a number of years (53). Final duration of the project's life will ultimately be determined by the extent of the ore reserve and the mining grade of the deposit as well as milling capacity and market conditions.

Employment during the first few years of mine development in Phase II will range from 15-30 personnel. As production capacity grows, employment could reach a high of approximately 40 employees at the 300 ton per day rate, working two shifts per day.

Most employees are expected to be drawn from the surrounding local communities. Employees will be provided transportation to and from the project area in busses provided and operated by EFNI. Management and technical staff support will be based at the Fredonia Mine Operations Office.

Areas to be Disturbed: There are three specific areas that will be temporarily used or disturbed during the project life:

(1) Clearing of 20.8 acres for the mine yard.

(2) 8.3 miles of electric powerline, less than 1 acre.

(3) Upgrading 17 miles of existing access, 31.0 acres.

Operations where all activities will take place, together with planned surface facilities, during Phase I and Phase II are shown on Plates 2 and 3 (Appendix) respectively. The area of operations and actual impacts have been minimized as much as possible by clustering the various surface facilities and waste/ore areas. During both phases, the design of the area of operations will ensure adequate working areas while minimizing the area to be disturbed (53).

Areas Impacted During Phase I-Underground Evaluations: During the first two years (Phase I) of this project (underground evaluation phase) only the central third or 8.0-acre portion of the project area will be utilized. This initial yard is within the 20.8-acre area of operations to be utilized during Phase II. During Phase I, only the shaft and sinking hoist area will be graded to a final yard elevation. Diversion drainage ditches will be constructed around the area of operations to divert runoff from the small watershed (208 acres) to prevent it from entering the mine yard. An existing road through the project will be relocated outside the area of activity.

A water well is needed to supply a few gallons per minute to accommodate underground drilling and sanitation during Phase I. Consequently, a water well will be drilled on the west edge of the area of operations to a depth of 3,000 to 3,600 feet. In the event the water well fails to generate sufficient quantities of water, water will be hauled via truck to the project area. Tankage to accommodate water will be located on the site near the well.

During Phase I, at least two house trailers will be located to serve as temporary lodging for the mine staff and for a security guard if needed. No full time resident other than a security guard is proposed.

Prior to construction of the mine yard, top soils will be removed and stored at the western edge of the areas of operations. Contract studies confirm that sufficient quantities and qualities of top soils are available to warrant its storage. Top soil placement will be located in an area of the mine yard that will not be disturbed by ongoing mining activities. In addition, after construction of the water diversion facilities, the stock piles will be protected from erosion (53). The size and dimension of the top soil stock pile will increase at the beginning of Phase II when additional top soil is removed and stored during the construction of the final mine yard.

A temporary hoist to excavate the shaft will be located on a 10 x 15-foot concrete slab located approximately 125 feet west of the shaft. A wood frame building will surround the temporary sinking hoist. A diesel-electric generators, diesel air compressors, semi trailers for shop, warehouse office and showers will be located as shown on Plate 3. A septic field will be located northwest of the shaft to handle sewage. The final location of the septic drainage field will be determined by soil testing but is tentatively located as shown on Plate 3.

EFNI estimates no more than a few thousand tons of ore will be generated during Phase I. This material will be stored at the location depicted on Plate 3 until shipped to a mill for bulk sampling and amenability testing.

Located just east of the temporary sinking hoist will be a holding pond. During Phase I all surface drainage from the disturbed areas will flow into this pond. No discharge of water from the disturbed area will be allowed during Phase I, and consequently, a National Pollution Discharge Elimination System (NPDES) permit will not be necessary.

In order to ensure that no surface runoff from outside the area of operations is allowed to enter, EFNI will construct water diversion facilities on both the east and west perimeters of the area of operations. Prior to the design of surface diversion water structures, it was necessary to analyze the watersheds and the potential of the area to experience severe storm events (53). A consulting hydrologist was contracted to evaluate the surface runoff issues and has advised EFNI regarding the most appropriate and safest design and location for diversion facilities. This design system will ensure that runoff from a 500-year event can be diverted around the project area. This design is further facilitated by making maximum use of existing channels. Diversion facilities will be constructed during Phase I and will be maintained throughout the life of the project.

Access to the project area will be by existing roads from the south and southwest. The route will require only minor maintenance and upgrading during Phase I.

Areas Impacted During Phase II-Ore Recovery: After Phase I has been completed, the nature and extent of activities will be expanded as shown on Plate 3 (Appendix).

A powerline will be constructed to tie in with the existing Garkane powerline located at the Hack's Canyon Project to supply the needed electricity.

In addition, the actual yard area will be expanded to accommodate the ore reserves. This activity will include construction of ore pad areas, additional top soil stockpiled and expansion of the surface water holding pond. Ore piles will be located topographically in high areas of the yard and holding ponds in the low area of the yard.

Finally, as Phase II activities proceed, the Pinenut road (See Plate 1 Appendix) upgrading activities will be necessary to accommodate all weather hauling of ore. Upgrading will require an additional 15 feet of road bed and shoulders and a 16-inch gravel base (from barren waste) with appropriate drainage and culverts. Haulage is estimated at 12 truck loads per day at full production (53).

Yard excavation during Phase II will entail the following: grading of a low ridge southwest of the main shaft to approximately 5,335 feet. Material graded will be used to fill in the area below yard elevation and just east of the ridge as noted on Plate 3 (Appendix). The entire leveled area will have a slight eastern slope of 1:200. The expanded holding pond will be located at low yard elevation. The pond will be lined with impermiable plastic and sized to accommodate the potential runoff from within the yard resulting from a 100-year, 24-hour event. Prior to commencing surface expansion activities, available top soil within the additional disturbed areas will be collected and stored for use in final reclamation.

Barren waste rock will be disposed of along the northern edge of the project area. This area will accommodate piles 500 feet wide and 10 feet high. Barren rock areas were designed with the capacity to hold several times the 40,000 cubic yards of barren rock material anticipated without noticeable change to the original topographic features.

Further underground expansion will be required as dictated by the findings during Phase I. The lowest level of the mine will ultimately be extended under the deposit to the northeast to a point beyond the lateral extent of the ore (an estimated 1300 feet). Thereafter from a point on the surface, the 8-foot diameter shaft will be drilled to connect this lower level. Adjacent to the ventilation shaft, a small hoist will be located to provide a second exit or escapeway from the underground workings (as required by Federal regulation). A ventilation fan will normally be positioned over the shaft (53).

The only major building in the surface plant will be located just west of the temporary sinking hoist utilized during Phase I. This facility will house the permanent hoist, air compressors, standby electric generators, warehouse and emergency medical facilities. Just west of the main building, various supplies will be stockpiled including tankage for gasoline and diesel fuel.

Once the Phase II surface facilities have been constructed, a 6-foot chainlink security fence with lockable gates will be installed. The mine use area will also be posted with "No Trespassing" signs. Gates will be locked during periods of inactivity at the mine.

As stated previously, an 8.3-mile electric line will tie into the Hack's Canyon Mine vent shaft located in T37N, R5W, Sec. 27, east quarter corner.

The access road upgrading will be complete approximately 2 years into Phase II to accommodate efficient and safe ore haulage.

Measures to Limit Surface Disturbance: This plan of operations was designed to minimize disturbance to the environment and to provide for complete reclamation of the surface after completion of activities to the standards required by law. The areas proposed to be disturbed during Phase I and Phase II are as compact as practical with surface facilities, stockpile and disposal areas clustered together where feasible.

During the design of this plan of operations, it was also recognized that several environmental issues had to be investigated prior to submittal of this plan, including but not limited to: the proper handling of runoff from adjacent watershed and potential air quality impacts of the proposed activities, particularly on the Class I Airshed of the Grand Canyon National Park (53).

To address the runoff issue and to ensure the integrity of the area of operations, flood control measures were built into the plant layout consistent with the drainage plan that was specifically designed for this site. This study was performed independently by a consulting surface water hydrologist. As designed the surface water from outside of the mine yard cannot enter the yard from any direction. In addition, rainfall within the yard will be completely contained in the yard because of internal drainage. The lowest point in the yard will accommodate the holding pond during both phases. The holding pond will be lined with a plastic liner to ensure seepage/ leaching is prevented. Any water encountered in the mine during Phase I and II underground activities will be discharged into this pond to the extent it cannot be utilized during drilling activities. The Phase I holding pond is sized to accommodate a 10-year, 24-hour event and Phase II holding pond is sized to accommodate at least a 100-year, 24-hour event as well as any insignificant amount mine water which may be encountered during

mine operations. Not withstanding the inherent design capabilities of the holding ponds, EFNI may apply for an NPDES permit, if required, as a precaution so that it will have the authority if necessary to discharge mine water encountered during Phase II under the conditions of the permit (53).

Diversion channels will be constructed to divert surface runoff during the very first part of Phase I. A 200-acre watershed will be diverted to flow through two channels, located on the outer perimeter of the area of operations. A copy of this drainage plan is located in the Appendix.

To increase site surface runoff security, both a road and top soils stockpiles will be located near the diversion channels as located on Plates 3. By relocating the road as noted and raising the surface a few feet above existing grade, all runoff above the project area will be diverted to the constructed channels. These channels will provide sufficient flow capacity to carry runoff resulting from a 500-year event (6,3,12,14,41,42).

The southern portion (topographically high) of the mine yard will be used to stockpile ore prior to shipment. Ore piles will be located on constructed ore pads. Each ore pad will be at least 1-foot thick and shall be constructed utilizing an equal mixture of limestone and shale. It is the purpose of these ore pads to prevent leaching of mineral values contained in the ore piles during rainfall. Such leaching is prevented by the impermiable characteristics of the shale and by the chemical binding reaction which occurs when and if any dissolved uranium contacts the limestone component of the ore pad (15, 53).

All material containing an excess of 0.03% uranium which is uneconomical to ship, will be temporarily stockpiled. At present it is anticipated that approximately 10,000 to 20,000 tons of such low grade material will be produced during Phase II. In light of volatile market prices, it is expected that nearly all of this material will be shipped to the mill. In the event this material is not utilized for milling, during the reclamation phase it will be hauled from the site or used to backfill the shaft (53).

Fire security will be maintained at the surface facilities as well as on all vehicles travelling to and from the project area (53).

EFNI will maintain the access road from the project area to the Mt. Trumbull road at least to BLM specifications (53).

Ore haulage from the site will be by independent contractors using 25 ton capacity trucks which comply with Arizona Highway Department of Transportation requirements. Each load will be covered with a tarpaulin, lapping over the side about a foot and secured every few feet around the truck. Therefore, wind erosion and rough road will not cause loss of any material during transit. In the event of ore

spillage, EFNI will take immediate action to clean up any spilled material immediately, generally within two working days, providing that the action is not prevented by conditions beyond the control of EFNI. To insure no materials remain after cleanup, EFNI will conduct a radiometric survey of the area of the spill to confirm the effectiveness of the cleanup (53).

The electric powerline has been located to follow the shortest useable route which is adjacent to existing roads for minimal surface disturbance (general alignment shown on Plate 1 Appendix). The exact alignment will be finalized by BLM and EFNI after a preliminary survey line has been staked and an archaeological and T&E survey has been completed (53, 35,48).

Proposed Radiological Monitoring Program

The proposed radiological monitoring program involves collection of appropriate data before the mine is operational. Additional measurements will be taken as appropriate and in the event of an accidental release of radioactivity in the wash (19).

Each part of the monitoring program is summarized below:

1. Pre-operational measurements will be collected for 1 year and will measure: direct gamma radiation, radon gas and progeny concentrations in air, water and soil (19).

   Gamma radiation will be measured by at least 3 independent monitoring devices at a minimum of 5 locations. Dosimeters (dose, cumulative) will be measured quarterly (19).

   Radon measurements will be performed quarterly using an instrument which obtains independent measurements of the progeny "working levels" (19).

   Water samples from Kanab Creek and the Colorado River have been collected and analyzed to establish baseline conditions. This data is avialable and can be used to detect variations in radiological parameters during mining operations (19).

   Soil samples down wash from the mine site have been obtained and assayed specifically for Ra-226, and a gamma spectrometry will be performed to determine baseline concentrations in the area (19).

2. Operational Measurements. Background, cumulative and instantaneous measurements will be taken on a quarterly basis at the location depicted on Figure 10. Additional sites may be established on the haul road (19, 53, 27, 28, 28).

Radon measurements will continue to be made in and around the mine site until sufficient background data, in the opinion of BLM, has been gathered. During mining activities, in the event BLM determines the activity may be causing radon levels to be increasing significantly, new measurements will be made and compared against background levels, prior to implementation of additional mitigation measures (53, 28).

Should an accidental release occur, soil samples immediately downwash from the mine will be collected and compared to background to ensure that no residual impact has occured (53).

Periodic samples of water from the mine well (if present) will be taken and the sampling program integrated with sampling activities performed at other mining operations on the Strip. The results of this sampling will be used to confirm that activities are not adversely impacting any ground water (53, 29, 1, 2).

Measures to be Taken During a Period of Non-Operation: It is the intention of EFNI to operate this project until all economic ore reserves are exhausted. However, pursuant to Federal regulations, this plan must formulate measures to be taken in the event an "extended period of non-operations" should occur (53).

Two possible scenarios could occur in the event of a shut down. A short term shut down of a few months to a year would require only limited action as follows. A few employees would be kept on-site for repair and maintenance. It is likely that at least one person would reside on-site as a watchman. All inventory items having a potential for deterioration (explosives, oil, gas, medical supplies, etc.) would be used or removed from the area. Hardware would be secured in place. All equipment would be checked and most stored in the main shop building or in the mine workings. All economic grade ore would be shipped from site. If low grade ore is present, it will be maintained on-site until economically feasible to ship. Ventilation fans, electric lines and transformers would be left in place. Steel gates on the mine shaft would be closed and locked (53).

In the event a shut down lasts more than one year, another scenario would occur. Nearly all mobile equipment and a portion of fixed equipment would be removed from the area. Fans would be removed and the ventilation shaft capped with perforated steel plates welded into place. The main building, head frame, hoist and powerline would all be left in place, but secured and maintained as during a short term closure (53).

Measures to Reclaim at the End of Operations: At the conclusion of proposed mining activities, EFNI will disassemble and remove hoist/shop building and will remove the concrete slabs by burial or breaking them up and backfilling the shaft. All facilities, supplies and equipment will be removed. Low grade ore material will be removed from site or backfilled into the mine shaft. Shaft entrance will then be sealed to prevent entry by unauthorized persons and then entire area will be fully reclaimed. The following reclamation activities will be implemented at the end of mining activities:

1. After removal of all equipment, the shaft will be sealed in a manner approved by the appropriate regulatory agency.

2. All portions of the area of operations not previously reclaimed will be recontoured and top soiled. All remaining top soil will be spread over the area of operations.

3. All ground surface which has been disturbed will be drill seeded using an approved BLM seed mixture.

4. The entire disturbed area will be radiometrically surveyed and material found exceeding acceptable radiation standards will be removed or buried in the mine workings.

5. Diversion channels will be kept in place to divert runoff around the area of reseeding until revegetation has been adequately established. Thereafter, if requested, these channels will be recontoured and seeded.

6. Sediments accumulated in the holding pond if any, will be scalped and hauled away or disposed of in the mine-out workings.

7. The potential usefulness of the powerline to the site will be evaluated as part of the final site reclamation plan. If no other use for the line is found, it will be dismantled and removed.

8. The existing road used for site access and haulage will continue to exist as part of the regional road system under jurisdiction of the BLM.

B. Alternatives Considered

1. No Action. The no action alternative is that situation that exists as described in the existing environment. Under the no action alternative, the Plan of Operations would be denied. Impacts would be those resultant from Site No. 156, the existing plan of exploration. Rehabilitation requirements would be those stated in EA: AZ-010-84-75P.

2. Alternative 2 - Proposed Plan of Operations. This alternative would involve the approval of the Plan of Operations as submitted by EFNI.

3. Alternative 3 - Proposed Plan of Operations with Modifications. This alternative would involve approval of the Plan of Operations with various modifications. The range of modifications considered under this alternative included the following.

   - Require access to the project area as depicted on the alternative routes shown on Plate 1 (Appendix).
   - Allowance of employee access to the project area by private vehicles or aircraft rather than on company supplied busses.
   - Allowance of fencing of site AZ B:6:44 rather than implementation of the Archeological Recovery Plan as submitted by EFNI.
   - Requirement that power be generated on-site rather than through permanent power via a powerline, or the requirement that the powerline be buried.
   - Denial of the right to upgrade the proposed access road during Phase II.
   - Relocation of surface facilities within the project area.
   - Require EFNI to fully construct holding ponds at the beginning of Phase I, and require that the capacity of ponds be increased.

IV. EXISTING ENVIRONMENT

The No Action Alternative is equivalent to the existing environment. The proposed action and all the alternatives will be evaluated against the existing conditions.

A. Land Status

Plate 1 (Appendix) shows the existing land status and land boundaries in relation to this project.

The project area is located within a partially unsurveyed Township, where the only definitive section boundaries are Sections 2 and 32. The project area is located in Section 21, in an area that is open to mineral entry and mining. The Grand Canyon Game Preserve boundary is approximately one quarter of a mile from the project area. The U.S. Forest Service and Kanab Creek Wilderness boundaries are approximately 3.5 miles east of the proposed mine

yard. The Grand Canyon National Park is approximately 3.6 miles south of the project.

B. Non-Living Components

1. Airshed

The airshed in the immediate vicinity of the project area has been designated as a Class II airshed. Virtually no industrial pollutants exist. Air quality and visibility are good to excellent. The major pollutant is fugitive dust resulting from disturbed areas, mostly roads, stockponds and high livestock use areas. This project lies approximately 3.6 miles from the Grand Canyon National Park (see Plate 1 Appendix), a mandatory Class I area. This classification carries greater restrictions and requires stricter protection than does a Class II airshed (17, 31, 32, 49).

2. Climatology

The general project area is classified as a semi-arid continental climate. As such it is typified by cool winters, warm summers and light precipitation. Winter temperatures commonly drop below freezing at night, while temperatures in summer months routinely rise above 90°F. Annual precipitation in the area ranges from 8 to 20 inches (15, 16).

a. Precipitation

Twenty-three years of meteorological data have been collected and summarized from the Fredonia, Arizona weather observation station. A summary of this data shows that the average annual precipitation is approximately 10.1 inches. Spring is usually the driest season, while winter is usually the wettest. Figure 1 shows average precipitation and temperatures for the Fredonia area) (17).

The Bureau has summarized approximately 7 years worth of local rain gauge data. The results show approximately 12 to 13 inches of precipitation at the project area (Big Jackson rain gauge).(See Figure 2, (54).

b. Winds

Long term wind data are limited in the vicinity of the project. To better define the wind patterns, an independent consultant was hired to measure the wind patterns of the area. As a result, a 1-year data set was obtained from a meteorological station located near Sunshine Point and approximately 8.0 miles north of the project area. Plate 1 (Appendix) shows the location of this station (17).

FIGURE 1

CLIMATOLOGICAL SUMMARY for FREDONIA, ARIZONA

Month	Temperature Mean Daily Monthly	Mean Daily Maximum	Extremes Minimum	Totals High	Low	Precipitation Snowfall Mean	Maximum	Mean	Maximum[2]	Mean No. Days Precipitation[2] ..1"
JAN	32.7	46.0	19.4	66	-18	1.17	3.28	8.1	13.6	4
FEB	36.2	50.6	21.7	71	-15	.89	1.65	4.2	11.0	3
MAR	42.4	58.6	26.2	79	5	1.09	3.56	4.2	14.5	2
APR	50.7	68.7	32.7	86	10	.68	1.87	.7	2.0	1
MAY	58.0	77.0	39.0	94	20	.44	1.33	0	0	2
JUN	66.5	86.7	46.2	104	26	.32	.96	0	0	1
JUL	73.8	92.8	54.7	105	37	.69	1.88	0	0	2
AUG	72.1	90.1	54.1	104	33	1.27	2.68	0	0	4
SEPT	65.1	84.6	45.6	99	26	1.04	2.82	T	T	2
OCT	53.8	72.4	35.4	96	17	.88	3.08	.3	1.5	2
NOV	41.6	58.3	24.9	76	0	.62	1.39	1.2	6.0	3
DEC	34.6	48.5	20.7	70	-15	1.00	2.30	4.6	6.0	2
ANN	52.3	69.5	35.1	105	-18	10.09	3.56	22.3	14.5	28

Source: Climatography of the United States NO. 86-2 Arizona.

1. Unless otherwise specified, based upon period of record 1937 - 1960.
2. Period of record 1951 - 1960.

FIGURE 2

RAIN GAUGE DATA: BIG JACKSON

Gauge No. Average	Name	Water Year	Fall	Winter	Spring	Summer	Annual
21	Big Jackson	76 - 77	0.90	0.80	1.74	2.10	5.74
		77 - 78	1.04	5.84	4.25	1.34	12.47
		78 - 79	5.19	5.99	3.72	1.66	16.56
		79 - 80	1.15	6.08	4.25	2.87	14.35
		80 - 81	1.65	1.45	3.36	9.52	15.98
		81 - 82	3.05	3.01	2.23	6.30	14.59
		82 - 83	3.19	2.61	3.24	6.80	15.84
		83 - 84	3.14	1.23	0.42	6.93	12.72
		84 - 85	1.60	3.61	2.56	3.34	11.11
	Fall Ave.:	2.41					
	Winter Ave.:	3.38					
	Spring Ave.:	2.93					
	Summer Ave.:	4.81					
	Annual Ave.:	13.53					

Wind data at this station was collected from March 1983 to March 1984 and because of the similarities in elevation and close proximity to the station, the resultant data is considered representative of the project area. Figure 3 presents the annual graphical wind rose and Figure 4 presents the tabular wind rose which also represents wind speed data (17).

It is apparent from the data collected that the prevailing wind direction at the project area is from the south-southwest. Nearly 40 percent of all winds blew from the south-southwest sectors. Conversely, easterly component winds are least frequently occurring with east-southeast winds occurring less than 1.0 percent of the time (17).

As shown in Figure 5, windspeed averaged 3.4 m/sec. (7.6 MPH) throughout the 1-year monitoring period, with higher average wind speeds more often associated with the southern component winds. However, high winds were not as common as wind speeds in excess of 11 m/sec. (24.6 MPH) occurred only 0.32 percent of the time.

3. Air Quality

Associated with the Arizona Strip meteorological monitoring program, a Total Suspended Particulate (TSP) monitoring program was also conducted to establish the background TSP concentrations. Data for this study was also collected at the weather station. In addition this study/data was collected in accordance with EPA monitoring and quality assurance guidelines. Collated samples were operated to assess the precision of the TSP measurements. Summaries of the 1983-1984 TSP data is summarized in Figure 6 (17).

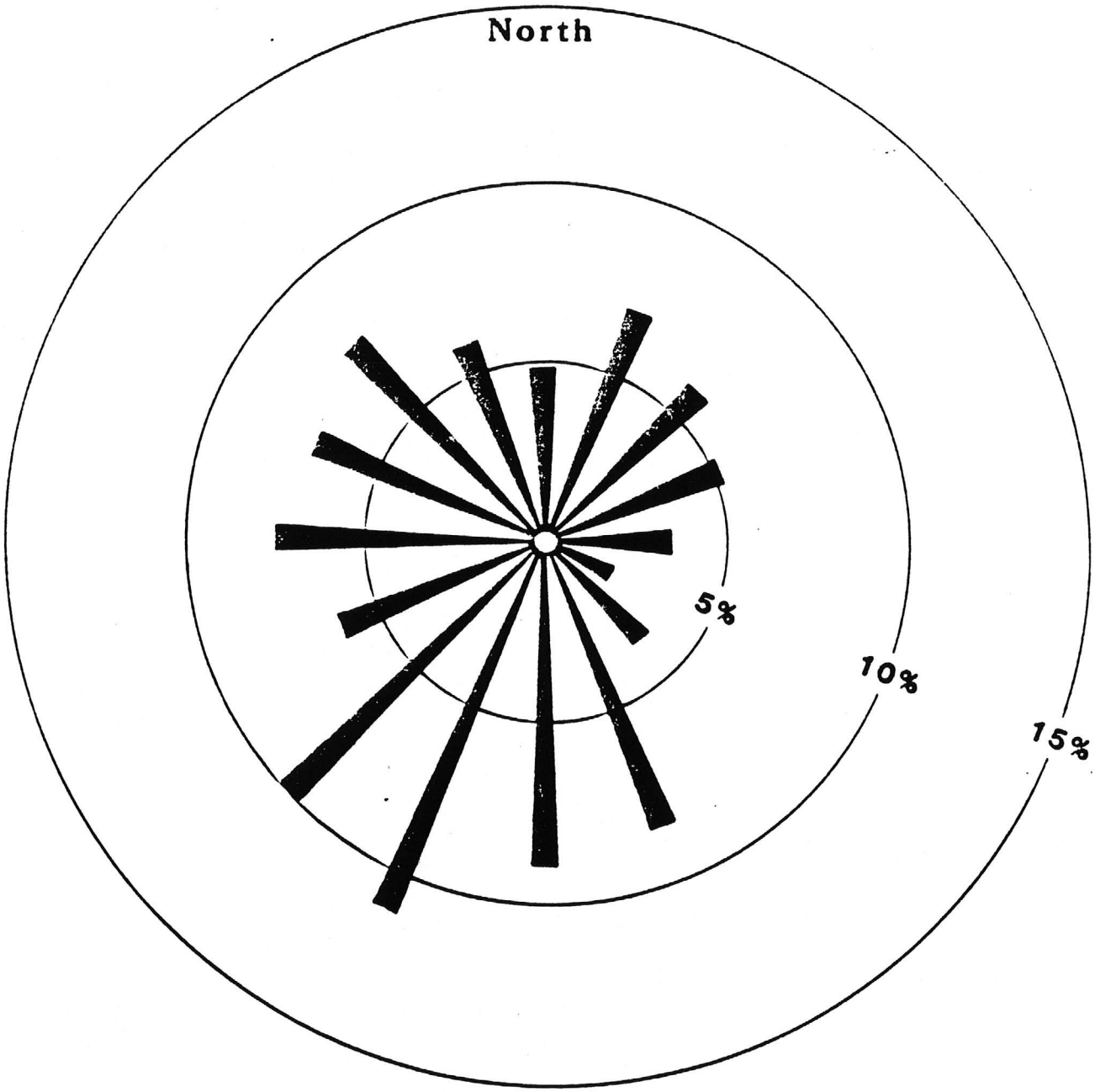
It is apparent that the annual geometric mean for TSP in this location was 13.7 mg/m^3. The highest 24-hour concentration measured was 59 mg/m^3. This data is considered representative of the project area given the close proximity of the monitoring station, similarities in climatology and absence of any major polluting sources (17).

