White Pine Power Project

DRAFT ENVIRONMENTAL IMPACT STATEMENT

U.S. Department of the Interior
Bureau of Land Management

White Pine County, Nevada

DRAFT
Environmental Impact Statement

WHITE PINE POWER PROJECT

1500 Megawatt Coal-Fueled Generating Facility
White Pine County, Nevada

Prepared by:

U.S. Department of the Interior
Bureau of Land Management
Nevada State Office
Reno, Nevada

Edward F. Spang
State Director, Nevada

SUMMARY

[X] DRAFT ENVIRONMENTAL IMPACT STATEMENT [ ] FINAL ENVIRONMENTAL IMPACT STATEMENT

Department of the Interior
Bureau of Land Management
Nevada State Office

1. Type of Action: [X] Administrative [ ] Legislative

2. Brief Description of Action:

White Pine County, Nevada Power Company, and Sierra Pacific Power Company propose to construct a 1500 megawatt coal-fueled, steam-electric generating facility in White Pine County, Nevada. The site is on 2250 acres of land currently administered by the Bureau of Land Management. The power transmission system will connect the facility with an existing station in northern Nevada by a 230,000 volt transmission line and with an existing station in southern Nevada by two 500,000 volt transmission lines. The water supply system will deliver water from well fields in White Pine County in buried pipelines to the site. The coal transportation system will deliver coal from mines in Utah, Colorado and/or Wyoming over existing, upgraded, and new railroad to the site.

3. Summary of Environmental Impacts:

Environmental impacts will occur on earth resources, air resources, water resources, ecological resources, cultural and paleontological resources, visual resources, and socioeconomics. Mitigative measures are available to reduce most impacts to insignificant levels. Long-term resource commitments include up to 25,000 acre-feet per year of water. Irreversible commitments include the burning of approximately 140 million tons of coal.

4. Alternatives Considered:

Site alternatives, project alternatives, power transmission system alternatives, water supply system alternatives, and coal transportation system alternatives were considered as means of meeting project objectives.

5. Comments Requested from the Following: See list in Chapter 5.

6. Date of Availability to Environmental Protection Agency and Public:

Draft Environmental Impact Statement: OCT 20 1983

SUMMARY

The White Pine Power Project (WPPP) is a proposed 1500 megawatt coal-fueled steam-electric generating facility to be located in White Pine County, Nevada. The project will be jointly owned by White Pine County, Nevada Power Company, and Sierra Pacific Power Company. Participants in the electrical output of the project (and their percentage entitlement share of electrical output) include the following eight Nevada entities and six California municipalities:

- <u>Nevada Entities</u> (49 percent)

  Boulder City (2.5 percent)
  Lincoln County Power District No. 1 (2.53 percent)
  Mt. Wheeler Power, Inc. (3.0 percent)
  Nevada Power Company (25.0 percent)
  Overton Power District No. 5 (2.53 percent)
  Sierra Pacific Power Company (10.0 percent)
  Valley Electric Association (2.44 percent)
  Wells Rural Electric Company (1.0 percent)

- <u>California Municipalities</u> (51 percent)

  Anaheim (3.621 percent)
  Burbank (1.938 percent)
  Glendale (1.836 percent)
  Los Angeles (39.117 percent)
  Pasadena (1.836 percent)
  Riverside (2.652 percent)

Because the proposed action consists of applications for use of federal lands, a Draft Environmental Impact Statement was prepared to assess the probable impacts from construction and operation of WPPP. The Final Environmental

Impact Statement and other available information will be utilized by the Bureau of Land Management to determine whether or not the project should be granted rights-of-way to use lands currently under federal jurisdiction.

NEED FOR THE PROJECT

The primary objectives of WPPP are:

- o Provide capacity and energy as an integral part of generation resource planning thereby reducing the dependency on foreign oil and natural gas fuels.

- o Provide economic development and diversification of industry in White Pine County thereby alleviating significant unemployment conditions.

For the Nevada participants, projections for 1982 through 1989 indicate that peak demand and energy annual growth will average about 3.8 percent and 3.3 percent, respectively. From 1989 through the year 2000, when WPPP is in operation, both peak demand and energy annual growth are projected to average about 2.8 percent. Total peak demand growth in the latter period will be 1505 megawatts. Combined reserve margins (that is, additional capacity required in order to maintain system reliability) in the year 2000 would be 13 percent with WPPP and a negative one percent without WPPP.

For the California participants, projections for 1982 through 1989 indicate that peak demand and energy annual growth will average about 1.6 percent and 1.5 percent, respectively. From 1989 through the year 2000, both peak demand and energy annual growth are projected to average about 1.8 percent. Total peak demand growth in the latter period will

be 2155 megawatts. Combined reserve margins in the year 2000 would be 13 percent with WPPP and 5 percent without WPPP.

Under the County Economic Development Revenue Bond Law (a provision of Nevada statutes), White Pine County can finance a power plant in order to enhance economic development. Since April 1978, the Kennecott copper mines in White Pine County have been closed. In addition, the Kennecott copper smelter in McGill has operated intermittently and is currently closed. WPPP would provide economic recovery from the downturn caused by the closure of the copper mines and reduced smelter operation. WPPP would also help diversify the local economy.

DESCRIPTION OF THE PROJECT

The location of the WPPP Generating Station and major lineal facilities is shown on the Study Area map located in the map pocket. The preferred site for the WPPP Generating Station is the North Steptoe Valley Site on 2250 acres of federal land in Steptoe Valley approximately 48 miles north of the City of Ely. WPPP includes four major systems.

The power generation system consists of two nominal 750 megawatt net coal-fueled steam-electric generating units. Major components of the power generation system are the steam turbine generators, steam generators, air quality control equipment, plant cooling facilities, waste management facilities, and coal handling facilities.

The power transmission system consists of the Southern Transmission System and the Northern Transmission System, each of which includes transmission lines, access roads, stations, and a microwave or communication system. The Northern Transmission System will connect WPPP to the existing

Machacek Substation (near Eureka, Nevada) by a new 230,000 volt alternating current transmission line. The Southern Transmission System will connect WPPP with the existing McCullough Switching Station (near Las Vegas, Nevada) by two new 500,000 volt alternating current transmission lines.

The water supply system consists of well fields, buried pipelines with pumping stations, and a storage reservoir located on the site. For the preferred site, the estimated maximum annual water demand of 25,000 acre-feet per year will come from well fields in Steptoe Valley. The Nevada State Engineer granted water permits on August 17, 1983.

Approximately 140 million tons of coal will be required over the life of WPPP. The coal will come from existing and future coal mines in Utah, Wyoming, and Colorado and will be transported over existing mainline railroad systems to Cobre or Shafter in northern Nevada. New and upgraded railroads will be required from these "gateways" to the site. In addition to new and upgraded rail trackage, the coal transportation system includes rolling stock for unit train operation, and facilities for maintenance and repair of the rolling stock.

ALTERNATIVES TO THE PROJECT

A nine-month site selection study was conducted to select the preferred and alternative sites. Two-mile-wide study corridors were also selected for the transmission lines and railroad. (Actual right-of-way requirements will be 330 feet for the two 500,000 volt transmission lines, 200 feet for the 230,000 volt transmission lines, and 100 to 200 feet for the railroad.) In addition, alternative sources of generation were investigated.

Site Alternatives

The study region for the site selection study was defined as the area within White Pine County (approximately 8905 square miles). Exclusion criteria were applied to screen out areas in which it would not be possible to site a power plant because of environmental and/or engineering constraints. A commuting time criterion was applied to the remaining areas to keep potential sites within a distance from existing population centers that would maximize the economic benefits to those centers and also attract plant personnel. This ultimately resulted in the identification of 25 candidate sites of ten square miles each.

The candidate sites were evaluated and ranked by comparing environmental impacts and economic costs. Highly suitable sites were then evaluated for licensability, and three alternative sites were selected. Based on a final comparison of environmental impacts and economic costs, the North Steptoe Valley Site was designated as the preferred site and the Butte Valley Site and Spring Valley Site were designated as alternatives to the preferred site.

Project Alternatives

Based on current forecasts, the WPPP participants need to obtain about 1630 megawatts of new base load capacity by 1995 in order to assure a reserve margin that will maintain system reliability. Table 1 includes alternatives to WPPP capacity and energy that were investigated along with a brief discussion of their ability to achieve the primary objectives of WPPP. None were feasible alternatives to WPPP either because they are not technically or economically feasible, or because they would not be available in the time-frame required for WPPP. Without WPPP (the no project

alternative), reserve margins would be reduced to levels that could impact system reliability in both California and Nevada. This could result in regulatory agencies enforcing mandatory conservation measures. In addition, the economic benefit to White Pine County would disappear if WPPP were not constructed.

ENVIRONMENTAL SETTING

White Pine County is situated within a region characterized by structurally elevated north-south trending mountain ranges separated by deeply alluviated valleys. Maximum elevations in the ranges vary from 7000 feet to 13,063 feet at Wheeler Peak. The elevations of the valley floors average from 5500 to 6500 feet. The landscape is characterized by open country, without dense vegetation or manmade development, that lends itself to wide and scenic vistas.

Local climate is influenced by the interior location, regional weather systems, and the north-south topographic orientation. The climate of White Pine County is semi-desert, characterized by aridness, clear skies, and wide daily ranges in temperature. Surface winds channeled by valleys are predominantly southerly or northerly. A significant amount of annual precipitation occurs in the form of snow during the winter months. In areas of high snowfall, snowmelt accounts for most of the surface water runoff and groundwater recharge. Current water use does not exceed perennial yield and no groundwater basins in White Pine County are being depleted.

The soils of White Pine County generally support sagebrush and shadscale communities which are characteristic of the valley floors. Pinyon-juniper woodland occurs at higher elevations. Terrestrial wildlife species in the area

are characteristic of the local habitat, and include pronghorn, mule deer, wild horses, ferruginous hawks, golden eagles, sage grouse, and rattlesnakes. Aquatic species occurring in small streams and reservoirs include relict dace, cutthroat trout, and rainbow trout. Three threatened and endangered species (Pahrump killifish, Peregrine falcon, and bald eagle) have been observed in the area.

The pre-history of White Pine County includes settlements associated with the earliest evidence of human presence in the Great Basin. Later inhabitants were forebearers of the modern Shoshoni. Caucasians first entered the area during the 19th century. Permanent settlements began when mining and agriculture became the most significant industries in White Pine County.

White Pine County is currently in a social and economic transition due to the closure of the copper mines. Population has declined over 20 percent since 1970 and current leading employment sectors are government, trade, and service industries. Most of the housing was constructed before 1940 and could be marginally habitable. Local services have supported larger populations but some parts of the established infrastructure are in need of repair or replacement. The quality of life in White Pine County has historically been high although the satisfaction with life component is currently deteriorating due to economic conditions.

ENVIRONMENTAL CONSEQUENCES AND MITIGATION

Baseline data were gathered and environmental impacts were evaluated in the following areas:

- o Earth resources
- o Air resources

- o Water resources
- o Ecological resources
- o Cultural resources
- o Visual resources
- o Socioeconomics

The application of mitigative measures will reduce most environmental impacts to insignificant levels. These impacts are summarized in Table 2.

Earth Resources

Proper design of WPPP facilities will minimize erosion potential. Subsidence due to groundwater withdrawal will be minimal and localized around well fields.

Air Resources

Air emissions from the WPPP Generating Station will be below allowable federal and state levels. In addition, there is a potential for a net positive benefit if the White Pine County Air Proposal (which is a part of the application to the Environmental Protection Agency for a construction permit) is implemented. Under the proposal, improvement in air quality would result from the contribution of savings, due to reduced sulfur dioxide emission control levels at the WPPP Generating Station, to the financing of a sulfur dioxide reduction program at the McGill smelter. This would produce an air quality improvement by reducing three pounds of sulfur dioxide emission from the McGill smelter for each pound of sulfur dioxide emission from the WPPP Generating Station.

Water Resources

The primary impacts on water resources will result from groundwater withdrawals to meet WPPP water requirements.

(Potential impacts to groundwater quality will be mitigated by project facilities being designed for "zero liquid discharge.") As a part of the water permits, WPPP will continue to participate in a groundwater and surface water monitoring program. The purpose of the program is to establish baseline data for current seasonal groundwater level fluctuations. The information from the monitoring program will be used to identify impacts before they become significant in order to apply the appropriate mitigative measure.

Ecological Resources

Impacts on ecological resources from groundwater withdrawals will also be mitigated as a part of the groundwater monitoring program. However, construction of WPPP facilities will remove soils, vegetation, and habitat from production. In addition, secondary impacts could result from increased human activity in the area. Potential impacts to threatened and endangered species or candidate species are being evaluated by the U.S. Fish and Wildlife Service as a part of its biological assessment required by federal legislation.

Cultural Resources

Mitigative measures associated with cultural resource impacts will be included in a Memorandum of Agreement which is currently being prepared. This will be an agreement with the Advisory Council on Historic Preservation that will serve as the focus for all cultural resource mitigation activities. When mitigation is required, its scope will be determined through negotiation as described in the Memorandum of Agreement. Paleontological resources and sites of concern to Native Americans will be managed in a similar manner.

Visual Resources

The introduction of WPPP will add new elements to the existing landscape, with potential to alter the aesthetics or visual character of the region. For the most part, the WPPP facilties will be prominent and mitigation will be limited to architectural design that will reduce contrast. Careful grading and landscaping can also be employed to shield the less prominent facilities.

Socioeconomics

Construction and operation of WPPP will affect the lives and interests of many people, including White Pine County residents, transient workers in-migrating from other areas, and visitors passing through White Pine County. The socioeconomic impacts will result primarily from new workers and new spending in White Pine County. Direct employment by WPPP will total 2345 persons during the peak year of construction and 530 persons during the operation period. At the peak of construction, the total population of White Pine County will be nearly 50 percent more than its projected level without WPPP.

The increased population will place an increased demand on housing, education, law enforcement, fire protection, health services, social services, transportation, water and sewer systems, local and outdoor recreation, and agriculture. There could also be impacts to various areas assocated with the quality of life as perceived by local residents.

In order to assess the socioeconomic impact of WPPP and establish the necessary mitigation strategies to alleviate the adverse impacts, a community development program was instituted that included the participation by local residents

over a two-year period. The community development program resulted in the preparation of an Impact Alleviation Plan.

The Impact Alleviation Plan will offset the financial demands that WPPP will place on the population of White Pine County. The plan is in the form of an agreement between WPPP and impacted entities and establishes a detailed process which was used to identify anticipated impacts and which can be used to negotiate and resolve future impacts.

CONCLUSION

In exchange for short-term and long-term impacts, electrical energy will be available to consumers in Nevada and California. Generation of electricity from coal will help conserve other fossil fuels. In addition to energy, employment and economic benefits will accrue to White Pine County as a result of the construction and operation of WPPP.

Table 1

Summary of WPPP Alternatives

	Objective	
Alternative	Economic Development in White Pine County	Capacity and Energy to WPPP Participants
1. Nongeneration Sources o Purchase of Capacity and Energy o Conservation	Does not provide economic development.	Significant amounts of power are not available for purchase. Conservation has occurred and future conservation is already part of load forecasts. New generation is required to replace older fossil-fired units.
2. Existing Resources o Repowering or Upgrading o Postponed Retirement o Alternate Base Load Operation	No large generation units exist in the county.	Changes would primarily occur in existing older oil and gas units which should be replaced. Delays in units scheduled for retirement are included in resource plans.
3. Developed Resources o Hydroelectric Generating Facilities o Gas/Oil-Fired Generating Facilities o Nuclear Power Plants o Cogeneration	No major hydroelectric sites in the county. Other facilities could provide economic development.	No major hydroelectric sites are economically available for development. Gas and oil are not reliable long-term fuels for electric utilities. Nuclear power is feasible but uncertain at this time. Cogeneration is included in resource plans.
4. Developing Resources o Geothermal Energy o Solar Energy Conversion o Wind Energy Conversion o Solid Waste Energy Conversion o Coal Energy Conversion	Minimal resources exist in the county. Some economic development could be provided.	Feasible geothermal resources are included in resource plans. Other resources represent a diffuse energy source usually not compatible with base load generation. Large-scale technologies have not been demonstrated and the economics of present demonstration plants preclude their large-scale use.

Table 2

Summary of WPPP Impacts

	Butte Valley Site	North Steptoe Valley Site	Spring Valley Site	Power Transmission System	Water Supply System	Coal Transportation System
Earth Resources	Soil compaction during construction and modification of existing drainages could increase the potential for erosion.			Soil compaction and modification of existing drainages could increase the potential for erosion.	Groundwater withdrawal could cause minor subsidence in the vicinity of the well fields.	Soil compaction and modification of existing drainages could increase the potential for erosion.
Air Resources	Implementation of the White Pine County Air Proposal will result in a net air quality improvement in White Pine County.			NA	NA	NA
Water Resources	Solid waste disposal could impact groundwater quality.			NA	Groundwater withdrawals will lower water table.	NA
Ecological Resources	Construction of facilities will remove soil and vegetation on the site, thereby reducing wildlife and livestock forage and habitat. The potential exists for invasion by weedy species in disturbed areas near the site. Construction activities and human encroachment will impact wildlife and aquatic habitats, including areas with sensitive species. Potential impact to threatened and endangered species.			Construction of towers and access roads wil remove soil and vegetation. Potential impacts to raptors due to collision with facilities.	Potential for impacts to wetlands and sensitive aquatic habitat from groundwater withdrawal near well fields. Potential for change in vegetation from lower water table.	Construction of the railroad will remove soil and vegetation. Minor impacts to wildlife habitat.
Cultural and Paleontological Resources	High potential for inadvertent impacts to cultural resource sites.	Moderate potential for inadvertent impacts to cultural resource sites.	Moderate potential for inadvertent impacts to cultural resource sites.	Potential for inadvertent impacts in several corridor segments that cross areas with high potential for cultural resource sites and fossil-bearing deposits.	Potential for inadvertent impacts to cultural resource sites in Steptoe Valley.	Potential for inadvertent impacts to cultural resource sites in Steptoe Valley and Spring Valley.
Visual Resources	Generating Station will have a visual impact of moderate significance.		Generating Station will have a visual impact of moderate to high significance.	Highest visual impacts where transmission line is adjacent to highways.	Low visual impacts.	Low visual impacts except at higher elevations.
Socioeconomics	The County will experience a 47 percent increase in population during peak construction and a 13 percent increase in population during operation. Additional population could impact local services not included in the Impact Alleviation Plan. Increased human activity could impact dispersed recreation. Impacts to agricultural community will result from removal of grazing land.			NA	NA	Impacts to the agricultural community will result from removal of grazing land and interference with ranching activities.

NA = Not applicable.

TABLE OF CONTENTS

Page

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF TABLES (continued)

LIST OF FIGURES

LIST OF FIGURES (continued)

LIST OF FIGURES (continued)

LIST OF FIGURES (continued)

LIST OF FIGURES (continued)

1.0 PURPOSE AND NEED FOR ACTION

The purpose of this chapter is to present information on the purpose and need for the proposed action, the White Pine Power Project (WPPP). A brief history of WPPP, as well as a summary of the scoping process that preceded the preparation of this Environmental Impact Statement (EIS), are also included.

1.1 HISTORY OF THE PROJECT

In early March 1978, representatives of the Los Angeles Department of Water and Power (LADWP) were contacted by business leaders from Ely, Nevada, regarding the possibility of siting a coal or nuclear power plant in the Steptoe Valley of White Pine County (County), Nevada (Figure 1-1). A formal presentation by County representatives was made on March 20, 1978, to LADWP and other southern California municipalities. The basis of the presentation was a report prepared for Kennecott Copper Corporation (Kennecott) in September 1977, which made a preliminary evaluation of siting a nuclear power plant in Steptoe Valley.

Kennecott's role in the siting effort resulted from its concern over the impact on the Ely area should the local copper mines be forced to close. Over the years, the fortunes of Kennecott and the County have been tied to the price of copper on the world market. In February 1976, the open pit copper mines near Ruth were shut down for ten months. Mine operation was closed down again in April 1978. At the present time, ore production is marginal and it is not known if the mines will reopen. In addition, the Kennecott copper smelter in McGill, Nevada (McGill smelter) has been operated intermittently during 1982 and 1983, and is currently closed.

The Kennecott report concluded that up to 6000 megawatts (MW) of electric generation could be supported from local water supplies in Steptoe Valley. A power plant would also help diversify the local economy.

After reviewing the 1977 report, representatives from LADWP met with political and business leaders in the County in April 1978 to discuss a proposed coal-fueled power plant. It was agreed that certain preliminary studies would be required before proceeding further. In August 1978, LADWP and the County entered into a formal agreement to undertake these preliminary studies. By October 1978, 14 utilities in California and Nevada had expressed interest in WPPP and subsequently agreed to share in the funding for the studies.

In addition to the studies, changes were also required in Nevada statutes. Under the County Economic Development Revenue Bond Law, Nevada counties can issue revenue bonds for the construction of facilities which would enhance the economic development of that particular county. In order to allow the County to finance a power plant, amendments were submitted during the 1979 legislative session. These amendments, which were signed into law in May 1979, approve of a generating facility in the County up to a nominal rating of 1500 MW.