4. Water

Surface Wate

Surface water in this area is derived exclusively from precipitation. Storm intensity can be quite severe due to intense localized summer showers. Surface waters exist in the form of impoundments constructed and designed to capture the intermittent flows from localized and sporadic showers for livestock and wildlife use. The closest such water structure

Percent Occurrence Of Winds By Direction
March 1983-March 1984
Arizona Strip Station



ENECOTECH
Denver, Colorado

PROJECT Pinenut

Wind Rose

FILE NO. _____ DATE 11/86 FIGURE NO. 3

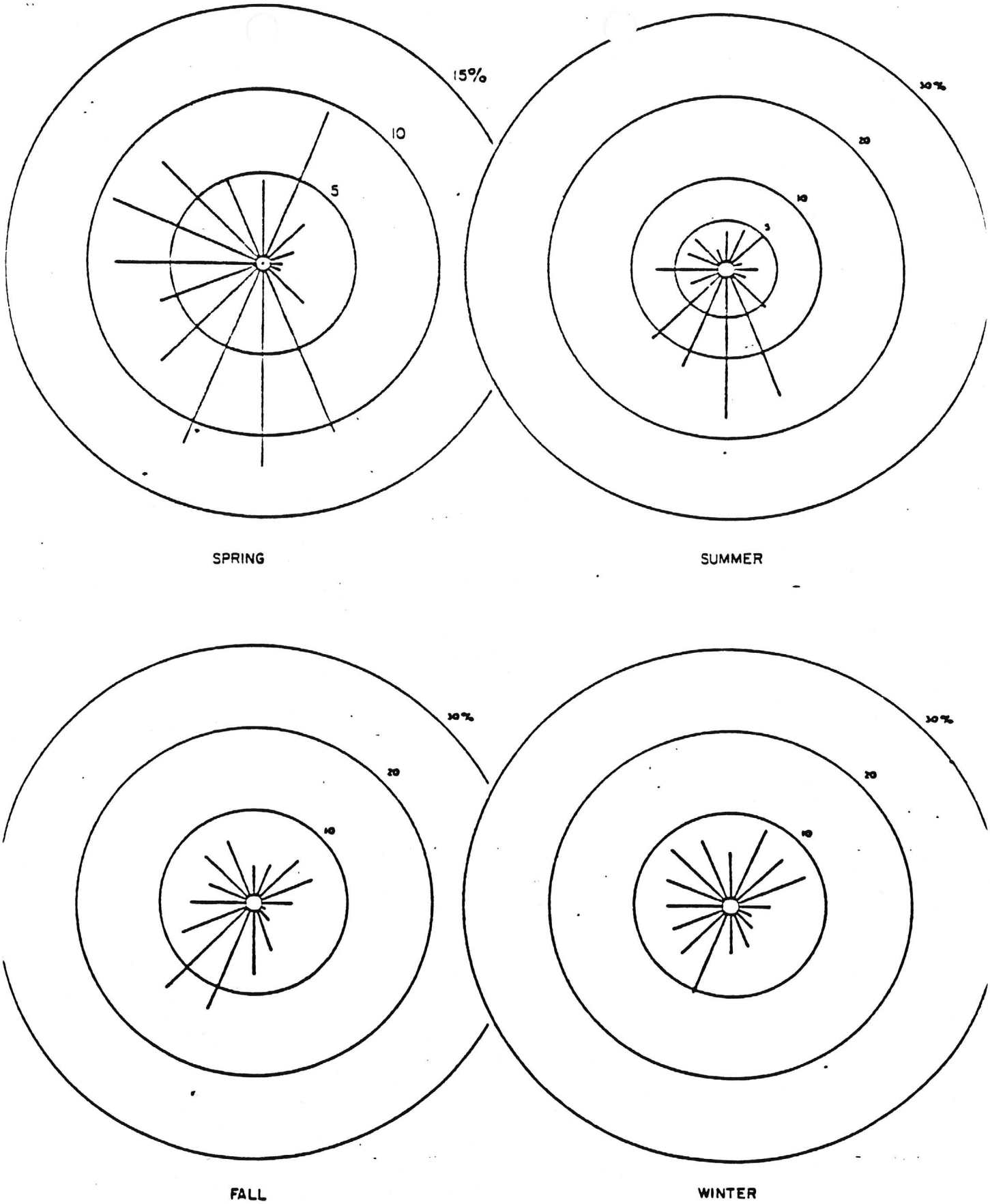


FIGURE 4

Annual Geographic Wind Rose

FIGURE 5

FREQUENCY OF WINDS BY DIRECTION AND SPEED
FOR
MARCH 1983 THROUGH MARCH 1984
ENERGY FUELS - ARIZONA STRIP - TOP SITE
TIME (MST): 0100-2400

SPEED CLASS INTERVALS (M/S)

DIRECTION	1<1.5	1.5<3	3<5	5<8	8<11	<11	ALL	MEAN SPEED
N	0.31	2.10	1.41	0.35	0.04	0.00	4.21	3.0
NNE	0.29	2.18	2.89	1.05	0.15	0.00	6.56	3.6
NE	0.39	2.89	1.61	0.47	0.09	0.01	5.46	3.0
ENE	0.19	1.53	1.46	1.10	0.19	0.04	4.51	4.0
E	0.31	1.45	0.75	0.19	0.00	0.00	2.69	2.7
ESE	0.17	0.64	0.16	0.00	0.00	0.00	0.97	2.2
SE	0.44	2.06	0.63	0.09	0.00	0.00	3.22	2.3
SSE	0.32	4.26	2.76	0.87	0.07	0.00	8.27	3.0
S	0.79	4.30	2.90	1.85	0.04	0.00	9.88	3.3
SSW	0.56	5.00	3.22	2.09	0.56	0.05	11.49	3.6
SW	0.63	3.30	2.78	2.61	0.49	0.07	9.88	4.0
WSW	0.23	2.70	1.42	1.32	0.19	0.04	5.90	3.7
W	0.49	3.41	1.76	1.10	0.21	0.04	7.01	3.4
WNW	0.45	2.28	2.20	1.30	0.09	0.03	6.35	3.6
NW	0.32	2.81	2.73	1.08	0.12	0.04	7.09	3.5
NNW	0.20	1.66	2.49	0.96	0.20	0.00	5.51	3.8
ALL	6.07	42.58	31.16	16.42	2.44	0.32	98.99	3.4

CALM (less than one meter per second) = 1.0
PERIOD MEAN WIND SPEED = 3.4 M/S

ENECOTECH, INC.
WIND4 12/03/85

FIGURE 6

TSP SUMMARY FROM THE ARIZONA PROJECT*

March 1983 - March 1984

Concentration (mg/m^3)

	Spring	Summer	Fall	Winter	Annual
Arithmetic Mean	19.3	27.3	12.0	8.1	16.6
Geometric Mean	17.4	25.5	11.2	6.3	13.7
First 24-hr Max	32	59	23	16	59
Second 24-hr Max	30	46	20	14	46

*Data collected on EPA one day in six schedule.

Consequently, this factor should be higher than what would be expected at this Project, but is used as conservative data.

is at present approximately 1,200 feet northeast of the project area and is not visible from the project area (6).

Ground Water

To date, drilling and mining in the general area of the project has resulted in limited discovery of subsurface waters. The regional dip and close proximity to deep canyon systems and Karstic-type topography produce conditions not conducive to the accumulation of ground waters in those zones that would be affected by surface drilling from atop the canyon.

If water were to be found, it would be expected to be more than 3,000 feet deep and below usual deep zone drilling. Water movement vertically or laterally through the local stratigraphy is ephemeral and limited due to lack of a consistent recharge source. Low annual rainfall, high surface runoff, evaporation, soil absorption and retention all combine to greatly limit water movement into lower horizons and/or substrates. No known local aquifers exist that substantially contribute to the deep (greater 3000') recharge of the regional groundwater.

Ground water can occur in alluvial or bedrock aquifers. Alluvial aquifers exist as narrow strips along dry or ephemeral streams and do not exist in the Pinenut area (16).

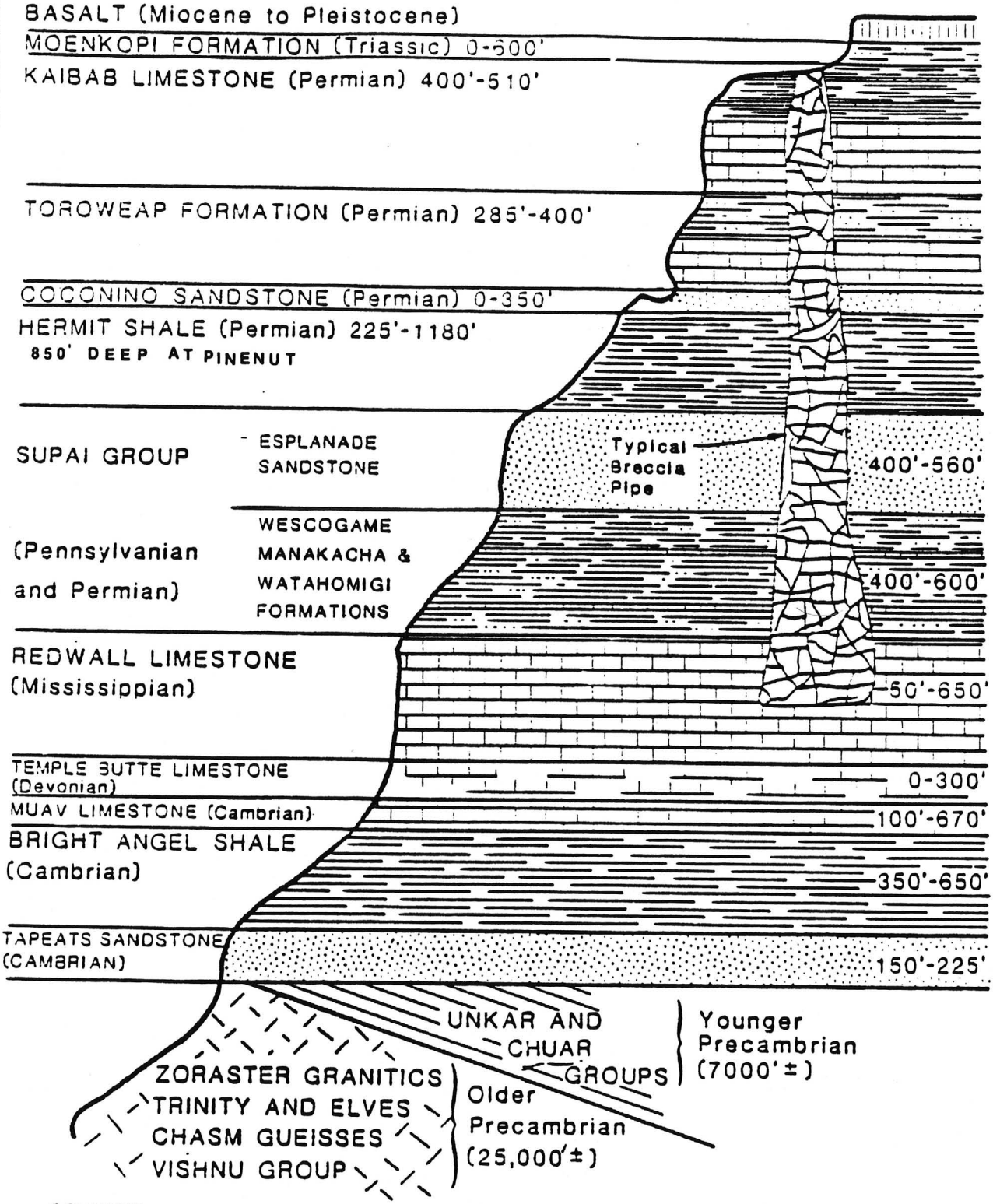
The major bedrock aquifers are chiefly those found in Triassic sandstone occurring only along the northern edge of the Strip and the regional Cambrian Mauv limestone found below 3000 feet which outcrops in the bottom of the Grand Canyon (16, 6).

The annual evapotranspiration rate on the plateau exceeds the annual precipitation but rapid infiltration due to the local soils and topography allow some of the annual precipitation water to move downward, generally following more permeable fracture zones and faults. These interconnected rock fractures influence ground water movement, probably more than the regional dip of the rock units. Little water migrates below the top of the Cambrian Bright Angle Shale as it is almost impervious to water (See Figure 7, Geology Cross Section) (16, 6).

There is a small seep located approximately 4.6 miles north of this project in the bottom or entrance of Water/Hack's Canyon confluence, which outcrops below the Hermit Shale formation.

5. Soils

Soil surveys conducted by the U.S. Soil Conservation Service characterize these soils as being a Curhollow-Winona complex,



SOURCES:

- DEPT. OF INTERIOR, 1976, DRAFT ENVIRONMENTAL STATEMENT, GRAND CANYON
- NUEXCO, REPORT 176, APRIL, 1983

Arizona Strip District
Generalized Stratigraphy

FIGURE 7

Dames & Moore

mapping unit number 10, 2-12% slope. These soils were derived from limestone parent materials in the Kaibab formation. Generally, these soils on slope areas are considered to be somewhat shallow and well drained. Typically surface layers consist of gravelly loams approximately 2 inches deep. Subsoils are also gravelly loams approximately 7 inches deep. Substratum is extremely gravelly loams about 5 inches deep over a line cemented hardpan. Permeability of these soils are moderate and available water capacity and water supplying capacity are considered low. Effective rooting depths are 10-20 inches. Runoff is medium and hazards of erosion are moderate. Productivity potentials of these soils are low. However, the area of operations constitutes an inclusion of slightly deeper and more productive sandy/loam soils. These surfical deposits on the plateau are residuum and alluvium weathered from Kaibab limestone (12, 23).

Given the subtle drainages and relief, the low slope and the gravelly surface; there is limited potential for significant soil loss.

6. Geology/Topography

The entire project area is covered by flat lying mid-Permian sedimentary rocks. The area of operations is on the Harrisburg unit of the Kaibab formation, a marine deposited limestone that contains minor zones of shale and sandstone. The Kaibab and a similar formation, the Toroweap, extend to a depth of approximately 800 feet. The resistance of these two limestone units to erosion account for the existence of the extensive regional plateau. Under the Toroweap is a nearly 100-foot massive sandstone unit known as the Coconino (53, 16).

Next is the dark red Hermit Shale which hosts known mineralization. The deposit in question is found in a breccia zone within the Hermit Shale. Drilling has suggested a total thickness of 800 feet of this formation. Below this formation is the Supai formation (53, 16).

Topographically, the project area is on the Kanab Plateau, within the Grand Canyon section of the Colorado Plateau Physiographic Province. The area is characterized by gently sloping plateaus and mesas abruptly dissected by deep canyons.

Uranium mineralization occurs in a breccia pipe structure that cuts vertically through flat-lying sedimentary rocks. Cavities formed millions of years ago by water dissolving the deeper Redwall Limestones created space into which the overlaying rock collapsed. The collapsed zone worked its way up many hundreds of feet to form a narrow cylinder. This broken rock, or pipe created a favorable environment for mineral deposition (16).

The surface topography around Pinenut is gently undulating hills ontop of the plateau. The mine yard is located in an approximate 50' low swale which hides it from view from the surrounding area. Natural slope of the area is 1-5%.

7. Radiological Assessment

For comparative purposes only, the deposit at the proposed mine site has several characteristics which are representative of the nearby Hack's Canyon Mine. Where applicable, radiological information that has been obtained from the Hack's Mine will be applied to assess the potential impact of the Pinenut Project (19).

The form of radiation that is of interest at the Pinenut Project is ionizing radiation. The specific types of ionizing radiation that need to be considered are x-rays, gamma rays and alpha/beta particles (1, 2, 19).

The cause and effect relationship between forms of ionizing radiation and the potential for negative health effects is a function of many parameters including the amount of radiation received (dose), the dose at which radiation is delivered (dose rate), the type of radiation, organs of interest, age, sex and general health (1, 2, 19).

It is noteworthy that, only in the case of ionizing radiation, the standards for average exposure are at about the same levels as that found in the natural radiation environment.

To facilitate the environmental assessment, the area around the proposed action has been radiometrically surveyed and the findings presented here. The radiological aspects have been categorized into background radiation, airborne radiation, surface and ground water radioactivity, and transportation.

Where possible, radiological data will be compared with existing regulations or the natural radiation environment. Figure 8 provides basic radiological comparisons with other environments. In addition, the regulatory guide is shown in the Appendix (19, 27, 28, 29, 30).

Background Radiation: Monitoring stations which measure background gamma radiation were established on November 22, 1985. The five sites are depicted on Figure 9. Other sites have been established at Kanab North, Pigeon and a more extensive monitoring network has been established at the Canyon site (McKlveen 1986). Since all information is being collected using identical detection methods and the entire region has similar radiation characteristics, any changes from existing levels should be detectable (19).

Initial gamma radiation measurements at the site are on the order of 75-90 mrem/yr (19).

The units of dose are rem (roentgen equivalent man). However, because this unit is so large it is often useful to divide the value by one thousand and discuss radiation dose in terms of 1/1000 rem, or millirem (mrem). The dose rate may be described in terms of mrem per hour (mrem/hr), or mrem per year (mrem/yr), etc. Possible sources of radiation dose include cosmic ray interactions, radioactive materials in the natural radiation environment, medical ionizing radiation treatments, radioactivity in numerous consumer products, and radiation from the nuclear power fuel cycle. Examples of possible doses are listed in Figure 8. Unless specifically stated, doses are expressed in terms of the amount of radiation delivered to the whole body (19).

Note, as with radiation dose, "Working Level" is such a large value that it is often times reduced by a factor of 1,000 and expressed in terms of milliWorking Level (mWL) (19).

Radon concentration, daughter exposure in WL, and doses to the lung are correlated in Figure 10.

8. Accoustics

Due to the complex nature of accoustical studies conducted to evaluate potential impacts, an accoustical guide in the Appendix has been added describing nomenclature, instramentation and methodologies used to gather and analyze data (16).

Background ambient sound levels within the accoustical environment of the Arizona Strip District vary depending on the proximity of receptors to human activities; particularly highways or local roads, aircraft flight paths and local meteorological conditions. The most common noises resulting from man's activities in the Arizona Strip include off road vehicles such as jeeps, motorcycles and trucks (including lumber, oil and ore trucks) on U.S. Alternate 89, State routes 67 and 389 and other unpaved roads such as Ryan or Mt. Trumbull roads (16).

The Day-Night Average Sound Levels (Ldn), for open unpopulated areas away from highways is expected to vary from 30-45 dB (decibels). (U.S. Bureau of Reclamation, 1976; National Park Service, 1976) (16).

Typical values of yearly Day-Night Average Sound Levels for low density residential areas where there are no defined local noise sources are presented below for comparison (National Research Council, 1977).

FIGURE 8

Typical Radiation Doses

Source	Millirem (mrem)	
Cancer treatment (to specific organ)	5,000,000	per cancer
Lethal Dose	450,000	instantaneous
First physiological effects	25,000	instantaneous
Maximum allowable average occupational dose (medical and natural background excluded)	5,000	per year
Maximum allowable dose to an individual member of general public (medical and natural background excluded)	500	per year
Cosmic ray doses of flight crew (McK 75)	380	per year
Average dose received by all workers in uranium mines, mills and power plants	365	per year
Average allowable dose to general public (medical and natural background excluded)	170	per year
Vicinity of Canyon Mine Project, Az. (McK 85)	70 - 125	per year
Arizona Strip near Pinenut Project (McK 85)	75 - 90	per year
Average dose from natural background	100	per year
Phoenix, Arizona (McK 85)	100	per year
Arizona Strip near Hack Canyon Mine and Kanab North Project (McK 85)	70	per year
Window Rock, Cove and Red Valley, Az. (McK 80)	70	per year
Average dose from diagnostic x-rays (also studied by McK 80)	70	per year
Control Room Operator at Nuclear Power Plant	50	per year
X-ray Technician	50	per year
Cigarettes dose to lung (Po-210 from U-238 decay chain present)	30	per year
Water and food; U.S. average	25	per year
Work in granite buildings like U.S. Capitol	20	per year

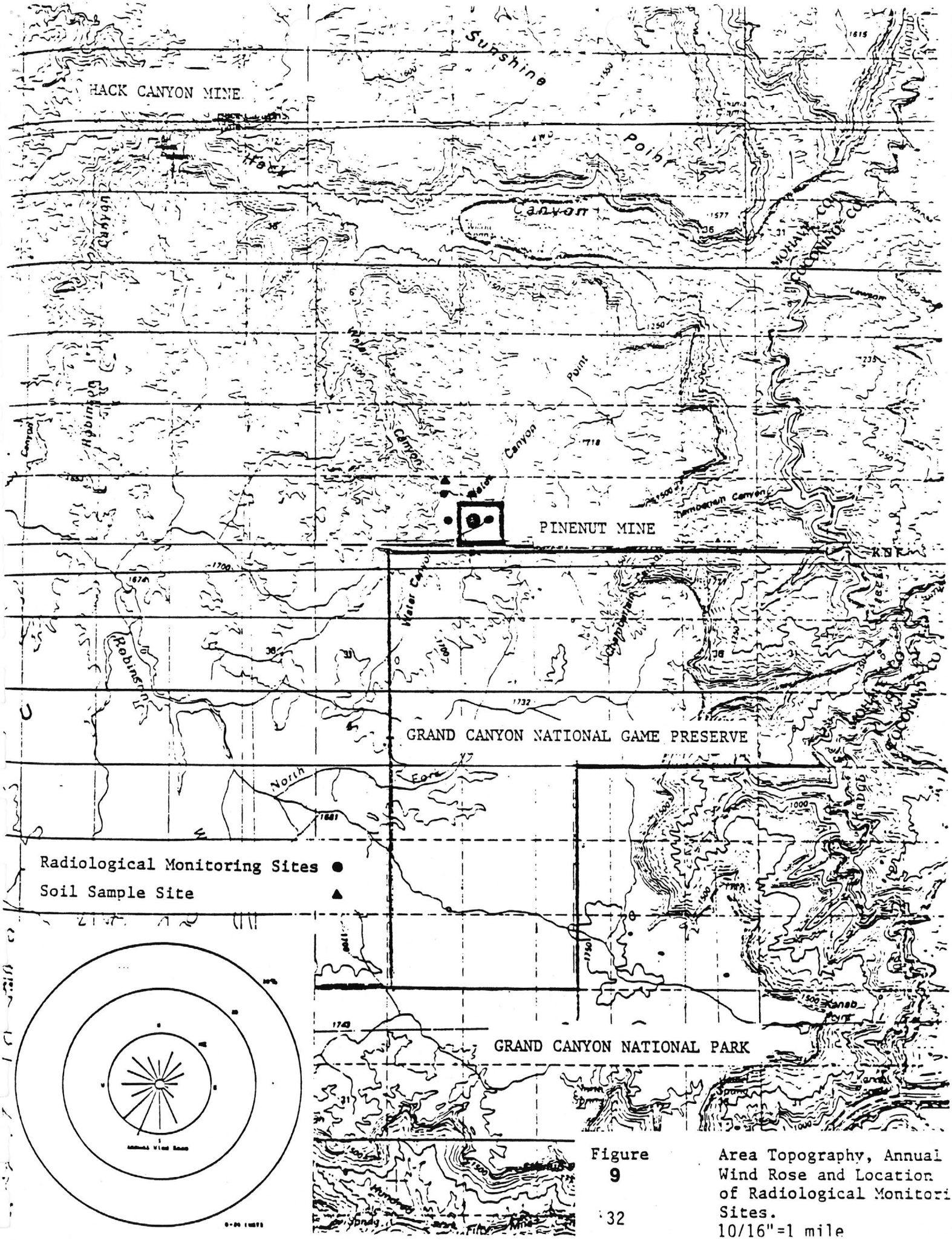


Figure 9

Area Topography, Annual Wind Rose and Location of Radiological Monitori Sites.
10/16"=1 mile

FIGURE 10

Radon Doses to Lung Compared to Radon Gas Concentrations and Radon Progeny Exposure

Source of Radon/progeny	Concentration or working level	lung dose (mrem/year)
Occupational limit, underground mining	4 WLM/yr	20,000
U.S. uranium miners, current average (NCRP 84)	4 WLM/yr or less	10,000
Hack Canyon Miners (average) (HU& 85)	2.2 WLM/yr	11,000
Average exposure to public from natural environment (NCRP 84)	0.2 WLM/yr(3 mWL)	375
Average radon levels atop high-grade uranium ore pile (McK 85)	10 pCi/L	93,750
Average radon levels atop mill tailings pile (MO 79)	10 pCi/L	6,250
Energy efficient homes (higher or lower depending on amount of ventilation, etc.) Concrete buildings in Arizona (McK 85, NCRP 75)	5 pCi/L	3,125
Conference Room, Canyon Squire Inn, night of public meeting on Canyon Mine Project (McK 85)	1.7 pCi/L	750
New Mexico, average outside air (MO 79)	0.5 pCi/L	312
Western U.S. Average outside air (USNRC 79)	0.2 pCi/L	125
Owl Tank and Mine Site (McK 85)	0.2 pCi/L or less	125
Historical Cabin, Bright Angel Lodge, South Rim (McK 85)	0.2 pCi/L	125

Day-Night Average Sound Levels for Residential Areas

Description	Population Density (mi^2)	dB (Ldn)
Rural (undeveloped)	20	35
Rural (partial development)	60	40
Quiet Suburban	200	45
Normal Suburban	600	50

Proximity to roads and highways substantially change the sound quality by increasing the Day and Night Average Sound Levels from those expressed above (16).

Specifically to document the noise that would be anticipated from a project such as Pinenut, ambient sound levels were measured at three locations along the roads used by ore haul trucks originating at the Hack's mine (16).

For proper assessment of noise impact due to future mining activities, sound emissions from the operating Hack's No. 2 mine and from a loaded ore truck were measured (16).

2. Mine Sound Levels

Two sources of steady sound emissions were noted at Hack's. They are air compressors and the mine exhaust blower located on the south rim of Hack Canyon (16).

Most activities at Hack mine produce time-varying sound. Examples are: haul truck loading, maintenance activities, pick up truck activities, ore hauling and dumping at the Hack's No. 2 portal area.

Ambient sound levels were measured for at lease 20 minutes (except for truck bypass) at a number of locations at and near the mine and along haul truck route. Descriptions of sound measurement locations are provided below:

Location 1. North rim of the Hack canyon at an old copper mine noise. This location is an elevation 4300 (approximately), some 700 feet away from the maintenance area. The microphone was placed so that a line-of-site to the maintenance area was maintained.

Location 2. One hundred feet to the northwest of the maintenance area. This location receives sound from the air compressor building and the maintenance activities such as welding and grinding.

The administrative trailer is nearby where company pick-up trucks are parked.

Location 3. Five hundred feet to the northwest of the maintenance area. This location is off the mine road.

Location 4. Three hundred feet to the north of the Hack No. 2 mine portal.

Location 5. Along Mount Trumbull Road, approximately 200 feet from the center of the road. The area is quite flat with no high foliage between the road and the measurement location.

Location 6. On the route to the north rim of Hack Canyon. The location is approximately 1000 feet from a corral and water pump. The pump is driven by a windmill.

Two additional locations were selected for the octave band sound pressure level measurements of the mine's two steady sound emissions.

Location 7. Fifty feet from the air compressor room of the maintenance building.

Location 8. Fifty feet (and 400 feet) from the Hack Mine vent located on the south rim of Hack Canyon.

The following Table contains the location number, the Accoustical numbers containing the data resulting from the measurements, and the important statistical sound levels, L_{10}, L_{50}, L_{90}, and L_{eg} where applicable. Other relevant information is in the Accoustical Appendix.

MINE SOURCE SOUND DATA

Location	Figure	L_{10}	L_{50}	L_{90}	L_{eg}
1	1	44	41	40	42
2	2	61	57	54	58
3	2	48	42	41	44.5
4	3	44	40	40	49
5	7	50	42	40	49
6	4	42	40	40	41
7	5	--	--	--	69
8	6	--	--	--	70 (50 ft) 48 (400 ft)

Haul Route Sound Levels

To document community sound levels along the ore haul truck route, ambient sound levels were measured at three locations near the route during morning, afternoon, evening, and nighttime periods (16).

The ore haul trucks leave the Hack Mine, travel along Mount Trumbull Road to State Route 389 where they turn right and continue to Fredonia, where they turn left onto U.S. route 89 and travel north to Kanab and beyond. The three selected locations are along this route. One selected location is alongside route 389 in an unpopulated area. The second location is in Fredonia after the left turn is made. The third location is between Fredonia and Kanab. The following are descriptions of these measurement locations (16).

Location 9. One hundred feet from Route 389. This location is at the eastern portion of the Kaibab Indian Reservation. The posted speed limit is 55 miles per hour.

Location 10. One hundred feet from U.S. Route 89. This location in Fredonia is at the intersection of South Main Street and West Jensen Street and West Jensen Street in the church parking lot. The posted speed limit is 25 miles per hour.

Location 11. One hundred feet from U.S. Route 89. This location is between Fredonia and Kanab on Energy Fuels Nuclear, Inc.'s property across from the Buckskin tavern. The posted speed limit is 55 miles per hour.

A summary of the measured statistical sound levels and vehicle counts are provided below:

SUMMARY OF HAUL ROUTE SOUND LEVELS

Location	Figure	Morning L_{eg}	Morning C	Morning T	Afternoon L_{eg}	Afternoon C	Afternoon T
9	8A	52	22	3	53	35	0
10	8B	55	60	4	56	85	3
11	8C	61	60	2	60	67	3

Location	Figure	Evening L_{eg}	Evening C	Evening T	Nighttime L_{eg}	Nighttime C	Nighttime T	L_d	L_n	L_{dn}
9	8A	52	21	0	47	16	0	52	47	55
10	8B	52	67	0	49	20	1	55	49	57
11	8C	57	41	1	56	12	2	60	56	63

Note: C = Number of cars and light trucks.
T = Number of heavy trucks.
All sound levels are A-weighted in dB.

Discussion of Results

This section consists of two parts: a discussion of the mining activity and or hauling noise sources, and a discussion of the present accoustical environment along the Hack Mine ore haul route. The mine sound emissions were measured at a number of locations close to and some distance from individual mine noise sources. Two sources of steady sound, the mine's air compressors and the mine vent blower, were investigated by obtaining their octave band sound pressure level spectra. Since other mine sources produced time-varying sound, measurements were made for at lease 20 minutes and the cumulative distributions (exceedance levels) of the A-weighted sound were obtained. By its nature, highway sound is time-varying. Thus, along the ore haul route, 20 minute measurements were obtained during morning, afternoon, evening, and nightime periods at three locations representing an unpopulated area, light density populated area (Fredonia) and a commercial/industrial area between Fredonia and Kanab (16).

Mine Sources of Sound

The sound emissions from the Hack Mine were from:

- Air compressors.
- Exhaust vent blower (Raise).
- Stockpiling of ore.
- Ore truck loading.
- Maintenance/administrative buildings.

The transmission of sound from these sources is affected by topography to a great extent. Since the mine is located in a canyon with twists and turns, sound emitted in one portion of the canyon is greatly reduced in another portion of the canyon separated by one of these turns. This is clearly demonstrated by a comparison of the data in figures 2 and 3 of the Accoustical Guide in the Appendix (16).

The activity at the maintenance/administrative area (which included air compressor sounds) produced sound which was measured at 100 feet and 500 feet. This sound was not audible 3200 feet away near the Hack Mine No. 2 portal. Without the canyon acting as a barrier, high sound levels, for example the L_1, sound level of 65dB measured 100 feet from the maintenance/administrative area (see Appendix, Accoustical Guide), would have been received at the area near the portal at about 36 dB (16).

A measurement was made about 700 feet above the mine on the north rim. Mine sounds from truck loading, the maintenance/administrative area (including air compressors, and the mine vent blower on the south rim) were barely audible. The data provided in Figure 1 of of the Accoustical

Guide is very similar to data obtained at a greater distance i.e. 1000 feet from a rancher's corral and pump (see Appendix Accoustic Guide, Figure 3).

At 300 feet from the Hack Mine No. 2 portal while the ore loader was in the mine, ambient sounds were representative of an unpopulated area (Appendix Accoustical Guide, Figure 3). Note that the L_{10} levels measured on the north rim, the rancher's corral and pump, and near the Hack Mine No. 2 portal were:

	L_{10}dB
North Rim (Accoustical Guide Appendix, Figure 1)	44
Rancher's Corral (Appendix, Figure 4)	42
Hack Mine No. 2 Portal (Appendix, Figure 3)	44

Environmental sound was below the levels shown above 90 percent of the time, indicating that sounds were produced by environmental factors most of the time with mine sounds affecting the environment for only short periods (16).

Measurements were made 300 feet from the Hack Mine No. 2 portal for 20 minutes. During most of this period, sound levels were low and produced by environmental factors, particularly wind and birds. When the loader left the portal to stockpile ore, ambient sound levels increased and reached a level of 65 dB, which was exceeded 1 percent of the time. The maximum sound level observed during this measurement was 74 dB, which only lasted for an instant (16).

The air compressor and mine vent blower octave band sound pressure level spectra (Appendix, Accoustical Guide, Figures 5 and 6) are provided for future use in assessing impacts of future mine development. The measurements made at 500 feet are indicative of compressors and blower. The blade passing frequency contributions are evident at 125 Hz for the air compressors and 250 Hz for the vent blower (16).

The statistical distribution of A-weighted sound levels at a distance of 300 feet from the stockpile loader is shown in figure 3 of the Accoustical Guide (Appendix). Operating sound levels at 300 feet ranged from 50 dB to 65 dB. The empty loader occasionally emitted 76 dB because of the banging of one of its components (16).

Truck loading sounds were not measured directly but a truck was being loaded when maintenance/administrative area measurements were being made. Since this ore loading is done by a Caterpillar 992-C Front-end Loader into a 20-ton truck, A-weighted sound levels of 61dB at 1000 feet can be expected (16).

The results of the measurement program conducted along the haul route are shown in Figures A, B, and C of the Accoustical Guide. The following Table contains a summary of the average sound levels for each measurement period, together with the number of cars and trucks which passed along the route. The Daytime, Nighttime, and Day-Night Average Sound levels for each location area also provided. During each measurement period, sources of sound were observed and noted. This inventory of environmental sound sources is summarized below:

Location 9. Along Route 389

Morning: Traffic (3 trucks, 22 cars), breeze rustling foliage, car horn, birds.

Afternoon: Traffic (35 cars), breeze rustling foliage, birds.

Evening: Traffic (21 cars), birds, car horn.

Nighttime: Traffic (1 truck, 20 cars).

Location 10. Church parking lot South Main Street and West Jensen Street.

Morning: Traffic (4 trucks, 60 cars), breeze rustling trees and foliage, birds, horse, dogs.

Afternoon: Traffic (3 trucks, 85 cars), breeze rustling trees and foliage, birds.

Evening: Traffic (67 cars), children in school playground, birds, dogs, aircraft overflight.

Nighttime: Traffic (1 truck, 20 cars), dogs, cat, people.

Location 11. Along route 89, across from the Buckskin tavern

Morning: Traffic (2 trucks, 60 cars), breeze rustling foliage.

Afternoon: Traffic (3 trucks, 67 cars), dog, cars starting at tavern.

Evening: Traffic (1 truck w/o trailer, 41 cars), birds, children at nearby home, cars starting at tavern.

Nighttime: Traffic (2 trucks, 12 cars), music from tavern, cars starting at tavern, breeze rustling foliage.

It should be noted that none of the trucks noted above were from the mine. Many of the trucks were oil carriers from a nearby refinery (16).

The average (equivalent) sound levels for each measurement period were used to compute the Day-Night Average Sound Level, L_{dn}, for each location. The Day-Night Average Sound level is a community noise level description suggested by the Federal Environmental Protection Agency (EPA) as a measure of community sound quality (EPA, 1974). Other federal, state, and local agencies are using this description for regulatory purposes. Note that nighttime sounds are penalized by 10dB when evaluating L_{dn} (16).

Tables 1 and 2 Accoustical Guide (Appendix) contain criteria suggested by federal agencies (Federal Interagency, 1981) on the effect of ambient sound on people. While there are no people being exposed to traffic and environmental sound at Location 9 along route 389, there are some residences along the highway closer to Fredonia. The noise exposure is "moderate" and by the Federal Housing and Urban Development (HUD) standards "acceptable." This is true for the areas represented by the other measurement locations, Locations 10 and 11. The Day-Night Sound Level at Location 11 was higher than the other two because of the activity at the Buckskin tavern during the nighttime period. Note that measurements were made Saturday night when the tavern was busiest and that nighttime sound is penalized by the addition of 10 dB (16).

C. Living Components

1. Animals

a. Big Game

Three big game species are known to exist in the immediate vicinity of the project area; mule deer, desert bighorn sheep and pronghorn antelope (7, 21, 22, 24, 39, 40).

Mule deer densities are estimated to be quite low in this area at .5 to less than 1.0 deer per section (source: Kanab Creek Habitat Management Plan). Herd numbers may increase slightly in the winter months due to the migratory nature of these animals. Most of the limited winter use is confined to the lower canyons, and rims/ benches and small drainages on southern exposures. At least two studies/surveys were contracted to determine baseline conditions. One of these studies involved a 45 square mile aerial survey with contracted biologists and Arizona Game and Fish personnel and the other study combined intensive ground surveys (transects) (39, 40).

These investigation included, both aerial and ground reconnaissance (transects). Aerial reconnaissance by helicopter for an intensive survey included big game to document the presence of big game over a larger area (45 square miles) around the project. The ground reconnaissance entailed a more intensive search for wildlife signs in the immediate vicinity of the mine site. The objective of this study was to establish baseline data on wildlife and to assess potential impacts (39, 40).

The results of the above surveys supports the data in the Paria Kanab Creek HMP and the professional projections of the Arizona Game and Fish, and BLM biologists. The Game and Fish Department will continue monitoring these areas (24).

Several antelope transplants have occurred in the Clayhole area on the Vermillion Resource Area. However, the project area is located approximately 17 miles from the farthest pioneered habitat that has been selected by these animals. The general terrain and habitat is not preferred by antelope and it is not anticipated that they will ever inhabit this area.

Twenty four bighorn sheep were transplanted at Willow Spring in Hack's Canyon during the summer of 1985 in an effort to re-establish sheep in their historical habitat at the Kanab Creek Drainage. Prior to this time only limited and sporadic occurrences were known in the area, primarily in Chamberlain Canyon and near Dripping Springs on Park Service lands. Arizona Game & Fish and BLM plan to eventually manage about 135 sheep in the area (24).

The sheep have shown a substantial amount of movement. Some have crossed the canyon to Forest service lands and then returned. Some have joined the remnant herd at Dripping Springs. Only one is thought to have died because of the mortality signal received from the radio-collar. Since the body was not found, it could be a faulty collar.

At this point in time, lambing grounds have not been selected. Lambing grounds most likely selected will be those areas in close proximity to a water source, near intermediate benches with good forage and escape cover. Lambing grounds selected will most likely be used throughout the years.

b. Birds of Prey

The canyon proper offers excellent potential nesting habitat for several species of raptors including; golden eagles, red-tail hawks, marsh hawks, prairie falcons, small kestrals and great horned owls. These species are considered relatively low to common (20, 24).

Joint aerial surveys by BLM, FS, and AGFD are conducted to determine presence and abundance of particular species. Of special interest in the Kanab Creek Drainage is the presence of golden eagles (threatened) and the peregrine falcon (endangered) and the bald eagle (endangered). As a result of these surveys, the most likely nesting areas have been determined (24).

To date, there have been two separate informal Section 7 consultations with the U.S. Fish and Wildlife Service regarding peregrine falcon and eagles. The consultation established procedures to protect the birds from mineral exploration activities on the rims of Kanab Creek Canyon (44).

Sightings of peregrine falcon in Kanab Canyon have been documented most recently since 1984. It is suggested that nesting is occurring in the canyon with the dominant prey base located in the canyon bottom riparian areas. Locations of known or suspected use areas are not within close proximity to this action. Other sightings of peregrine are known within Park Service Lands (lower Kanab Creek), the Cedar Knoll area and south of Colorado City.

The presence of bald eagle in the Arizona Strip is limited to the winter months and then only as a rare visitor. The presence of bald eagle in the Arizona Strip in the summer months has not been documented.

The area surrounding Pinenut is not suitable habitat for raptors (Ellis 1979) such as peregrine or eagle as they usually require shear cliff faces or structures. However, they may pass through the area as they fly canyon to canyon. As a result of the biological assessment prepared by the BLM and previous consultation with the USFWS, it has been determined that the proposed action is not likely to affect either peregrines or eagles. The area around the project area is not a designated habitat nor is it considered suitable habitat (44,55).

c. Non-Game/Small Game

This immediate habitat, given its variability (sage, Pinyon-Juniper, grasses, and low desert shrub types) is home to many species of non-game. An indepth species list of animals is found in the Appendix, and cites relative abundance and habitat preference of each species, (Source: Arizona Strip Species Checklist). These lists include birds, mammals and reptiles.

d. Carnivores

Lion are present, but very uncommon. No sightings of Lion have been reported in immediate vicinity. Coyote is probably abundant or at least common and badger and fox are known to exist in the resource area, but most likely are very rare. However, the site specifiec surveys conducted failed to disclose any actual signs that the species were present.

2. Vegetation

Vegetation characteristics as typed by the June Tank Allotment Management Plan considers this area a sage community (Type 2-208, Source: Strip Vegetation Inventory) interspersed with Pinyon and Juniper and lesser amounts of low desert shrubs. Forage grass species include, blue gramma, galletta and squirrel tail. The approximate useable forage is 60-75 lbs./acre equaling 13 acres/AUM (animal unit month). Sage brush makes up approximately 60% of the area around the mine yard (22).

The Pinyon-Juniper component occupies ridge tops and other shallow soiled areas. Interspersed in heavy Pinyon-Juniper are cool season forage grasses such as squirrel tail, needle and thread grass and Indian rice grass. Useable forage is approximately 50 lbs./acre or 17 acres/AUM (22).

Range condition varies from good to poor with most in the fair condition (22).

Several surveys for Threatened and Endangered plant species were conducted on site and in the immediate vicinity. None were found (43).

D. Human Values

1. Archeological Resources

Prior to the approval of the original plan of operations, a Class III Cultural Resource Inventory was conducted on the portion of the claim south of the existing access road.

Isolated artifacts were noted at the time of the survey. A subsequent survey of a larger acreage, including lands north of the access road, was conducted by Abajo Archaeology. This survey resulted in the location of two archaeological sites: (1) AZ B:6:44 (BLM) is an Anasazi-era habitation site with at least four architectural features and a midden. The site is located immediately adjacent to the project area. (2) AZ B:6:45 (BLM) consists of a prehistoric chart procurement and processing area of unknown cultural and temporal affiliation. It is located on the boundary of the project area (46).

These sites have been evaluated using the criteria set forth in 36 CFR 800. It is the Bureau's opinion that AZ B:6:44 (BLM) has the potential to contribute data important to the prehistory of northwestern Arizona, and therefore is probably eligible for inclusion in the National Register of Historic Places (NRHP). It is felt, however, that the research potential of AZ B:6:45 (BLM) has been exhausted by recordation and is not eligible for the National Register. Final determination of NRHP eligibility was determined and site AZ B:6:45 was found not eligible. Site AZ B:6:44 has been found to be eligible (46,35).

The State Historical Preservation Officer has concurred with these findings and also concurs with the Data Recovery Plan presently being implemented (47).

In addition to the Data Recovery Plan, Abajo Archeology was again contracted to prepare a preliminary assessment of the potential resources that are likely to occur in the vicinity of the proposed powerline corridor. The assessment shows low site potential with relatively easy mitigation requirements if encountered (47,48).

2. Socio-Economics

The 1985 statistics for employment/unemployment in this area are as yet unpublished. However, it was assumed that the previous summaries (1970-1980) are still reasonably accurate.

Social and Economic Conditions

Four counties would be affected by uranium exploration and development at the Pinenut Site: Mohave and Coconino Counties, Arizona, Kane and San Juan County, Utah.

a. Population

The Bureau of Census subcounty population data are from units known as census county divisions (CCDs). The primary population areas consist off three CCDs, for which population data are summarized below in Figure 11.

FIGURE 11

Census County Division Population Change: 1970-1980

CCD	Population 1970	1980	Numerical Change	Percent Change
Mohave North (Co.)	950	1,786	836	88.0
Kaibab (Coconino Co.)	967	1,417	950	46.5
Kanab (Kane Co.)	1,621	3,116	2,781	92.2
Total:	3,538	6,319	4,067	78.6

Source: 1970 Census; 1980 Census of Population and Housing Arizona and Utah

It is reasonable to assume that at least the CCDs containing Kanab, Utah and Fredonia, Arizona have experienced a moderate increase in population, in the period from 1981-1984.

As of 1980, the three CCDs had two incorporated towns, Kanab, Utah and Fredonia, Arizona. Kanab had a 1980 population of 2,148 and Fredonia had a 1980 population of 1,040. The total population in these two towns represent 50.4 percent of the 1980 populations for the three CCD north of the Grand Canyon National Park. The eastern portion of the Mohave North CCD contains most of the Kaibab Indian Reservation population as well as the small communities of Moccasin and Colorado City. These three population units represent an estimated 25 percent of the total population of the three CCDs north Grand Canyon National Park.

FIGURE 12

Selected Employment Data by County: 1980

Employment Category	Mohave*	Coconino**	Kane***
Manufacturing	1,925	2,150	65
Construction	225	50	15
Transportation/Public Utilities	875	1,025	15
Wholesale/Retail Trade	4,575	7,425	275
Finance/Insurance/Real Estate	675	750	40
Services	2,750	7,675	145
Government	2,625	8,925	275
Agricultural	4,075	1,100	435
Other	-	-	-
Total	18,625	31,275	1,370

*Arizona Statistical Review, Valley National Bank, Phoenix, Arizona 1982.
**Utah, County Economic Facts, 1980, Utah Industrial Development Information System, Salt Lake City, Utah.

As of July 1984, the following unemployment rates existed for the three counties:

*Mohave *(AZ) . . . . . 7.3% unemployment
**Coconino (AZ) . . . . . 9.0% unemployment
***Kane (UT). . . . . 10.0% unemployment

*Source: Mohave/Coconino County Job Services (Telephone Conservation)
***Source: Kane County Job Services (Telephone Conservation)

(Both sources were named from quarterly unemployment bulletins.)

b. Employment

Figure 12 shows employment data for Mohave, Coconino and Kane Counties.

In addition to the above data, it is known that operations at the Hack's Canyon complex (since 1980) has generated at least $2,456,000 of severance, and property taxes for the state of Arizona. This figure will be actually higher when all of the mines (Kanab North, Pigeon and Pinenut) are brought into production. EFNI's presence in the communities of Kanab and Fredonia provides significant employment and benefits accrued therein.

3. Public Attitudes

Attitudes of the public regarding mineral exploration can be classified as falling into one of three categories: uninterested/uninformed, supportive, and opposed.

a. The Uninterested/Uninformed Category

According to the 1980 Census data, 134,664 people live in the three county region. Figure 11 shows 6,319 residents in the three CCDs closest to the Pinenut Site, representing only 4.7 percent of the total population (three counties). Most residents live in larger cities of Coconino and Mohave Counties, such as Flagstaff, Kingman, Lake Havasu City, Bullhead City, Riviera and Page. Because of uneven population distribution, one can assume that a large portion of its residents are not aware of, informed or interested in uranium exploration at Pinenut.

b. The Supportive Category

Support for the proposed action exists on two levels. Generally, most of the three county residents are traditionally supportive of mining. Many feel that mining has been an important part of the economy and mining benefits the economy. Such supporters are sympathetic to the concerns of mining companies and are concerned about Federal and State Legislation/Regulation, which they view as curtailing/hampering mineral development and production.