The preliminary studies, which covered air quality, water availability, biological sensitivity, and socioeconomics, were completed during summer 1979. The studies favorably concluded that there were a number of potential 1500 MW power plant sites in the County.

In October 1979, negotiations were begun for project agreements to provide short-term financing to fund siting and feasibility studies and to begin the local, state, and federal regulatory approval process. A Power Supply Development Agreement and a Development Work Agreement between the County and others were approved in October 1980. Under these agreements, LADWP is the Development Manager and is responsible for carrying out all planning studies, surveys, estimates, and other activities necessary to secure regulatory approvals and meet environmental procedural requirements. The Development Work period was estimated to take approximately 42 months and includes the preparation of the EIS.

1.2 NEED FOR THE PROJECT

As currently proposed, WPPP will be jointly owned by the County (81.33 percent), Nevada Power Company (NPC) (13.34 percent), and Sierra Pacific Power Company (SPPC) (5.33 percent). The proposed WPPP participants and their percent entitlement share of the project output are listed in Table 1-1. LADWP is the Development Manager and the Construction Manager. NPC will be the Operation Manager.

1.2.1 Objectives

The primary objectives of WPPP are:

- Provide capacity and energy as an integral part of generation resource planning thereby reducing the dependency on foreign oil and natural gas fuels.

- Provide economic development and diversification of industry in the County thereby alleviating significant unemployment conditions.

1.2.2 Need for Power

The amount of new generation required is determined through electric load forecasting. Resource planning is used to determine the amounts and types of resources required to meet projected electric loads, both reliably and economically. Both the estimated peak load and the energy requirement play an important role in making this determination.

Concern about rate of growth, effects on the environment, and the capability to site, finance, and construct generating facilities has resulted in utilities continuously improving electric load forecasting methods and obtaining a better understanding of the causes of load growth. The WPPP participants share this concern. Studies are conducted to assess the impact on electric loads by such factors as solar heating and cooling systems, cost of electricity and utility rate structures, energy conservation, and expected shortages of natural gas. However, uncertainties in forecasting still exist no matter how much data are collected or how sophisticated the approaches used may be.

Each of the participants has developed specific methods and techniques for forecasting electric loads in its service area. The current electric load forecasts of the WPPP participants for peak demand and energy are listed in Table 1-2 through Table 1-5. These tables also list actual growth since 1970.

For the Nevada participants, historical (1970-1982) peak demand and energy annual growth has averaged about 6.5 percent and 5.7 percent, respectively. Projections for 1982 through 1989 indicate that peak demand and energy annual growth will average about 3.8 percent and 3.3 percent, respectively. From 1989 through the year 2000, when WPPP is in operation, both peak demand and energy annual growth is projected to average about 2.8 percent.

For the California participants, historical (1970-1982) peak demand and energy annual growth has averaged about

3.1 percent and 1.7 percent, respectively. Projections for 1982 through 1989 indicate that peak demand and energy annual growth will average about 1.6 percent and 1.5 percent, respectively. From 1989 through the year 2000, when WPPP is in operation, both peak demand and energy annual growth is projected to average about 1.8 percent.

In order to supply reliable electric service, sufficient generating capacity must be planned to provide adequate reserve margins. The reserve margin is the difference between the total anticipated generating resources and the expected peak demand. Electric utilities require a 15 percent to 25 percent active reserve margin in order to maintain ystem reliability. Table 1-6 lists the actual and projected reserve margins at time of peak demand for the WPPP participants. The table includes WPPP in the total capability of the participants.

For the Nevada participants, the combined reserve margins are estimated to be about 16 percent in 1990, the first year of full WPPP operation. The combined reserve margins will decrease to about 13 percent in the year 2000.

For the California participants, the combined reserve margins are estimated to be about 23 percent in 1990, the first year of full WPPP operation. The combined reserve margins will decrease to about 13 percent in the year 2000.

1.3 SCOPING PROCESS

The U.S. Department of the Interior, Bureau of Land Management (BLM) issued a Notice of Intent to prepare the EIS in the February 4, 1982 issue of the Federal Register (47 FR 5360). Formal briefings for federal and state agencies were conducted on March 2, 1982 in Reno and Carson City, Nevada.

The following evening, a public scoping meeting was held in Ely, Nevada. Twelve persons presented public comments which were based primarily on socioeconomic impacts. In addition, written comments from two organizations, two federal agencies, and seven Nevada agencies were received during the 45-day scoping period. Comments received as a part of the scoping process have been incorporated into the preparation of the EIS.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The purpose of this chapter is to present information on the proposed action, as well as alternatives to the proposed action. The description of the project is based on the selection of the North Steptoe Valley Site as the preferred site as discussed in Section 2.2.2.3. Information in this chapter is summarized from the WPPP Feasibility Report.

The proposed action consists of application for use of federal lands required for WPPP. The purpose of this EIS is to assess the probable impacts from construction and operation of WPPP so that BLM can decide whether or not to grant WPPP right-of-way to use lands currently under BLM jurisdiction.

2.1 DESCRIPTION OF THE PROJECT

The term White Pine Power Project (WPPP) is used in two ways in the EIS. In the political sense, WPPP is the Project, defined under agreements with participants and owners, for which LADWP is the Development Manager and Construction Manager. In the physical sense as an electrical system, WPPP consists of a power generation system, a power transmission system, a water supply system, and a coal transportation system.

The power generation system includes most of the facilities that will be located on the WPPP site. When referring to the source of electrical power, the term WPPP Generating Station is used.

The power transmission system is composed of the Southern Transmission System and the Northern Transmission System, each of which includes transmission lines, access roads, stations, and a microwave system. The WPPP switchyard, which is on the site, is a part of the power generation system.

The water supply system includes the well fields and water conveyance pipeline. The water supply reservoir, which is on the site, is also a part of the water supply system.

The coal transportation system is composed of the Northern Transportation System (or the alternate Southern Transportation System), which includes new and upgraded railroad to the site. Railroad facilities on the site are a part of the power generation system. Existing railroads from coal sources to specified "gateways" are not a part of WPPP.

2.1.1 Power Generation System

The location of the 2250-acre North Steptoe Valley Site is shown on Figure 2-1. The site is located in the northern part of Steptoe Valley approximately 48 miles north of the City of Ely. This portion of the valley is bounded on the east by the Schell Creek Range and on the west by the Cherry Creek Range. The elevation of the site is approximately 5900 feet. The ground surface slopes to the northwest at average slopes of 2.5 percent in the southeastern portion of the site and flattens to less than 0.5 percent in the northwest corner of the site.

The power generation system consists of two nominal 750 MW net coal-fueled steam-electric generating units designed for base load duty with load cycling capability. Major components of the power generation system are the steam turbine generators, steam generators, air quality control equipment, plant cooling facilities, waste management facilities, and coal handling facilities. The site arrangement is shown on Figure 2-2.

The site arrangement provides adequate area for development of all ancillary facilities. The arrangement of the generating station, the cooling towers, and switchyard will provide: 1) logical construction and operation access; and 2) orientations which minimize effects of windblown particulates or drift. A prominent feature of the site layout is the coal unloading and storage area. Separate trackage spurs and loops are provided for delivery of construction and operation materials. Waste management areas have been located to minimize pumping and transportation costs. Space is provided for temporary construction facilities and staging and laydown areas. A landing strip for light utility-class jet aircraft and/or a helicopter landing area may be provided on the site.

2.1.1.1 Civil, Structural, and Architectural Systems

The site has sufficient land slope to provide for drainage around key facilities. Grading will be done to protect key areas. Drainage and flood protection can be accomplished by surface channels or ditches with culverts at road and railroad crossings. Non-contaminated site storm runoff from improved areas will be returned to natural drainage channels. Plant contaminated storm runoff will be collected and treated or evaporated.

Temporary construction facilities necessary for the construction of the power generation system and water supply system will be located at the site. The construction worker housing (CWH) facilities will consist of approximately 55 buildings and a recreational vehicle park.

Concrete batch plants on the site will provide concrete for construction. Potential borrow areas of construction material are shown on Figure 2-3. Additional information on construction material is included in Section 2.2.6.2.

The construction water system, supplied by two wells on or near the site, will provide an adequate and reliable source of construction water. Portions of the construction water system will be incorporated into the permanent service water systems. Diesel-driven generators will initially provide power for construction trailers and water well pumps. Subsequently, transmission lines from the local utility system to the site will be constructed. Initial communication will be provided by temporary rural radio telephone equipment followed by installation of a permanent telephone system.

The architectural design theme of the buildings and structures will blend with the surrounding areas of the site in order to achieve a pleasing appearance. Furnishings will harmonize with the style, materials, and colors of the building interiors. Rough textured concrete, fluted metal siding, earth tone colors, landscaping, and scale will be incorporated in the architectural design theme.

A rendering of the WPPP Generating Station is shown on Figure 2-4. Major buildings and structures are listed on the figure. The tallest structures are the two 750-foot-high acid-resistant reinforced concrete stacks. Each stack will be marked and lighted in accordance with Federal Aviation Administration (FAA) regulations.

Most landscaping will retain the existing flora of the site. A minimum amount of introduced vegetation will provide the transition from the natural environment to the newly constructed buildings.

Plant security will include fencing around the site boundary. Information on road access is included in Section 2.2.6.1.

2.1.1.2 Mechanical Systems

The WPPP Generating Station will be designed for two nominal 750 MW units with a common control room between the units. Identical equipment serving the same function will be used to insure equipment interchangeability.

Coal will be transported by unit trains to the site and unloaded into a subgrade hopper via automatic discharge bottom dump hopper cars. The coal handling system will: 1) receive and unload the coal; 2) stockpile, reclaim, and blend the coal; and 3) deliver coal to the steam generator coal silos.

The steam generator will be a pulverized coal-fired unit with a dry bottom furnace and will use a balanced draft, single reheat, drum-type design. It will generate approximately 5,900,000 pounds per hour of main steam at 2515 pounds per square inch gauge and 1005 degrees Fahrenheit (°F) for the turbine generator to produce 820 MW at 100 percent load. The maximum continuous rating (MCR) of the steam generator will be sufficient to meet the steam demand of the turbine generator at valves wide open and five percent overpressure. For design purposes, the estimated gross power output at MCR is 890 MW.

The steam piping systems will convey main and reheat steam between the steam generator and the turbine generator. Bleed steam will be extracted from the turbine to the feedwater heaters and boiler feed pump.

The turbine generator will be a tandem-compound unit and will consist of a single flow high pressure turbine, a double flow intermediate pressure turbine, and two or three double flow low pressure turbines. The net plant heat rate at 100 percent load will be approximately 10,000 British thermal units (Btu) per kilowatt-hour. Each turbine generator will be matched by a suitable sized steam generator.

The draft system will provide combustion air to the steam generator and remove the resultant flue gases for treatment in the air quality control system before discharge through the stack. The draft system will be a balanced draft system for each steam generator unit and will consist of two primary air fans, two forced draft fans, two primary air heaters, two secondary air heaters, and four induced draft fans.

The air quality control systems will control particulates (fly ash) and sulfur dioxide (SO_2) in the flue gas. Lime spray dryers and fabric filters will be used. A calciner may be located on the site to produce lime from limestone for the dry scrubber. Air quality improvement in the County could occur from implementation of the White Pine County Air Proposal, discussed in Section 4.1.2.2.

The ash handling systems will collect and remove bottom ash and economizer hopper ash from the steam generator, pulverizer rejects from the pulverizer, and dry fly ash and scrubber reaction products from the fabric filter and air heater outlet hoppers. The systems will also transport bottom ash, economizer hopper ash, and pulverizer rejects to the ash basin and transport fly ash and scrubber reaction products to the dry fly ash silo. All waste products will be disposed of on the site.

The boiler feedwater systems will condense the turbine exhaust system, purify and deaerate the feedwater, provide regenerative feedwater heating, and pump water to the steam generator. The circulating water system will transfer the heat rejected by the main condensers and the equipment cooling water heat exchangers to the atmosphere using mechanical draft wet cooling towers.

Input and output quantities associated with full load operation of the WPPP Generating Station are shown on Figure 2-5. These quantities are based on full load operation during peak summer months. The total economic life of each unit is 306,600 hours (35 years). During that time, each unit will operate 231,269 hours and will be inactive 75,331 hours. During the first 20 years of operation, the average capacity factor will be 68 percent.

2.1.1.3 Electrical Systems

The alternating current (ac) generator will be connected to a three-phase main transformer which will step up the generated voltage from 26 kilovolts (kv) to 500 kv. A high current generator breaker will be installed in the isolated phase bus between the generator terminals and the tap to the unit auxiliary transformer.

The auxiliaries power system will consist of two three-winding auxiliary transformers per unit at 26 kv - 6.8 kv - 4.16 kv three-phase which will be connected to the generator terminals by the isolated phase bus to provide normal operating and start-up power to the unit auxiliaries. Three voltage levels for the auxiliaries power system (6.9 kv, 4.16 kv, and 480 volts) will be used within the plant. Space will be provided within the plant for auxiliaries power system switchgear and secondary unit substation equipment.

The motor driven loads for each unit will be supplied from the unit auxiliary transformers with each of their 6.9 kv secondary windings connected to a large motor bus and the 4.16 kv secondary windings connected to a small motor bus.

The emergency power system will supply all loads required for safe shutdown of the units in the event of a loss of auxiliary power. The emergency power system will be composed of an emergency generator and switchgear, transfer system, direct current power systems, and uninterruptible power systems.

The lighting system will provide illumination of safe access to all plant and yard areas. Working areas will be lighted to provide maximum safety, working efficiency, and visual comfort for working personnel.

The communications system will include a dial telephone system, a public address system, an intercom system, and a radio page system. The intraplant system will cover the main plant, yard, switchrack, and coal unloading and handling areas. The plant telephone system will be connected to the local system for universal telephone service.

A plant grounding system will be provided to reduce shock hazard, protect equipment, and allow application of ground relay protection.

2.1.2 Power Transmission System

The power transmission system is composed of the Southern Transmission System and the Northern Transmission System, each of which includes transmission lines, access roads, stations, and a microwave or communication system. A schematic diagram of the power transmission system is shown on Figure 2-6.

The Northern Transmission System is that portion of the WPPP power transmission system which connects WPPP to the existing SPPC and Mt. Wheeler Power, Inc. transmission systems. The Northern Transmission System includes all of the facilities to deliver a combined total of 210 MW at 230 kv ac for SPPC, Mt. Wheeler Power, Inc., and Wells Rural Electric Company at the Machacek Substation near Eureka, Nevada.

The Southern Transmission System is that portion of the WPPP power transmission system that connects WPPP to the transmission systems of NPC and LADWP. The Southern Transmission System includes all of the facilities necessary to deliver a combined total of 1290 MW at 500 kv ac, for LADWP, the cities of Anaheim, Burbank, Glendale, Pasadena and Riverside, NPC, Boulder City, Lincoln County Power District No. 1, Overton Power District No. 5, and Valley Electric Association at the McCullough Switching Station.

2.1.2.1 Transmission Line Corridors

After evaluating all reasonable alternatives linking alternative WPPP sites to the participants' delivery points, two-mile-wide study corridors were selected. The study corridors associated with the North Steptoe Valley Site are shown on Figure 2-7. The figure also indicates the preferred corridor that has been selected for feasibility studies and environmental licensing.

The actual right-of-way requirements will depend on the voltage and the number of circuits in the right-of-way. Two 500 kv ac transmission lines require a 330-foot right-of-way. A 230 kv ac transmission line requires a 200-foot right-of-way.

The preferred corridor for the Southern Transmission System is approximately 325 miles long and includes 13,000 acres, of which approximately 374 acres are private land. The

WPPP preferred corridor for the Northern Transmission System is approximately 87 miles long and includes 1582 acres, of which approximately 16 acres are private land. The BLM preferred corridor for the Northern Transmission System is approximately 94 miles long and includes 1709 acres. This corridor parallels an existing 230 kv ac transmission line in part and does not cross private land.

2.1.2.2 Transmission Lines

Towers for the 500 kv ac transmission lines will be freestanding, lattice-type, galvanized steel towers. The towers will support conductors arranged horizontally with a phase spacing of 35 feet.

Six general types of towers will be used. They are the standard suspension, heavy suspension, angle suspension, and three types of dead-end towers. A typical standard suspension tower, which will comprise about 90 percent of the towers used, is shown on Figure 2-8. Towers will range in weight from 12 tons to 19 tons for suspension towers and from 23 tons to 53 tons for dead-end towers. Approximately four towers per mile will be required.

Each phase will consist of a 2312 thousand circular mil aluminum cable, steel reinforced (ACSR) conductor. Each tower will have two groundwires. The 500 kv ac suspension hardware will consist of two strings of insulators per phase in a Vee configuration. The dead-end hardware will consist of four strings of insulators per phase.

Towers for the 230 kv ac transmission line will be either an H-frame wood pole structure or a free-standing lattice type galvanized steel tower. The towers will support conductors arranged in a horizontal plane with a phase spacing of 26 feet.

Four general types of towers will be used. They are the standard suspension, heavy suspension, angle suspension, and dead-end towers. A typical wood pole suspension tower is shown on Figure 2-9. The average span length will be approximately 1100 feet. However, some span lengths could exceed 2500 feet.

Each phase will consist of a 1272 thousand circular mil ACSR conductor. Each tower will have two groundwires. The 230 kv ac suspension hardware will consist of one vertical string of insulators per phase.

Four footings will be required for each new steel transmission tower. Footings for the tower will be cast-in-place concrete piles. Where soil conditions make this type of footing impracticable, the footings will either be a pad footing or a rock bolt footing. The wood pole structure usually does not require concrete footings. However, selected backfill may be required to improve the stability of soil conditions.

Access roads will consist of a main road running the length of the transmission line right-of-way with stub roads providing access to each tower. Existing public and private roads will be used wherever possible. New access roads will be constructed where suitable existing roads are not available. The preferred corridor for the Southern Transmission System will require approximately 328 miles of access roads of which 35 miles (200 acres) will be outside the right-of-way. The preferred corridor for the Northern Transmission System will require approximately 103 miles of access roads of which 9 miles (56 acres) will be outside the right-of-way.

2.1.2.3 Stations

The WPPP switchyard will be one terminus for both the Southern Transmission System and the Northern Transmission System.

The Southern Transmission System will terminate at the existing McCullough Switching Station located near Boulder City, Nevada. The station is owned by NPC and LADWP. Because of the long length of the Southern Transportation System, an intermediate switching station located approximately midpoint in the transmission route could be required. This station would be located within the transmission line right-of-way.

The Northern Transmission System will terminate at the existing Machacek Substation (owned by SPPC and Mt. Wheeler Power, Inc.) near Eureka, Nevada.

2.1.2.4 Microwave System

The microwave communication system configuration will include two new terminal stations. The microwave terminal stations will be located at the WPPP Generating Station and at the McCullough Switching Station. Repeater stations will be located between these stations.

For the North Steptoe Valley Site, eight new repeater stations will be required for the preferred westerly corridor. All potential microwave sites are shown on Figure 2-7. A typical layout of a microwave repeater station is shown on Figure 2-10.

2.1.3 Water Supply System

The water supply system consists of well fields, buried pipelines with pumping stations, and a storage reservoir located on the site. The water supply for the North Steptoe Valley Site will come from well fields in Steptoe Valley as shown on Figure 2-11. The estimated maximum annual water demand is 25,000 acre-feet per year (afy). A typical water budget during a normal year of operation is shown on Figure 2-12. Monitoring, discussed in Section 4.1.3.2, is being conducted to establish a baseline to determine future effects, if any, from pumping associated with WPPP.

2.1.3.1 Well Fields

The results of pumping tests and groundwater investigations indicate that a supply of 25,000 afy can be obtained by well field development. The well fields will consist of at least two wells per well field in a single row configuration with a one-mile to two-mile space between each well. A typical well pump installation is shown on Figure 2-13.

The North Steptoe Valley Site will utilize water supplied by five well fields in Steptoe Valley. The wells will be spaced two miles apart. The pumping rate of each well will be 1250 gallons per minute (gpm). Water from the most distant well will be pumped via pipeline approximately 30 miles to the site.

The individual water wells will consist of drilled and cased wells. Well screens and sand packing in the water bearing formation will be necessary to reduce sand entrainment in the pumped flow. Sand accumulation will be controlled at the well or in the conveyance system.

2.1.3.2 Water Conveyance

Groundwater will be conveyed from the well fields to the site by a pipeline system. The discharge pipelines from individual wells will be connected to larger diameter collector pipelines serving groups of wells. Collector pipelines will increase in diameter up to 36 inches as more wells are connected. All pipelines will be buried with a minimum cover of four feet to provide protection from freezing and other hazards. Power lines will follow pipelines where feasible and existing roads will be utilized as much as possible. The power lines, pipelines, and access road together will constitute a utility corridor and will require 100 feet of right-of-way as shown on Figure 2-14. Equipment will be provided for monitoring and control at a control station at the site, as well as at the pump and well locations.