On a more specific and localized level, past and present experience demonstrates, residents of the CCDs strongly support the proposed action. They perceive the proposed action as potential employment and economic benefit. To many, this action represents the kind of development needed to broaden the economic base of the area beyond ranching, tourism and retirement.

c. The Opposition Category

Two specific groups oppose the proposed action. The main opposition comes from local groups and individuals associated with specific environmental interests and issues. The second group of opponents consists of local residents who are wary and anxious of/about uranium mining. Some of these individuals aware of specific mining activities in the area (i.e., Cameron, Grand Canyon, Pigeon, etc.), oppose more mining. Others, unfamiliar with the specifics of the proposed action, but apprehensive over the potential health hazards of uranium mining and processing (in general the nuclear fuel cycle) question the need for additional uranium mining.

4. Wilderness Resources

This area was dropped from further consideration as a wilderness study area as of August 28, 1984. Consequently, it was released from Section 603(c) (FLPMA) and of the Non-Impairment Criteria of the Interim Management Policy of Lands Under Wilderness Review.

The closest designated wilderness area is the Kanab Creek Wilderness area which abuts the Kanab Creek rims 2.4 miles east and 3.6 miles north (see Plate 1, Appendix).

There is a possibility of increased recreation in lower Kanab Creek drainage due to the designation of Kanab Creek Wilderness, but to date there is no action to suggest such an increase in use is occurring.

5. Visual Resources

The immediate site is located in a swale surrounded on the east and west sides by shallow drainages. Relief is generally low with elevation difference of 250 feet within a half mile of the mine yard. The immediate site is not spectacular or unique as are the rim areas and deep walled dissected canyons of Hack's and Kanab Creek.

This area is considered part of the Kanab Creek Scenic area, but has a Class IV VRM designation. It is considered as background to unique features and has low sensitivity (4, 8, 21, 20).

The proposed action is not visible from the wilderness area, nor any portion of the Grand Canyon National Park. Visibility of the proposed action is limited to the immediate area surrounding the project.

6. Other Values

The main value of this region as stated in the MFP is in

supporting ranching, wildlife and mineral interests. Sightseeing, camping and hunting activities are thought to be low based on Park Service, Forest Service, Arizona Game and Fish and BLM records (20).

E. Cummulative Impacts

1. Existing Situation

Uranium exploration and development has been ongoing on the Arizona Strip since approximately 1980. Eight companies have been involved in exploration throughout the past five years, but never more than four at the same time. These companies are as follows:

Company	Comment
Noranda (N)	No longer active in Arizona Strip
Western Nuclear (WN)	No longer solvent
U.S. Energy (U.S.E.)	No longer active in Arizona Strip.
Uranerz (U)	Very limited activity at existing mine sites in past 5 years.
Intermountain Exploration (IE)	Only active at Sun Valley Mines.
Rocky Mountain Energy (RME)	Slightly active
Pathfinders Mines Corp (PMC)	Active exploration
Energy Fuels Nuclear, Inc. (EFN)	Active in exploration, and production.

From the table above, it is apparent that three companies no longer operate in this district nor have they expressed plans to continue exploration in the future. All of their sites have been rehabilitated and released.

Intermountain Exploration owns the Sun Valley Claims in the Vermillion Cliffs area. All of their exploration is limited to the Sun Valley Mine. A validity exam must take place prior to further plan approvals due to the wilderness area designation of the lands where Intermountain claims are located.

Uranerz is exclusively conducting exploration operations at the Savannic and Cunningham Mines.

a. Cumulative Surface Disturbance Impacts Resulting from Exploration

The total cumulative surface acreage disturbed as a result of mineral exploration activities since 1980 is shown in Figure 13.

Cummulative Surface Disturbance
Resulting from Exploration (1980-1985)

Company	NO. Plans (P) or sites (S) Drilled	Total Surface Disturbance	Total Reclaimed	Total Unreclamed	Comments
Noranda	1 (P)	App. 2.0 AC	2.0 AC	0	1 plan submitted 1981
W. Nuclear	5 (P)	App. 5.0 AC	5.0 AC	0	last plan submitted 1983
U.S. Energy	1 (P)	App. 1.0 AC	1.0 AC	0	last plan submitted 1981
Uranerz	5 (P)	App. 5.0 AC	4.0 AC	1.0 AC	ongoing exploration in Savannic Mine area and Lake Mead R.A.
Intermount. Exploration	2 (P)	App. 2.0AC	2.0AC	0	All exploration within areas previously disturbed.
Rocky Mountain Energy	10 Notices	App 10.0AC	8.0AC	2.0 AC	Reclamation efforts yet to be submitted to BLM for inspection.
Pathfinders	182 (S)	182 AC*	129 AC	53 AC	53 AC. will be reclaimed within 60 days.
Energy Fuels	156 Plans, Notices and Ammendments	312 AC	296 AC	16 AC	Approx. 60. AC submitted by EFN for inspection.
		519.0 AC	447.0 AC	72.0 AC	

NOTE
All surface disturbance figures include access.
*Pathfinder surface disturbance based on 1.0 acre per hole drilled.
**Energy Fuels surface disturbance based on 2.0 acres per plan drilled.

FIGURE 13

It is apparent from the above table, in the last five years of exploration on the Arizona Strip that approximately 519 acres have been disturbed. However, of this disturbance approximately 447 of those acres have been rehabilitated, with only 72.0 acres left to reclaim. It is anticipated that in the next 2 months an additional 53 acres will be reclaimed. Given an approximate 3,400,000 acres in the "Strip" area, only 0.015% of the entire area has been directly affected.

b. Cummulative Surface Disturbance Resulting From EFN Production

Hack's 1,2,3.

EFN submitted a mining plan in 1981 to gain approval for mining of a uranium ore deposit. The plan actually involved two mining scenarios but only the one portal, and is considered as Hack's No. 1 and 2. The plan was later amended to include Hack's No. 3.

The Hack's operation has resulted in the following:

Hack's 1, 2	Hack's 3
9.1 acres disturbance	2.55 acres disturbance
4.5 miles existing access upgraded	.77 miles additional access

Total 11.66 ac + 10 acres buffer = 22.0 ac
Total 5.27 miles

- original access was existing but upgraded to accomodate ore haulage
- 48 people are employed.
- EFN provides bussing for employees.
- Life expectancy is approximately 1 - 2 years before reclamation is scheduled to take place.
- Mt. Trumbull road presently receives maintenance by EFN.
- Powerline constitutes - 14.5 miles on public lands.

Pigeon

40 acres (including 10 acre buffer zone).
10 miles of existing access upgraded to accomodate ore haulage (1/4 mile new access).
10 miles of U.S. Forest Road (mostly paved) an additional 5.0 acres evaporation ponds was ammended to original plan.
- 38 people are employed.
- EFN provides bussing for employees.
- EFN maintains BLM access road, to the Ryan Road which USFS maintains.
- Hauling is at approximately 10-15 trips per day.
- Life expectancy is 1990-1991, reclamation is scheduled immediately afterwards.
- Powerline 8.0 miles.

Kanab North

- 28.0 (includes 10 acre buffer)
- 6.5 miles of existing access upgraded to accomodate ore haulage.
- 2.0 miles new access constructed.
- Mt. Trumbull road is also used as access.
- Powerline = 8.0 miles
- Ore haulage will not take place until 1988.
- 42 people are employed.
- Life expectancy 1992.

Total Disturbance Resultant from Production

Mine Yard Acreage	95.0 acres approximate
Existing Access Upgraded	22.0 miles
New Access Constructed	3.0 miles
Miles of Powerline	30.5 miles (on Public Lands)

Thus the total impact of mining disturbance has affected less than .0026% of the entire Strip area. It is important to note that Hack's Canyon complex is scheduled to be mined out by mid 1987. Reclamation will then proceed. At this time the Kanab North complex should be approaching the ore hauling stage. Pigeon will also be mined out by 1990-1991. Therefore as one mine operational phase begins another will be ended.

The Pinenut project would have a total life expectancy of about 10 years. By the time it reaches the hauling phase Pigeon will be approaching reclamation.

Plate 4 (Appendix) illustrates the location of all mines.

1. Analysis of Cummulative Impacts from Exploration

Exploration has resulted in approximately 519 acres of surface disturbance within the Arizona Strip during the last 5 years. Of this, 447 acres have been reclaimed. Only 72 acres remain unreclamed.

The following impacts have occurred:

Vegetation. Generally vegetation is trampled by overland type vehicles. Damage is usually not severe where heavy equipment has not been used. Blading will destroy vegetation entirely. Drill pads are generally not bladed unless on an excessive slope. However revegetation is a requirement on plans, notices, amendments or modifications. It is a renewable resource. The 72 acres yet unreclamed are considered insignificant. Reclamation is an ongoing activity.

It is a requirement that all areas to be disturbed have clearances done. All T and E species have been avoided. No T and E species have been impacted.

Wildlife. Generally, wildlife is affected by the loss of vegetation which provides food, cover and nesting sites. Loss of vegetation is not permanent. Given the total loss plus that which is rehabilitated, impacts are considered insignificant.

The presence of humans/machines and other foreign sites, sounds and smells associated with drilling activities are thought to have had a potentially greater impact on wildlife than the actual temporary loss of vegetation. However the short duration of most exploration operations and the small areas affected do not pose significant impacts. Exploration activities generally are seperated by great distances and most last less than 3-4 weeks, depending on drilling results.

Peregrine Falcons are provided strict protection during breeding and fledging periods pursuant to Section 7 consultation with U.S. Fish and Wildlife Service. No operation may be approved within 1.0 miles of the Kanab Creek rims from the period of March 1 to August 15th, unless a determination is made that Peregrine are not present. Surveys are conducted between March 1st and May 15th. If Peregrine are not found during that period the the site may be explored.

Soils

Soils are slightly affected by overland travel and where access or drill pads have been bladed. Significant erosion events are eliminated with proper mitigation and reclamation. Impacts are insignificant (12, 23).

Rehabilitated sites do not provide a major source of dust. Given the millions of acres of loose fine soils that naturally are blown into the atmosphere, it is doubted that such an impact could be quantified given the known amount of surface disturbance and background Total Suspended Particulate Matter.

Fugitive dust resultant from vehicle travel is the largest contributor of dust (17). Historically there are normally less than four drill rigs operating within the entire district at anyone time. Smaller support vehicles do most of the overland exploration activities (ie, casual use operations). The increase in dust resulting from exploration activities is short lived and local to the immediate area around occasional road blading to the exploration site and therefore is considered insignificant.

Air Quality. Impacts to air quality (Class II) are negligible based on the negligable amount soils actually disturbed. Fugitive dust resultant from vehicle travel constitutes a line source that could be quantified via computer models but would be insignificant give the amount of vehicle use, temporary duration on each site and the amount of disturbance during operations (17).

Water Quality. No impacts to surface water have been observed on the Strip District as a result of any mineral action.

Ground water is protected and regulated by Arizona State Law which requires immediate plugging of drill holes to prevent surface waters and sediments from entering a potential ground water aquafier.

In any event, the probability of finding mineralization in any single hole is extremely low. (The vast majority of holes are found to be barren).

No quantifiable impacts to the Kanab Creek Drainage has ever been observed. Sixty water/sediment parameters are measured regularly and there has never been a quantifiable change in the results obtained which can reasonably be attributed to mining activities (16).

Remoteness. The remote and isolated nature of the district can be said to have been affected to some degree by the increase in exploration activities over the last 5 years. However, the level of frequency of the activities within the district has not been and is not expected to be of a magnitude reasonably expected to alter the fundamentably remote character of the district. In order for this fundamental character to be changed, activities would have to expand tremendously. The affect of exploration activities are considered insignificant for the following reasons:

1. The probability of being in the vicinity of a drill rig during operations is extremely low given the great distances that usually separate these activities and the short duration of time (less than 3-4 weeks) that exploration activities persist on any single site.

2. There are less than 4 drill operations occurring simultaneously on the Arizona Strip's millions of acres. Visual impacts are usually screened by topography and vegetation.

3. No permanent adverse impacts are allowed from any operation pursuant to requirements that provide for mandatory reclamation.

Social/Economic Structure

Economic impacts from exploration activities are positive from the standpoint of employment of locals and support needs for exploration and mining equipment. These operations provide economic revenues to local and state agencies. Additional benefits are added by support of other local services that are not directly associated with exploration activity. Most people hired for exploration and mining are "locals" thus the influx of "outsiders" is very limited. It should be noted however that these activities can have negative impacts on those members of the public, that oppose this type of operation.

3. Impacts Resulting from Production Operations

Impacts to soils and vegetation are directly related to the actual surface disturbance that occurs when mine areas, roads or powerlines are constructed. The total amount surface disturbance associated with mining in the District is insignificant when compaired to the total amount of land within the District. All operations are temporary and full reclamation is a mandatory requirement.

Visual Impacts

Visual impacts do occur as a result of mining, but such impacts are temporary and usually confined to local on site concerns. Examples: The Hack's Canyon complex can be observed only when one is at the mine site due to twisting canyon turns or at specific places on the rims atop the canyon. The Pigeon Mine is generally not observable from any portion of the access except for the evaporation pond and the yard enclosure atop the canyon. Pigeon Mine is observable from Forest Service lands across the Canyon but not directly visible from the bottom of the Canyon.

Kanab North Mine is located on the rim of Kanab Creek. It is

not visible on the West side of the creek except at an approximate distance of .5 miles the head frame is visible, as an approach draws nearer the mine yard then becomes visible. Kanab North is visible from a wide area on the east side of Kanab Creek approximately 2.0 miles away.

Wildlife. Wildlife is potentially affected by ongoing mining operations. Impacts occur due to vehicle use of roads and human activities. The extent of impacts are limited to those impacts that occur within a close proximity to the mine yard or haul route. Impacts are considered insignificant due to the small amount of habitat that is temporarily lost and of short duration of activities and the vast acreages of similar habitat available in the district. Impacts generally are also site specific.

No adverse impacts to resident deer populations antelope or bighorn sheep have been observed as a result of mining activities. There have been no documented cases of mortality to deer, antelope or sheep from any hauling operation.

Regular monitoring for falcon and eagles are mandatory. Such monitoring is required to insure these species are not adversely affected by any activities.

Air Quality. Analysis of the potential for cumulative impacts on the air quality of the district establishes that at present and reasonably foreseeable levels of mining activities within the district, no significant impact on air quality is anticipated. The small impact areas resulting from mines like the Pigeon and Kanab North Mines and the relatively large distances between operations, make any cumulative impacts highly unlikely. Utilization of haul roads by the operations similarly are not likely to generate levels of TSP which approach the air quality standard of 260 Mg/m. Morever, if such a level were to be approached, mitigation measures are available to alleviate the impact. For additional analysis see the proposed action.

If one or more operations were to result in a noticeable visible impact, a dust abatement program would be required to reduce the adverse affects.

Water Quality. No surface waters have ever been affected as a result of mining operations, including Kanab Creek.

Kanab Creek and several springs are regularly monitored. There has never been an increase above background fluxuation of any mineralized material that is not found naturally in the environment.

Even the discharges at Hack's Canyon in August of 1984, resulting from 120 year, 3 hour storm event, did not result in any measurable change in surface water quality.

V. Anticipated Impacts of the Proposed Action

A. Non-Living Environment

1. Air Shed

The proposed action would have no significant adverse affect on the immediate airshed classifications (Class II designation) nor the Class I designation of the Grand Canyon National Park (3.6 miles southeast). See Potential Hazard Analysis Section V.D.

2. Climatology

The proposed action would have no impact on regional climatological patterns.

a. Precipitation

The proposed action would not affect local or regional precipitation patterns.

b. Winds

The proposed action would not effect local or regional wind patterns.

3. Air Quality

As stated in the Existing Environment, Section IV, 5. Air Quality, in depth studies were conducted pursuant to EPA recommendations/guidelines and regulations to determine baseline data on the following: precipitation, wind direction, wind speeds, TSP inventory and an emissions inventory, and emissions rate study used to assess air quality impacts under the most severe and conservative scenarios which might occur at the project area. To assess potential air quality impacts resulting from the project area and the unpaved haul roads two separate EPA approved dispersion models were used to quantify impacts for a Potential Hazard scenario. Section V D.1 provides this analysis. So it can be seen there is little chance for any adverse environmental impacts to air quality especially if the required mitigating measures are incorpated (17).

6. Water Resources

The proposed action would not be expected to have any adverse impact on any impounded surface waters in the area.

The Pinenut will penetrate approximately 1300 feet into bedrock. It will be situated within the hermit shale formation. This formation is considered very impermeable to water flow except where fracturing or faulting exists.

Below this formation lies the Supai group consisting of layers of shale, sandstone and limestone.

It is extremely improbable that ground water that has been contaminated from mining would travel through the Hermit shale layer. However, even if water were to travel via a fracture or fault through the Hermit Shale it would contact the Supai Sandstone and be filtered as it descended through an additional 800' - 1160' of sandstone. Furthermore, at this point water movement would descent through more than 500' - 1000' of Redwall, Temple Butte and Muav Limestone. The chemical properties of these limestones would react with uraniferous properties of water and would precipitate the uranium constituents in place within the limestone layers. (See Figure 7, Geology Cross Section) (16).

As empiracal data suggests, no impact is anticipated to any underground water source or aquifer as these sources are expected to be well below anticipated mining depths.

Furthermore, the drainage plan for the proposed project would ensure, that no materials would be carried off site during high run-off incidences from the local watershed. The internal drainage design of the yard itself would further ensure contaminated sediments would remain on site. Moreover, if a spill did occur, analysis has demonstrated that the corresponding dilution, which would necessarily accompany any storm event of a size and intensity large enough to cause a release from the project area, would reduce to insignificance the impact of the discharged attributable to the mineral values which might be released. (53, 41, 42, 19)

5. Soils

It is anticipated that Phase I would have insignificant negative impacts to several soil parameters, including soil depth, structure and fertility. These impacts would increase slightly in magnitude during Phase II of the Project.

Surface soil layers would be removed and stockpiled during yard construction, and replaced when reclamation proceeds.

On haul routes, soils will be compacted by the use of heavy equipment and other vehicle activities. Compaction will reduce infiltration and correspondingly erosion/runoff may occur during periods of intense storm activity. Proper drainage, gravel capping and culvert sizing will mitigate most of these effects (12).

6. Geology/Topography

During Phase I and Phase II, there would be some change in relief (20.8 acres) of the project area. To accommodate full internal yard drainage, cut and fill grading will be necessary.

However, upon cessation of operations, only minor changes in the pre-mining contours would occur. As revegetation proceeds, these changes would be unnoticeable to the average visitor (53).

7. Radiological Impacts

General

Based on an evaluation of the direct radiation, radon and dust emission described in the existing environment, and the commitment by EFNI not to allow a liquid release from the mine yard, there is not expected to be any adverse radiological impacts from the proposed activities to the surrounding area, to the inhabitants and/or to the mine workers (19, 17, 18).

During mine operation, the impact from the ore piles would not be measureable at distances greater than a few hundred meters from the mine site (19). In other words, it should not be possible to distinguish mine induced radiation from in the natural radiation in the environment which existed before mining began.

Ore transport to the mill would not expose inhabitants along the haulage route to any statistically significant doses of radiation (19).

Specifics

The likelihood of a vehicle accident resulting in an ore spillage is quite small. However, should an ore spillage occur, EFNI has committed to an immediate clean up program (19).

The ore is moist, uncrushed rocks and would contain only a small percentage of respirable dust which could be released during an accident. For an ore truck accident the NRC assumes that up to 4.6 lb/m of ore dust could be released in the atmosphere. If all of the dust were in the respirable range, then a maximum individual lung dose would be on the order of 130 mrem at 1600 feet, 14 mrem at 6500 feet from the accident scene. Direct radiation would be the same whether or not the ore were in the truck. Comparatively, an individual must remain on top of the ore for about 50 hours per week in order to receive the suggested weekly occupational exposure limit or remain atop the pile for about 80 hours before receiving the

suggested yearly non-occupational doses/exposure limits. The remoteness of the haulage route, low specific activity of material radioactivity per gram of ore and the ease and efficiency with which the contamination could be removed results in a potential impact which would not be considered significant (19).

Impacts to water quality would be anticipated to be insignificant given the design of the surface facilities, the geology, variation in the flow rates, dilution factors and the naturally high mineral content of the surface waters in the region. No noticeable increases would be expected (19).

Dust releases from the mine vent and ore stockpiles would be on the order of 300 times less than the limits set for facilities which require a radioactive materials license. The Pinenut project does not come under this jurisdiction, but comparatively the low amount of release is noteworthy (19).

During Phase II the radiation levels in the vicinity of the ore stockpiles would be on the order of 1 mrem/hr. Levels should be expected to return to background within a few hundred meters from the site. It is also expected that gamma radiation would remain unchanged at the monitoring stations during mine operations (19).

Airborne Radioactivity. Radon gas would be diffused from the ore piles and be exhausted from the mine vent. Once airborne, gas is transported by prevailing winds and it decays to its progeny.

Uranium and all progeny would be present in dust blown off the ore piles and in dust released from the mine vent. The potential impact from these radionuclides can be determined based on the magnitude of each release and the prevailing meteorological conditions (19).

As a comparison, the environmental radon gas concentrations in the vicinity of the Pigeon project are the order of .2 to .5 p Ci/L. This data is representative of radon levels expected at the Pinenut site (19).

The largest concentration increase would at Pinenut, occur just north of the mine yard. Radon concentrations would be slightly above normal background concentrations, but would not be detectable above normal background fluctuations. The rem dose (existing level) to the lung at the nearest residence (55 kilometers north) would be about equal to the radiation received from one puff on a cigarette, or flying on a commercial jet (19).

If ground water is found to be present in the mine, there would be no reason to anticipate changes in its radioactivity due to mining operations (19).

There would be no significant radiological impact on the environment from the release of radon gas or dust from the mine site (19).

Transportation. Direct radiation from one ore truck would be about 2 mrem/hr at the truck bed, about 0.3 mrem/hr on the shoulder and normal background levels would exist at approximately 96 feet from the trailer (19).

As a truck passes, individuals on the shoulder of a highway would receive a dose of radiation too small to quantify. The truck driver would receive a measurable dose of radiation of approximately 500 mrem/year. As shown previously in Figure 8, this dose is only slighly higher than that received by airline flight crews (19).

Radiation in the Mine Environment. The miners can expect direct radiation levels to be on the order of 0.8 mrem/hr. The direct radiation limits, dosimetry and record keeping requirements are mandated by 30 CFR 57 (27, 28, 29). Theoretically, a miner can remain at or near high grade ore bodies during an entire work period and not exceed the weekly guidelines (100 mrem) or the annual limit (5,000 mrem) (19).

Radon gas and progeny would be exhausted from the mine with a 150,000 cfm vent fan. Based on existing Hack's Canyon vent information, radon gas concentrations would be on the order of 2400 pCi/L and 1600 mWL. Thus, radon progeny would be present at approximately 10% of their potential equilibrium values. This means that much of the radon gas would be removed from the mine before it is able to decay to its hazardous daughter products. The occupational radon progeny limits are 4 WLM/yr. Miners at the Hack's Canyon Mine complex are currently averaging 2.2 WLM/year. Currently uranium miners work an average of 10 years underground, thus the cummulative 10 to 25 WLM is well below the 100 WLM value where studies indicate possible increases in lung cancer may appear (19).

> Note: 1 WL = 100 pCi/L (Rn-222) = 1 working level. Considered the standard measure of radon daughter concentration in air.
>
> A working level month (WLM) is a standard level of cumulative exposure. This is an exposure equivalent of working in an atmosphere containing 1 WL of radon gas daughters for 173 hours. It is generally accepted that:

1 WLM = 5,000 mrem, occupational dose to broncial epithelium. As with radiation dose, "Working Levels" is such a large value, that it is reduced by a factor of 1,000 and expressed as a milli working level (mWL).

Figure 10 illustrates Lung Dose in comparison to working level concentrations.

These impacts would be considered insignificant and temporary during the duration of Phase I and II. Positive benefits would result when the area is rehabilitated.

9. Accoustical Impacts

It is anticipated that the accoustical impact that would result from operations at Pinenut would be similar to those analyzed at Hack's Canyon No. 2. However because Pinenut is not in a canyon it is anticipated that noise will dissipate faster and consequently would not travel as far (16).

It is expected that those levels of sound found at Pinenut would fully dissapate within 5000' or at least be below the natural environmental accoustical levels within that distance. Consequently, there should be no adverse impact to the USFS, the Kanab Creek Wilderness or the Grand Canyon National Park. Noise from the mine yard is expected to travel into the Game Preserve, however due to the terrain and the P.J. woodland plant community surrounding the area the noise is not anticipated to travel far and should not have any significant adverse impacts on the wildlife (16).

Hauling noises would not be expected to exceed ambient background levels on that portion of the access road that is closest to the Park Service Boundary. Hauling would not be audible at Kanab Point (5.5 miles southeast). Based on the experience of the USFS the noise from hauling is not expected to adversely affect the wildlife and/or the Game Preserve.

B. Living Environment

1. Animals

a. Big Game

It is anticipated that impacts caused by Phase I would be slightly negative only for mule deer. The increased sights, sounds, and smells of human activity and development of the mine yard (i.e., removal food sources) would interrupt daily movement/use of the immediate area (1, 2).

Impacts would increase in magnitude during Phase II. These impacts would be associated the realignment of the road and construction of the powerline. Impacts on the habitat and the daily movement is anticipated to be insignificant since deer population in the area are low and most of the deer are associated with the canyon rims.

Road access to the site includes approximately four miles which is contiguous to or within the Grand Canyon Game Preserve. This area (as stated in existing environment) supports low (0.5 to 1.0 deer/section) densities of deer, given the poor habitat and lack of surface water (24). Some published literature suggests that deer use decreases in areas when road construction or traffic increases. Based on the anticipated work schedules, bussing of employees and an average of 12 ore loads per day, low travel speeds and low deer number; the probability of direct vehicle mortality to mule deer is low. Given the above, it is apparent that this portion of project activities would not significantly impact big game in the area.

b. Birds of Prey

This project is expected to have no impact on golden eagle or peregrine falcon, as this area is not considered suitable nesting habitat (55). The chance for future adverse impact is extremely remote. However, if any threatened or endangered species are observed in the area of the project, BLM will make a biological assessment and consult with the U.S. Fish and Wildlife Service for concurrence (44).

An insignificant impact could occur to other raptors when 20.8 acres of the mine yard is removed as a primary food sources. These impacts to the prey base and the consequent effect on eagle and falcon are also expected to be insignificant.

c. Non-Game

Loss of 20.8 acres of habitat would destroy food/cover/burrowing/nesting sites of small animals. Impacts are negative, but considered insignificant due to the small amount of habitat actually lost. In addition, when reclamation is finally accomplished, it is expected the area would support at least the original populations that existed in the pre-disturbance conditions.

d. Carnivores

Lion

No direct impact would be anticipated. Secondary impacts may occur if the already low deer population should shun the immediate area.

Coyote

These animals are opportunistic, and are not expected to be adversely affected by the increased activity. In addition studies have shown, that these animals may even increase near some forms of human activities. (Source: Impacts of Uranium Mining and Milling Upon the Fish and Wildlife Resources of the New Mexico San Juan Basin, Sept. 1980, USFWS, DOI). Coyote numbers are anticipated to be low in this area due to limited food base and water availability.

Badger/Fox

No impacts expected. No sighting have been recorded in the vicinity.

Miscellaneous

At the present time, most studies regard the most obvious impact to wildlife during mining is surface disturbance. However, it is important to note that little information is known on the effects, especially cumulative, on vegetation and wildlife from radioactive radon gas and decay daughters in the vicinity of uranium mines, vents and mills (Source: Proceedings of the Uranium Mining and Milling Workshop, 1980; USFWS, DOI).

Since surface disturbance would consist of 20.8 acres, mine yard, road alignment and the powerline the overall impacts to wildlife is anticipated to be insignificant.

Increased vehicle traffic and human/wildlife encounters along the aligned road could result in shifts in wildlife use patterns and avoidance of the road area.

2. Vegetation

Negative impacts would result when the mine yard is cleared and graded to ensure internal drainage. This impact would involve 20.8 acres of vegetation within the mine yard. As Phase II proceeds, upgrading and realignment of the existing access would involve several additional acres of disturbance. Correspondingly, those portions of access that are unused because of realignment would be rehabilitated (5, 10, 13).

Construction of the powerline would result in only nominal impact. Vegetation would be trampled by vehicles which supply

the material for construction and maintenance. Visual mitigation will occur by reducing the areas of trampled vegetation, and keeping it out of site to extent possible. All other possible impacts, could be lessened by requiring final surveys to be accomplished on foot.

Pole pad blading (pad approximately 10' x 10') would be kept to a minimum, eliminating complete removal vegetation to the extent practical.

C. Human Values

1. Archaeological Resources

Site AZ B:6:44 (BLM) meets National Register criteria and is located immediately adjacent to the boundary of the proposed mine yard (46). No direct impacts to this site from mining operations would be expected. However, there is a high probability of occurrence of indirect impacts. These impacts would include inadvertent disturbance associated with the proximity of workers on site and heavy equipment in use during the life of the operation, as well as potential deliberate vandalism. EFNI has been notified of the importance and integrity of this site. An on-site meeting was held with EFNI, BLM officials and Abajo Archaeology concerning the best methods of protection/mitigation. Several alternatives were discussed, including burial and/or fencing of the site, covering the site with a structure, and data recovery. Ultimately it was determined that the best method of mitigation of possible adverse effects would be to implement a full Data Recovery Plan (47).

SHPO has concurred with the Data Recovery Plan and it has be implemented.

All recommended mitigation as submitted in the supplemental "preliminary" powerline assessment for archeological resources will also be implemented.

Some secondary impacts to the other cultural resources of the area may result from upgrading access in the area. The opportunity for cultural vandalism must be acknowledged. However, the use of busses for employee transportation, and the significant distance of the project from any main access will serve to mitigate the liklihood of these secondary impacts.

Quarterly inspection and proper signing would provide the data necessary to assist the Bureau in applying the proper mitigating measures to protect the to cultural resources.

2. Socio-Economic

a. Population, Social Conditions, and Employment

This propsal should have no direct effect on the actual population in the local communtities. EFNI plans to utilize employees from the soon to be rehabilitated Hack's Canyon complex. Positive benefits would accrue, when additional local residents are hired to supplement the work force during Phase II. In addition, increased employment translates into continued support of local services not associated with mining (i.e., manufacturing, construction, public utilities and wholesale/retail trades and local tax base also).

Further benefits would be gained by the State of Arizona through taxes on EFNIs new properties.

3. Public Attitudes

Implementing the proposed action would not create significant changes in public attitudes. The intensity and extent to which opponents of uranium mining express their opinions is expected to increase, however this should have little effect on the prevailing local attitude.

Past and present experience in analyzing public comments from EFN production operations have shown the majority of commentators to fully support EFN and their operations.

4. Wilderness Resources

The proposed action is not expected to have any direct effects on the Kanab Creek Wilderness Area. It would not be visible or audible from any portion of the wilderness area.

This action will not cut off any access to wilderness. Water Canyon Point is a good viewing area, but the wilderness area is not really accessible from the point.

Some secondary impacts to the Wilderness area my occur in the form of increased accessibility to the viewing area. However, presently existing roads to the view area have shown no noticeable increase in use. Opinions vary as to whether this would be a positive or negative impact.

5. Visual Resources

a. General. Visual disturbance is expected to increase in the immediate area of the mine yard.

Magnitude of disturbance would increase as this project proceeds from Phase I to Phase II. Visual contrast is expected to be moderate and limited only to the immediate area of operations. Negative impacts from road upgrading and the powerline will occur, but with appropriate mitigation they will be insignificant (4, 5, 9, 45).

b. Visibility

Section 169A of the Clean Air Act establishes goals for the protection of visibility in Federal Class I areas, (Grand Canyon National Park). Thus it is necessary to determine the potential impacts of the proposed Pinenut project's on the Grand Canyon (32, 49).

Visibility and particularly visibility impairment remains a complex subject and an assessment of visibility impacts is difficult to do objectively. Perhaps the most useful index to measure visibility is the visual range or the distance a person can view through the atmosphere to an object. Certainly many factors affect a person's ability to see objects at great distances. These include, among others, color of the object, contrast of the object to the horizon, the viewer's perception capabilities, the angle of the sun, cloud cover, water and water vapor in the atmosphere and suspended particulate concentrations. However, all of these factors in essence relate to two distinct processes that affect visual range. These are: the amount of light being scattered into the observer's light path; and the amount of light being absorbed out of that light path (17).

Since the proposed Project would result in the release of particulates into the atmosphere and since particulates are one of the factors affecting visual range, the assessment of potential visibility impacts upon the Grand Canyon National Park will focus on particulates. Specific to particulates, visual range is a function of the size and chemical composition of the particulates present in the atmosphere. The EPA states that smaller or fine particulates (less than 2.5 microns) are much more effective light scatters than larger or coarse particles. Further, EPA-sponsored research has shown that the inert composition of natural dust prevents it from being an effective light absorber. Thus an assessment of potential visibility impacts resulting from the project and associated haul road activities should first start by evaluating the size of the particulates expected to be released by the project's activities and the distance to which these particles will remain suspended (17, 18).

It was shown previously that the greatest potential for particulate impacts to the Grand Canyon National Park would result if ore haulage activities were conducted on the southern haul route alternative. It is also evident from the impact modeling that the particulate emissions from the project area should not travel far enough to be of concern to visibility in the Park. Therefore, this analysis will also focus on the potential particulate emissions from the proposed access and the potential effect on visibility in the Park. Clearly, if particulates from hauling activities along this route result in an inconsequential visibility impact in the Park, it follows that visibility impacts from the other haul road alternative and the project area proper will also be inconsequential (17, 18).

As stated earlier, particulates smaller than 2.5 microns are by far the most effective light scatters. Thus, the quantity of these fine particulates generated from haul road activities on the southern route must be determined before their effect on visibility can be evaluated. Particulate emissions released from haul road activities is a function of the number of haul trucks, their speed, weight and number of wheels as well as the amount of natural precipitation and the silt content of the roadway surface. However, EPA has refined this emission factor to specifically quantify the amount of particulates less than 2.5 microns in diameter expected to be released from haul road activities. Using this emission factor and the relevant activity, precipitation and known silt content parameters, the expected emission rate of particulates less than 2.5 microns is calculated to be 3.2 pounds per vehicle mile traveled (17).

Using this emission rate and specific meteorological conditions, the concentrations of fine particulates within the Park resulting from hauling activities can be calculated through the use of an accepted computer dispersion model. Once knowing the amount of fine particulates suspended in the Park's atmosphere an estimate of the resultant visibility range impacts, if any, can be made. This Potential Impact analysis is presented in Section V D.1.(17)

6. Other Values

a. Ranching

It is anticipated that the proposed action would have a nominal effect on actual livestock operations. The loss of 20.8 acres of habitat translates into approximately 1 AUM. Some benefits would accrue to local ranchers during

Phase II when the proposed access is to be upgraded. It would provide a safer all weather access for land users to access their allotments and range improvements in the area.

Some ranchers do not like improving roads in the more remote parts of the Arizona Strip and may perceive the improved road as a negative impact.

To date there are no known direct impacts to livestock from existing EFNI mining operations. There is potential for conflict between road realignment requests and proposed future water developments. These potential conflicts are thought to be mitigatable and insignificant.

b. Recreation

The proposed action would have little actual impact to the average visitor in these areas. However, two scenarios could occur.

First, increased access may be perceived by sightseers as a positive benefit. Phase II would ensure all weather and easier access to additional public lands.

Secondly, there may be an opposite negative reaction from backcountry recreationists who feel mining operations detract from the natural scenic beauty of the area.

Both reactions would most likely be limited due to the small area of impact and the low numbers of visitors that can reasonably be affected in the area.

c. Suitability

This area is considered suitable for mineral activities and it is supported by the existing BLM planning documents (MFP/URA/HMP/AMP) available for review that the Arizona Strip District office (20, 21, 22).

d. Compatibility

This action is considered to be compatible with other existing land uses (i.e., ranching, wildlife, recreation, etc.,) in the area and is also supported in the above mentioned planning documents (21, 22, 23).

D. Potential Hazard Analysis

Based on the available scientific studies and the Bureau experience a potential hazard analysis or worst resource senario has been presented in order to aid the understanding of the extent and magnatude of potential adverse impacts. This will aid BLM

in providing mitigation to prevent their potential adverse impacts from occurring.

1. In addition to the TSP data, an emission inventory was conducted as a "potential hazard analysis" in assessing potential air quality impacts. This inventory quantifies all emissions, assuming maximum production, that could potentially release pollutants in the air. Also as part of the potential hazard analysis, with the exception of tarpaulin-covered trucks, no emission controls nor mitigation techniques were assumed (17, 18).

   The only pollutant to be released in any measureable amount would be particulates (TSP). Further, these TSP emissions are almost exclusively comprised of dust. While the EPA distinguishes between process-related particulates (fugitive emissions) and non-process dust (fugitive dust) in its delineation of major emission sources, these emissions have not been segregated to allow for the analysis of potential hazards (17, 18).

   A summary of TSP emissions and the calculated rate in tons per year (based on maximum activity) is presented in Figure 14. Note that off-site emissions (haul road) were also included in these calculations (17).

   All emission factors used in generating this study are EPA recommended (17).

   A number of studies have been conducted to attempt to quantify dust emissions generated from various sized haul trucks, traveling different speeds on various road conditions. In order to evaluate the "potential impact", the emission factors used in Figure 15 were recommended by the EPA to calculate haul road emission rates (17).

   Using the above factors results in higher emission rates than are currently cited by other Federal and state agencies, but was necessary to determine a "Potential Hazard Analysis".

   As shown in Figure 14, during maximum production, in one year, the total of 27.1 tons per year of TSP emissions could potentially be released from the project. The primary source of TSP emissions within the project area would be wind erosion of disturbed areas and stockpiles. These emissions account for over one-half of all TSP emissions (17).

FIGURE 14

PINENUT PROJECT

SOURCE	ANNUAL EMISSIONS (TPY)
Project Area:	
Ore loadout to stockpile	1.56
Ore loading from stockpile to haul trucks	1.95
Waste rock dumping to waste rock stockpile	0.30
Wind erosion, disturbed area and stockpile	14.30
Mine vent	9.00
Project Area Total	27.1
Project Transport:	
Haul road Emission (per mile) (assuming 16.0 lbs/VMT * 12 round trips per day)	49.92

FIGURE 15

EMISSION FACTOR
PINENUT PROJECT

SOURCE TYPE	EMISSION FACTOR	REFERENCE
Haul road, unpaved	k*5.9(s/12)(S/30)(W/3)**0.7* (w/4)**0.5½(365-p)/365)¾	EPA
Ore, rock, loadout	0.04 lbs/ton	EPA
Ore, rock load to truck	0.05 lbs/ton	EPA
Wind erosion	a*I*C*K*L*V	EPA
Mine vent	0.002 grains/SCFM	AMAX 1980*

where s is the silt content (12%)
S is the vehicle speed (25 mph)
p is the number of days with 0.01 inches or more of precipitation (95)
a is the fraction of material that remains suspended (0.025)
k is the fraction of material below 30 microns (0.80)
I is the soil erodability (38 ton/acre)
C is the climatic factor (1.0)
K is the roughness factor (1.0)
L is the field width factor (1.0)
V is the vegetative cover factor (1.0)
W is the average vehicle weight (15 tons)
w is the number of wheels (10)

* AMAX 1980 - State of Colorado air permit for Mount Emmons. Factor derived from stack tests on AMAX's Henderson underground Molybdeum mine vent in Henderson, Colorado. During testing this mine's annual production was a factor of 10 higher than the proposed Pinenut Project's annual production.

Also, from Figure 14, it is apparent that haul road traffic has, as a maximum, the potential to release 16.0 pounds per vehicle of TSP for each mile traveled on haul roads (unpaved). Since trucks are tightly covered, haul road emissions would result exclusively from natural dust from the road surface (17).

TSP emissions from haul roads are dependent upon the number of trucks, vehicle speed, number of wheels, vehicle weight, silt content of road surface and precipitation occurrences. The resultant dust emissions from each 1-mile section of unpaved road is calculated to be 49.2 tons per year, based on factors expected for the project (17).

With the exception of the mine vent, all project area and haul road emissions would be surface released. Emissions from the mine vent would be an elevated release due to mechanical buoyancy caused by the ventilation fans.

The dispersion models selected to assess these impacts are state of the art EPA generated and approved air quality dispersion models and are routinely used in impact analysis such as this one (17).

As stated earlier, only particulates are expected to be emitted from the proposed project in noticeable enough quantities to result in an air quality impact. The National Ambient Air Quality Standards (NAAQS) for particulates are 260 mg/m^3 for the 24-hour maximum average and 75 mg/m^3 for the annual geometric mean; and since the state of Arizona has adopted these same standards, modeling was conducted to address these standards. However, since the project is located only approximately 3.6 miles (7.9 kilometers) from the Grand Canyon National Park boundary, an assessment was also made whether or not emissions from the project potentially could result in a significant air quality impact in the Park - a mandatory Class 1 area. As part of the Prevention of Significant Deterioration (PSD) regulations, the EPA has developed levels of significance for certain air pollutants within a Class I airshed. The levels of significance, as established for particulates, are 1 mg/m^3 for an annual average and 5 mg/m^3 for a 24-hour average. Modeling was also conducted to determine the location of these levels resulting from the proposed Pinenut Project and to determine if any significant air quality impact could potentially occur within the Grand Canyon National Park (17).

2. Annual Results-Potential Hazard Impact Analysis - TSP

The results of the annual ISC (ISCLT) computer model run are presented graphically in Figure 16. The predicted particulate concentrations resulting from the project area are shown as

lines of equal concentration or isopleths. The maximum concentration is predicted to be northeast of the project area with a concentration of 3.3 mg/m^3 (17).

The annual particulate background in the vicinity of the Project is, at a maximum, approximately 14 mg/m^3. Even adding the background concentration to the modeled impact, the resulting concentrations are predicted to be quite low, with a maximum impact of no more that 25 mg/m^3, and is well below the applicable state and Federal standards. This is half of the existing normal background fluxuation (17).

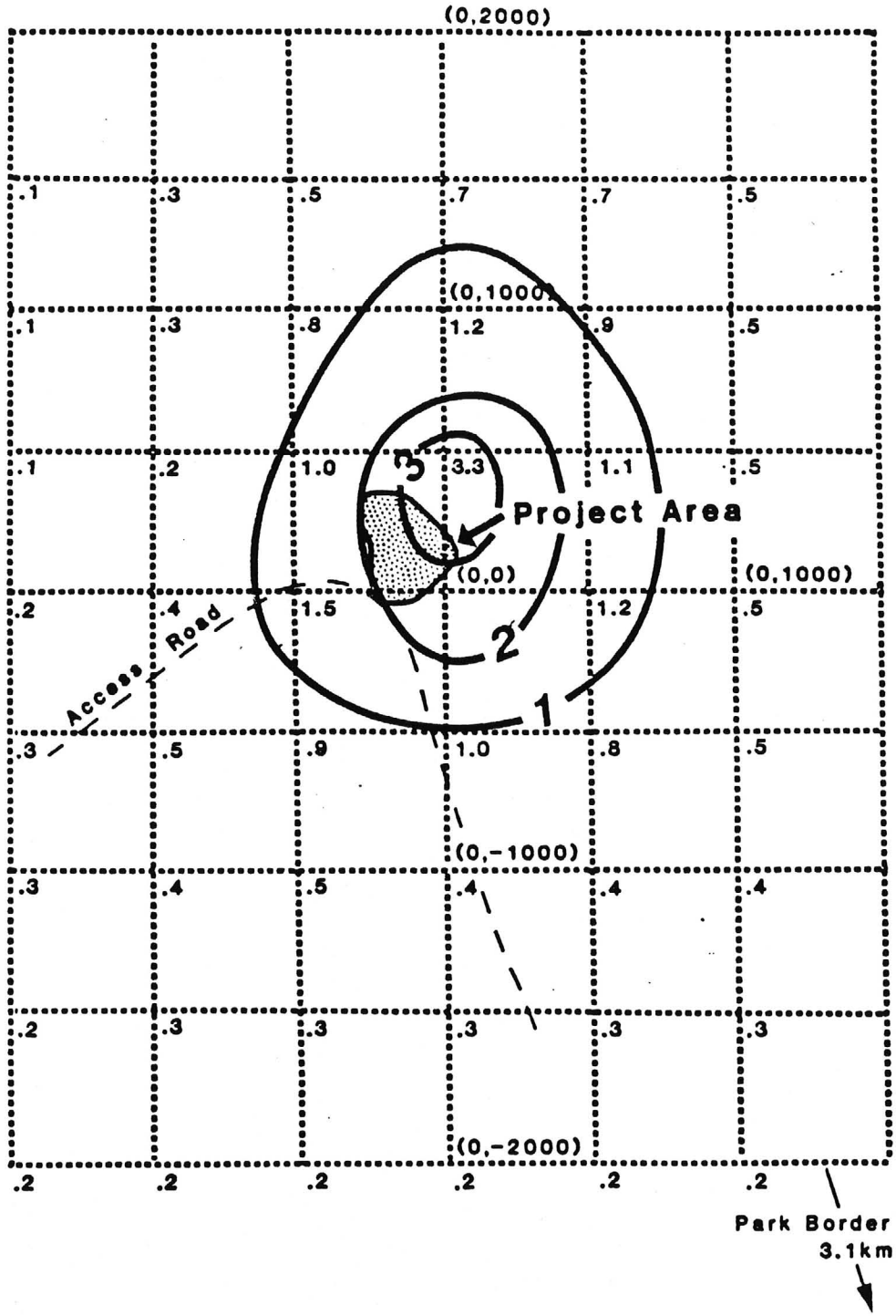
Figure 16 also shows that the 1 mg/m^3 significance level isopleth, at its furthest distance in the direction of the Grand Canyon National Park, extends less than 1000 meters from the project area. Thus, there will be no adverse impact from the project on Grand Canyon National Park under the Potential Hazard case scenario (17).

3. 24-Hour Results - "Potential Hazard" Analysis - TSP

Project Area

To assess the short-term, or 24-hour, air quality impacts which might result from operations at the project area, potential maximum emission releases were input into the ISCST (short-term) version of the ISC model and resultant pollutant concentrations were computed for each day (24-hour period) contained in the 1983 - 1884 Arizona Strip meteorological data set. The ISCST modeling analysis used actual meteorological data and computes the individual daily particulate concentration that would result if the proposed Pinenut project were in full operation during each day of the 1983-1984 data set. By using actual meteorological data in conjunction with the expected emission releases from the various project emission sources, more realistic air quality impacts from the project can be determined. These impacts, in turn, can be compared to the applicable State and Federal standards to see if the proposed project would, in reality, pose a threat to air quality of the area.

However, to allow an added air of conservatism to this modeling analysis, project emission were assumed to be continuous throughout the one year meteorological data set, notwithstanding the fact that actual mining activities are scheduled for only two eight hour shifts per day, five days per week. Thus, concentrations computed by the ISCST model should in fact be higher than would realistically occur. The purpose of allowing emissions to be released continuously in the modeling analysis was to establish the outside limits or "potential hazard" of any air quality impacts resulting from the project.



Sec. 21, T36N, R4W
Mohave Co., Arizona

1" 2000ft.