2.1.3.3 Water Supply Reservoir

A reservoir will be constructed on the site to store water conveyed to the site from the well fields. The purpose of the reservoir will be to insure an uninterrupted water supply in the event of a pipeline outage or other such emergency. The reservoir capacity will be approximately 775 acre-feet.

2.1.3.4 Electrical Systems

A transmission line will be constructed to provide power for operation and control of pump stations and well fields. The transmission line will be constructed on treated wood poles and will support approximately 50 miles of 69 kv class circuit and approximately 40 miles of 15 kv class circuit. Poles for the 69 kv circuit will be 65 feet in length; poles for the 15 kv class circuit will be 50 feet in length. Whenever possible, the 15 kv circuit will be constructed on the same pole as the 69 kv circuit. The poles will generally parallel the maintenance access road and pipeline corridors.

Equipment will be provided to control and monitor the various components of the water supply system from the WPPP Generating Station control room, as well as from the pump and well locations.

2.1.4 Coal Transportation System

The coal transportation system is based on delivery by rail from the north. The existing railroad systems and potential sources of coal are shown on Figure 2-15. New and upgraded railroads will be required from the Cobre and Shafter gateways to the site.

In addition to the new and upgraded rail trackage, the coal transportation system includes rolling stock for unit train operation, and facilities for maintenance and repair of the rolling stock.

Depending on the type of coal burned, approximately four to six million tons of coal will be required annually for WPPP. Coal will be transported by railcar to the site and unloaded via automatic discharge bottom dump hopper cars.

The coals which encompass the envelope of coal quality parameters available from potential sources are called the design coals. Five design coals have been selected which represent the range of coal which WPPP is expected to burn during operation. The design quality range is broad and will result in a flexible steam generator design. This will enhance the negotiating position with suppliers and will minimize exposure to risks to security and reliability of supply.

A composite coal was also established. This coal represents the typical quality of coal that is expected to be burned for at least the first 20 years of operation. The composite coal qualities were used for calculating the amount of material that will be handled annually. In addition, the composite coal qualities are being used for air quality licensing. Based on the composite coal, WPPP will burn approximately 140 million tons of coal over the operating life as shown on Figure 2-16.

A performance coal will be established at a later date for incorporation into the steam generator specifications and for use in equipment performance tests.

2.1.4.1 Railroad Corridors

After evaluating all reasonable alternatives linking the alternative WPPP sites to the gateways, two-mile-wide study corridors were selected. In some areas, the corridor width is reduced where constrained by narrow passes or Wilderness Study Area (WSA) boundaries. The study corridors associated with the North Steptoe Valley Site are shown on Figure 2-17. The figure also indicates the preferred corridor that has been selected for feasibility studies and environmental licensing.

The railroad will require a minimum of 100 feet for right-of-way from the gateways to the site. Additional right-of-way width up to 200 feet will be required to accomodate construction of sidings and cut-and-fill slopes. Depending on future agreements, the right-of-way along the existing Nevada Northern Railway (NNRy) will be either within the NNRy right-of-way or offset approximately 150 feet in a new right-of-way.

2.1.4.2 Railroad

The railroad will consist of a single-line trackage, siding, and bad order track. Sidings along the alignment will be provided for meeting or passing of the trains. The sidings will be approximately 7300 feet long and parallel to the line at intervals of 10 to 15 miles. In addition, a 500-foot storage and bad order track will be provided at one or two key sidings.

The track structure for the railroad will consist of new rails, hardwood ties, and steel tie plates. The rail will be fastened to the tie using cut spikes with lock spikes used for hold downs.

The track structure will be supported by six inches minimum of ballast under the ties. The ballast shoulder will be 12 inches minimum. An average of six inches of sub-ballast will be furnished over the full width of roadbed section to provide a uniform bearing for the track load and also to provide a cover for the subgrade.

In general, the crossing of highways and paved roads will be accomplished by crossings at grade with safety devices provided. Drainage structures will normally be constructed with corrugated metal pipes. Culverts will also be provided where necessary for livestock or wildlife crossing.

Fencing will be provided along the right-of-way only in those areas where there are significant hazards to people, livestock, or wildlife. It is estimated that less than ten percent of the route will require fencing. Cattle guards will be provided at fences crossed by the rail line.

The best available visual, acoustical, electronic, and/or mechanical devices will be installed to ensure the safe operation of the railroad. The equipment will detect malfunctioning rolling stock, expedite switching, and provide communications between trains and control centers.

The railroad signalization and communication system will interface with the mainline carriers and users of common trackage. In addition miscellaneous signs, milepost markers, and switches at passing tracks will be installed along the alignment.

Access roads will consist of a 12-foot unpaved or gravel-surfaced road within the right-of-way. Where possible, existing roads will be used outside the right-of-way.

2.1.4.3 Rolling Stock

The rolling stock for a unit train consists of locomotives, coal cars, and caboose. It is anticipated that WPPP will own the coal cars. The locomotives and caboose may be either owned by WPPP or the contract carrier.

Locomotives for the unit trains will be diesel-electric. Tractive effort booster units will be used to help obtain the necessary traction or dynamic braking required to ascend or descend long grades encountered along the route.

Depending on the source of coal, each unit train will have between 80 and 110 cars each with a capacity of 100 tons of coal. Approximately two unit trains per day during the week will be required to supply WPPP.

Each unit train will be equipped with a high visibility caboose, with a structural integrity for either being pulled or pushed through by the locomotives. The caboose will be equipped with an alerter system.

2.1.4.4 Maintenance Facilities

All normal maintenance functions will be headquartered at a shop complex at a site to be selected at a later date. The building will be equipped and sized to perform routine maintenance and repair on coal cars and railroad right-of-way maintenance equipment and, if owned by WPPP, locomotives, booster units, and cabooses.

Due to the isolation from any other railroad repair facility, the shop complex will have the capability of performing most maintenance functions. These include: 1) truck repair; 2) removing and installing diesel prime movers, generators, and traction motors; and 3) removing, repairing, and installing air compressor fuel systems, air systems, lube oil systems, electrical systems, and drawbars. Complete wheel turning and replacement equipment will also be provided.

2.1.5 Labor Requirements

The construction and operation of WPPP will require the employment of a large number of personnel new to the County. These people, and their dependents, will require that specific accommodations such as housing, schools, social services, water and sewage facilities, medical services, and law and fire protection, be provided if they do not already exist. Most of these impacts will be mitigated by implementation of the Impact Alleviation Plan discussed in Section 4.1.7.12.

The estimated labor force required for the construction and operation of the power generation system and water supply system is listed in Table 2-1 by major skill categories. The estimated peak labor force is estimated to be 2610 workers with the permanent operating force being approximately 530 people. The project labor force requirement in Table 2-1 is listed by quarters and assumes that construction will begin in the first quarter of 1985 and be completed by July 1990.

The projected labor force to construct the power transmission system and the coal transportation system has not been estimated in detail. Based on previous projects, there will be a relatively small number of workers required and they will be spread over the length of the transmission line and railroad. This labor force will probably be hired from various local labor groups in the particular area where work is being done. It is not anticipated that any problems will be encountered in attracting the necessary work force or that there will be any significant impact on services along the rights-of-way.

Generally, the installation of the construction facilities will be phased to accommodate the changing personnel, material, and equipment needs. Phase I will consist of the initial facilities to accommodate site preparation and similar early construction activities. This phase will commence at the beginning of the construction period and last approximately one year. Phase II will encompass the remainder of the construction period.

When economically feasible, construction facilities will be incorporated into the permanent plant systems and these facilities will remain during operation.

During Phase I, a limited number of workers will require housing accommodations at the site. These workers will be accommodated by early construction of part of the CWH facilities, chemical toilets, and potable water from site wells.

During Phase II, the CWH facilties will be designed to accommodate the increasing number of personnel and will ultimately utilize 45 acres for approximately 55 buildings capable of housing 700 people in addition to the recreation vehicle park, which will be expanded to accommodate 250 people. In this second phase, the CWH facilities will have separate sewer and water supply lines with the water system supplying water both for drinking and for fire protection.

After construction, the CWH facilities may be used to house temporary maintenance workers or workers involved in major overhauls which typically last for 3 months every 5 years and involve 200 to 300 people.

2.1.6 Project Schedule and Costs

The current schedule for WPPP is based on receiving all major permits and executing Power Sales Contracts in 1984. Following the first bond sale, construction activities can begin. Commercial operation of Unit 1 is currently scheduled for mid-1989. Commercial operation for Unit 2 is currently scheduled for mid-1990.

The total capital requirements (excluding financing and interest during construction) in January 1983 dollars to design and construct WPPP is estimated at approximately $2.5 billion for the North Steptoe Valley Site. The estimated levelized cost of electrical energy at the WPPP Generating Station switchyard is approximately 67 mills per kilowatt-hour.

2.1.7 Interrelated Projects

Several major projects (either existing or proposed) are in the general vicinity of WPPP. The status and relationship of these projects to WPPP is summarized below:

- Intermountain Power Project (IPP) - IPP is a two-unit, 750 MW coal-fueled generating station currently under construction near Delta, Utah, approximately 154 highway miles east of Ely, Nevada. Unit 1 is scheduled for commercial operation in July 1986. During early WPPP studies, a 230 kv ac transmission intertie between IPP and WPPP was under consideration. However, the proposal was subsequently eliminated.

- North Valmy Generating Station - SPPC is nearing completion of a two-unit, 500 MW coal-fueled power plant in Humboldt County near Valmy, Nevada. There is no connection with WPPP.

- Harry Allen Generating Station (HAGS) - The proposed project to construct a four-unit, 2000 MW plant 25 miles northeast of Las Vegas has been deferred until the mid-1990s. The original WPPP power transmission system included a transmission intertie with HAGS. The power transmission system now terminates at McCullough Switching Station.

- Thousand Springs - Thousand Springs, a 1500 MW to 2000 MW coal-fueled generating station proposed by SPPC in Elko County, has been deferred until the 1990s.

- o M-X Program - The Department of the Air Force considered areas in the County and in Lincoln County as proposed locations for shelters and operating bases associated with the M-X missile. This area was dropped from consideration in 1981.

- o Aquatrain Project - Aquatrain is a proposed staged project that would include a liquid carbon dioxide slurry pipeline for delivering coal near the WPPP site. WPPP is not a part of this proposal.

- o Local Zoning - WPPP is not currently a part of the County General Plan. A Conditional Use Permit may be required.

2.2 ALTERNATIVES TO THE PROPOSED ACTION

2.2.1 Project Alternatives

Based on the current forecasts, the WPPP participants need to obtain about 1630 MW of new base load capacity by 1995 (assuming a reserve margin of 25 percent). This section discusses alternatives to WPPP capacity and energy, as well as the consequences of cancellation of the project.

2.2.1.1 Nongeneration Sources

2.2.1.1.1 Purchase of Capacity and Energy

All of the WPPP participants are currently purchasing peaking or emergency power from other sources. However, most of the WPPP participants are currently purchasing base load power and would continue to do so after WPPP is in operation. As of today, no additional base load capacity that could replace WPPP capacity over its expected lifetime is available for purchase.

2.2.1.1.2 <u>Conservation of Electrical Energy</u>

Since the oil embargo of 1973, energy conservation has received greater emphasis as a means of postponing, or as an alternative to, construction of new electric generation facilities. The predicted average annual electrical energy growth rate for the WPPP participants for the next 12 years is approximately 2.2 percent. This compares to a projected 3.0 percent rate of growth for the United States for the same period. A major cause of the forecast growth rate being lower than the national average is the conservation programs being implemented by the WPPP participants.

Voluntary conservation has caused the forecasted electrical energy growth rate to decline in recent years. The WPPP participants have also instituted utility sponsored conservation programs which have caused a further reduction in the forecast load growth. The reduced forecast for the growth rates of system annual peak demands are based on the assumption that consumers will continue to take voluntary energy conservation measures and that utility sponsored programs will continue to be effective.

Some of the WPPP participants began efforts to encourage energy conservation as early as 1969. These efforts, and others incorporated into utility programs since that time, include such measures as:

a. Providing consultation services to consumers, architects, and engineers regarding the most efficient ways of utilizing electrical energy.

b. Suggesting designs of buildings and installation of equipment to optimize energy conservation.

c. Conducting systems analysis studies for customers to ensure optimum utilization of energy.

d. Providing information and recommendations on peak load controlling devices and on power-factor correction.

e. Working with elected officials and state agencies to develop useful laws and codes to eliminate wasteful energy practices.

f. Using load management on residential air conditioners.

g. Participating in the development of energy conservation programs for various states and the nation through representation on the Federal Power Commission Technical Advisory Committee on Energy Conservation, and through membership in the American Public Power Association and other organizations.

Since 1975, all WPPP participants have instituted conservation programs. The effects of such conservation programs are included in forecasts of peak demands and energy requirements. The WPPP participants are convinced that the load forecasts are justified and that all energy conservation efforts reasonably likely to occur have been included in the forecasts. Any further reductions from additional conservation programs cannot be justified at this time.

2.2.1.2 Existing Resources

2.2.1.2.1 Repowering or Upgrading

The requirements for new generation can sometimes be postponed or eliminated through increased use of existing capacity by repowering existing oil-fired or natural gas-fired generating units or operating existing plants at a higher output. However, most of the older units in the systems of the WPPP participants are operated as intermediate units and are already rated at their maximum capacity to meet system reliability requirements or to provide adequate resource capacity to meet generation system daily requirements. Therefore, upgrading of existing units, even if feasible, would provide minimal additional capacity and energy.

In repowering, the existing generating facility is converted into a combined-cycle generating facility by adding combustion turbines with waste heat recovery boilers. The exhaust gases from the combustion turbines produce additional steam to drive existing steam turbines. This conversion could provide intermediate generation, but would not provide additional economic base load generation. The reliability of the repowered oil-fired and gas-fired units would be dependent on availability of oil or natural gas supplies.

2.2.1.2.2 Postponed Retirement

There are no retired units within the systems of the WPPP participants that can be recommissioned for use. At the present time, all of the WPPP participants with existing generation are considering delaying, or have already delayed, retirement of older units beyond their economic life in order to provide sufficient operational capacity during system emergencies. However, even if the retirement of some of the older units is postponed, WPPP would still be needed to provide base load generation.

2.2.1.2.3 Alternate Base Load Operation

Most peaking and intermediate units operated by the WPPP participants are oil-fired or natural gas-fired generating facilities that operate at low capacity factors because of their low efficiencies. Changing their status to base load units would require increased use and dependence on oil or natural gas resources and would significantly increase operating costs. There could be a significant increase in maintenance requirements on these units, thereby reducing system reliability.

2.2.1.3 Developed Resources

2.2.1.3.1 Hydroelectric Generating Facilities

There are few remaining sizable hydroelectric dam sites available to the WPPP participants for possible development. Some of the WPPP participants have potential pumped storage sites in their service area. However, these facilities are for peaking rather than base load generation.

It has been estimated that the proportion of hydroelectric generation nationally could be increased by 50 percent of its current level. The additional hydroelectric generation would require the use of scenic areas, such as the Grand Canyon on the Colorado River, for storage reservoirs. Numerous small hydroelectric sites are located around the United States. However, only a small number of these sites are available to the WPPP participants.

The development of hydroelectric resources is expected to provide a small part of the generating capacity required by the WPPP participants in their resource plans. The development of substantial additional hydroelectric resources is considered unlikely and, therefore, this resource is not a feasible alternative to WPPP.

2.2.1.3.2 Gas/Oil-Fired Generating Facilities

One of the essential requirements of base load generation is the long-term availability of fuel. Currently, utilities in the Southwest have sufficient supplies of natural gas for their existing gas/oil-fired generating units. However, this situation is expected to be temporary and use of natural gas in conventional generating units is projected to be curtailed by the end of the 1980s as supplies become scarce. In addition, the Powerplant and Industrial Fuel Use Act restricts natural gas from being used in new generating units. Therefore, the use of natural gas in conventional base load generating facilities is not a viable alternative to WPPP.

Use of fuel oil in conventional gas/oil-fired generating units has similar problems. Supplies of domestic low sulfur fuel oil are limited. The supplies of foreign oil are more abundant, but world political instabilities make foreign oil supplies vulnerable. Although the price of fuel oil has dropped slightly due to the current overproduction of world crude oil, the long-term trend is for the cost of oil to escalate substantially as supplies eventually become scarce. World political events could further disrupt the supplies. These factors limit the potential for fuel oil as an alternative to WPPP.

Synthetic and liquefied natural gas were both eliminated as alternative fuels because of uncertainties associated with long-term availability in large quantities and the expected high costs of these fuels.

2.2.1.3.3 Nuclear Power Plants

Participation in nuclear power plants is being pursued by some of the WPPP participants. Additional nuclear power is not currently feasible because of the uncertainties related to licensing lead time and the receipt of operating licenses.

2.2.1.3.4 Cogeneration

The development of cogeneration resources is expected to provide a small part of generating capacity as forecasted by the WPPP participants in their resource plans. The development of substantial additional cogeneration resources is considered uncertain at this time and is not a feasible alternative to WPPP.

2.2.1.4 Developing Resources

2.2.1.4.1 Geothermal Energy

Geothermal resources are known to exist in California and Nevada. Many of the WPPP participants are actively involved in geothermal energy as a potential source for generating electricity. The resources being explored, tested, and developed by the WPPP participants are hot water resources.

LADWP, along with the cities of Burbank, Pasadena and Riverside, are participating in a 10 MW demonstration unit located in Imperial county near the town of Brawley, California. This facility, which went into operation in July 1980, is a research and development project. It has not yet been demonstrated whether it is possible to produce electricity economically and reliably from this geothermal resource. In addition, there are serious questions concerning the availability of cooling water, potential for subsidence, and feasibility of additional transmission lines in the Imperial Valley. The Brawley field could provide the California WPPP participants with an estimated 450 MW.

Geothermal development activities in Inyo County are in a preliminary study and exploration stage. The potential yield from the area could be 200 MW for LADWP. The majority of electricity from the Imperial and the Inyo county resources is not expected to be available until the 1990s.

SPPC plans to construct a 10 MW demonstration unit at Beowawe, Nevada. This unit is planned to be operational in mid-1984. Subsequent development on a commercial scale will depend on the reservoir assessment and reaching an agreement with the geothermal field operators.

Progress is being made to demonstrate technical and economic viability of geothermal hot water energy as a source of generating electricity. However, there is insufficient experience to rely on this resource with a high degree of confidence.

2.2.1.4.2 Solar Energy Conversion

Studies have indicated that the area served by the WPPP participants is one of the most favorable regions in the United States for the application of solar-electric generation. Several of the WPPP participants are actively supporting research to accelerate the development of this technology. To assist in the development of solar energy, solar insolation data are being measured extensively throughout the service areas of Western utilities.

The primary development in solar-electric generation is thermal conversion which collects sunlight and transfers heat to a working fluid to generate electricity or provide thermal energy. Solar thermal conversion may become an alternative means of generating peak and intermediate electric power in the 1990s in the southwestern United States if research, development, and demonstration programs are successful. It is not expected, however, that these technologies will become commercially or economically available for large-scale base load application in the time frame required for WPPP.

2.2.1.4.3 <u>Wind Energy Conversion</u>

Wind energy conversion could supply a limited part of the energy requirements of the WPPP participants in the 1990s if wind turbines with proven reliability become available at reasonable costs. Wind resource areas have been identified in both Nevada and southern California. The installation of small wind turbines by entrepreneurs is currently economical due to substantial tax benefits.

Because wind energy is an intermittent, non-dispatchable resource, it is expected to primarily displace fuel consumption at conventional power plants rather than displace new power plant capacity. Therefore, wind energy conversion is not considered a feasible alternative to WPPP.

2.2.1.4.4 <u>Solid Waste Energy Conversion</u>

Although large quantities of solid waste are produced in the service areas of the WPPP participants, it requires approximately 1000 tons (the amount of solid waste produced in a day by a city of 400,000 people) to produce 20 MW of capacity. In addition, market penetration for solid waste electrical generation has been severely restricted by air pollution restrictions, ash disposal problems, high interest rates, poor or nonexistent markets for recovered materials, and low competing landfill disposal costs.

Liquid or gaseous fuels produced from solid waste may become a feasible alternative in the future if the technology is proven and process costs decrease sufficiently to be competitive with other fuels. If liquid and gaseous solid waste fuels were used in the future, they probably would displace oil or natural gas fuels in existing boilers rather than be used to provide fuel for new generating facilties. Therefore, solid waste is not considered a feasible alternative to WPPP.

2.2.1.4.5 <u>Coal Energy Conversion</u>

Efforts are being made by the Department of Energy (DOE), Electric Power Research Institute, and others to develop a technology to produce relatively clean synthetic fuels from western coals. The resulting clean, low or intermediate energy gas, liquid, or solid fuels could be used in traditional or advanced fossil-fueled generating facilities.

Most advanced of the processes is the solvent-refined coal (SRC) process in which coal is partially hydrogenated and solvent extracted to yield a solid (SRC-I) or liquid (SRC-II) fuel low in sulfur and ash. Although chemically and physically somewhat different from raw coal or refined petroleum, these products can be acceptable power plant boiler fuels in terms of current emission standards and production costs. Pilot-plant production and test burning of these fuels have been performed successfully. However, SRC-I is being phased out by DOE and SRC-II has been cancelled. The major unresolved questions relate to costs and the adequacy of the lowered sulfur content to meet future air quality standards and environmental regulations. The clean liquid fuels should be acceptable, but the clean solid fuels may not meet those standards without additional air quality control equipment.