ENSCO TECH
Denver, Colorado

PROJECT Pinenut

Annual Average Concentration
Units Are Micrograms Per Cubic Meter

FILE NO. _____ DATE 11/85 FIGURE NO. 16

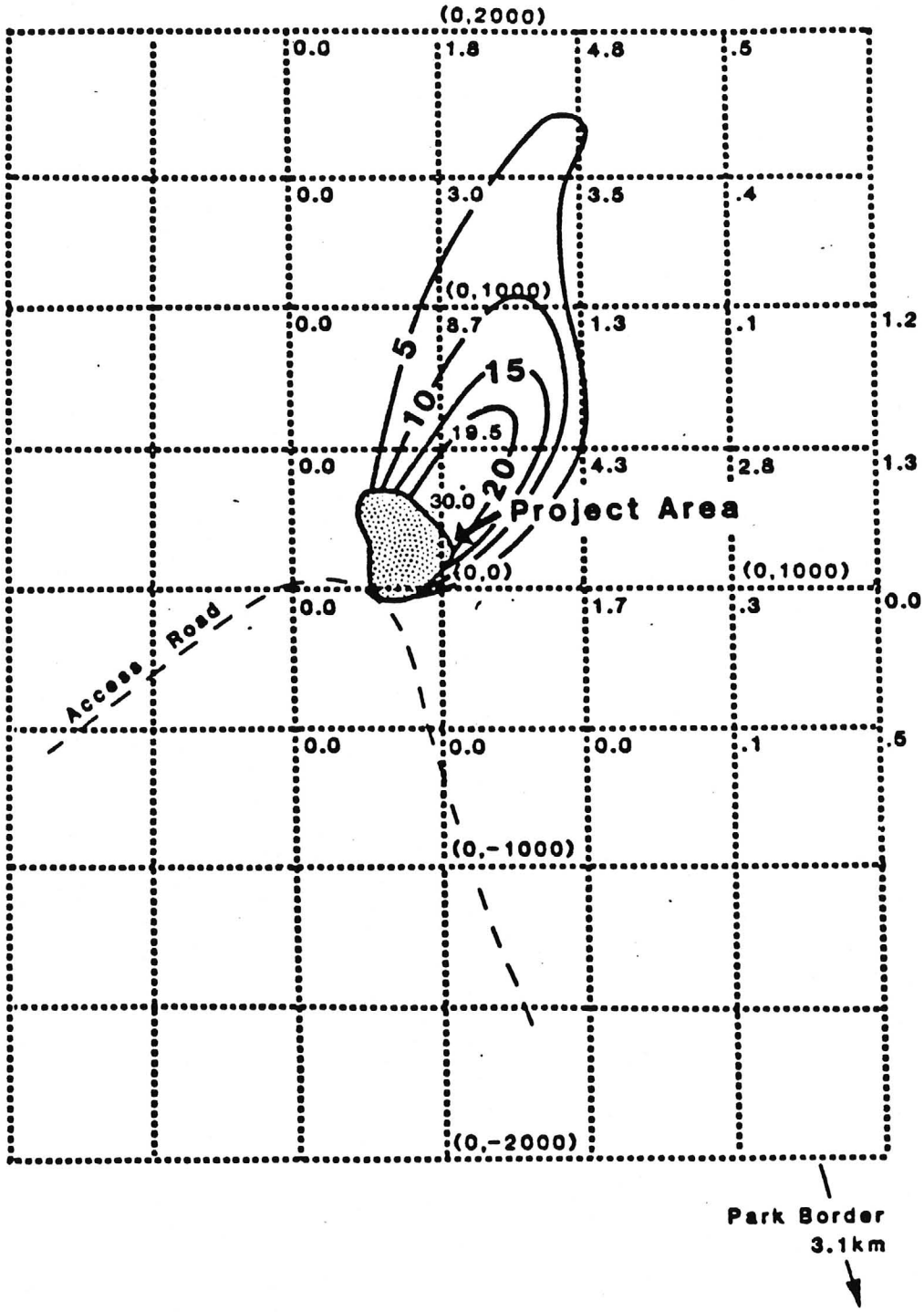
The "potential hazard" day (24-hour period) particulate concentrations computed in the ISCST modeling analysis are presented graphically in Figure 17. In this Figure, the predicted 24-hour particulate concentrations resulting from the project areas are shown for each receptor point and are plotted as isopleths.

From Figure 17 it can be seen that the maximum off-site particulate concentration occurring on the actual "Potential Hazard" data was 30 mg/m^3 and the 5 mg/m^3 level of significance extended, at its furthest point, to just over 2000 meters north-northeast of the project area. The predicted "Potential Hazard" maximum of 30 mg/m^3 is well below the State and Federal particulate standard of 260 mg/m^3 even when the highest 24-hour background concentration of 58 mg/m^3 is added. Thus, this modeling study which employed actual meteorological data shows that there would be no significant air quality impact resulting from the project (17).

As shown in Figure 17A, the maximum 24-hour impact from the project area would occur north-northeast of the project area (in a direction away from the Grand Canyon National Park). Since it was also desired to evaluate the potential air quality impact on the Grand Canyon National Park resulting from the operation on the proposed project, the ISCST model and 1983 - 1984 meteorological data set were again used to compute the maximum or "potential Impact" 24-hour particulate impact in the vicinity of the Grand Canyon National Park.

This modeling analysis involved using the actual hourly meteorological data contained in the 1983-1984 data set and superimposing maximum project emissions to compute the individual daily (24-hour) TSP concentrations at each receptor point in the direction of the Grand Canyon National Park (in essence all receptors in the east-southeast through southwest sectors). To add an element of conservatism to the analysis, project related emissions were again allowed to be continuous throughout the year.

Figure 17 shows the 24-hour TSP concentrations at each receptor point on the concentrations at each receptor point on the "Potential Hazard" or highest concentration day. As can be seen from Figure 17, the 5 mg/m^3 level of significance in the direction of the Park extends, at its furthest point, fewer than 2000 meters from the project area. This is nearly four kilometers short of the Park boundary. Thus, this modeling analysis has shown that there would be no significant adverse impact on the Grand Canyon National Park resulting from project related emissions (17).



Sec. 21, T36N, R4W
Mohave Co., Arizona

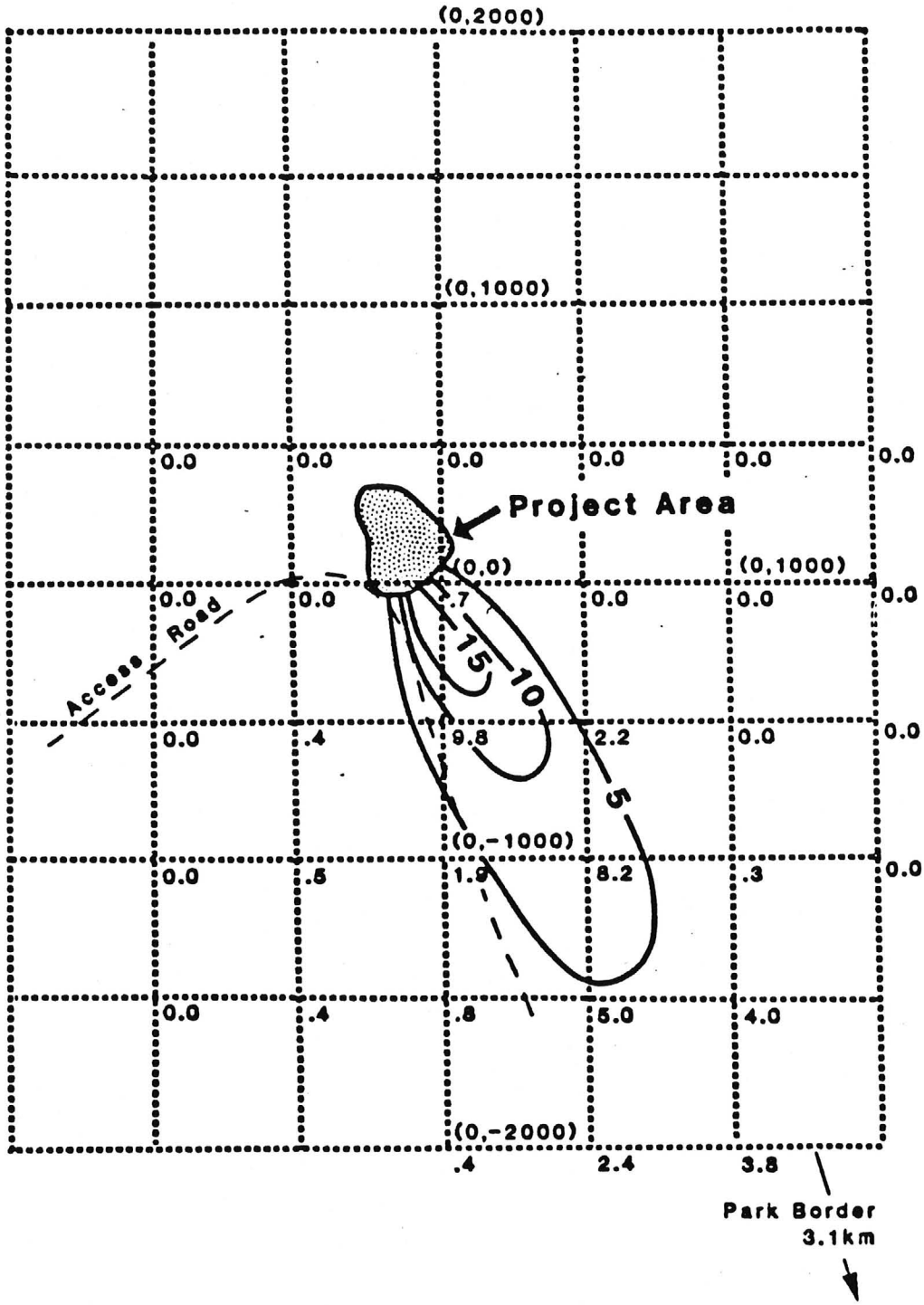
1" 2000ft.

Enseotech
Denver, Colorado

PROJECT Pinenut

"Worst-Case" 24-Hour Impact
Units Are Micrograms Per Cubic Meter

FILE NO. _____ DATE 11/86 FIGURE NO. 17



Sec. 21, T36N, R4W
Mohave Co., Arizona

1" 2000ft.

Engeotech
Denver, Colorado

PROJECT Pinonut

Maximum 24-Hour Impact Towards The Park
Units Are Micrograms Per Cubic Meter

FILE NO. _____ DATE 11/86 FIGURE NO. 17 A

4. Haul Roads Analysis

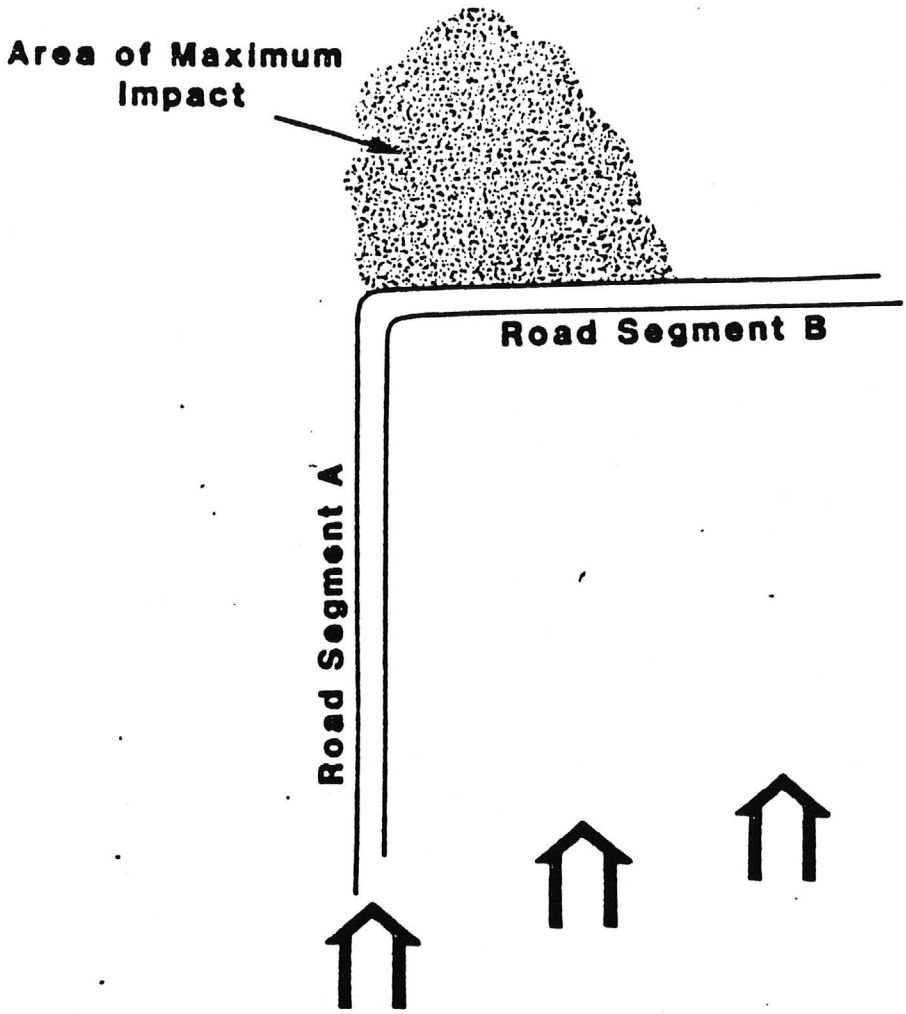
While the haul roads and, consequently, haul road emissions would be outside of the project area, it was desired to determine what impact, if any, the haul road emissions would have on the area's air quality and, specifically, the Grand Canyon National Park. To do this, restrictive emissions (haul road geometries) and actual meteorological conditions were again examined to compute the "Potential Hazard Analysis" impact scenario.

Two haul road alternatives routes are being evaluated for potential use during the life of the project. Plate 4 (Appendix) shows these proposed haul road alternatives. While a final route has not yet been selected, in essence, emissions from each of the alternative routes should be approximately the same.

Typically, the highest short-term pollutant concentrations resulting from fairly continuous haul road emissions would be observed when there is a sustained parallel wind to a road segment which subsequently makes a sharp, near 90 degree, turn. This is because, the wind has the capacity to transport dust from the paralleled section of the road (the section before the turn) as well as the dust from the more perpendicular road segment after the turn. Figure 18 better illustrates this wind and haul road configuration.

Since use of either haul road alternative would generate approximately the same particulate emissions, both proposed haul road routes were examined for specific cases of the potential haul road/wind configuration scenarios described above. Upon close examination of the proposed haul road geometries, it was evident that potentially the highest particulate concentrations should result from traffic on the southern route road segment, shown as the dotted line in Figure 19, when the winds are from the west-northwest or east-southeast (parallel to the road segment).

Coincidentally, traffic on this road segment could also potentially have the greatest impact on the Grand Canyon National Park since this road segment passes closest to the Park and since particulate emissions from traffic transversing this road segment could be blown in the direction of the Park during west-northwest wind conditions. Figure 19 shows the Impact Area of Concern within the Park resulting from this haul road/wind configuration. However, for this roadway geometry to actually result in particulate concentrations in, or near, the Grand Canyon National Park, as a minimum, west-northwest winds would have to persist concurrently with haul road activity on this section of road. The highest particulate concentrations would, of course, result when, and if, restrictive atmospheric stability and wind speeds also occurred simultaneously (17).



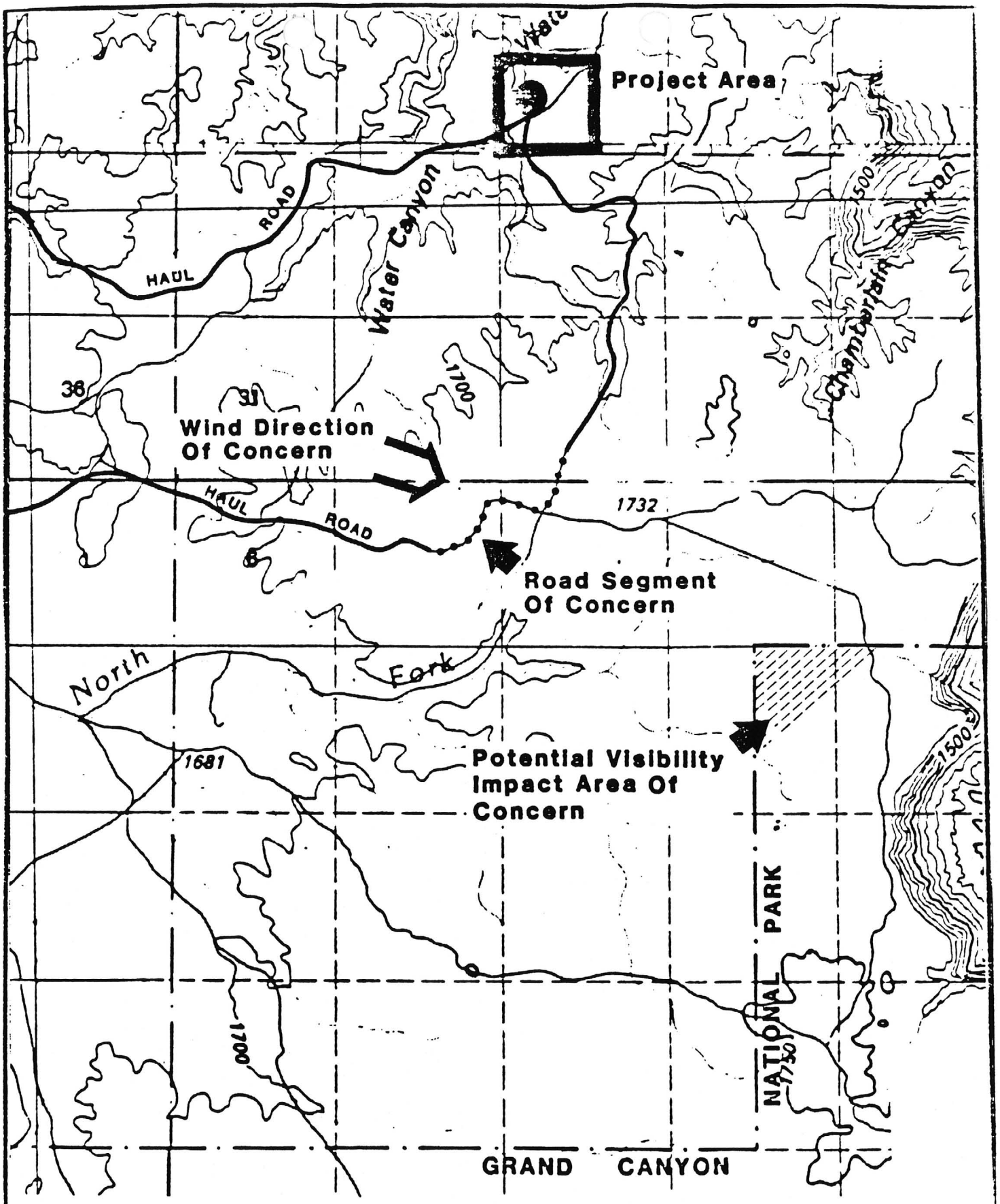
Wind direction parallel to road segment A

ENSCO ECH
Denver, Colorado

PROJECT Pinonut

ROAD/WIND GEOMETRY
MAXIMUM IMPACT

FILE NO. _____ DATE 11/85 FIGURE NO. 18



Energy Tech
Denver, Colorado

PROJECT Pinenut

Haul Road
"Worst-Case" Scenario

FILE NO. _____ DATE 11/86 FIGURE NO. 19

To determine the potential maximum particulate impact resulting from the above haul road/meteorological configuration, haul road emissions were input into the ISCST model and the 24-hour particulate concentrations were computed for each day in the 1983-1984 meteorological data set. However, to be consistent with the conservative approach of this analysis, haul road traffic was assumed to continue from 7 a.m. until 11 p.m., seven days a week, at a rate of 12 round trips per day.

In other words, no adjustment was made in the modeling analysis for weekend shutdowns. The particulate emission rate of 16.0 pounds per vehicle mile traveled was used throughout the modeling analysis.

The maximum or "Potential Hazard" day particulate concentrations computed by ISCST show that the maximum 24-hour particulate concentrations resulting from actual meteorological conditions and full haul road activities was 51 mg/m^3 and occurred to the east-southeast of the road (a result of west-northwest winds). This value is well below the allowable state and Federal standards and, thus, poses no threat to the local or regional air quality.

Further, the modeling analysis showed that the maximum 24-hour particulate concentration at the Park boundary was only 1.2 mg/m^3. This is also well below the 5 mg/m^3 level of significance. Thus, haul road emissions should result in no significant impact to the Grand Canyon National Park (17).

5. Potential Hazard Analysis; Visibility

The maximum potential particulate impact should occur as a result of haul trucks traversing the sharp turn shown in Figure 18 and 19 during periods of persistent west-northwest winds. Particulate concentrations in the Park resulting from traffic on this segment of haul road during periods of restrictive meteorological conditions, could be transported into the very small section of the Park just to the east-southeast of the road segment. This potential impact area is highlighted in Figure 19 for reference. However, it should be pointed out that reductions, if any, to visibility could only occur if an observer were looking through this small area of the Park when haul road traffic was present on this road segment and when restrictive meteorological conditions occurred simultaneously. Since the impact area of concern does not include any part of the Grand Canyon proper, the viewing of the Grand Canyon itself would not be affected. Also, if any restrictions to visibility were to occur they would be very short-lived as haul truck traffic would traverse this segment of road in less than five minutes (assuming a 25 mph vehicle speed) and, consequently, the residence time of road generated particulates would be very short (17).

Since restrictions, if any, to visibility within the Park resulting from haul road emissions would be intermittent and short in duration, the CALINE-3 dispersion model was used in the visibility analysis. This dispersion model is more ideally suited for calculating short duration impacts from roadway emissions (17).

It should be noted that the percent reduction in visual range is very sensitive to the existing background visual range. A background of 170 km (105 miles) is very good, but this is the value that EPA has designated for this area. If one assumes instead a background visual range of 50 miles and the same "Potential Hazard" meteorological scenario, the percent visual reduction at the Park boundary resulting from haul road generated fine particulates would drop to less than five percent (17).

To put the "Potential Hazard" results presented in the summary into perspective, before any visibility impairment could result, haul road traffic must occur simultaneously with west-northwest winds with associated very low wind speeds and very restrictive stability conditions. (As pointed out earlier, the necessary meteorological conditions occurred only a total of nine hours in the 1983-1984 data set.) Also, haul truck traffic would be intermittent. Travel time through the segment of haul road of concern should be less than five minutes. Any potential visibility reductions would only occur in a very small portion of the Park and would only be present if there were an observer located in the Park, southeast of the haul road, looking, out of the Park (17).

In order to define the outside limits of any potential visibility impairment resulting from use of the southern haul road, a very restrictive metorological scenario was generated and used in the CALINE-3 model to estimate short duration concentrations of fine particulates entering the Park's atmosphere and, in turn, any visual range impairments that might result.

Since haul road traffic and potential resultant visibility impairment events are, primarily, daylight hour concerns, the restrictive meteorological scenario was comprised of a persistent west-northwest wind with an associated 2.4 m/sec (5.4 mph) wind speed under D stability conditions (D stability is the most restrictive daytime stability class). Examination of the 1983-1984 Arizona Strip data set showed that these meteorological conditions occurred simultaneously during daytime conditions only 0.24 percent of the time or a total of nine hours throughout the year. With the obvious

infrequency of this meteorological scenario coupled with the statistical requirement for the simultaneous occurrences of haul road traffic and a Park observer actually being present, the real probability that the results of this "Potential Hazard" visibility analysis ever occurring is truly remote indeed. The probability of occurrence of the necessary conditions is 0.0024%. Thus, the restrictive meteorological scenario used in this analysis should clearly define the maximum outside limits of possible visibility impacts within the Park.

The following summary presents the fine particulate concentrations and resultant visual range reduction calculations from the use of this "potential hazard" meteorological scenario. As is shown in this table, at the Park boundary the concentration of fine particulates was calculated to be 1.1 mg/m^3, which results in approximately a 12 percent reduction in visual range (assuming a background visual range of 170 km). By 500 feet into the Park, the fine particulate level drops to 0.8 mg/m^3 with an associated nine percent reduction in visual range (17).

SUMMARY OF "POTENTIAL HAZARD" FINE PARTICULATE CONCENTRATIONS
and VISUAL RANGE IMPAIRMENT RESULTS

Distance into Park	mg/m^3 Concentration	bscat	bscat (total)	Visual Range	Percent Reduction
Park Boundary	1.1	0.0033	0.0263	149 km	12
500 feet	0.9	0.0027	0.0257	152 km	10
500 feet	0.8	0.0024	0.0254	154 km	9
1500 feet	0.7	0.0021	0.0251	156 km	8

Vr = 3.912/bscat (assume babs = 0)
Assume background visual range 170 kilometers - bscat = 0.023
Assume addition to bscat = 0.003 $km^{-1}/mg/m^3$ of fine particulates

E. Cummulative Impacts with Pinenut and Other Reasonably Foreseeable Actions

1. Cummulative Impacts with Pinenut.

With the addition of Pinenut, the total cumulative surface disturbance resulting from mining operations will be increased by 20.8 acres. An additional 8.3 miles of powerline will be constructed and approximately 17.0 miles of road will be upgraded.

Total mining disturbance would equal the following:

Mine yard acres:	112.86	acres
Miles of powerline:	38.8	miles
New access constructed:	3.02	(same as without Pinenut)
Access upgraded:	38.0	miles

Based on the above, total cumulative disturbance from mining operation results in approximately .0033% of the entire Strip Area. It is not anticipated that Pinenut activities will cause any form cumulative impact that would correlate with other mines on the Arizona Strip (except for hauling) based on the data provided in Section V.

For example, fugitive dust and radiological impacts are limited in extent to a certain periphery of the surrounding mine yard and haul routes. Thus those impacts do not translate into area wide impacts regarding air quality.

Hauling will cause short term impacts on Mt. Trumbull Road (approximately 8 miles) for the duration that Pinenut and Kanab North are hauling simultaneously (approximately 2 years). This amount of hauling would be less than that which occurs today because Hack's Canyon will be mined out. Thus, an additional three mines and associated hauling activities will be eliminated.

2. Reasonable and Foreseeable Operations

There is an extremely low possibility of any deposit being found north to Hack's Canyon or east to Kanab Creek from the Pinenut Project due to the lack of targets and success of the exploration drilling in those areas. Thus additional mining would not occur any closer to the wilderness area or Forest Service boundaries.

It is known that mining cannot occur directly south of Pinenut as these areas are closed to mining (ie, Grand Canyon National Game Preserve and Grand Canyon National Park).

It is also reasonable to assume that mining will not take place any closer than 3.0 miles west of this project based on the terrain and lack of target areas in the vicinity.

However, based on the amount of exploration that has occurred and the fact that breccia pipes have been found in the area, it is anticipated that at least one additional mine could occur south of Kanab North Mine.