Coal gasification can be accomplished in moving bed, fluidized bed, or entrained bed reactors. Many gasifiers are under development. Most of these developmental and commercial gasifiers appear capable of producing a clean gas fuel that can be used in combined cycles. A 100 MW combined cycle coal gasification demonstration program began construction in December 1981, at Daggett, California. Construction should be completed by June 1984 and a 6-1/2-year test program has been planned to test various coals. The uncertainty of pollution control equipment needed to meet air quality requirements does not permit reasonable estimates to be made of the economics of a commercial facility.

Experience to date indicates that the availability of coal conversion technology on the scale and time frame required for WPPP cannot be considered likely. Therefore, coal conversion is not considered a feasible alternative to WPPP.

2.2.1.4.6 Other Developing Energy Technologies

Other developing energy technologies (such as ocean thermal energy conversion, fusion, and magnetohydrodynamics) are not expected to have significant commercial applications within the next ten years and are not considered feasible alternatives to WPPP.

2.2.1.5 No Project Alternative

If WPPP were cancelled, the power generating reserve margins of the WPPP participants would be reduced or eliminated. The reserve margins of the WPPP participants without WPPP are listed in Table 2-2.

For the Nevada participants, combined reserve margins without WPPP would range from only about one percent in 1990 to a negative one percent excess in total peak demand over total capacity in 2000. For the California participants, combined reserve margins without WPPP would range from about 16 percent in 1990 down to about 5 percent in the year 2000. Overall, combined reserve margins for the WPPP participants would be about 12 percent in 1990 and about 4 percent in the year 2000.

In order to meet minimum reserve margin requirements, the WPPP participants would need to purchase power from other utilities, not only during maintenance operations or contingencies, but for firm peak load. In order for WPPP participants to meet projected demands, power from other sources would be required. Several projects are in various stages of planning but most are fully subscribed for projected base loads.

Most WPPP participants promoted voluntary conservation measures during the "energy crisis" in 1974 and savings as high as 25 percent were realized by some power consumers. These measures proved economically advantageous, especially with commercial users, and are still being practiced. However, it is unlikely that considerable additional energy savings could be realized through voluntary conservation measures.

Regulatory agencies could enforce extreme conservation measures even resorting to revolving blackouts (i.e., a certain part of each service area would be without power for part of each day). Cancellation of the WPPP could bring about such mandatory conservation measures.

In addition, if WPPP were postponed, the economic benefit to the County would disappear. This would also prevent economic recovery from the downturn caused by the closure of copper mines and reduced smelter operations in the area.

2.2.2 Site Alternatives

A nine-month Site Selection Study was conducted in 1981 in the following three sequential stages:

- o Identification of Candidate Sites
- o Evaluation of Candidate Sites
- o Selection of preferred and alternative sites

The first two stages are discussed in the Site Recommendation Report. The third stage is discussed in the Site Selection Report.

2.2.2.1 Site Recommendation Report

2.2.2.1.1 Candidate Site Identification

The Study Region for the Site Selection Study was defined as the area within the County (approximately 8905 square miles) and exclusion criteria were applied to screen out areas in which it would not be possible to site a power plant because of environmental and/or engineering constraints. The exclusion criteria included land use, potential wilderness areas, land slope greater than ten percent, and unique geological features.

The areas remaining after applying the exclusion criteria were divided into 58 Candidate Areas of approximately 100 square miles each. A commuting time criterion was then applied to keep potential sites within a distance from existing population centers that would maximize the economic benefits to those centers and also attract plant personnel. As a result of applying the commuting time criterion, the number of Candidate Areas was reduced to 34.

The final refinement to reduce the amount of land to be investigated was locating Candidate Sites of ten square miles each within Candidate Areas. Due to constraints in some of the Candidate Areas, the number of Candidate Sites that could be located was 25. These 25 Candidate Sites are shown on Figure 2-18.

2.2.2.1.2 Candidate Site Evaluation

The Candidate Sites were evaluated and ranked by comparing the groups of criteria. These criteria, which include basic parameters by which site suitability can be measured, are:

a. Environmental Impacts - The impact of all components of the project on the environment (including the socioeconomic environment).

b. Engineering Costs - The costs related to the construction and operation of the project.

The criteria related to environmental impacts were selected based on their relevance to the Study Region and the types of impacts that are likely to occur. These criteria are:

- o Air quality impacts
- o Water resource impacts
- o Land surface impacts
- o Ecosystem impacts
- o Cultural resource impacts
- o Socioeconomic impacts

Engineering costs (including capital and operating and maintenance costs) were calculated for facilities which would be required in addition to facilities that would be common at any Candidate Site. These differential engineering costs were related to the lineal facilities for the following:

- o Power transmission system
- o Water supply system
- o Coal transportation system
- o Road access

Because the final design and configuration of WPPP had not been determined, the environmental impact and engineering cost analyses were performed for 12 project scenarios. These scenarios were based on the air quality (Steptoe Valley classified as nonattainment for SO_2 with emission offsets available or reclassified as attainment and no emission offsets required), the power transmission system (three schemes, depending on power delivery to California participants), and the coal transportation system (railroad delivery from the north or from the south).

The air quality impact evaluation emphasized the effect of dispersion potential as the most critical factor in the siting process. In addition, the two air quality scenarios were evaluated. In the nonattainment scenario, proximity to the nonattainment area was also considered.

The groundwater impact evaluation considered the impacts on the hydrologic environment from excessive withdrawals of groundwater. In general, valleys with large storage capacities and perennial yields also had other established users. The impacts were related to the displacement of these users due to project water consumption.

The land surface impact evaluation included the temporary disturbances to the land surface and, in some cases, the permanent removal of vegetative cover. The latter could accelerate the erosion of soil surfaces by wind and water.

The ecosystem impact evaluation was related to plant ecology, wildlife ecology, soils, and aquatic ecology. The evaluation considered the occurrence of threatened and endangered species, the occurrence and distribution of other important species (and their crucial habitats), and the occurrence of unique ecosystem impacts.

The cultural resource impact evaluation considered the significance of archaeological and historical sites. Impacts were measured based on the variety, quantity, integrity, clarity, and research potential of the data present, and on the local or ethnic group interest in the resource.

The socioeconomic impact evaluation focused on the social/economic costs of the project's work force, the opportunity costs of converting land, and the economic benefit from the project. Factors in the evaluation included commute distance, tax base, and land utilization.

The engineering cost analysis considered the differential costs of constructing lineal facilties to the Candidate Sites. The lineal facilties were new power transmission lines, water supply pipelines, railroads, and access roads. In addition, operating and maintenance costs for the water supply and railroad were also considered. The most important factor in the total differential cost was related to the cost of transportation of coal by rail. This made the total differential cost evaluation dependent on the two coal transportation scenarios (whether the coal was shipped from the north or from the south).

The individual values of environmental impacts and engineering costs for each of the 25 Candidate Sites were combined and used to develop a ranking of sites. The purpose of ranking the sites was to separate the sites into three groups:

- Highly suitable sites
- Moderately suitable sites
- Unsuitable sites

Highly suitable sites included those that were considered most appropriate for detailed studies. These sites generally had the lowest impacts and costs and were considered licensable under federal and state regulations. Moderately suitable sites were considered not as good as the highly suitable sites but could be licensable or potentially licensable with specific mitigative measures. Unsuitable sites could result in significant impacts, excessive project costs, or delays in the project.

2.2.2.1.3 Candidate Site Recommendations

Based on a review of data prepared for the Site Recommendation Report, the Development Manager recommended six

Candidate Sites for detailed evaluation. These sites, shown on Figure 2-18, are located in Newark Valley (S1), Butte Valley (S5), Jakes Valley (S7), North Steptoe Valley (S12), Central Steptoe Valley (S16), and Spring Valley (S22). In May 1981, the White Pine County Power Plant Advisory Committee endorsed, by resolution, the six Candidate Sites but requested that additional sites in White River Valley (S9) and South Steptoe Valley (S17) also be included in the detailed evaluation. The Board of County Commissioners acted (under authority granted by the Development Work Agreement) to approve the eight sites in June 1981. All eight sites were subsequently endorsed by the WPPP Management Committee.

2.2.2.2 Site Selection Report

2.2.2.2.1 Recommended Candidate Site Evaluation

The primary focus of site evaluation and comparison in the Site Recommendation Report was the degree of impact that the project would have on the environment. In the Site Selection Report, however, the impact of the environment on the project was considered. This concern is generally labeled as the "licensability" of the site. Licensability considers how potential environmental problems at a specific site increase the complexity of the licensing process, thereby creating delays in the overall project schedule. A site that requires fewer permits without significant potential for delays is considered superior to a site where permit problems exist.

In order to evaluate licensability, a series of six evaluation criteria were established as follows:

- Air quality impacts
- Water resource impacts

- Ecosystem impacts
- Cultural resource impacts
- Socioeconomic impacts
- Visual resource impacts

The air quality impact evaluation emphasized the impact on the Steptoe Valley nonattainment area as the most critical factor affecting licensability. The required levels of SO_2 removal were calculated for each site. In addition, two air quality scenarios (which depended on whether or not SO_2 emission offsets were available in Steptoe Valley) were evaluated.

The water resource impact evaluation considered the effects on the hydrologic environment from withdrawals of groundwater. Computer calculations and modeling to determine water table drawdowns were conducted.

The ecosystem impact evaluation used information from the water resource impact evaluation to determine licensability. The evaluation considered the effects on threatened and endangered species, other important species, and unique ecosystems.

The cultural resource impact evaluation included a reconnaissance level archaeological field study. The sampling included investigations of prehistoric and historic cultural resources.

The socioeconomic impact evaluation focused on the social/economic cost effects of commuting distance to the WPPP site and land utilization. The latter factor emphasized the opportunity costs of converting public domain lands (currently used for livestock grazing) to WPPP-related uses.

The visual resource impact evaluation considered viewing distance from major travel routes, viewing time, scenic quality of the area, background, and the presence of topographic and/or vegetative screening. These criteria were used to group the sites depending on the preference for development.

In addition to the evaluation of environmental impacts, generalized estimates of engineering (i.e., construction and operation) costs were prepared. These costs included both capital costs and operating and maintenance costs for the following:

- Power generation system
- Power transmission system
- Water supply system
- Coal transportation system
- Site access

The engineering cost analysis considered the differential costs of constructing and operating lineal facilities to the sites and the differential costs of constructing and operating air quality control equipment. The most important factors in the total differential cost were related to the cost of transportation of coal by rail and the cost of the air quality control equipment.

An assessment of the fault rupture hazard at the sites was also undertaken to provide input to the study. Photogeologic and field investigations were conducted as a part of the assessment.

Using the environmental impact, engineering cost, and fault hazard evaluations, the eight recommended Candidate

Sites were compared and a ranking (order of selection) developed. Because of the differences in the air quality evaluation procedure and the requirement to evaluate sites for two different scenarios, two summary rankings of sites were prepared.

2.2.2.2.2 Recommendations

Based on the information developed for the Site Selection Report, the Development Manager recommended that three of the eight Candidate Sites be selected for baseline environmental studies leading to preparation of an EIS and other permit applications. The recommended sites are located in Butte Valley (S5), North Steptoe Valley (S12) and Spring Valley (S22). The sites in Butte Valley and Spring Valley had the highest potential for licensability considering existing air quality scenarios. The site in North Steptoe Valley, which was not considered licensable, was recommended because of potential economic savings to the project and the net air quality improvement that would occur in the County if certain regulatory problems could be resolved. (These problems were resolved by the redesignation of the northern part of the Steptoe Valley nonattainment area and by the signing of the Option Agreement which, if exercised, will implement the White Pine County Air Proposal, discussed in Section 4.1.2.2.) The recommendation by the Development Manager was approved by the WPPP Management Committee in October 1981.

2.2.2.3 Preferred and Alternative Sites

The sites investigated in the Site Selection Report were reduced in size from a ten-square-mile circular area to a square three miles on a side (nine square miles total area). Preliminary geotechnical studies were conducted to optimize the layout of WPPP facilities and reduce the size of the sites. The studies focused on major geologic hazards (e.g., faulting, flooding, liquefaction, and subsidence) and subsurface soil properties in relation to design of foundations and waste disposal areas. Based on the Preliminary Geotechnical Studies technical report, each of the three alternative sites was reduced to approximately 2500 acres. The three sites, and their legal descriptions, are shown on Figure 2-19.

In order to designate the preferred and alternative sites, significant environmental factors associated with each of the three alternative sites were compared. (All of the identified impacts can be mitigated and do not preclude licensing any site.) In addition, the incremental costs of constructing and operating a power plant at each of the three sites were calculated.

Impacts associated with earth resources primarily affect the economics of the site and were included in the economic studies. The comparison of sites is not sensitive to air resource impacts because all sites are considered essentially equal or can be equalized by exercise of the Option Agreement and implementation of the White Pine County Air Proposal. There may be minor variations in emission control for site specific reasons but these would not affect the economics of the site. The Spring Valley Site could be affected if the Wheeler Peak Scenic Area were again proposed as a national park.

The Butte Valley Site has the least available water sources within the County and will require importation of supplemental groundwater from wells in Steptoe Valley. Therefore, its water resource impacts (as well as ecological resource impacts) would be similar to the North Steptoe Valley Site impacts. Both the North Steptoe Valley Site and the Spring Valley Site are near wetland areas that could be affected by groundwater pumping. The Spring Valley Site is also near an area with a federally listed endangered species. Any impacts, however, can be mitigated by well field location and design. However, the high water table at the North Steptoe Valley Site and Spring Valley Site could affect the design of the waste disposal facilities on these sites.

With respect to cultural resources, each site has specific resource potential. Resource sites at the North Steptoe Valley Site and Spring Valley Site could be eligible for the National Register of Historic Places (NRHP) but these sites are either small or can be avoided. Visibility would be high at both the North Steptoe Valley Site and Spring Valley Site, with the latter site in the vicinity of Wheeler Peak. Although the Butte Valley Site would have the least visibility impact, it is located in the least developed area.

The Impact Alleviation Plan will mitigate most of the impacts associated with socioeconomics. Transportation problems could result because of highway constraints in McGill, which is between Ely and the North Steptoe Valley Site, but these constraints can be mitigated. Although the North Steptoe Valley Site has the longest commute distance, there are no summits or passes subject to snow closure as there are with the other two sites. There would also be some loss of grazing land through development on any of the sites.

The incremental costs of constructing and operating a power plant at each of the three sites were calculated. Because the air quality control systems would be essentially the same at the three sites, there would be little variation in costs associated with the power generation system, and these costs were set at base. The only significant difference would be in the costs associated with the lineal facilities. There could be other site-specific costs associated with development at each of the sites. However, these costs would not change the relative order.

Overall, construction and operation at the North Steptoe Valley Site would be the least costly of the three sites. This is because this site is nearest to the potential sources of coal and would have the shortest rail haul. Railroad savings are reduced by the increased costs associated with the power transmission system. Power from the North Steptoe Valley Site would have to be transmitted the longest distance to load centers of any of the three sites and would require the most series compensation.

Overall, construction and operation at the Spring Valley Site would be the most costly of the three sites. The Spring Valley Site has the longest rail haul of the three sites resulting in significantly higher construction and operation costs. The overall cost, however, is reduced because of the shorter power transmission lines and reduced series compensation. There could be additional costs for a power plant at the Spring Valley Site due to adverse soil and foundation conditions. Preliminary geotechnical studies indicate that faults located in Spring Valley have the highest potential of the three sites for surface rupture from a large earthquake.

The Butte Valley Site was originally the most expensive site because of the high levels of emission control that were anticipated for facilities at this site. However, current air quality modeling studies show that required emission control levels do not vary significantly among the three sites.

A review of the data indicated that the North Steptoe Valley Site would have the least environmental impact (the highest licensability potential) and the lowest economic cost and, therefore, should be designated as the preferred site. The Butte Valley Site and Spring Valley Site were also licensable and should be designated as feasible alternatives to the preferred site. Either site would be acceptable, although the Butte Valley Site would be less costly to develop.

Based on the above conclusion, the Development Manager recommended the designation of the North Steptoe Valley Site as the preferred site and that the Butte Valley Site and Spring Valley Site be designated as alternatives to the preferred site. This recommendation was approved by the WPPP Management Committee in June 1983.

2.2.3 Power Transmission System Alternatives

2.2.3.1 Preliminary Studies

The WPPP Transmission System Planning Committee originally considered 12 power transmission system alternatives. In general, northern Nevada participants would be served by either a new 230 kv ac or a new 345 kv ac transmission line from the WPPP Generating Station to Gonder Substation, located approximately eight miles northeast of Ely. The southern Nevada participants would be served by either a new 345 kv ac or a new 500 kv ac transmission line to the proposed HAGS to be located approximately 25 miles northeast of Las Vegas. The California participants would be served in any of the following three ways.

The first scheme includes a new 230 kv ac, 345 kv ac, or 500 kv ac tie to IPP to be constructed near Delta, Utah, with the tie consisting of one or two transmission lines. (IPP includes a new 230 kv ac transmission line to Gonder Substation which could be upgraded to 345 kv ac for WPPP.) Power from IPP would be transmitted over its ±500 kv direct current (dc) transmission lines to a new ac-dc converter station in southern California.

A second scheme includes a new 500 kv ac transmission line to HAGS with a continuation on to the McCullough Switching Station in southern Nevada. From this station, the power would be transmitted over existing lines. Power from the Hoover Dam and coal plants in the southwest currently is transmitted to southern California over transmission lines emanating from McCullough Switching Station. An alternative scheme consists of a ±500 kv dc transmission line with a tap on one of the IPP ±500 kv dc lines.

A third scheme includes a new ±500 kv dc transmission line westerly to California and then southerly to the Valley Generating Station in the Los Angeles area.

Two of the 12 alternatives were eventually eliminated and the remaining alternatives were rated based on their relative technical performance. The evaluation included load flow and stability studies and costs of the alternatives.

2.2.3.2 System Studies

When the power transmission system studies began, numerous sites were being evaluated within an approximate 50-mile radius of Ely, Nevada. Because of the large number of site and route permutations, it was impossible to investigate all transmission system alternatives. Therefore, a potentially viable site was selected to begin the system analysis. The White River Valley site was initially selected and power flow studies were made. Based on power flow analysis and cost evaluations, the number of transmission alternatives were narrowed to those alternatives that were rated as preferred and acceptable/good alternatives. Stability studies were then made on the remaining alternatives. Based on selection criteria, a 500 kv ac transmission system was then selected.

2.2.3.3 Preferred System

In order to proceed with environmental and licensing activities, a preferred transmission system had to be selected. In November 1981, the WPPP Management Committee was informed of the Transmission System Planning Committee endorsement of a preferred system. This system consisted of a new 345 kv ac transmission line to Gonder Substation and two new 500 kv ac transmission lines to HAGS with a continuation of one line to McCullough Switching Station. In addition, the proposed transmission line between IPP and Gonder Substation could be upgraded from 230 kv ac to 345 kv ac. This preferred system was subsequently modified to include two 500 kv ac lines between HAGS and McCullough Switching Station and to exclude the upgrade of the IPP line.

In January 1983, NPC announced the deferral of HAGS to the mid-1990s. This decision required a reconsideration of the WPPP power transmission system and the possible need for an intermediate switching station with some series compensation. In addition some of the northern Nevada participants were reconsidering their points of delivery.

The results of the new evaluation were presented at the March 1983 WPPP Management Committee meeting. The revised preferred transmission system, as shown on Figure 2-6, was approved at that meeting.

2.2.3.4 Preferred and Alternative Corridors

The selection of transmission line corridors was based on the following procedure:

- Identifying all possible corridors on U.S. Geological Survey (USGS) maps.

- Inspecting the potential corridors in the field.

- Meeting with government agencies to determine specific constraints or possible restrictions for unique corridors.

- Evaluating the environmental impacts of the potential corridors, including impacts on land use, physiography, geology, hydrology, ecology, demography, and archaeology.

- Using, where possible, existing corridors.

Two-mile-wide study corridors were selected after a study of reasonable alternatives linking the WPPP sites with delivery points. Reasonable alternatives are defined as those that:

- Traverse a minimal distance and turn a minimum number of major angle points through areas with the lowest elevations possible.

- Avoid populated areas, if possible.

- Minimize impact to private lands.

- Are accessible to conventional construction and maintenance equipment.

- o Minimize new access road construction.
- o Use existing utility corridors and traveled ways.
- o Minimize environmental disturbance.
- o Avoid designated WSAs.
- o Allow construction of two parallel circuits with minimum separation.

The alternative corridors were plotted on topographic maps and checked against Wilderness Inventory maps and Master Title Plats. The corridors were checked in the field to identify physical constraints, utility corridors, and traveled ways that were not apparent on the existing maps. Meetings were held with the staffs of the Ely District and Las Vegas District of the BLM to identify land use and management plans and other constraints.

The transmission line route will be located within the two-mile-wide corridors. The specific center-line alignment for the transmission line right-of-way will be determined during detailed design. Power transmission line right-of-way requirements vary with the voltage and number of circuits in a given right-of-way. Typical right-of-way requirements are shown on Figure 2-20.

The major portion of the transmission line route will be on BLM land. Formal applications including maps, showings, and other information necessary to acquire grants of rights-of-way will be filed with the BLM offices having jurisdiction over the required land. Private lands will be purchased from the individual owners at fair market value. Where the transmission lines cross lands under jurisdiction of other federal or state agencies, the appropriate applications, including supporting data, will be filed with the agency involved.

Both the preferred corridor and alternative corridor segments for the preferred North Steptoe Valley Site are shown on Figure 2-7. (It should be noted that, for the Northern Transmission System, the WPPP preferred corridor and the BLM preferred corridor are different.) The preferred corridor and alternative corridor segments for the alternative Butte Valley Site and the alternative Spring Valley Site are shown on Figure 2-21 and Figure 2-22, respectively.

2.2.4 Water Supply System Alternatives

2.2.4.1 Groundwater Applications

Applications to appropriate groundwater from seven hydrographic basins in the County for industrial use (power generation) were submitted to the Nevada State Engineer. In June 1978, applications for 51,983 afy of water from Steptoe Valley were submitted. In September 1979, the State Engineer declared Steptoe Valley to be a designated hydrographic basin and, subsequently in August 1980, established irrigation of additional lands as a "non-preferred use" in a part of the basin in and around Ely (Groundwater Curtailment Area). Additional applications for 26,063 afy were submitted in November 1979 for Butte Valley, Jakes Valley, Long Valley, Newark Valley, and White River Valley. Applications for 26,063 afy in Spring Valley were submitted in March 1981.

2.2.4.2 Groundwater Investigations

A three-phase groundwater investigation was conducted in the County. The results of the studies were documented in three separate reports.

The Phase 1 groundwater investigations were reconnaissance level and relied on data and information developed by others. Based on an analysis of the data information, a ranking was made of the seven major valleys in the County as a water supply source for WPPP. The ranking, from most likely water source to least likely water source, was as follows: Spring Valley; Steptoe Valley; White River Valley; Jakes Valley; Butte Valley (southern part); Newark Valley; and, Long Valley.

The Phase 2 groundwater investigations verified and refined Phase 1 findings through geophysical investigations and field testing of existing wells. These verified findings were then used to develop specific water supply plans for each of the eight sites evaluated in the Site Selection Report.

The water supply system described in the Site Recommendation Report included wells located approximately on one mile centers and capable of producing up to approximately two cubic feet per second (cfs). These wells were generally located near the centers of the groundwater basins (playas). The Phase 2 investigations indicated that the well fields should be located away from the playas in order to take advantage of better aquifer characteristics.

In the Site Selection Report, the wells were located nearer the valley edges in alluvial fan deposits. These deposits tend to be composed of poorly sorted sands and gravels that readily transmit water and, consequently, produce more efficient wells than those located in finer materials of the playas. Water quality is generally better near the valley edges than in the playas.

The Phase 3 groundwater investigations included exploratory well drilling and test pump operations in Steptoe

Valley and Spring Valley. The drilling and pump testing occurred during the summer of 1982. In addition, geophysical resistivity surveys were conducted in the vicinity of potential well field locations in Steptoe Valley and Spring Valley. The results of these surveys provided information on subsurface geophysical characteristics. The Phase 3 studies also included computer modeling to assess the magnitude and extent of possible groundwater level changes due to WPPP pumpage. Information from the groundwater investigations was used to assist in obtaining the WPPP water permits and for evaluating potential environmental impacts.

2.2.4.3 Water Permits

Based on the results of siting studies and groundwater investigations, the pending applications for groundwater from Jakes Valley, Long Valley, Newark Valley and White River Valley were withdrawn in July 1983. In August 1983 a public hearing was held in Ely, Nevada, to discuss the preferred use designation for Steptoe Valley and the pending WPPP applications in Steptoe Valley. At the conclusion of the hearing, the Nevada State Engineer ruled that industrial use (power generation) would be the preferred use for the Steptoe Valley Groundwater Basin, excluding the Groundwater Curtailment Area. In addition, the State Engineer granted water permits for 25,000 afy from Steptoe Valley.

2.2.4.4 Preferred Well Fields and Pipeline Corridors

Because the well fields (and therefore interconnecting pipelines) are tied to the water permits, there are no alternatives to those shown on Figure 2-11 for the preferred North Steptoe Valley Site. Well fields and pipeline corridors for the alternative Butte Valley Site and the alternative Spring Valley Site are shown on Figure 2-23 and Figure 2-24, respectively.

2.2.5 Coal Transportation System Alternatives

Coal supply and transportation studies were conducted in 1981 to identify, screen, characterize, and evaluate potential coal sources and modes of transportation for a project located on any of the sites identified in the Site Recommendation Report.

2.2.5.1 Coal Sources

Coal reserves exist throughout the continental United States. The quality of coal contained in these coals range from the high sulfur and high heating value coals of the Appalachian Region to the low sulfur and low heating value coals and lignites of Wyoming, Montana, and North Dakota. A list of the most economically viable coals for WPPP was developed through a four-step screening process. This process included an increased level of detail at each successive step.

In Step 1, coals from east of the Mississippi River and from the Interior Province (Kansas, Oklahoma, Missouri, Arkansas, and Iowa) were evaluated but were eliminated because of high mining and transportation costs. Gulf Coast lignite was eliminated because of its low heating value and high transportation cost.

In Step 2, approximately 80 coal deposits represented as regions, basins, or fields were identified in the Pacific Coast Province (Washington, Oregon, California); Rocky Mountain Province (Nevada, Arizona, New Mexico, western Colorado, Utah, Idaho, western Montana, western Wyoming); and Northern Great Plains Province (eastern Montana, eastern Wyoming, North Dakota, South Dakota). Of these, all but nine were eliminated because of insufficient reserves, uneconomical transportation, prohibitive mining costs, and/or environmental sensitivity. The nine coal deposits which resulted from the Step 2 screening process are as follows:

- o Black Mesa Region (Arizona)
- o Green River Region (Colorado and Wyoming)
- o Hanna Field (Wyoming)
- o Hams Fork Region (Wyoming)
- o Henry Mountains Field (Utah)
- o North Park Region (Colorado)
- o Powder River Basin (Wyoming and Montana)
- o Southwestern Utah Fields (Alton and Kaiparowits)
- o Uinta Region (Utah and Colorado)

Step 3 involved preparation of detailed descriptions of each of the nine coal-bearing regions. These descriptions included: 1) location by state and county; 2) geology; 3) mineable reserves (both underground and surface); 4) coal quality and production (past, present, and future); 5) mines (active, inactive, and proposed mines); and 6) market prices. Based on these parameters, approximately 80 active or proposed mines were identified as potential sources of coal.

The final step of the screening process included the development of estimated generation costs for each of the approximately 80 coal mines identified and described in Step 3. The development of generation bus-bar costs considered the following parameters, as appropriate: 1) coal prices (FOB mine); 2) railroad tariffs; 3) new railroad construction; 4) rehabilitation of existing railroad; 5) coal car capital and operating costs; 6) slurry pipeline capital and operating costs; 7) plant capital costs; and 8) plant operation and maintenance costs. The following computations were developed for each coal: 1) distance to Ely, Nevada; 2) unit train cycle time; 3) slurry pipeline length; 4) number of slurry pipeline pumping stations; 5) fuel burn rate; 6) steam generator efficiency; 7) auxiliary power requirements; 8) scrubber additive requirements; and 9) solid waste quantities. The results of a computer-assisted evaluation indicated that the following mix of potential coal fuel supply systems should be considered for WPPP:

- Uinta Utah Region (rail or slurry)
- Uinta Colorado Region (rail only)
- Alton Field (rail or slurry)
- Hams Fork Region (rail only)
- Green River Region in Wyoming (rail only)
- Powder River Basin in Wyoming (slurry only)

Coals from the other coal supply areas identified in Step 3 were eliminated for the following reasons:

- Black Mesa Region - Poor transportation and legal/ environmental concerns.

- North Park Region - High transportation costs and marginal reserve position.

- Kaiparowits Field - Poor access, environmental concerns, and no existing production.

- Henry Mountains Field - Poor access, environmental concerns, and no existing production.

- Hanna Field - Poor economics.

- Green River Region (Colorado) - Poor economics.

- Powder River Basin (Montana) - Poor economics.

Based on the results of Step 4, 58 coal mines or reserves were identified as potential sources of coal for WPPP. Of these 58 sources, 19 located in the Powder River Basin of Wyoming are potential coal sources only if delivered by slurry pipeline. The low heating value of the Powder River Basin coal in conjunction with the distance from the Gillette, Wyoming area to the County make railroad transportation of this coal too expensive. The feasible coal sources are shown on Figure 2-15.

2.2.5.2 Coal Transportation

The existing mainline railroad systems serving the coal regions in Wyoming, Utah, Nevada, and Colorado are adequate to haul coal from each of the identified coal sources with the exception of coal from the Alton Field. The existing railroad system, as shown on Figure 2-15, include trackage owned by the Denver and Rio Grande Western, Union Pacific (UP), Western Pacific (WP), Southern Pacific (SP), and Utah Railway. Although some operating constraints exist within these rail systems, the overall physical and operating characteristics of these systems require little improvement.

With few exceptions, all of the identified coal sources would be served by the existing railroad systems or would require that a short spur be built as a part of mine construction. The exceptions would involve substantial new construction to provide rail access to the Alton and Emery areas of Utah.

Possible slurry pipeline routes originating in the Alton area, Utah Uinta Region, and Powder River Basin were evaluated. The pipeline routes were selected to avoid state and national parks, Indian reservations, population centers, and severe topography, where possible. The maximum pipeline slope of the grade along the routes was set at 16 percent which is an operational requirement to limit solids build-up that would occur in elevation sags during pipeline shutdowns.

The pipeline routes follow existing road, railroad, and transmission line rights-of-way where possible. The pipeline routes are located near existing transmission corridors to minimize the costs of the transmission lines required to provide the power requirements of the pumping stations located along the pipelines. The number of pumping stations was determined based upon using positive displacement pumps which could develop hydraulic heads in the range of 1100 feet to 1900 feet to meet the requirements of raising the coal slurry over successive mountain ranges.

In general, the design characteristics of the pipeline subsystems were based on those of the Black Mesa pipeline, which is associated with the Mohave Generating Station located in southern Nevada. The possibilities of using water at the mine (the no-recycle option) and of using recycled slurry water combined with plant water (the water recycle option) as sources of water for the coal/water slurry were also investigated.

2.2.5.3 <u>Preferred System</u>

The coal supply and transportation studies were documented in the Coal Supply and Transportation Study. Based on this study, the Development Manager determined that coal delivery by rail would be more economically attractive than by slurry pipeline. In addition, it was determined that the capability of using coals from the Uinta Region, Green River Region, and Hams Fork Region would enhance the WPPP negotiating position with coal suppliers and that these sources should also be used in developing the design basis coal. Subsequent to these determinations, it was also found that coal from Alton Fields would not be available in sufficient quantities to justify the construction of a new railroad. With the elimination of this source, delivery by rail from the north would be the preferred transportation option.

2.2.5.4 Electrified Railroad System

As currently proposed, the preferred coal transportation system includes unit train operation from the coal source to the WPPP site. Because of potential advantages from an electrified railroad, the feasibility of using all electric locomotives along the NNRy right-of-way is being investigated.

The most feasible alternative would be for WPPP to own and operate all electric locomotives and ancillary equipment betwen the SP and WP interchange points at Cobre and Shafter and the WPPP site. The locomotives would be energized with power from the WPPP Generating Station. Sites to exchange empty unit trains for loaded trains with the delivery carriers would be located at either Cobre or Shafter. This alternative could represent significant savings during the operation period with an early payback period for the initial capital investment. A typical cross-section of the electrified railroad is shown on Figure 2-25. The most visible aspect of the electrified railroad would be the 28-foot-high stanchions which would be located every 200 feet along the right-of-way.

2.2.5.5 Preferred and Alternative Corridors

Study corridors were selected after a study of reasonable alternatives linking the WPPP sites to northern or southern "gateways". These study corridors are approximately two miles wide except where constrained by narrow passes or

WSA boundaries. The specific centerline alignment for the railroad right-of-way will be determined during detailed design.

Both the preferred corridor and alternative corridors for the preferred North Steptoe Valley Site are shown on Figure 2-17. The preferred corridor and alternative corridors for the alternative Butte Valley Site and the alternative Spring Valley Site are shown in Figure 2-26 and Figure 2-27, respectively.

2.2.6 Other Alternatives

2.2.6.1 Road Access

Road access will be provided from adjacent highways or, in the case of the Butte Valley Site, the nearest major highway. The site will have a main access driveway which will ultimately lead employees and visitors to the main security gate and parking areas. Additional driveway entrances may be necessary for material delivery and employee access during construction.

Roads on the site will be paved where necessary for routine operational access. Unpaved roads will be surfaced with crushed rock and will provide access to areas which are visited or patrolled on an infrequent basis (once daily or less).

The Butte Valley Site will require construction of an access road of approximately 14.5 miles from U.S. Highway 93 to the site as shown on Figure 2-23. The road will generally follow and, for a majority of its alignment, be an upgrading of the existing, unpaved Thirty Mile Road. The road will be paved to provide two lanes of traffic and shoulders.

Design will be consistent with state and County highway standards and will permit safe driving speeds up to 50 miles per hour.

Development at the North Steptoe Valley Site may require that U.S. Highway 93 be upgraded or rerouted in the McGill area. Currently, this highway is routed through the central business district and access corridor in McGill. The increased traffic volumes, which would be generated during construction and operation, may overtax the carrying capacity of the highway at this location and create undesirable impacts on safety and increased commuting time.

A study to explore possible alternatives to alleviate this problem resulted in three alternatives. The street widening alternative would require widening 7000 lineal feet of existing two-lane streets to four lanes. The tailings bypass alternative would require constructing a new three-mile long, two-lane highway that would branch off U.S. Highway 93 south of McGill and rejoin the highway north of McGill after traversing the Kennecott tailings area approximately 200 feet to 600 feet west of the community. The west end bypass alternative is similar to the tailings bypass alternative except that the new highway would be constructed between the tailings area and the community.

At the Spring Valley Site, it will be necessary to relocate a paved, two-lane County road. This road traverses the site in an east-west direction and provides access from U.S. Highway 93 to the east side of the valley. The road may be routed easterly along the north site boundary and then southeasterly to join the current alignment. Approximately four miles of relocated road would be required.

2.2.6.2 Construction Material

Earth materials for construction of dikes, cover for the synthetic liners in the bottom ash basins and evaporation ponds, and for soil cover of the solid waste landfill area will be developed from borrow sites on the site. These materials will be predominantly silty sands.

Approximately 670,000 cubic yards of rock materials, such as aggregate, sand, gravel, and riprap, will be needed for concrete amd asphalt mixes, road base, lining of dikes, and rock-surfaced areas during the construction period. Potential borrow areas for sand, gravel, and aggregate materials have been identified in the vicinity of each of the three WPPP sites. The borrow areas for the preferred North Steptoe Valley Site are shown on Figure 2-3. Borrow areas for the alternative Butte Valley Site and Spring Valley Site are shown on Figure 2-28 and Figure 2-29, respectively.

Additional rock materials will be required for construction of the power transmission system, the water supply system, and the coal transportation system. Concrete and some rock products for the portions of these systems within economical haul distances will most likely be developed from the same source areas as for the power generation system. However, the portions located beyond an economical haul distance will require development at other sources.

3.0 AFFECTED ENVIRONMENT

The purpose of this chapter is to present existing (baseline) conditions of the environmental resources which will be affected by WPPP. The level of detail of the technical discussions are commensurate with the magnitude and intensity of the potential impacts for each resource. Baseline data have been summarized from the following technical reports prepared in support of the EIS:

- Air Resources Baseline
- Water Resources Baseline
- Ecological Resources Baseline
- Cultural Resources Baseline
- Visual Resources Baseline
- Socioeconomics Baseline

Information on earth resources is based on geotechnical investigations included in the technical report on Preliminary Geotechnical Studies. In addition, information on threatened and endangered species and candidate species is included in the Biological Assessment.

The description of the affected environment is presented in a regional context and in a site-specific context for each of the three WPPP sites. When referring to earth resources, air resources, water resources, and socioeconomics, the regional area is the County. When referring to ecological resources, cultural resources, and visual resources, the regional area includes the County and other parts of Nevada traversed by the corridors for the lineal facilities (the WPPP region).

3.1 REGIONAL SETTING

3.1.1 Earth Resources

3.1.1.1 Physiography

The County is situated within the Basin and Range Physiographic Province, a region characterized by structurally elevated north-south trending mountain ranges separated by deeply alluviated valleys. Relief varies from low to extreme with the mountain ranges rising 2000 to 7000 feet above the adjacent valleys. The mountain ranges are typically elongated with many extending for more than 50 miles in a north-to-northeast direction. Maximum elevations in the ranges vary from 7000 to 13,063 feet at Wheeler Peak in the Snake Range. The elevations of the valley floors average from 5500 to 6500 feet.

Most of the valleys within the County are characterized by internal drainages (i.e., streams flow toward the lowest point in the valley with no outlet). The White River Valley, part of the Colorado River drainage basin, is the only valley in the County with external drainage. The closed basins are generally floored by nearly flat-bottomed playas that may be flooded by runoff from the mountains during times of high precipitation.

3.1.1.2 Geology

The mountain ranges within the County are composed of a diverse sequence of late Precambrian to mid-Tertiary igneous, metamorphic, and sedimentary rocks representing about 500 million years of earth history. A geologic time scale is shown on Figure 3-1. The Precambrian and Paleozoic rocks consist primarily of quartzite, limestone, and dolomite with lesser amounts of sandstone, siltstone, and shale. Mesozoic rocks are generally scarce in the County but include a heterogeneous sequence of nonmarine Cretaceous strata which crop out only in the westernmost portion of the County. Tertiary rocks exposed in the mountain blocks consist of interbedded volcanic, volcaniclastic, and sedimentary rocks ranging in age from Eocene to Pliocene. Quaternary deposits blanket the valley areas and consist mainly of semi-consolidated to unconsolidated alluvial fan, lacustrine, and minor aeolian deposits.

The structural setting of the Basin and Range Province is dominated by a complex system of faulting as shown on Figure 3-2. Movement along these faults has resulted in the relative uplift of linear mountain ranges, and the relative subsidence of adjacent segments to form the valleys. This type of structural deformation began about 17 million years ago and is thought to be related to deep-seated extension in the upper mantle. The present topographic configuration of basins and ranges was established by about 11 to 13 million years ago but did not reach its present degree of development until about 7.5 million years ago. Most of the present ranges are bounded on one side by a major, large displacement fault and on the other by numerous short, small displacement faults with the mountain block being tilted toward the latter side of the range. Many of these range-bounding faults have been active in the late Quaternary (last 500,000 years), and a few have moved during historic time, indicating that this style of deformation is continuing to the present.

Sediments eroded from the carbonate and volcanic rocks comprise the bulk of the valley fill materials. These unconsolidated materials include gravel, sand, silt, and clay deposited under subaerial or lacustrine conditions. Most of the valleys are underlain by deposits of older, very coarse gravel and boulders deposited by streams on the alluvial fans and narrow pediments along the mountain fronts. The alluvial fan deposits grade from coarse sand and gravel, near the heads of the fans (adjacent to the range fronts), to fine sand and silt toward the distal portions of the fans (closest to the valley floor). Silt and clay predominate in the playas in the lowest part of the internally drained valleys.

3.1.1.3 Seismicity

The Basin and Range Province has experienced several earthquakes of Richter Magnitude (Magnitude) 7 or greater since 1840. Each of these earthquakes occurred within a north-south trending zone extending from Owens Valley in east-central California northward through west-central Nevada. The largest of these events are the 1872 Lone Pine (Magnitude 8) and 1915 Pleasant Valley (Magnitude 7.6) earthquakes. These earthquakes have been accompanied by zones of surface rupture up to 50 miles long and 3 to 6 miles wide with scarps as high as 20 feet. In the County, however, earthquakes larger than Magnitude 5 are not known to have occurred. Table 3-1 lists major historic earthquakes that have occurred in the Great Basin region and vicinity.

Active and potentially active faults in the Basin and Range Province appear to be evenly distributed throughout the region and are not confined to a particular area such as the zone of historic earthquakes described above. Therefore, the locational distribution of large historic earthquakes is misleading if used for determining seismic risk. In the long term, large magnitude earthquakes could occur anywhere throughout the Basin and Range Province. In the near term (within the life of the project), earthquakes could occur along the north-south zone of historic seismicity previously discussed or could occur along active faults.

3.1.1.4 Geologic Hazards

A brief regional discussion of geologic hazards is presented in the following sections.