For this analysis we will assume that a new mine would not be approved for at least another year. Based on the new mine being at least 3 miles away it is reasonable to assume that

there will not be any cummulative significant adverse impacts from the mine yards. Therefore the only potential cummulative impact would come again from the hauling and haul routes. Considering again that Hack's complex will be mined out and Pigeon is on another road system the only operating mines would be Kanab North and Pinenut. Having all three mines in full production would equal the current level of hauling coming from the Hack's mine area today. This situation would only occur for a year or two because by the time the new mine would be producing, Kanab North should be close to reclamation (1 or 2 years). Considering the present level of hauling has not caused any significant adverse environmental impact, we can reasonably assume that the hauling from yet another additional mine should not cause any significant adverse environmental impacts (17).

VI. Impacts Resulting from Proposed Alternatives

A. The No Action Alternative is that situation that exists as described in the existing environment. If the project were denied none of the impacts described in Section V would take place. However, the environmental analysis has determined the following:

1. The project as proposed plus additional mitigation required will ensure that no unnecessary or undue degradation will occur.

2. The project has provided the necessary mitigation to prevent adverse impacts to archeological resources pursuant to Section 106 of the National Historical Preservation Act and 43 CFR 3800.

3. The project has provided the necessary mitigation to prevent adverse impacts to endangered plant and wildlife species pursuant to the Endangered Species Act.

4. The plan of operations has provided for reasonable reclamation pursuant to 43 CFR 3809.

5. The area in question is located on unappropriated Federal Lands pursuant to the General Mining Laws (1872).

6. No long term significant adverse environmental impact would result if this project were approved.

Pursuant to 43 CFR 3809 and BLM 3809 Manual, if the above criteria are met then the plan of operations must be approved.

B. Alternative 2 would require the Plan of Operations to be approved.

C. Alternative 3 would allow the proposed Plan of Operations with one or more of the following modifications.

1. Other haul route alternatives:

a. Under this alternative the existing access north of the Game Preserve would be upgraded and used, approximately 14 miles of the access is the same as the proposed action.

This access would have eliminated approximately 4.0 miles of traversing the game preserve.

To allow for all weather hauling, this route would have to be upgraded, using cut and fill operations on approximately 2.0 miles of the access. Cut and fill operations would leave major scars that would be extremely difficult to rehabilitated. Cut and fill operations would be major (up to 15 feet). A significant amount of blasting would be expected to accommodate the construction.

Major cut and fills, sharp turns and steep grades would provide safety hazards. Maintenance would be a difficult problem due to steep grades, drainage problems and fill slope stability. Rehabilitation of the road would be difficult, if not impossible and expensive.

Wildlife would be adversely impacted by blasting and hauling, due to the habitat diversity found at the canyon heads where the better forage and cover exists. The probability of direct mortality to deer is greater than the proposed action. The potential for adverse impacts to Bighorn sheep and raptors is substantially higher (Arizona Game and Fish).

Adverse impacts to vegetation and soils would be greater in severity but less in extent due to the alternative being about one mile shorter than the proposed access route.

Visual impacts and contrast with the existing environment would be greater due to the size and location of the scar.

A safety hazard for haul trucks would still exist on restrictive grades in and near Robinson and Water Canyons.

b. This alternative haul route would require construction of new access slightly north and parallel to that described above but would reduce the accessive steep grades and sharp turns. This access route would eliminate the need to traverse the game preserve.

Environmental consequences are more severe. Cut and fill construction would involve approximately 3.0 miles of new access. Cut slopes would be as high as 20 feet. Stability problems could result and soil loss would be expected

to increase above both the proposed action and alternative (a.) above. More blasting would be expected (3-4 months) and would have negative impact on wildlife and vegetation. The impacts from this alternative are similar to those described above except much more adverse due to the increased disturbance in a more environmentally sensitive area i.e. greater impacts to the head of Water Canyon.

Blasting and hauling in this area where relative deer densities are high would increase the potential of adverse impacts. Probability of direct mortality to deer would be higher than the proposed action or alternative (a.) above.

Visual impacts and contrasts would also be greater than those described from impacts resulting from the proposed action or alternative (a.) above.

c. This alternative would use the proposed action haul route but not allow it to be upgraded. Shallow drainages on the un-improved road would cause increased erosion and sediment transportation with continuous ore hauling. Improper grading, no realignment, no culverts and no channel work would increase erosion and result in adverse down channel impacts. The continuous use of heavy equipment would cause a significant amount of deterioration unless the roads were maintained and graveled. This would also reduce the safety and ability for other land users to reach range improvements in the area.

Since the access must accommodate all weather hauling, the 9-16" gravel road base would still be necessary. This would lessen the potential effect of fugitive dust on ambient air quality.

2. <u>This alternative would require alternate methods of transportation to be used to gain access to the mine yard</u>.

a. Deny bussing of employees and require that each use private vehicles.

This alternative could result in 132 vehicle trips per day during Phase I and slightly less than that for Phase II. The mine yard would need to be increased to accommodate a parking lot which would result in additional surface disturbance. Impacts would be significantly greater to wildlife, remoteness, solitude, etc.

In effect this alternative would defeat the objectives of reducing traffic volumes and eliminating surface disturbance.

b. Allow personnel to be transported by aircraft.

This alternative would result in additional impacts to the wilderness area, recreationists and wildlife. Additional surface disturbance would be necessary to accommodate a heliport or in the case of fixed wing aircraft, a landing strip. Employees safety would be a more significant concern.

3. Other archaeological mitigation to the Data Recovery Plan.

a. This archaeological alternative would deny the Data Recovery Plan and would require the fencing of the archeological site.

Fencing the site would not provide any data on the cultural resource and there is still the possibility that direct and indirect impacts could occur through time during the life span of the project. Cost for fencing is similar to the proposed action. Fencing might bring additional attention to the site and add to the probability to adverse impacts for vandalism.

b. This second archaeological alternative would deny the Data Recovery Plan and would require the site to be buried.

The burial operation would require extensive operation measurements prior to burial including complete spacial context pin point mapping of every single artifact. All structural components would have to be mapped in place. Some form of structural covering would be required over pit and wall structures. Burial of site would be accomplished by hand tools since use of heavy machine might damage the site. This operation would be time intensive and extremely costly. It would provide no additional archeological data and may even cause the loss of future information as a result.

4. Other alternatives to the powerline.

a. This alternative would require all power to be generated on site. Associated impacts of this alternative are described as follows:

Power generated on site would eliminate the visual impacts associated with construction and placement the powerline. The size of the generator needed during Phase

I would be a 12 cylinder generator that would emit a constant 70-90 dB. This level of sound (at 90dB) would require hearing protection pursuant to OSHA standards. Furthermore, the level of accoustical impact would increase significantly around the perimeter of the mineyard.

As Phase II commenced the capacity of generator would have to be increased to one 16 cylinder or two 12 cylinder generators. Correspondingly, the increase in generator size would result in constant sound emissions of 110-120 dB. At these levels, a typical sound comparison (as noted in the Accoustical Guide, Appendix would be equivalent to a riviting machine or a jet take off (at 200 feet distance). At these levels some form of hearing loss would be expected. Hearing protection at these levels would be mandatory.

Correspondingly the accoustical impact would drastically increase and would be audible for several miles. Increased noise impacts would occur to Kanab Creek Wilderness, Park Service Lands and the Game Preserve. Recreation users and wildlife would be adversely affected.

This alternative would require one round trip per day for a fuel truck. Require much more fuel storage on site and increase the potential for a fuel fire or other type of fuel accident.

b. This alternative would require burial of the powerline.

Under this alternative the impacts associated with powerpole construction and placement would not occur. However, the following impacts would occur.

A D-9 cat with parallel ripper would be needed or at least a large ditch witch with a continual circular tooth/bucket attachment would be required. If a ditch witch were used it would be attached to a large 4 X 4 vehicle so it could be pulled along the final alignment.

Additional road blading would be required to accommodate the cat or the pickup that hauls the trencher. Some blasting may be needed to accommodate vehicles on slope areas or areas with shallow soils. Linear visual contrasts will result when lower horizons are overturned to allow for placement of underground lines.

The same impacts would again occur if the line was removed.

Impacts to wildlife would be greater due to the increased time of construction and the additional disturbance in the head of Robinson and Water Canyon. Noise from machinery would also adversely affect wildlife.

Surface disturbance would be greater concurrent with the amount of construction necessary to accommodate a D-9 cat or trenching machine. Run off and increased erosion would occur on slopes.

Mitigation for environmental problems and maintenance for the powerline would prove more difficult if the lines malfunctioned, heavy equipment may again have to be brought in to repair the problem.

Construction costs would be significantly greater than regular pole transmission lines.

Reclamation would be more difficult.

5. Other alternative to the mine yard.

Because the ore body is stationary there are not many viable alternatives to evaluate in regards to the mine yard. A few different options were analyzed within the scope of this alternative.

a. Move ore piles to the most northern part of the mine yard. This would result in placement of ore piles at the lowest point in the yard. This area would be subject to runoff from within the mine yard and would preclude placement of the evaporation pond where it would be most effective in gathering surface run off. The potential of water to become contaminated would increase. In effect, this alternative would defeat the objectives of keeping ore piles in the topographically high part of the yard.

b. Require surface construction facilities to be placed along the east and/or west perimeters of the mine yard.

This would preclude proper placement of ore piles and would also possibly effect the placement of barren waste rock. It would affect proper storage of top soils which must be protected through out the duration of operations. Buildings that would not be in the higher areas of the yard would be subject to impacts from run off within the mine yard. This alternative would defeat the objectives of requiring surface facilities to be located in a limited compact area to reduce surface disturbance and would effectively cut down on the useable space in which heavy equipment could operate (ie, ore stock piling, loading areas, turn around areas, etc.).

c. Move the mine yard facilities within the surrounding area to the best suitable locations, (ie, ridge tops, flat area, etc.).

This would increase the size of the yard significantly making security and safety much less efficient. The beneficial impacts from reducing cut and fill operations would be off set by the disturbance from normal operations between the selected areas. The resulting impact would be greater in extent to all of the environmental parameters; surface disturbance, water, wildlife, noise, flooding, vegetative, air quality, soils, cultural resources and visual impacts. It would be less cost effective and increase the potential for accidents and environmental contamination through the sheer increase in the size of the mine yard area.

6. Other alternatives to the plan of operations include alterations regarding storage ponds.

a. This alternative would require the construction of the Phase II evaporation pond at the commencement of Phase I.

This action would result in an extra margin of safety that would allow for a hundred year event to be handled safely before any ore is stockpiled in the mine yard during Phase I. This will require greater surface disturbance in the mine yard during Phase I but because of the internal drainage design the impact would be insignificant.

b. Require a larger or secondary overflow pond at commencement of Phase II.

This action would eliminate the possibility that a storm larger than a 100 year 24 hour event would breach the storage capacity of the holding pond. It would reduce the possibility of overflow and downwash contamination. If the additional capacity could be obtained in the mine yard the increased disturbance would be insignificant. According to E.O. 11988 the 100 year event is the federal government's requirement for this action. Therefore requiring greater capacity storage facilities could be considered undue and unnecessary.

7. This alternative would require oil/gas and diesel storage areas to be bermed to prevent accidental impacts on and off site.

This action would provide an additional safety margin to prevent the release of contaminated liquid. Berm material is available on site and would result in no additional adverse environmental impacts.

VII. Recommended Mitigation Measures

As a result of the environmental analysis performed for the Pinenut project, the following terms and conditions will become mandatory.

A. Powerline

1. EFN's proposed powerline alignment will be submitted to BLM as an amendment to the Plan of Operations to insure the appropriate clearances and NEPA compliances.

2. The powerline will be constructed as close as is possible to the existing access to reduce surface disturbance.

3. Prior to approval of any surface disturbing activities relating to the powerline, a visual analysis will be completed in accordance with BLM procedures. Every possible attempt will be made to reduce visual impacts and contrasts.

4. Prior to the approval of any surface disturbing activities relating to the powerline, a Class III Archeological resource inventory will be conducted in compliance with Sec. 106 of the National Historic Preservation Act. Impacts to archeological or historic sites will be mitigated according to established BLM policy and procedure and in consultation with the State Historic Preservation officer. BLM will place emphasis on avoidance.

5. Prior to approval of any surface distrubing activities relating to the powerline, a complete Threatened and Endangered Species clearance will be conducted pursuant to existing law.

6. Surface disturbance will be kept to an absolute minimum, blading of pole pads will be allowed where absolutely necessary and only where approved by the authorized office.

7. Powerlines must be constructed according to REA standards to prevent raptor electrocution.

8. Off road travel shall be minimized during powerline construction. All clearances, staking and final alignments will be kept to existing roads or be non-motorized.

9. Safety globes must be placed on the powerline where required by the authorized officer.

10. The powerline will be dismantled when operations cease at the request of the authorized officer. All surface disturbance will be reclaimed in accordance with the reclamation procedures submitted by EFN.

B. Mine Yard

1. If the protection of topsoil stockpiles becomes warranted in the future, EFN will consider use of a tacktifier/or asphalt emulsion to prevent wind erosion.

2. EFN will ensure that topsoil is equally distributed over the disturbed area to better insure successful rehabilitation.

3. Should periods of prolonged drought ensue, EFN will implement during the day period a short term dust abatement program within the mine yard as approved by the authorized officer.

4. Signs will be installed at the mine yard to inform visitors or other land users that a uranium operation is in progress, in addition to the "No Trespassing Sign."

5. EFN will dispose of all concrete pads at least 24" below surface, or break them up and backfill them into the shaft.

6. To be successfully rehabilitated ground cover must be established to at least the predisturbed conditions i.e., (approximately 40% canopy cover) and approved by the authorized officer.

   The following seed mixture and rate is recommended on all disturbed areas:

Fourwing Salt Bush	2.0 lb./acre
Pubescent wheatgrass	2.0 lb./acre
Russian Wild Rye	2.0 lb./acre
Indian Rice grass	2.0 lb./acre
Sand drop Seed	0.5 lb./acre
Yellow Sweet Clover	0.5 lb./acre
TOTAL	9.0 lb./acre

   Harrowing the recontoured area, broadcast seeding, then chain dragging the seed to cover it is generally the most successful procedure for BLM.

7. If the State of Arizona Department of Health Services, water permit units determines that an NPDES permit is necessary, then EFN will be bound to the conditions of the permit. Compliance is mandatory if the permit is required.

8. Pursuant to 3809, EFN will report any sighting of Peregrine Falcon or Bald Eagle. Upon such sighting no employee will harm, harass, or injury the species.

9. Construct a holding pond sufficient to handle the run off capacity from the 100 year 24 hour event prior to any ore stockpiling at the mine site. (EFN has volunteered to construct their internal storage pond to the standards

required to contain the 500 year 24 hour storm. BLM will approve this additional proposal.)

10. Uranium ore stockpiles will never exceed the size of the ore pads.

11. All fuels and solvents will be stored in one area which is bermed to prevent accidental releases of liquid contaminates.

12. EFN will be required to take water and sediment samples from the reservoir (1200' NE of the mine yard) prior to any ore stockponding for baseline purposes. They must then sample the reservoir at least once annually when ore is stockpiled in order to determine any change. Results will be coordinated with BLM.

C. Upgrade Access

1. All road upgrading and re-allignments will be done to at least BLM standards and submitted to BLM as a Plan of Operations amendment to insure the appropriate clearances and NEPA compliances.

2. Cattleguards will be placed at all fence crossings when the road is upgraded.

3. Culverts must be sized according to expected maximum drainage flow and installed according to at least Bureau standards.

4. During upgrading or re-alignment, no action will be allowed that will have the potential to affect "in wash flow", down stream reservoirs, etc.

5. All re-alignments will be kept minor, and will only be allowed where approved by the authorized officer

6. If road kills of big game animals are demonstrated, the authorized officer may require the use of sconic whistlers to reduce the mortalities.

7. Prior to any road upgrading or re-alignment, a Class III Archeological resource inventory will be made mandatory pursuant to Section 106 of the National Historic Preservation Act. Impacts to archeological or historic sites will be mitigated according to established BLM policy and procedure and in consultation with the State Historic Preservation Officer.

8. Prior to any road grading or re-alignment, a complete Threatened and Endangered Species Clearance will be conducted pursuant to existing law.

9. A 9 to 16 inch gravel road base will be applied to all swales

and bottom areas where fine soils materials are likely to create unsafe driving condition due to dust. In addition, at least two major curves must be graveled. These are the one west of the wilderness area and northwest of the Grand Canyon National Park. Specific gravel areas will be identified by the Authorized Officer upon approval of the final road reallignment and upgrade.

10. The Pinenut access road will be rehabilitated to its original "pre-disturbed" condition at the discretion of the Authorized Officer, when operations cease.

11. During Phase II, if additional data determines that increased mitigation is necessary, EFN will be required to provide additional dust abatement by using gravel, water, wetting agent or other adequate substance such as "Bitumate" or "Cohorex" for the control of fugitive dust.

12. EFN will post a sign at the junction of the Mt. Trumbull and Pinenut access road to warn people of the hazard from uranium haul trucks. (BLM will improve the information signs at the same junction to encourage visitors toward the Toroweap overlook and Mount Trumbull area.)

13. Road upgrading for the first 3/8 of a mile of the Pinenut Road (that which is visable from the Trumbull Road) will be only the minimum necessary to meet safety standards. This will help discourage increased visitor use of the area.

14. No facilities, structures or other improvements other than the road upgrading will be allowed in the Game Preserve unles approved by the authorized officer.

D. Archeology

1. Standard BLM signs warning against violations of the Archeological Resources Protection Act will be placed along all access roads to the Water Canyon Point area.

2. Archeological sites along the haul road and in the vicinity of the mine yard will be monitored at least quarterly. Sites will be selected at the conclusion of a judgemental inventory that will include: (1) likely site areas easily accessed from the haul road and (2) the headwaters of Water Canyon Point.

3. The BLM will require that all employees of EFNI be advised of the provisions of the Archeological Resources Protection Act of 1979.

E. Aircraft Use

1. EFN will not utilize Kanab Creek Canyon as a flight path to gain access to the Pinenut mine yard.

2. EFN will only be allowed to use their helicopter for necessary and due operations.

3. EFN will not land on the Grand Canyon National Park to gather water samples unless previous approval by the Park has been granted.

4. EFN is not allowed to land within the Kanab Creek Wilderness Area and must abide by the existing Interagency Agreement between BLM and the Federal Aviation Administration - Navigable Airspace Over Wilderness Areas (IM. 86-94), EFN must maintain the established 2000 foot minimum altitude over Wilderness.

5. Helicopter landing approaches will be from the West to West/Southwest to reduce potential adverse impacts from Hacks Canyon, head of Water Canyon, the Kanab Creek Wilderness, the Grand Canyon National Park and the Grand Canyon Game Preserve.

F. Radiological Impacts - All operations at Pinenut shall comply with all pertinent Federal and State laws associated with Radiological impacts, including but not limited to:

1. ARS-27-31, concentration of radon gas shall not exceed such amount as may be set by the inspector. Current settling is 1 working level.

2. ASR-27-372, in all uranium operations the operator shall test regularly for radon daughter concentrations and submit records of testing as may be required by the State Mine Inspector.

3. R11-1-473, smoking is prohibited where uranium is mined.

4. R11-1-472, when radon daughters concentrations above 0.1 working levels are found in an active working area, measurements representative of the worker breathing zone shall be determined. Sample date, locations and results shall be recorded and retained at the mine office for at least two years.

5. Diversion system and berms will be maintained before an after all major rain storm events. Down stream impact due to diversion of any channel-sizing around the mine yard will be immediately mitigated as approved by the Authorized Officer.

G. Accidental Release

EFN will submit to BLM for our review and approval their Best Management Practices Plan for radiological and environmental clean-up in the event of accidental discharge or release, prior to any production of ore.

VIII. Residual Impacts

Until rehabilitative efforts prove successful, the following residual impacts are expected.

Yard: A small amount of accelerated soil loss will occur until revegetative efforts became established.

Access: Some increased erosion will occur after the road is rehabilitated to its original dimensions. Benefits will accrue if some gravel is left on the road which should result in less suspended TSP and less loss than pre road upgrade conditions.

VRM: The results of human activity will remain for several years until rehabilitation is completed.

Cultural: Vandalism of cultural resources may increase, due to increased human activity in the area.

IX. Relationship Between Short Term Use and Long Term Productivity

The approximate 10 year duration of this project should not significantly reduce the long-term productivity of this area as rehabilitation is expected to return disturbed areas close to prevailing conditions. Rehabilitation recommendations are aimed at reducing impacts to long term productivity.

X. Irreversible and Irretrievable Commitment of Resources

As a result of this project, uranium ore will be extracted and processed thus constituting an irretrievable commitment.

XI. Public Involvement

A. General

Of sixty four individuals, organizations and surface management agencies that were solicited to provide comments on this project, BLM received 181 written comments and three submitted comments by phone.

Over 178 comments support the project while six do not.

In addition, the Arizona Clearinghouse ensured review by the appropriate Arizona State Agencies and Regional Councils of government pursuant to Executive Order 12372. This project was supported as written in draft.

B. Public Comment Requested

Jane Whalen, Southwest Resource Council, Inc.
Nina Johnson, National Wildlife Federation
Arizona Wildlife Federation
Levi Packard, Arizona Game and Fish Department
Dixie Judd, Mayor - Fredonia
Kaibab Tribal Council, Kaibab Reservation - Pipe Springs
Chairman Board of Supervisors, Coconino County Courthouse
Mohave County Board of Supervisors, % David Bishop
Chamber of Commerce, Greater Kane Co. Area, Attn: Donald M. Bennett
Office of Economic Planning and Development
F. Duane Blake
Md. Vincelletti, Energy Fuels Nuclear, Inc.
Mr. Paul M. Jenkins, Mayor
Robert Lippman, Attorney, Friends of the River
Steve Cassidy, U.S. Soil Conservation Service
Sierra Club, Rob Smith
Arizona Radiation Regulatory Agency
Congressman James T. Hansen
Senator Dennis D. DeConcini, Attn: Mike Crusa
Senators Jake Garn and Orrin Hatch, % Jeanean Holt
Robert Russell, Kane County Commission
Ace H. Peterson, Coconino Sportsmen/Arizona Wildlife Federation
Terry Sopher, Wilderness Society
Mr. Richard M. Marks, Grand Canyon National Park c/o John Ray
Mr. Vard Heaton
Kieth V. Church
Source (2)
Pathfinder Mines Corporation, Attn: Dieter Krewedl, Ted Kendall
Martha Collins
Don Randal
El Roy Taylor
State Mine Inspector
John Vaughn
Brad Doores, EFNI
Bob Steel, EFNI
John Ray, Grand Canyon NP
Clayton Atkin
Arizona State Mine Inspector
Clayton Atkin
Fred Burke
Daniel P. Crotta
Ms. Janel L. Smith
Ms. Joan Stavely
Jerry Jones
Alvin Barlow
Jerry Holt
Russell D. Butcher
Phil R. Ogden
State Historical Preservation Officer
Arizona State Clearing House
William Steed

Dan Dagget, Plateau Group of Sierra Club
Del Smith - Southern Utah Wilderness Alliance
Tom Wright
Lawrence Michalsky - Kaibab National Forest
George Hammon, President, Basic Transportation, Inc.
Norman L. Johnson, City Administrator, City of Blanding
Michael D. Young, Small Business Owner
K. Blaine Silliman, Owner of Kenneth Silliman Trucking & Bulldozing
Glenn Skinner
Paul Foreman
Walter K. Steed
H. E. Jackson
Duane H. Edwards
Ben Arthur
Hiram E. Jackson
T. Purcell
Curtiss E. Perkins Trucking
Elmer Hurst, Former EFNI employee
Calvin Black, Chairman, San Juan County Commission
Danny Black
M. L. Williams
Mr. & Mrs. Truman Lynch
Philip L. Palmer & Family
Mr. & Mrs. Jeff Black & Family
Tom Cook
Daniel Barlow, Mayor of Colorado City, AZ
R. E. West & Son (David R.)
Richard W. Marks, Superintendent, Grand Canyon
Zelma Acton
Norman & Ruth Johnson
Dr. Raymond Rick Lyman, DMD, Blanding, Utah
Mr. & Mrs. Norman Hammon
Jack & Lynette Squires
W. E. Hoggard, Jr., President, E.D.D.C.O. Exploration, Inc.
Lucy M. Harris
Dave and Freeda Guymon
Kim H. Acton
Ellis & Mabel June Palmer
Kay R. Johnson
K. E. Hoggard & Sons Logging, President and Owner
Glen A. Shumway, Uranium Miner
Lynn Lee, Director, College of Eastern Utah
Mr. & Mrs. D.R. West, Employee of Basic Transportation
Ritchie Stubbs, Sr.
Kenneth R. Bailey, Commissioner of San Juan County
John K. Black, CLU
Kris Black
Leon Black
Carlyle Gibbons
Layne Williamson
Ritchie Stubbs, Jr.
H. F. Cosby, Jr., Truck Company Owner
Ken Black, Partner-Manager C&K Black Trucking