3.1.1.4.1 Strong Ground Motion

Each of the three WPPP sites is located close to major block-bounding faults in the Great Basin as shown on Figure 3-2. This type of fault is capable of generating earthquakes greater than Magnitude 7. However, recurrence intervals for large (Magnitude $\geq$ 6) earthquakes on faults in the Basin and Range Province are estimated to be a few thousand to several hundred thousand years long. Therefore, the probability of strong ground motion occurring during the lifetime of the project from a nearby major fault is very low.

3.1.1.4.2 Surface Fault Rupture

As discussed in Section 3.1.1.3, the Basin and Range Province contains numerous active and potentially active faults along which surface faulting may occur. The potential for surface rupture on a particular fault depends on several variables including fault length, slip rate, recurrence interval, and the amount of time elapsed since the most recent earthquake on that fault. The potential for surface rupture depends upon the nature of faults and lineaments present.

The recurrence interval for earthquakes on major block-bounding faults in the Basin and Range Province such as those in the County is on the order of a few thousand to a few hundred thousand years. These recurrence intervals are at least an order of magnitude longer than for major active faults in California. Therefore, although the potential for surface fault rupture exists, the probability that surface fault rupture would occur within the next 50 years is low.

3.1.1.4.3 <u>Liquefaction and Dynamic Settlement</u>

Liquefaction and dynamic settlement are the result of strong earthquake shaking. Loose granular soils are particularly susceptible to liquefaction and dynamic settlement. Liquefaction is known to occur only in saturated or nearly saturated soils while dynamic settlement can occur in both dry and wet soils.

Based on preliminary geotechnical investigations, the potential for liquefaction and dynamic settlements is not expected to be a major geotechnical hazard. Minor exceptions include loose silty sand of mudflow origin and aeolian sand.

3.1.1.4.4 <u>Hydrocompaction</u>

Hydrocompaction (soil collapse) is a phenomenon whereby soils, with a loose particle structure and weakly cemented by water soluble minerals or by clay bonding, collapse under their own weight or under foundation loading upon initial wetting. The potential for hydrocompaction is greatest in soils associated with young alluvial fan deposits which tend to be underconsolidated and, therefore, may be moderately compressible under heavy foundation loads.

3.1.1.4.5 <u>Mud or Debris Flows</u>

Mud or debris flows are present within the young alluvial fan deposits in the County. These areas should be considered susceptible to either mud or debris flows in the future.

3.1.1.4.6 Landslides

Due to the relatively shallow slope gradients present on valley floors, landsliding of unstable slopes should not be a problem.

3.1.1.4.7 Flooding

Flooding of portions of valley floors may occur after periods of intense rainfall in the adjacent mountains. Those portions most susceptible to flooding are the fine-grained, young alluvial fan surfaces and areas containing lacustrine deposits.

3.1.1.5 Mineral Resources

The County has produced more mineral wealth than any other county in Nevada. Mineral commodities produced include 12 metals and 11 nonmetals. Copper has the greatest total value of all minerals found in the County. The Robinson Porphery Copper District in the vicinity of Ely has been one of the major producing districts in the United States. Other important metal ores present in the County include lead, zinc, silver, and gold. The bulk of the mineral wealth in the County is contained in the mountainous areas.

3.1.2 Air Resources

3.1.2.1 Climatology and Meteorology

The County is located near the southern rim of the Great Basin of the western United States. Local climate is influenced by the interior location, regional weather systems, and the north-south topographic orientation which dominates the area. Valleys are typically 50 to 100 miles in length and 10 to 15 miles in width. A summary of the climatological features of the County, based on long-term records for Ely, Nevada, is presented in the following sections.

3.1.2.1.1 Temperature

The average annual temperature in Ely, Nevada is 44°F. The warmest temperatures occur in July when the average daily maximum is 86°F and the average daily minimum is 48°F. The coolest month is January which averages a daily maximum of 38°F and a daily minimum of 9°F. Temperatures below freezing (32°F) occur almost every day in December and January and, on the average, 218 days per year. Temperatures below 0°F or above 90°F each occur about 18 days per year.

3.1.2.1.2 Relative Humidity

The average relative humidity in Ely is 49 percent. The average monthly relative humidity values range from 63 percent, in January and February, to 33 percent in July. Relative humidity is lowest in the mid-afternoon and highest during night and early morning. The highest average values of 73 percent are attained in February during early morning. Lowest average values of 21 percent are attained in July during mid-afternoon.

3.1.2.1.3 Precipitation

Average annual precipitation (all forms) in Ely is 8.7 inches (as water), which falls at a relatively constant rate throughout the year. From 1942 through 1981, annual precipitation has ranged from 4.6 inches to 14.7 inches. The maximum amount of precipitation to fall in a single month was 3.67 inches. Snowfall averages 46 inches per year. The greatest average snowfall months are January and March. The maximum snowfall in a single month was 24.8 inches.

3.1.2.1.4 Cloud Cover and Visibility

Cloudy days in Ely are most frequent in the winter months with these conditions occurring about 15 days per month. Clear and partly cloudy days occur most frequently in the summer months with clear days occurring about 15 days per month and partly cloudy days about 11 days per month.

Visibility is restricted to less than one-half mile on only about six days per year. This condition is most frequent during winter and early spring, most likely as a result of fog. Visibility less than 5 miles occurs about 12 percent of the time, primarily from October through May.

3.1.2.1.5 Wind

The average annual wind speed in Ely is 10.5 miles per hour (mph). Average monthly speeds are fairly constant throughout the year, ranging from 10.1 mph in November and December to 11 mph in April. The prevailing direction is southerly during all months. The relative frequency of southerly winds is approximately 25 percent, with winds from the other directions between south-southeast and southwest occurring an additional 28 percent of the time. This and the secondary maximum of northerly winds are indicative of the north-south orientation of Steptoe Valley.

3.1.2.1.6 Atmospheric Stability and Mixing Heights

Stability is an atmospheric property that reflects atmospheric mixing. In general, greater turbulence and mixing are possible as the atmosphere becomes less stable. The mixing height, measured from the ground upward, is the height of the atmospheric layer in which convection and mechanical turbulence promote mixing.

On an annual basis at Ely, unstable conditions (Pasquill-Turner Stability Class A, Class B, and Class C) occur 20.3 percent of the time; neutral conditions (Class D) occur 46.3 percent of the time; and stable conditions (Class E and Class F) occur 33.4 percent of the time. Atmospheric mixing, and hence dispersion, is greatest during unstable daytime conditions and least during stable nighttime conditions.

Unstable conditions are most frequent in summer and are the result of longer days, a high sun angle, and a low frequency of cloudiness. Stable conditions occur at night and are more frequent in fall than in winter because of cloudier winter skies which favor neutral conditions.

Average seasonal morning and afternoon mixing heights in Ely range from 479 feet in fall to 1401 feet in spring and average 686 feet on an annual basis. Average afternoon mixing heights (above ground surface) range from 3346 feet in winter to 11,755 feet in summer and average 7667 feet on an annual basis. Average afternoon mixing heights, which are most important in restricting atmospheric dispersion potential, are sufficiently high so as to have a minimal effect on restricting dispersion of pollutants in the area.

3.1.2.1.7 Severe Weather

Severe weather in Ely is primarily restricted to occasional thunderstorms which are most frequent in July and August, occuring eight days per month on the average. Thunderstorms are least frequent from November through March when they occur less than one-half day per month on the average.

Since 1916, only two tornadoes have been reported in the County. During the same period, approximately 20 tornadoes were reported in Nevada. Data regarding the severity of these tornadoes are not available.

3.1.2.2 Air Quality

3.1.2.2.1 Ambient Air Quality Standards

Establishment of ambient air quality standards is the responsibility of the Environmental Protection Agency (EPA) and the State of Nevada Department of Environmental Protection (DEP). National Ambient Air Quality Standards (NAAQS) describe acceptable air quality conditions. Air quality is considered acceptable if pollutant levels are continuously less than or equal to the NAAQS or, in the case of short-term federal standards (24-hour average or less), exceed the standards no more than once each year. State of Nevada ambient air quality standards are also not to be exceeded.

Prevention of Significant Deterioration (PSD) increments, also established by EPA and DEP, generally limit increases in pollutant levels. PSD increments are established for three types of areas:

a. Class I areas where almost no increases are allowed.

b. Class II areas where normal industrial growth is allowed.

c. Class III areas where greater than normal industrial growth is allowed.

The County (except for Steptoe Valley) and surrounding areas are designated PSD Class II areas. Federal and state PSD increments are equivalent and apply to SO_2 and total suspended particulates (TSP) only.

3.1.2.2.2 <u>Regional Emissions Inventory</u>

The County is a rural area with limited industrial activity. The only major industrial pollutant source is the McGill smelter. Pollutants emitted from the McGill smelter are primarily SO_2 and TSP. Wind-blown dust also contributes to TSP emissions in the County.

In recent years, SO_2 emissions from the McGill smelter averaged 20,000 to 30,000 pounds per hour (lb/hr), occasionally exceeding 65,000 lb/hr. As a result of smelter emissions, the central part of Steptoe Valley is designated by EPA as a nonattainment area (existing air quality worse than NAAQS) for SO_2. The Steptoe Valley nonattainment area is shown on Figure 3-3. The rest of the County is either designated as unclassified (remainder of Steptoe Valley) or attainment (all other areas) for SO_2.

Estimated TSP emissions from the McGill smelter average 2230 lb/hr. Steptoe Valley is designated by EPA as unclassified for TSP, indicating that existing air quality data are insufficient to determine whether the area is attainment or nonattainment. The remainder of the County is designated as attainment for TSP.

3.1.3 Water Resources

In order to obtain baseline information on groundwater resources in the County, develop specific design criteria for the water supply system, and assess environmental impacts, extensive groundwater investigations and computer modeling were conducted during 1982 and 1983. The groundwater investigations are described in in Section 2.2.4.2.

3.1.3.1 Geology

A description of the bedrock and surficial geology of the County is included in Section 3.1.1.2.

3.1.3.2 Hydrology

The mean annual precipitation in the County ranges from approximately 4 inches on the lower valley floors to more than 16 inches in the higher mountain ranges. A significant portion of the annual precipitation occurs in the form of snow. In areas of high snowfall, snowmelt accounts for most of the surface runoff and groundwater recharge. The mean annual snowfall averages between 10 and 40 inches on the valley floors to more than 80 inches in some of the higher mountain areas. The maximum precipitation events occur more frequently in the spring and summer months than any other season. The occurrence, amount and intensity, and type of precipitation are related mainly to topographic effects and elevation.

Estimates of surface water or lake evaporation in the valley bottoms range from 42 to 60 inches per year. Transpiration estimates range from a few inches per year for scattered vegetation types to about 18 inches per year for wetland areas. In most areas, water availability is the main factor limiting evapotranspiration.

Surface water occurrence within the County is largely seasonal and, with the exception of small streams which originate in the mountain areas or from springs, streamflow occurs only during or following periods of snowmelt or heavy rainfall. Continuous surface water discharge records are being collected by USGS at three stations within the County. In addition, the discharge on other surface water courses and from springs is being monitored on a irregular basis by USGS, BLM, and others.

Groundwater occurs both within the unconsolidated valley fill and bedrock units. In the valleys, the major component of groundwater recharge comes from precipitation from the bordering mountain ranges through infiltration of surface runoff on the alluvial slopes, and by underflow from the bedrock units which comprise the mountain ranges. In general, the direction of groundwater flow in the shallow flow systems within the valley fill materials is controlled by the surface topography, and by the thickness and physical composition of the unconsolidated materials. Groundwater flow within the deep bedrock system is controlled by the geologic structure, stratigraphy, and by major topographic features. A deep regional groundwater system within the carbonate section has been identified in eastern Nevada. Within both the shallow and deep flow systems, groundwater flow tends to be from areas of higher elevation toward the valleys. The major areas of groundwater discharge are located along the perimeter and within the central portion of the valleys. The primary mechanism for groundwater discharge within the valley floor is evapotranspiration. In some of the valleys, groundwater is discharged as springs and seeps along the edges of the valley and directly to stream channels or other topographically low areas.

Although the majority of the groundwater basins in the County are topographically closed basins, inter-basin groundwater transfer occurs through both the unconsolidated valley fill materials and through the bedrock. The quantity of inter-basin flow is generally small in relation to the total volume of water annually recharged to and discharged from the alluvial valley aquifer systems. It may, nevertheless, be a significant part of the total hydrologic budget in some valleys.

Favorable locations for groundwater development occur within the coarser alluvial fan materials located along the edges of the valley floor and away from the finer sediments within the playas, which typically are located near the center of the valleys. Where a playa does not exist in the center of the valley, wells usually can be located lower on the fan in order to intercept more of the groundwater flow. The principal water-bearing beds tapped by most of the wells in the County are in the unconsolidated sands and gravel underlying the alluvial apron and valley floor areas. Few existing water wells have been drilled deeper than several hundred feet. Therefore, most of the useful data on groundwater occurrence and potential yields are limited to the upper interval. Limited data, however, have been developed on the deep carbonate aquifer system in conjunction with the M-X Program. These data are not directly relevant to WPPP.

The perennial yield, which is defined as the largest quantity of water that can be drawn from an aquifer for an indefinite period of time without causing continuing depletion of storage or a deterioration of water quality beyond limits of economic recovery, has been estimated for the County by

USGS and the Nevada Department of Conservation and Natural Resources (NDCNR). Based on this information and current water use information, there are no groundwater basins in the County that are being depleted.

3.1.3.3 Groundwater Quality

Groundwater quality in the Basin and Range Province ranges from fresh to brine. Generally, the groundwater is fresh in the alluvial aprons at the margins of most valleys. Saline water occurs locally near some thermal springs and in areas where the aquifer includes rocks containing large amounts of soluble salts. Within the valley aquifers, groundwater quality decreases with residence time from the areas of recharge along the valley perimeter to the main areas of discharge within the central portions of the valleys.

3.1.4 Ecological Resources

3.1.4.1 Soils

Parent materials from which basin soils originate include the weathered limestone, quartzite, granite, and other rocks of the adjacent mountain ranges. Soils of the mountains and foothills have formed largely from residual sedimentary and igenous rocks.

The soils of the County are predominantly of the northern, or salt desert within the Calcareous Mountains Section of the Great Basin Division of the Intermountain Region in Nevada. These soils, in general, support sagebrush and shadscale communities which are characteristic of the region.

3.1.4.2 Vegetation

Typical vegetation zones in the WPPP region are shown on Figure 3-4. The WPPP region is primarily located in the Northern Desert Shrub Biome of the Cold Desert Formation. Portions of the power transmission system corridors also traverse Mojave Desert vegetation, which becomes increasingly more prominent in Clark County.

The Northern Desert Shrub Biome is characterized by shadscale and sagebrush vegetation zones. Shadscale-dominated communities are associated with valley floors and saline soils where precipitation is generally less than seven inches, and plants are generally sparse. Besides shadscale, bud sagebrush, Gardner saltbush, low rabbitbrush, spiny hopsage, and winterfat characterize the vegetation. Poorly drained seeps and saline riparian areas support meadow vegetation of inland saltgrass, alkali sacaton, and alkali cordgrass. Cattails and rushes mark wetlands where salinity is lower and drainage is somewhat improved.

Sagebrush is best developed on deep, permeable low saline soils, usually on valley floor, terrace and piedmont deposits. Big sagebrush characterizes this vegetation. Low sagebrush, black sagebrush, rubber rabbitbrush, and littleleaf horsebrush also occur as prominent associates.

Woodland and forest vegetation occurs from about the 6500-foot elevation on slopes above the valleys. Pinyon-juniper woodland forms the lowermost component of this vegetation, varying in composition with elevation, slope, exposure, and soil conditions.

White fir, with limited amounts of ponderosa pine, forms a montane zone (coniferous forest habitat) beginning

USGS and the Nevada Department of Conservation and Natural Resources (NDCNR). Based on this information and current water use information, there are no groundwater basins in the County that are being depleted.

3.1.3.3 Groundwater Quality

Groundwater quality in the Basin and Range Province ranges from fresh to brine. Generally, the groundwater is fresh in the alluvial aprons at the margins of most valleys. Saline water occurs locally near some thermal springs and in areas where the aquifer includes rocks containing large amounts of soluble salts. Within the valley aquifers, groundwater quality decreases with residence time from the areas of recharge along the valley perimeter to the main areas of discharge within the central portions of the valleys.

3.1.4 Ecological Resources

3.1.4.1 Soils

Parent materials from which basin soils originate include the weathered limestone, quartzite, granite, and other rocks of the adjacent mountain ranges. Soils of the mountains and foothills have formed largely from residual sedimentary and igenous rocks.

The soils of the County are predominantly of the northern, or salt desert within the Calcareous Mountains Section of the Great Basin Division of the Intermountain Region in Nevada. These soils, in general, support sagebrush and shadscale communities which are characteristic of the region.

3.1.4.2 Vegetation

Typical vegetation zones in the WPPP region are shown on Figure 3-4. The WPPP region is primarily located in the Northern Desert Shrub Biome of the Cold Desert Formation. Portions of the power transmission system corridors also traverse Mojave Desert vegetation, which becomes increasingly more prominent in Clark County.

The Northern Desert Shrub Biome is characterized by shadscale and sagebrush vegetation zones. Shadscale-dominated communities are associated with valley floors and saline soils where precipitation is generally less than seven inches, and plants are generally sparse. Besides shadscale, bud sagebrush, Gardner saltbush, low rabbitbrush, spiny hopsage, and winterfat characterize the vegetation. Poorly drained seeps and saline riparian areas support meadow vegetation of inland saltgrass, alkali sacaton, and alkali cordgrass. Cattails and rushes mark wetlands where salinity is lower and drainage is somewhat improved.

Sagebrush is best developed on deep, permeable low saline soils, usually on valley floor, terrace and piedmont deposits. Big sagebrush characterizes this vegetation. Low sagebrush, black sagebrush, rubber rabbitbrush, and littleleaf horsebrush also occur as prominent associates.

Woodland and forest vegetation occurs from about the 6500-foot elevation on slopes above the valleys. Pinyon-juniper woodland forms the lowermost component of this vegetation, varying in composition with elevation, slope, exposure, and soil conditions.

White fir, with limited amounts of ponderosa pine, forms a montane zone (coniferous forest habitat) beginning at about 8000 feet. Engelmann spruce and Douglas fir occur sporadically, primarily along stream courses and on north exposures. Similarly, aspen occupies seeps and moist colluvium.

Other vegetation is restricted to the upper elevations of the mountain ranges. Bristlecone pine, along with limber pine and, more rarely, white bark pine, form ridgetop forests above about 8500 feet, and alpine tundra occurs primarily above 11,000 feet.

Great Basin shrub vegetation is gradually replaced by Mojave Desert elements south of the Lincoln/Clark county line and is represented by creosote bush communities, with a creosote/bush-wolfberry/spiny hopsage association the most common. Blackbrush, along with scattered groves of Joshua tree, characterize a transitional zone between hot desert and cold desert biomes.

Plant species found in the WPPP region are listed in Table 3-2.

3.1.4.3 Terrestrial Wildlife

The WPPP region consists of several habitat types used by various terrestrial wildlife species. Terrestrial wildlife species found in the WPPP region are listed in Table 3-3.

The valley bottoms primarily provide shrub-steppe habitat composed of the shadscale, sagebrush and greasewood communities. Shrub-steppe is utilized by black-tailed jack rabbit, pronghorn, wild horse, horned lark, sage sparrow, Brewer's sparrow, sage thrasher, sage grouse western fence lizard, and western rattlesnake.

At higher elevations, fingers of pinyon-juniper woodland habitat extend downward from adjacent ridges into the shrub-steppe habitat. The pinyon-juniper woodlands provide habitat for mule deer, mountain bluebird, ferruginous hawk, and scrub jay. Also occurring in the valley bottoms are wetlands protected by Section 404 of the Clean Water Act of 1972 as amended in 1977 and Executive Order 11990. Species common to the wetland habitats include sandhill crane, long-billed curlew, snowy egret, American avocet, mallard, cinnamon teal, eared grebe, muskrat, and leopard frog. Coniferous forest habitat occurs above about 8500 feet and is used by Steller's jay, pine siskin, and gray-headed junco. Areas south of the County predominantly consist of desert shrub habitat utilized by bighorn sheep, loggerhead shrike, and vesper sparrow, while desert tortoise occur further south in Clark County.

Raptors nesting in the County include ferruginous hawk, goshawk, prairie falcon, golden eagle, Cooper's hawk, American kestrel (sparrow hawk), and red-tailed hawk. Bald eagles, a federally listed endangered species, are known to winter in the County, but are not known to occur during other seasons. Peregrine falcons have also been sited in the County. Additional wildlife species occurring in the WPPP region that are under consideration by the U.S. Fish and Wildlife Service (USFWS) for consideration for listing as threatened or endangered and are of special concern to the Nevada Department of Wildlife (NDOW) include the spotted bat, ferruginous hawk, Swainson's hawk, white-faced ibis, long-billed curlew, and desert tortoise.

3.1.4.4 <u>Aquatic Ecology</u>

Aquatic species found in the WPPP region are listed in Table 3-4. Aquatic resources of the County consist primarily of small streams and reservoirs and cool to warm springs. Most streams originate in the mountains adjacent to the valleys and, during the arid seasons, terminate before reaching the alluvial valley floors. Aquatic stream habitat is restricted to the cooler and relatively moist mountain ranges. Springs occur adjacent to the mountains, and their flow usually terminates within a short distance from the spring head. Aquatic habitat is usually limited to the spring head and associated pools. Exceptions include Comins Lake and Bassett Lake, located in south and central Steptoe Valley, respectively, and the restricted Shoshone Ponds in southern Spring Valley. Bassett Lake is fed by Duck Creek, originating in the Schell Creek Range and Tailings Creek, originating from springs southwest of McGill. Comins Lake receives water from Cave Creek, Williams Creek, and Willow Creek, originating in the Egan Range. Game fish species inhabiting streams and reservoirs in the project area include rainbow trout, brown trout, cutthroat trout, brook trout, bass, croppie, and northern pike.

Pahrump killifish, a federally listed endangered species, inhabits the Shoshone Ponds in Spring Valley. Additional aquatic species occurring in the project area, currently under status review by USFWS, and of concern to NDOW, include White River spinedace, White River desert sucker, White River springfish, Preston White River springfish, White River speckled dace, Clover Valley speckled dace, Independence Valley speckled dace, Independence Valley tui chub, Meadow Valley Wash desert sucker or White River Desert Sucker, Meadow Valley Wash speckled dace, Big Springs spinedace, relict dace, and Bonneville (Utah) cutthroat trout.

3.1.4.5 Threatened and Endangered Species

The Pahrump killifish inhabiting the Shoshone Ponds in Spring Valley, the Peregrine falcon, and the overwintering bald eagle are the only listed species known to occur in the WPPP region. However, 19 plant species, 6 terrestrial wildlife species, and 12 aquatic species occurring in the WPPP region are under review by USFWS for consideration as threatened or endangered. These species are listed in Table 3-5. The plant species are also protected by Nevada law, as administered by the Nevada Division of Forestry.

3.1.5 Cultural and Paleontological Resources

3.1.5.1 Archaeology

The pre-history of the County can be divided into several periods. The Pre-Archaic Period (12,500 to 8000 years ago) represents the earliest well-documented evidence of human presence in the Great Basin. Pre-Archaic settlement is marked by small sites located along features related to extinct water sources.

On the average, the environment during the Archaic Period (8000 to 750 years ago) was similar to that of the present. Technologically, the Archaic is more complex than the Pre-Archaic. Hallmarks of the period include a profusion of milling tools, basketry, and groundstone. A technological development, the bow and arrow, occurred late in the period.

The Archaic pattern prevailed until 1300 years ago. At that time, Fremont groups moved into the eastern part of the County. The dual occupancy of the County by Fremont and late Archaic peoples continued until 650 years ago, when both cultures were replaced by Shoshoni groups.

Circumstances relating to the origin of the Fremont Period (1500 to 750 years ago) are not certain. The expansion of grassland conditions about 1500 years ago allowed for the spread of Fremont groups who were dependent primarily on the collection of grasses and secondarily on horticulture. Fremont groups did not spread throughout the County, but were apparently halted by the presence of high, dry areas such as Butte Valley, Long Valley, and Newark Valley. The material culture of the Fremont Period is distinct from other cultural periods. Its most obvious indicator is pottery, the earliest in the County.

At approximately the same time as the Fremont Period, another cultural experiment was underway south of the County. Sites of the Virgin Branch Anasazi Period or Anasazi Period (2100 to 800 years ago) are most common along the Muddy River, the lower Virgin River, and Meadow Valley Wash.

The Anasazi Period has been divided into four phases. The first is the Moapa Phase (300 B.C. to A.D. 500) which is not well known. It is represented by pithouses on high bluffs above Moapa Valley and cultural deposits in several rockshelters in the region. Muddy River Phase (A.D. 500 to A.D. 700) sites consist of small clusters of pithouses situated on valley rims and on low knolls. Subsistence was based on a mixed farming and hunting/gathering economy and pottery appeared for the first time. Other artifacts found include the bow and arrow, slab and basin metates, and coiled and twined basketry. The Lost City Phase (A.D. 700 to A.D. 1100) is characterized by many of these same traits. Small villages consist of dwellings in a U-shaped arrangement and in rows. Cultivated crops include corn, beans, and squash. Cotton was grown and woven into cloth. The Mesa House Phase (A.D. 1100 to A.D. 1150) was short-lived and represents the end of Anasazi occupation of the region. Material traits are essentially the same as those of the preceding phase.

The Post-Fremont or Numic Period (950 to 100 years ago) represents the prehistoric forebearer of the modern Shoshoni inhabitants of the Great Basin. Present evidence suggests a gradual immigration of the new culture from 950 to 650 years ago. Sites in the County that contain evidence of Fremont and Post-Fremont occupations suggest alternating habitation or cohabitation over a period of some 100 years. By 650 years ago, only the Post-Fremont culture was found in the area.

The subsistence and settlement pattern of the Post-Fremont population is assumed to be the same as that of the historic Western Shoshoni. Subsistence activities were diversified. Close familiarity with the region and its resources allowed the scheduling of food gathering so as to maximize yield. The only real deviation from this gathering-oriented settlement pattern was the communal hunt. Hunts were sophisticated undertakings requiring a high technological investment and were conducted by members of several camp groups congregating specifically for that purpose.

Warfare was never a prevalent feature of Shoshoni life. Family feuds and revenge were the sole expressions of hostile activities. Both were considered the affair of a family or, at most, the household. Camp groups or larger aggregates did not draw together for the purpose of organized warfare.

3.1.5.2 History

The following sections include a brief history of the County. Figure 3-5 shows the locations of selected historical sites in the County.

3.1.5.2.1 Exploration and Early Development

In 1826, fur trappers were the first Caucasians to enter northeast Nevada. The County was largely untouched by these activities since their focus was further north along the Humboldt River. A small company traversed the County in 1827, camping once near Conners Canyon in the Schell Creek Range and again north of Baker.

The County also escaped the influx of people fostered by the transcontinental migration during the 1840s and 1850s. During these years, transcontinental freight and passenger routes passed to the north and south of the County. However, a shorter alternative was sought and a new central route, which ran through the County, quickly developed as a major transportation and communication corridor. The Butterfield Overland Mail Company and, in 1860, Pony Express riders, used the central route. The first transcontinental telegraph line, completed in 1861, also followed the central corridor. The role of this corridor as a transportation artery declined in 1869 with the completion of the transcontinental railroad through the Humboldt Valley.

3.1.5.2.2 Indian/White Relations

The history of Indian/White relations in the County is similar to that recorded elsewhere in the Great Basin. Trappers and explorers were looked upon as curiosities by Indian people who were friendly and cooperative. The number of Whites increased slowly until 1849, the year of the gold rush to California. The level of habitat destruction resulted in Indians organizing for the purpose of retaliation, and reciprocal acts of violence became commonplace. With the arrival of the military, hostilities finally ceased in 1863.

3.1.5.2.3 Mining

Mining, the most significant industry in the County, has produced more mineral wealth than any other industry in Nevada. Historic mining districts are shown on Figure 3-5. The mining history of the County can be divided into the pre-1890 silver period and the post-1890 copper period.

Mineral deposits were first discovered in the County by station masters and soldiers. In 1859, employees of the Overland Stage Company discovered silver and gold ores in Pleasant Valley. In 1861, a company of volunteer soldiers on their way from Fort Schellbourne to Fort Ruby discovered a gold-bearing ore in Egan Canyon. The Cherry Creek District was formed in 1863, and the first mill in eastern Nevada was constructed in 1864. Limited exploration was also undertaken elsewhere in the County.

In 1875, the Ward District, located west of southern Steptoe Valley, became the focus of mining activities. Its boom lasted some five years. Cherry Creek (1880-1883) and Taylor (1881-1885) absorbed people from the Ward District. With the decline of mines in these areas, the silver mining period ended.

As high grade gold and silver ores diminished, interest increased in high-volume, low-grade ores. In Nevada, the most important of these was copper. Miners first became aware of copper in the Robinson District in the early 1870s, however, exploration did not begin until 1903.

Encouraged by the advancement of technology, entrepreneurs and miners converged on Ely and the town grew.

The Nevada Consolidated Copper Company initiated underground exploration of the lode and built a small experimental concentrator. In 1906, a railroad was built to connect with the Central Pacific at Cobre.

Shortly thereafter, Guggenheim financial interests purchased the Nevada Consolidated Copper Company and began construction of a mill, reduction plant, and processor at McGill (later to become the McGill smelter), and production began in 1908. The Ruth Copper Pit mine west of Ely was next developed, later to be owned and operated by Kennecott.

3.1.5.2.4 Settlement

The history of White settlement in the County dates back to the early 1860s. The Ruby Station and Egan Station were the earliest settled areas. Pleasant Valley and Antelope Valley, in the northeast corner of the County, were the scene of the earliest ranching activities. The first settlements of consequence owed their existence to mining in the White Pine District and included the towns of Monte Cristo, Hamilton, Eberhardt, Shermantown, Swansea, and Treasure City. During the boom period (1868-1873), more than 30,000 people resided in these communities.

As new mining districts developed, communities formed. Mining districts that were small but steady producers supported stable communities. Ely, first known as Murry Creek, and Cherry Creek were settled in the 1860s and 1870s.

The turn of the century marked a transition in the history of settlement in the County. The prime mover was the shift to copper mining. Unlike the earlier silver period, the capital investment required was high, and large corporations became dominant early on. McGill, Ruth, Kimberly, and Veteran developed as "company towns," planned communities built and run for the convenience of the company and its employees. The company town did not permit gambling, the sale or consumption of alcohol, or prostitution. As a result, "saloon towns," including Ragtown, Riepetown, Smelterville, and Steptoe City, were developed.

3.1.5.2.5 Agriculture and Ranching

Agriculture and ranching began in the County as support industries, supplying commodities to isolated mining communities. Initial development took place between 1865 and 1875. By the mid-1870s, ranching and agriculture had reached a developmental plateau.

Compared to mining, agriculture played a small role in the development of communities and few towns owe their origin to this industry. Not until the 1890s were agricultural settlements such as Lund, Preston, and Baker established, signaling a period of marked expansion in the ranching and agriculture industries.

3.1.5.3 Native American Considerations

The primary Native American group in the WPPP region is the Shoshoni. The Shoshoni do not make an absolute distinction between secular and sacred aspects of life. The spiritual world is ever-present and not necessarily removed from the everyday activities of the group. Therefore, the environment is considered sacred due to its immediate association with the spirit world. Some parts of the environment are more sacred than others (e.g., burials, caves, rock art, and thermal springs). Mountain ranges, sites of recent historic significance, trails, ceremonial sites, lakes, and traditional use areas have a more general, nonspecific sacred association.

In contrast to many parts of the country, a majority of contemporary Native Americans in Nevada and Utah occupy lands once held by their ancestors. This contributes to a strong sense of continuity with the past and accentuates the ties between modern Indian people and traditional beliefs, practices, and resources. Although many nontraditional technologies and patterns have been adopted, contemporary Native Americans have not modified their views on the sacred nature of their ancestral lands. For them, the universe is based on the principle that reciprocity and continued modification of the natural order can only result in negative reprisal of one form or another.

Continued use of the flora and fauna in a traditional manner is seen as an important element in maintaining cultural identity, and many traditional patterns of use persist. For many Native Americans, hunting and gathering (especially pinyon nuts) contribute significantly to dietary needs, and access to procurement areas is a sensitive issue. Aside from their role in providing sustenance, plants and animals play a vital role in folklore.

3.1.5.4 Paleontology

The earliest geological evidence in the County is the late Precambrian McCoy Creek Group of quartzites and schists found in the Cherry Creek Range, Egan Range, Schell Range, and Snake Range. From Precambrian until early Mesozoic time, eastern Nevada was part of the Cordilleran miogeosyncline, a subsiding trough in which deposits accumulated. The materials representative of this period contain shallow marine deposits. Cambrian Period strata contain trilobites and are significant where these important fossils are present.

Several strata of the Paleozoic Era have moderate paleontological potential. The Ordovician Pogonip group contains marine invertebrates (mostly mollusks and algae). Devonian Period fossil-bearing strata include the Simonson dolomite and Guilmette Formation. The Joana Formation is the only unit in the County dating to the Mississippian Period, appearing to be highly fossiliferous and containing abundant corals, brachiopods, mollusks, and crinoids. Permian Period strata contain the majority of paleontological resources found in the County and account for most localities recorded to date. Figure 3-6 shows paleontological localities in the County.

Evidence of only limited sedimentary deposition exists in the County for the Cenozoic Era. Most of what is present dates to the Miocene Epoch when infilling of structural and sedimentary basins occurred. Although limited in extent, these deposits are rich in paleontological deposits.

The Quaternary Period of the Cenozoic Era is noted for climatic oscillations resulting in the development of glacial ice and related pluvial lakes. Deposits dating to the period consist of a variety of alluvial deposits, and none has much potential for paleontological resources. The presence of extinct Pleistocene mammals will serve to increase the level of significance.

3.1.6 Visual Resources

3.1.6.1 Landscape Characteristics

The WPPP region is characterized by a series of north-south trending mountain ranges separated by open flat valleys. Elevation differences between mountain peaks and valley floors are as much as 7000 feet.

The area is generally arid, resulting in a sparse vegetation distribution and few perennial surface water features. The arid climate limits agricultural activity to livestock grazing/ranching and irrigated farming. Natural vegetation patterns are largely determined by elevation. Since forested areas are found only in upper elevations, scenic views throughout most of the region are primarily open. Where views are restricted it is by local topographic relief and not by vegetative cover.

In general, the WPPP region is natural and rural in character, exhibiting comparatively little cultural modification to the natural landscape. In addition to the few urban centers in the region (Ely, McGill, Ruth, and other smaller communities), manmade features include highways, railroads, transmission lines, mines, and the McGill smelter. Regional landscape conditions are shown on Figure 3-7. Together, the steep mountain slopes, flat open valley physiography, and the predominantly rural character of the region create a landscape of interesting scenic views.

Recreational areas in the region are primarily found within the Humboldt National Forest and include Wheeler Peak Scenic Area and Lehman Caves National Monument. Historic sites include Fort Schellbourne, the Pony Express Trail, and Ward Charcoal Ovens State Monument. Each of these facilities attracts recreational visitors. The County also includes several major travel routes for persons traveling through eastern Nevada.

The landscape of east-central Nevada is characteristic of the American West. The open country, largely absent of dense vegetation or manmade development, lends itself to wide and distant scenic vistas. Consequently, an observer's visual attention is generally not directed at any specific elements within the landscape.

The landscape is most frequently viewed by persons traveling on highways for recreational or commercial purposes. Generally, the origins and destinations of these travelers lie outside the region. Other viewers include local residents engaged in hunting, fishing, and other recreational activities. With the exception of the Lake Mead/Las Vegas area and some attraction in the Humboldt National Forest, the WPPP region does not attract large numbers of recreational visitors from other parts of the country.

3.1.6.2 Visual Resource Management Classifications

The BLM has mapped visual resource management (VRM) classifications (classes) for portions of the WPPP region. These VRM classes are shown on Figure 3-8. According to BLM, these classes describe the different degrees of modification allowed to the basic elements of the landscape. Five VRM classes are possible and are described below as they appear in the BLM VRM guidelines:

- Class 1 - Natural ecological changes and very limited management activity are allowed. Any contrast created within the characteristic landscape must not attract attention. This classification is applied to wilderness areas, wild and scenic rivers, and other similar situations.
- Class 2 - Changes in any of the basic elements (form, line, color, texture) caused by a management activity should not be evident in the characteristic landscape. Changes are seen, but must not attract attention.
- Class 3 - Contrasts to the basic elements caused by a management activity are evident, but should remain subordinate to the existing landscape.

- Class 4 - Any contrast may attract attention and be a dominant feature of the landscape in terms of scale, but it should repeat the form, line, color, and texture of the characteristic landscape.

- Class 5 - This classification is applied to areas where the natural character of the landscape has been disturbed to a point where rehabilitation is needed to bring it up to one of the other four classifications. The classification also applies to areas where there is potential to increase the landscape's visual quality. It would, for example, be applied to areas where unacceptable cultural modification has lowered scenic quality; it is often used as an interim classification until objectives of another class can be reached.

- Other: In the absence of officially adopted VRM classes, some areas are assigned an interim Class 3 designation.

Humboldt National Forest lands administered by the U.S. Forest Service (USFS) are outside BLM jurisdiction and therefore, are not assigned VRM classes. Such lands are generally the most scenic in the region.

VRM classification throughout the WPPP region is based mainly on topography and the presence of surface water features (both of which, in turn, determine vegetation type and distribution). As shown on Figure 3-8, most of the WPPP region is occupied by VRM Class 3 land (either interim or adopted) and Class 4 land. Much of the central and southern portions of the region, including Spring Valley, are designated as VRM Class 4. Class 3 lands, which are more visually sensitive than Class 4 lands, include some forested areas at upper elevations, such as parts of the Delamar Mountains, Clover Mountains, and the Snake Range.

Class 2 lands are more sensitive than those designated Class 3 and include portions of the Schell Creek Range, Egan Range, and Wilson Creek Range. Valley of Fire State Park and part of Lake Mead National Recreational Area (both located in the southeastern portion of the region), and Pahranagat National Wildlife Refuge are also classified as VRM Class 2.

Class 1 describes the most scenic and visually sensitive landscapes. Class 1 lands within the WPPP region include Virgin Peak, located in the Virgin Mountains in the southeast part of the region; North Creek and Mt. Grafton Scenic Areas, located in the southern Schell Creek Range, and Blue Mass Canyon, located in the Kern Mountains in the northeast part of the region.

3.1.7 Socioeconomics

The County is a rural area located in the east central part of Nevada. The County is currently in a social and economic transition since Kennecott closed its copper mine and curtailed operations at the McGill smelter. The City of Ely, the County seat, is located between the smaller communities of Ruth and McGill in the south central portion of the County. The nearest major population centers to Ely are Reno (300 miles west), Salt Lake City (240 miles east), and Las Vegas (260 miles south).

The majority of County land (97 percent) is publicly owned and administered by the federal government. These lands are principally administered for agricultural, mining, and recreational uses. The land in agricultural use is leased for livestock grazing, historically a vital part of the local economic base.

Pertinent social and economic characteristics of the County are discussed in the following sections.

3.1.7.1 Demographic Characteristics

3.1.7.1.1 Population Trends

The population changes in the County and its principal cities, and in the State of Nevada, between 1940 and 1982 are summarized in Table 3-6. Current population estimates of the County for 1982 indicate a population of 8470 persons. Between 1980 and 1982, population increased approximately four percent, or 303 persons. For the same period, the state population increased 11 percent.

The population of the County declined 20 percent between 1970 and 1980, from 10,150 to 8167 persons. The closing of the Kennecott copper mine, a shutdown which began in 1976 and was completed in 1978, accounts for most of this decline. The Town of Ruth, west of the City of Ely and nearest to the Kennecott mine, experienced a 38 percent decrease in population between 1970 and 1980. The Town of McGill, north of Ely and the site of the McGill smelter, experienced the second largest population decline (34 percent) in the County during this period. These communities, essentially company towns, were more vulnerable to the mine closure compared to the City of Ely, whose population decreased 21 percent between 1970 and 1980.

Although the population declined in the County urban areas between 1970 and 1980, the County rural population increased by 30 percent. This increase may relate to former Kennecott employees returning to their farms and/or self-employed status outside of the County urban centers.

3.1.7.1.2 Population Profile

Table 3-7 includes selected demographic characteristics of the County. These data indicate that the County population distribution between males and females is almost equal, similar to that of the State of Nevada. The population is mainly Caucasian; ethnic groups include people of Basque and Hispanic descent. Average houshold size is 2.68 which is slightly larger than the statewide average of 2.35 persons. Both averages are smaller than the national average of 2.75 persons per household. In 1970, 55 percent of County residents who were 25 years and older were high school graduates (the comparable national average was 52.3 percent).

The Kennecott mine closure between 1976 and 1978 resulted in a net out-migration rate of 28 percent. In contrast, the state experienced a net in-migration rate of 53 percent.

3.1.7.1.3 Projected Population

Three sets of population projections to the year 2000 for the County are listed in Table 3-8. One projection was based on a cohort survival model prepared by the Nevada State Planning Coordinator's Office (PCO), and the other two were based on a Demographic/Economic Impact Simulation Model (DEISM) employed by the Nevada Employment Security Department (ESD). The latter population projections considered anticipated economic development in the County with and without the M-X Program. The PCO cohort survival model projects a low estimate of population growth, while the DEISM model projects moderate and maximum growth estimates.

The moderate growth population projections listed in Table 3-8 are currently considered the most representative of a reasonable future growth estimate for the County for the following reasons:

- o The basing of M-X Program facilities in Nevada is not likely, which effectively removes the maximum growth projections from consideration.

- o It is unlikely that a low growth estimate represents future conditions in the County because of renewed interest in developing local natural resources.