Joan Richards
Ken Harrington & Family, Former EFNI worker
R. L. Hall
Mike V. Christinsen
J.D. Bishop,
George Marian Jr.
Calvin Black, Partner, Trucking Company
Majorie Black
Mr. & Mrs. Robert A. Jones
Willaim D. Howell, Executive Director Southeastern UT Assoc. of Local Governments.
Merlin Jessop
J.L. Jessop
Royal Cook
William Knudson
Hal M. Jensen, Superintendent of Schools
Dian Hurst
Clea S. Johnson
Phil B. Acton
Glen Martin
Bruce L. Shumway, Director, Social Services

C. Recordation of Groups/Interests and Government Agencies Consulted

BLM-Arizona

District Staff

Cloyd Swapp - District Geologist
Ken Moore - Environmental Coordinator
Julian Anderson - Assist. DM, Resources
Bob Smith - Air, Water & Soils
Curtis Warrick - District Biologist
Ferron Leavitt - Assistant District Manager, Operations
Bill Lamb - District Manager
Ray Mapston - Associate District Manager
Ron Ray - Computer/Landscape Architect

Area Staff-Vermillion

Rob Roudabush - Area Manager
Tom Folks - Recreation Specialist/Wilderness
Bob Sandberg - Supervisory Range Con.
Tina Kulinovich - Range Con.
Ilene Anderson - Realty Specialist
Jennifer Jack - Area Archeologist

Area Staff-Shivwits

Tim Duck - Wildlife Management Biologist

State Office Staff

Ray Brady - Associate State Director, Minerals
Allen Rabinoff - Minerals
Keith Pearson - State Office Environmental Coordinator
Jane Clossen - Writer/Editor
Gary Stumpf - State Office Archeologist

Dixie Resource Area

Gordon Cormier - Geologist

Other Federal Agencies

Utah BLM - Dixie Resource Area
Glen Canyon Recreation (PS)
Grand Canyon National Park (PS)
Forest Service (Kaibab)
U.S. Fish and Wildlife Service

State Agencies

Department of Health Services
Air Quality Dept.
Water Quality Bureau (Northern Regional Office), Water Permit Units
Hazardous Waste Control

Arizona Lands Department
Division Natural Resources
Mineral Section

Arizona District Mineral Resources

Arizona State Clearinghouse

Arizona Radiation Regulatory Agency
Non X-Ray Division

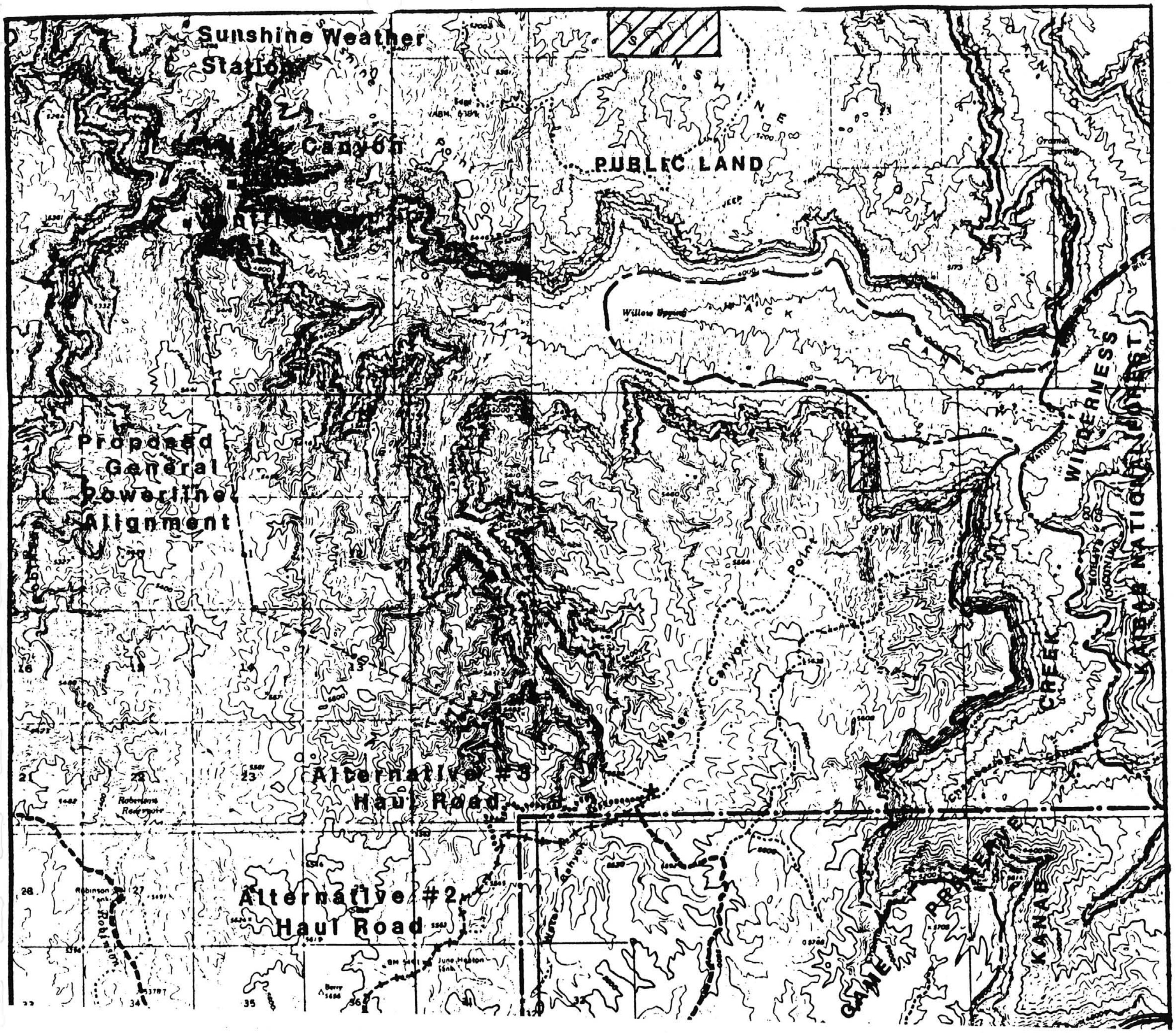
Arizona Department of Transportation

State Historical Preservation Officer

Arizona Game and Fish Dept.

APPENDIX

Appendix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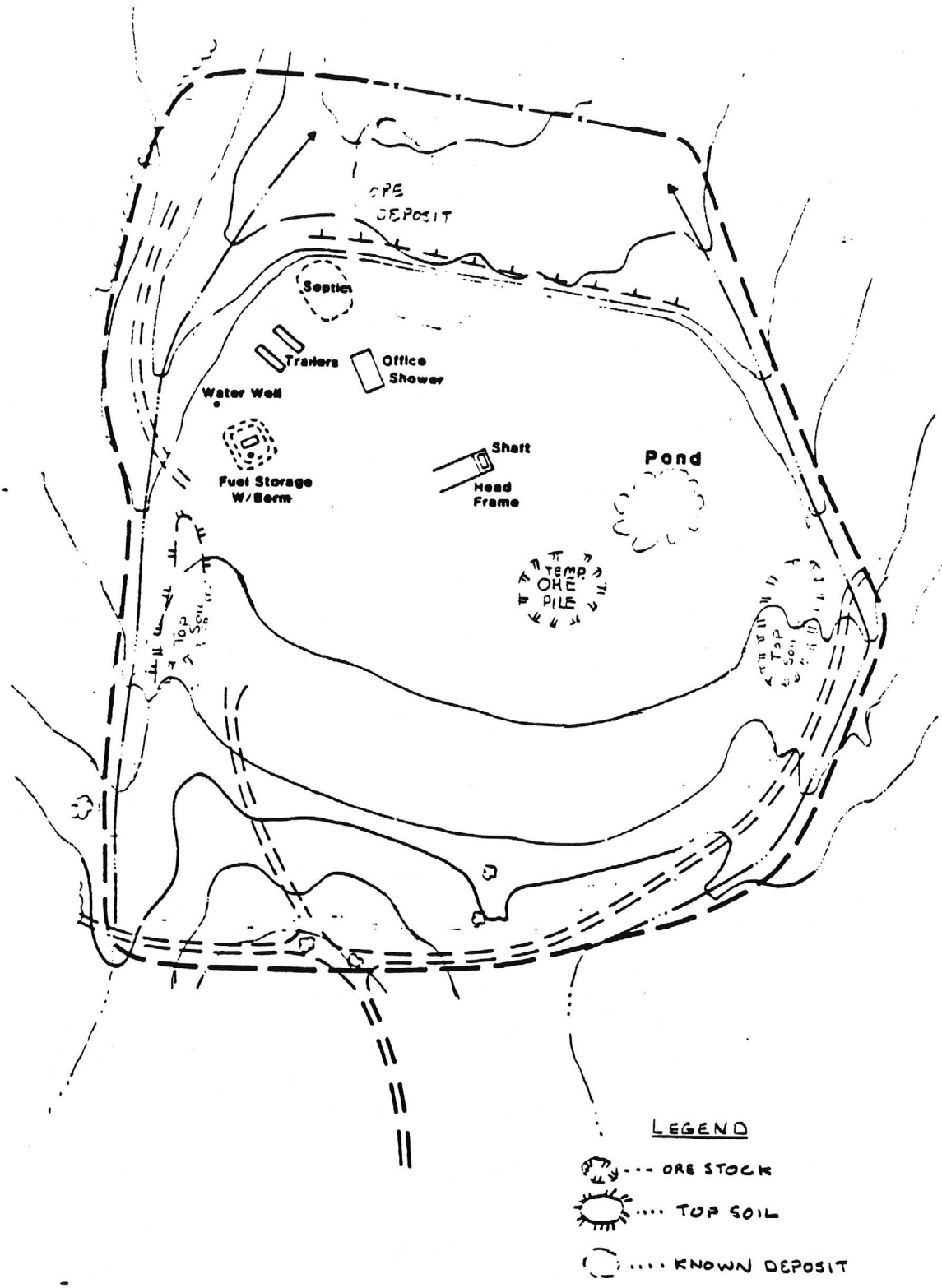
Station
Canyon
PUBLIC LAND
Proposed
General
Powerline
Alignment
Alternative #3
Haul Road
Alternative #2
Haul Road
WILDERNESS
CREEK
KANAB
GAME

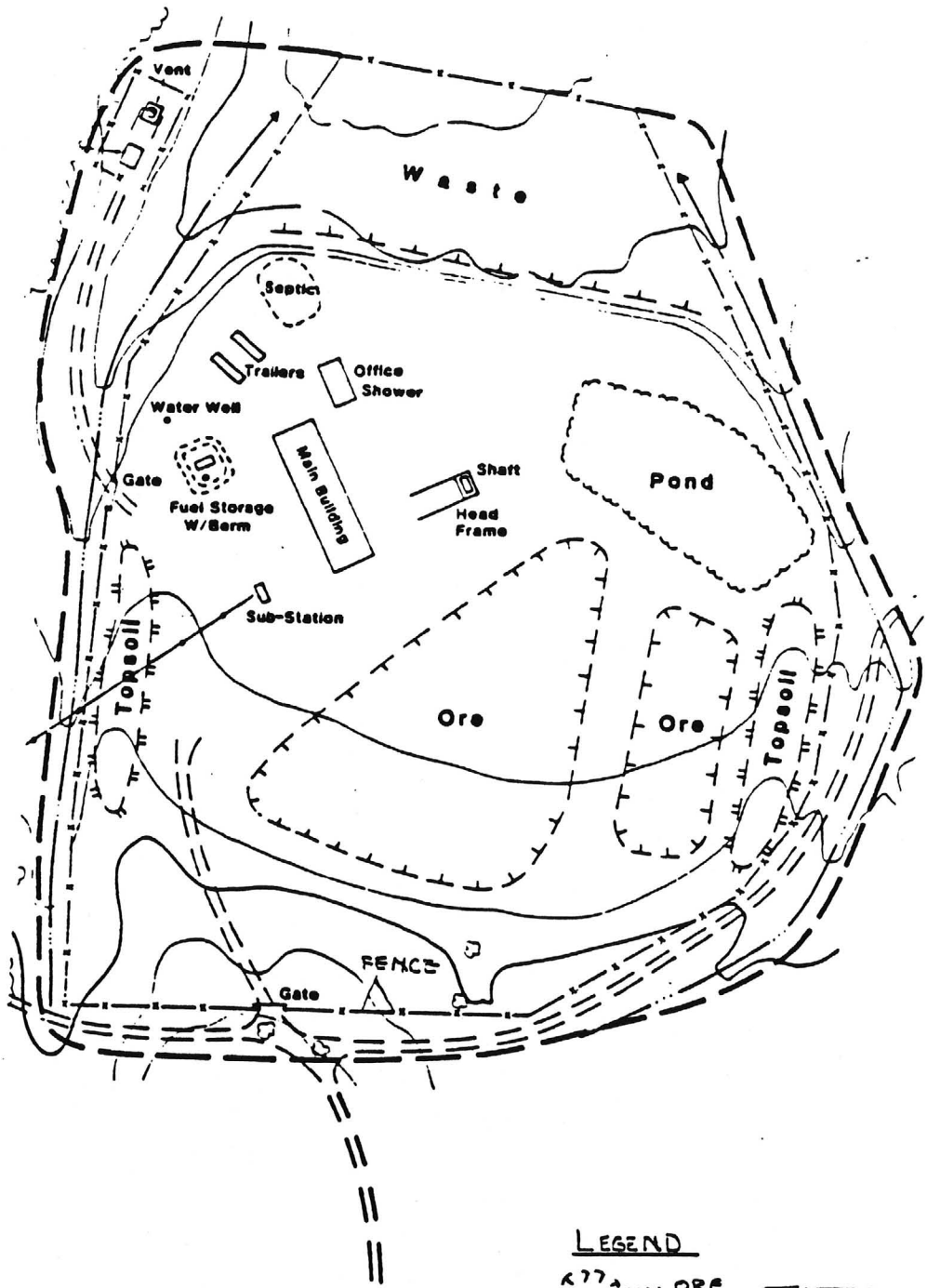


PHASE ONE
PROJECT AREA

PROJECT **Pinenut**

AS-010-84-75 P(A)

PLATE TWO

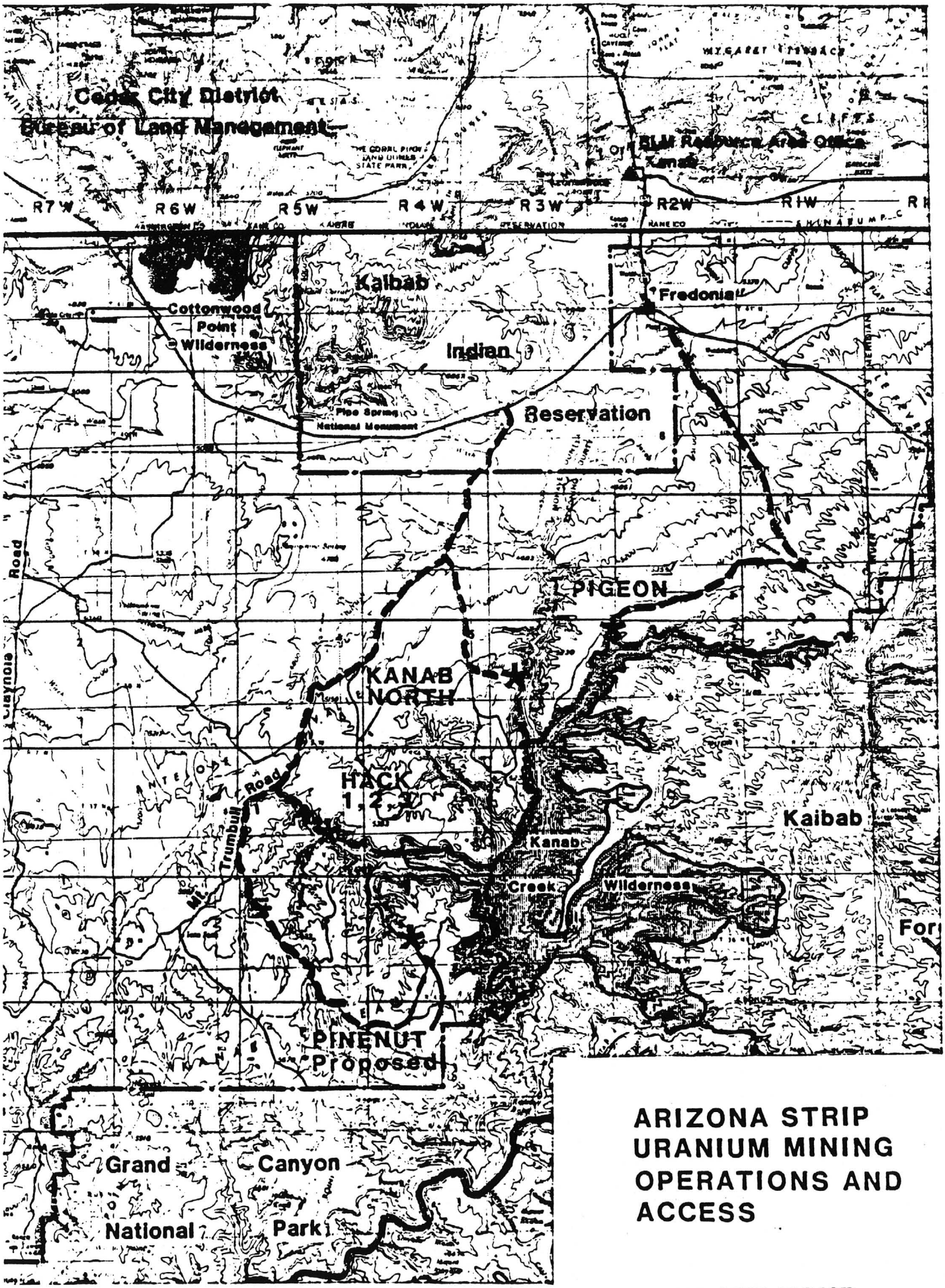


PHASE TWO
PROJECT
AREA

PLATE THREE

PROJECT **Pinenut**

AS-010-84-75 P(A) DATE 11.



ARIZONA STRIP URANIUM MINING OPERATIONS AND ACCESS

PLATE FOUR

URANIUM MINING RADIATION REGULATIONS

The pertinent regulations which govern the radiological aspects of uranium mining operation are summarized here.

Note: CFR = Code of Federal Regulations

30 CFR 57 Mine Safety and Health Administration

No Uranium miner permitted to receive more than 4 WLM/year.

Records kept on all miners where concentrations of radon daughters are in excess of 0.3 WL.

Respirators required when levels exceed 1 WL.

Additional protection against radon gas itself required when radon daughter concentrations exceed 10 WL.

If gamma radiation levels exceed 2 mrem/hr, dosimeters must be worn and records kept. Limit of 5 rems/yr.

Note: The regulations apply only to uranium mining activities. They do not apply to other underground mining operations or other possible sources of enhanced radiation such as energy efficient buildings.

U.S. EPA National Interim Primary Drinking Water Standards (1976)

If gross alpha particle activity in water is greater than 5 pCi/L, perform Ra-226 analysis. If Ra-226 analysis greater than 3 pCi/L, perform Ra-228 analysis. There are other regulations if gross alpha exceeds 15 pCi/L or gross beta activity exceeds 50 pCi/L.

40 CFR 61 Environmental Protection Agency

Subpart B---National Emission Standard for Radon-222 Emissions from Underground Uranium Mines.

Governs the positioning of bulkheads to reduce radon releases from areas of inactivity within the mine.

49 CFR Transportation

Governs proper containers and methods for transporting ore from mine to mill.

Species List/Arizona Strip

Information in this species list was compiled by Wildlife Biologists of the Arizona Strip District of BLM from published literature, research contracts and field data.

This list contains columnar data which describes: (1) a species abundance relative to another species, and (2) the most preferred habitat.

Abundance:
- A = Abundant
- C = Common
- U = Uncommon
- R = Rare
- L = Local
- S = Spotty
- N = No Record

Species	Abundance	Habitat Preference			
		Grass	Sagebrush	P-J	Shrub
Desert Shrew	S/R	X			
Yuma Myotis	U	X	X	X	X
California Myotis	C			X	X
Big Brown Bat	C			X	
Mexican Big Bat	R	X			
Pallid Bat	A	X	X	X	
Silverhaired Bat	R			X	
Spotted Bat	L/R			X	
Desert Cottontail	C	X	X	X	X
Jack Rabbit	A	X	X	X	X
Antelope Squirrel	A	X	X	X	
Rock Squirrel	C	X	X	X	X
Gopher, Commo	C	X	X	X	
Little Pocket Mouse	C	X			X
Great Basin Pocket Mouse	C	X	X	X	X
Desert Pocket Mouse	C		X	X	
Ord's Kangaroo Rat	A	X	X	X	
Merriam's Kangaroo Rat	C	X	X		X
Canyon Mouse	C		X		X
Deer Mouse	A	X	X	X	
Woodrat	A	X	X	X	X
Coyote	A	X	X	X	X
Kitfox	U		X		X
Grey fox	C	X	X	X	
Gadger	C	X	X	X	X
Spotted Skunk	U	X	X	X	
Mt. Lion	U			X	
Mule Deer	C	X	X	X	
Desert Bighorn	LR		X	X	

Species List

Abundance

A = Abundant
C = Common
U = Uncommon
R = Rare

L = Local
S = Spotty
I = Isolated
N = No record/may occur

Resident

S = Summer
W = Winter (migratory, not residential
P = Permanent
T = Transient

Vultures, Hawks, Falcons

	Abundance	Grassland	Sagebrush	PJ	Scrub
Turkey Vulture	P	X	X	X	X
Goshawk	R			X	
Sharp shinned hawk	R			X	
Coopers hawk	U			X	
Marsh hawk	U	X	X	X	X
Rough legged	C	X	X	X	X
Furriginous	R	X	X	X	
Red tail	C	X	X	X	
Swainoons	R	X			X
Golden Eagle	C	X	X	X	X
Prairie Falcon	Cliff near habitat				
Peregrine Falcon	Cliff near habitat				

Sensitive Candidate Plants on or near the Arizona Strip

Federal Register Dec. 15, 1980 - Table 3

The Bureau is allowed to take no actions that could possibly affect these species or jeopordize thier existance. Nor can any action take place that would necessitate them becomming classified as endangered.

Aquilegia desertorum	Ranunculaceae
Arctomecon californica	Papaveroceae
Arctomecon humilis	Papeveroceae
Argemone arizonica	Papeveroceae
Astragalus ampullarius	Fabaceae
Astragalus cremnophylax	Fabaceae
Astragalus geyeri var. triguetrus	Fabaceae
Astragalus lentiginosus var. ambiguus	Fabaceae
Astragalus striatiflorus	Fabaceae
Camissonia confertiflora	Onegraceae
Camissonia exilis	Onegraceae
Camissonia megalantha	Onegraceae
Camissonia specuicola ssp hesperia	Onegraceae
Camissonia specuicola ssp specuicola	Onegraceae
Carex curatorum	Cyperaceae
Costilleja kaibabersis	Scrophulariacae
Clematis hirsutissima var. arizonica	Ranunculaccoe
Coryphantha missouriensis	Cactaceae
Coryphantha vivipara var. rosea	Cactaceae
Crossosoma parviflorum	Crossosomatoccae
Crypthantha atwsodii	Baraginoccae
Crypthantha semiglabra	Baraginoccae
Draba asprella var. zionensis	Baraginoccae
Draba asprella var. kaibabensis	Baraginoccae
Encelia frutescens var. resinosa	Baraginoccae
Eriogonum heermanii var. subracemosum	Polygonaceae
Eriogonum mortonianum	Polygonaceae
Eriogonum thompsonae var. atwoodii	Polygonaceae
Eriogonum viscidulum	Polygonaceae
Eriogonum zionis var. coccineum	polygonaceae
Flaveria macdougalii	Asteraceae
Fraxinum cuspidata var. macripetala	Oleaceae
Haplopappus cervinus	Asteraceae
Haplopappus salicinus	Asteraceae
Machaeranthera mucronata	Asteraceae
Opuntia basilaris var. longiareolata	Cactaceae
Opuntia whipplei var. multigeniculata	Cactaceae
Pediocactus paradinei	Cactaceae
Pediocactus peeblesianus var. fickeiseniae	Cactaceae
Penstemon virgatus ssp. pseudoputus	Scrophulariacae
Phacelia cephalotes	Hydrophyllaceae
Phacelia filiformis	Hydrophyllaceae
Primula hunnewellii	Primulaceae
Psoraelea epipsila	Fabaceoe
Rosa stellata	Rosaceae
Townsendia smithii	Asteroceae
Phacelia anelsonii	Hydrosphyllaceae