The low growth projection for 1995 is 14 percent below the moderate growth projection of 9757. The high growth projection for 1995 is 11 percent greater. A reasonable range of forecasting error in the moderate growth population projection is judged to be approximately five percent.

3.1.7.2 Employment and Economic Base

The most prominent employment sectors in the County economy have historically been mining, government, trade, and services. The phased closing of the Kennecott copper mine from 1976 to 1978 caused mining to drop from the largest to fourth largest employment sector. Currently, the leading sectors are government, trade, and service industries. Important growth sectors in the County economy between 1971 and 1980 were farming, construction, transportation and public utilities, and services.

3.1.7.2.1 Employment Profile

Table 3-9 summarizes the labor force and unemployment changes for the County between 1970 and 1982. The peak labor force in the County during the 1970 to 1980 period was approximately 4200 persons in 1970. Since that time, the total labor force has fluctuated, reaching a low of 3110 in 1979, which represented a 25 percent decrease since 1970. Between 1979 and 1981, however, the County labor force regained the percent loss in labor force because of several new mining and mineral exploration activities and speculation that the M-X Program might be located in the area. The seasonally adjusted County unemployment rate ranged from six percent of total labor force in 1970, to 24 percent in 1976, a year after the Kennecott mine operation began phasing out. The 1981 County unemployment rate was 6.8 percent of total labor force, comparable to the 7.1 percent state average. The unemployment rate for the County increased to 16.6 percent in 1982, which was substantially higher than that for the state which was 12.2 percent.

3.1.7.2.3 Employment Projections

Projections of covered employment indicate that total employment in the County will increase by approximately ten percent by the year 2000. These increases have been projected based on renewed interest in mining of precious metals in the County, as evidenced by the Amselco (Alligator Ridge) mine which began operations in 1981. The projections indicate that the mining (44 percent) and finance, insurance, and real estate (46 percent) sectors should grow most quickly, with the largest decline expected in the agricultural services, forestry, and fisheries sectors (a loss of 31 percent).

3.1.7.3 Income

Between 1970 and 1980, personal income in the County grew only 7.5 percent anually compared to an average annual state increase of 14.3 percent. Approximately 75 percent of state and County personal income is from personal earnings.

Non-farm earnings (wage and salary plus proprietors income) represent the majority (97.2 percent) of earnings in the County. Approximately 78 percent of non-farm earnings was generated in the private sector and 20 percent was generated by government. Farm earnings decreased to about three percent of the County total between 1970 and 1980, consistent with state and national trends. In 1980 the mining sector accounted for 14 percent of total private earnings, far in excess of the state rate.

The mining, manufacturing, and government sectors accounted for 50 percent of 1980 personal income in the County. The comparable state and national average was 23 percent.

The County average per capita income was consistently 14 to 20 percent below the state average between 1970 and 1980. After 1978, the average per capita income in the County fell 21 percent below the state average, compared to 14 percent below in 1975.

County family income appears to have remained stable in relation to the state average. The U.S. Census estimated the median family income in the County at $9111 in 1969, which was 85 percent of the state median family income. The ESD estimates that, by 1980, County median family income grew to be $18,728, or 84 percent of the state median income of $22,227.

3.1.7.3.1 Projected Income

Between 1979 and 1995, total personal income and average wage per worker are projected to increase in the County. Per capita income, however, is expected to decrease somewhat. The projections assume that wage rates in the County will rise in proportion to national wage rates, and that labor force participation rates will be constant. However, County per capita income, as a percent of national per capita income, is assumed to drop from the 1970 average of 95 percent to 73 percent due to the loss of mining jobs.

3.1.7.4 Housing

Table 3-10 summarizes pertinent housing characteristics in the State of Nevada and the County. In the past decade, the number of housing units in the County has expanded by eight percent. During this same period, the total number of occupied housing units declined by five percent. As a result, the vacancy rate in the County over the past decade has almost tripled, rising from six percent in 1970 to 16 percent in 1980. Total estimated number of housing units for the County in 1980 was 3566 units.

The increase in total housing units was primarily due to an increase in the number of single family units (245) constructed between 1970 and 1980. The net increase in total housing units in the County also reflects an increase in the number of multiple units by some 90 units. The proportion of mobile homes in the County to total housing stock declined by 2.5 percent over the past decade. The total number of mobile homes in the County declined by about 60 units.

Another factor contributing to the net increase in total housing units in the County was the replacement of inhabited substandard housing units. The majority of County housing stock was constructed before 1940 when the population peaked at about 12,500 persons. It is probable, therefore, that a good portion of the County housing stock could well be marginally habitable due to its age and questionable construction practices during the 1940s.

The principal contributing factor in the decline of occupied housing units was an overall reduction of 11 percent in renter-occupied units. However, total number of owner-occupied units also declined slightly (one percent) over this same period. These trends significantly contrast with state increases in owner-occupied and renter-occupied units of 95 percent and 85 percent, respectively. However, they are consistent with the dramatic decline in County population (20 percent) that was experienced over the last decade.

The majority of housing is located in Ely Township, which is a census enumeration district that includes Ely, Ruth, McGill and Cherry Creek. Vacant housing was 15.4 percent of the total number of units (3302) located in Ely Township. The highest vacancy rates are found in the outlying areas of the County, particularly in those areas hit hardest by the closure of the Kennecott mine and McGill smelter (i.e., McGill and Ruth).

3.1.7.5 Education

During the early 1970s, when Kennecott was in full operation, school enrollments in the County stood at about 2600 students, close to the 2700-student capacity of the White Pine County School District (WPCSD). Since then, enrollment has fallen to its present level of about 1638 students, approximately 60 percent of the WPCSD capacity.

Enrollment is anticipated to stabilize over the next few years.

Table 3-11 lists educational facilities in the WPCSD. Capital improvements are required if the system is to operate at or near its design capacity of 2700 students. These facilities are, for the most part, older buildings which need upgrading to meet fire standards and to reduce maintenance costs. For some time, the school board and community have planned to build a junior/senior high school complex to replace some of the older facilities in the district. However, the recent uncertain economic prospects for the area have reduced the possibility of property tax funding for such a project.

The WPCSD has not had problems with accreditation. The average enrollment per teacher is 21.2 students, below the state average of 22.5 students. The average expenditure per student for the 1980-81 school year was $1662, slightly above the state average due to the lower student-teacher ratio and higher transportation costs in the County.

3.1.7.6 Community Infrastructure

3.1.7.6.1 Transportation Systems

The County maintains 13,800 miles of roads. Major roads in the County are shown on Figure 3-9. The City of Ely maintains city streets for which an improvement plan is being prepared. Major city and County roads are listed with their 1980 average daily traffic (ADT) volumes and capacities in Table 3-12.

Although the ADT is generally below the rated capacities of the roads listed, many roads managed by the City of Ely, the County, and the state require, or will require, improvement. The City of Ely street system has about 30.5 miles of improved and unimproved streets, with 80 percent in need of repairs. Some required repairs are extensive due to lack of good base material and the age of the asphalt surface. Such collector streets as Campton Street, Ogden Avenue, Lyons Avenue, North Street, Avenue "C", 13th Street, and Avenue "M" are in need of repair work. The Georgetown Ranch Road, managed jointly by the City of Ely and the County, should have roadway width and alignment improvements. It is expected that baseline population growth along the McGill Highway area will increase the use of this road.

The NNRy, a subsidiary of Kennecott, provides freight service to Ely using connections with the SP and WP in Elko County. The freight line is used by the McGill smelter and is adequate for current use.

Yelland Airfield, operated by the County, has two runways and is classed as a "trunk airport" which can accommodate carrier-type aircraft. Approximately 5300 passengers were serviced in 1978. This figure has remained stable and less than 20 percent of the airport capacity is currently used. Plans are underway to extend the runway and general aviation facilities. However, a 1980 FAA ruling denied provision of federal funds to the County for such an extension.

The airport services commercial flights and local area charter flights. Sky West Airlines currently provides commercial flight service to and from Yelland Airfield.

3.1.7.6.2 Utility Systems

Table 3-13 includes information on the water and sewer systems in County communities. For the most part, capacities of these municipal infrastructure systems are old but serviceable.

3.1.7.7 Public Health and Safety

Table 3-11 lists data regarding public health and safety. As this information indicates, only agencies in Ely provide public health and safety services.

3.1.7.8 Recreation

The County possesses a number of natural resources (including wilderness areas) and cultural facilities that are popular leisure time attractions. Given the number of federal and state facilities available, community recreational facilities appear to be adequate. However, specialized needs exist for multi-purpose courts, playlots, and winter recreation trails.

3.1.7.9 Land Use

The County contains approximately 8905 square miles. Land ownership is shown on Figure 3-10 and listed in Table 3-14.

3.1.7.9.1 Public Land

Approximately 97 percent of County land is public land managed by the BLM, Bureau of Indian Affairs (BIA), and USFS. These lands are under multiple-use management for grazing, hunting, forestry, fishing, mineral extraction, rangeland, recreation, and wildlife habitat. The BLM is responsible for the majority of land in the County (77 percent) and is currently evaluating its lands for potential wilderness designation; livestock, wildlife, and wild horse grazing utilization; and public land areas that would be more appropriately managed in private ownership.

The BLM has two resource areas within its Ely District for which Resource Management Plans are being developed. All of the County lies within the Ely District which also encompasses portions of Lincoln and Nye counties. The Egan Resource Area is located in the western portion of the District and the Schell Resource Area in the eastern portion. The Schell Management Framework Plan was completed in July, 1983. The Egan Resource Management Plan is scheduled to be finalized in 1984.

The USFS manages national forest lands within the County. The agency is in the initial phases of developing a management plan for national forest lands under its jurisdiction which will outline management guidelines. As a result of the Roadless Area Review and Evaluation (RARE II) process, two additional planning areas have been identified which are eligible for consideration as federally designated wilderness areas. These two areas lie in the Snake Range. If the areas are designated as national wilderness areas, development controls would most likely be implemented.

3.1.7.9.2 Private Lands

Agricultural, vacant, and developed acreage estimates have not been made for the County. Most of the 306 square miles of private land is used for agriculture. Agricultural land is concentrated in County valleys including Steptoe Valley, Spring Valley, and Newark Valley, as well as in the Preston/Lund area in the southern part of the County. The majority of County agricultural land is used for pasture and rangeland. Hay production accounts for about 80 percent of harvested cropland.

3.1.7.10 Government and Finance

3.1.7.10.1 Local Government Structure

The three major governmental units are the County, the WPCSD, and the City of Ely. The County is governed by a Board of Commissioners and is responsible for assessment and recording, County roads, County sheriff, and the courts. The County also administers the budgets of the communities of Ruth, McGill, Baker, and Lund, and contributes to the Regional Planning Commission, the Ely Fire Department, and the cemetery.

The City of Ely government consists of a mayor and council which administers streets and roads, sanitation, water, police and fire protection (police protection is contracted to the County), the cemetery, and parks and recreation. The WPCSD is governed by an elected board which administers schools and support services for the entire County.

3.1.7.10.2 Public Finance

Table 3-15 lists the relative contribution to local government general funds for each major revenue source for fiscal year 1981-1982. The State of Nevada has no personal income tax.

Both the City of Ely and the County depend heavily on sales tax receipts. Property tax revenues and federal in-lieu-of-tax payments are next in importance for the County. The City of Ely derives more revenue from licenses and fees than from property taxes.

The WPCSD receives the majority of its revenue from the state distributive fund, which derives its revenues from statewide gaming taxes. The second most important source of income for the WPCSD is the sales tax.

3.1.7.11 Quality of Life

Quality of life consists of social indicators and satisfaction with life. Social indicators are generally published statistics which characterize a community. Social indicators, however, do not yield much information on community social structure, or on social institutions and their functions. The satisfaction with life component of quality of life is a person's response to his or her overall life situation. It is a subjective response based in part on the person's social class, prestige, and social importance to other people in his or her overall group and/or community.

The two primary inputs for satisfaction with life analysis in the County include a statistical survey conducted in 1979 and a community leader survey conducted in 1982. Although three years separate the two studies, the results of the community leader survey indicate that many of the conclusions drawn by the earlier survey are still valid.

With regard to the existing setting, the quality of life in the County has historically been high. The relatively poor social indicators at times have been more than offset by a high satisfaction with life. The satisfaction with life component has been dependent upon: 1) a fluid class system allowing satisfactory social mobility; 2) a tolerable and stable economic activity; 3) the small town atmosphere; 4) the scenic and recreational setting; and 5) the strong community integration of the various social groups through such mechanisms as churches and service organizations.

However, the satisfaction with life component of quality of life in the County is presently deteriorating. The primary causes of the deterioration are: 1) lack of employment, especially in traditional blue collar occupations; 2) increasing political factionalism in the wake of declining involvement in the community by Kennecott; 3) ineffectual decision-making in dealing with economic problems; and 4) insufficient integration of young people (age 20 to 35 years) into the community.

Unless these trends are reversed, the satisfaction with life decline may expand beyond the groups presently most affected (i.e., young people, blue collar workers, and transients) to include professionals and business people. Such an expansion could ultimately result in more population loss, including persons most needed to revitalize the community.

3.2 SITE AND CORRIDOR SETTING

This section describes the existing environmental conditions of the three WPPP sites and, where appropriate, associated corridors for lineal facilities. The latter consist of transmission line corridors, well fields and water pipeline corridors, and railroad corridors. The level of data for the three WPPP sites is greater than for the corridors. In addition, the level of detail is greater for corridors within the County than outside the County where baseline data does not exist or is not at a comparable scale.

3.2.1 Earth Resources

3.2.1.1 Butte Valley Site

3.2.1.1.1 Physiography

The Butte Valley Site is located in the southwestern portion of Butte Valley between the Butte Mountains on the west, the Cherry Creek Range on the northeast, and the Egan Range to the south and east. Site elevations range from a maximum of 6765 feet in the west central portion to 6248 feet in the northeastern corner. Slope gradients of up to 25 percent occur locally in the area of bedrock outcrop in the west central portion of the site. Most of the site, however, is characterized by easterly to northeasterly slope gradients ranging from three to four percent in the upper portions of the alluvial fans in the western part of the site to less than 0.5 percent in the northeastern corner of the site. Shallow, incised drainages with up to three to four feet of relief trend generally northeast across much of the site.

3.2.1.1.2 Geology

Alluvial fans are the predominant unit on all but the northeast corner of the site where lake deposits are present. Alluvial fan units of intermediate age with dissected sloping surfaces are exposed in the western portion of the site. Surface soils consist mostly of loose to weakly cemented sand and sandy silt with some gravel. The central portion of the site contains relatively younger, fine-grained alluvial fan deposits that overlie and interfinger with the coarse-grained intermediate age fan deposits to the west and fine-grained lake deposits to the east. Soils of the young fan deposits consist of loose to weakly cemented silt and sandy silt with occasional lenses of gravel.

Lake deposits predominate in the northeast portion of the site. The fine-grained lake deposits consist mostly of silt and sand to a depth of nearly 100 feet as evidenced by soil boring data. Although these deposits occupy only a small portion of the site at the surface, the soil boring data suggest they extend laterally to the west beneath alluvial fan deposits at depths of between approximately 5 and 50 feet.

Small linear sand bar deposits exposed in the east central portion of the site consist almost entirely of sand. These sediments are probably no more than five feet thick and represent late Pleistocene shoreline deposits.

Bedrock exposed in the west central portion of the site consists of limestone and minor sandstone of Paleozoic age.

3.2.1.1.3 Seismicity

Seismicity is a regional phenomenon and is discussed in a regional context in Section 3.1.1.3.

3.2.1.1.4 Geologic Hazards

The Butte Valley Site is transected by the Butte Valley fault zone and is situated within ten miles of the west Steptoe Valley fault zone (Figure 3-2). Both of these faults are capable of generating earthquakes of Magnitude $\geq$ 6. However, due to the relatively long recurrence intervals for this type of fault, the potential for strong ground motion at the Butte Valley Site within the next 50 years is low.

Two northeast-trending, photolineaments (fault-related features identified on aerial photographs) trend across the southeastern portion of the Butte Valley Site (Figure 3-11) and appear to be related to the South Butte Valley fault zone. This fault zone is about ten miles long and is a primary block-bounding fault between the uplifted Cherry Creek Range and the downdropped southern Butte Valley. Scarps along the fault zone are conspicuous northeast and southwest of the site. The fault displaces late Pleistocene (last 120,000 years) or Holocene (last 11,000 years) shoreline deposits. The two lineaments on the site do not have any topographic expression although their alignment with the fault zone suggests that they are fault-related. It is conceivable that future displacements on the South Butte Valley fault zone could be accompanied by surface rupture along the lineaments on the Butte Valley Site.

Due to the relatively long earthquake recurrence intervals for major Basin and Range faults such as the South Butte Valley fault zone, the potential for surface fault rupture to occur at the Butte Valley Site within the next 50 years is low.

Preliminary geotechnical investigation of the Butte Valley Site did not encounter any extensive deposits which would be susceptible to liquefaction or dynamic settlement. In addition, the water table is deeper than 50 feet and liquefaction should not be a problem. However, some loose silty sand was found in mudflow deposits in the northern portion of the site. These deposits may be susceptible to dynamic settlement and possibly hydrocompaction.

Landslides may be a problem at the Butte Valley Site in areas where bedrock outcrops are found on slopes up to 25 percent. This should only be considered a viable problem during construction if slopes are altered or undercut.

The surfaces of intermediate age alluvial fan units which cover most of the western portion of the site are incised by drainages and should not be subjected to flooding. The fine-grained younger alluvial unit in the northern portion of the site appears to be of mudflow origin and may be subject to mudflows in the future. Other areas of young alluvial fan deposits may also be susceptible to mudflows. The fine-grained mixed lacustrine and young alluvial deposits in the eastern half of the site will probably be subject to ponding after high intensity rainfall. Ponding of shallow depressions in this area was observed during field work conducted after intense rainstorms.

3.2.1.2 North Steptoe Valley Site

3.2.1.2.1 Physiography

The North Steptoe Valley Site is situated in the northern portion of the valley between the Cherry Creek Range on the west and the Schell Creek Range on the east. The topographic surface at the site slopes from the southeast to the northwest at gradients ranging from three percent, in the southeast, to nearly horizontal in the western and south-western portions of the site. Site elevations vary from 6030 feet in the extreme southeastern corner of the site to 5850 feet along the western portion of the northern boundary of the site. Shallow, braided stream channels with less than two feet of relief trend northwesterly across the southeastern portion of the site.

3.2.1.2.2 Geology

The western two-thirds of the North Steptoe Valley Site are underlain by fluvial (river), paludal (swamp or marsh), and aeolian (wind) deposits. The fluvial and paludal units are generally fine-grained reflecting deposition in low-energy river or swamp environments. Surface soils consist of sandy clay, sand, and sandy silt that are covered with a white, crystalline evaporite (salt) mineralization. Sand dune deposits overlie these units in the north central and northern portions of the site. The dune areas have local relief of two to five feet which probably reflects their thickness.

Alluvial fan and paludal deposits make up the principal surface units exposed in the eastern one-third of the site. Young sandy alluvial fan deposits occur on top of or mixed with, the fine-grained paludal sediments in this part of the site. Surface soils consist of predominately sandy silt and sand with some gravel. An older alluvial fan unit is exposed in the southeastern portion of the site. Surface soils on this coarse-grained alluvial fan unit consist of moderately to weakly cemented sand and gravelly sand.

3.2.1.2.3 Seismicity

Seismicity is a regional phenomenon and is discussed in a regional context in Section 3.1.1.3.

3.2.1.2.4 Geologic Hazards

A major range-bounding fault located on the western side of Steptoe Valley passes within four miles of the North Steptoe Valley Site (Figure 3-2). This fault is typical of major faults in the Basin and Range Province which have generated earthquakes as large as Magnitude 7-3/4. Recurrence intervals for large earthquakes on this type of fault are estimated to be a few thousand to a few hundred thousand years long. Therefore, the potential for strong ground motion at the North Steptoe Valley Site generated by an earthquake on this nearby fault or other faults in the region is considered to be low.

The North Steptoe Valley Site does not contain any major fault traces. However, there are several north-trending lineaments present in the vicinity of the site (Figure 3-12). One of the two lineaments located within the site boundaries is aligned with a group of similar features along the east side of Steptoe Valley (Figure 3-2). The lineaments do not have any detectable topographic expression and are delineated by alignments of vegetation. Geotechnical investigations conducted in 1982 indicate that these lineaments are not fault-related.

Preliminary geotechnical investigations did not encounter any extensive deposits at the North Steptoe Valley Site which would be susceptible to liquefaction or dynamic settlement. However, several small areas of aeolian sand present at the site may be susceptible to liquefaction or dynamic settlement should they become saturated. (The depth of groundwater beneath some parts of the site is as little as a few feet). Due to the limited thickness of these deposits, this potential problem, as well as the potential for hydrocompaction, can be easily eliminated by removal or compaction of the material.

The fine-grained paludal and fluvial deposits that underlie most of the site are subject to ponding after high-intensity rainfall or high spring runoff. The alluvial fan deposits which underlie the southeastern portion of the site are dissected by well-developed drainages. These drainages should act to channel overland flow and promote infiltration into the relatively coarse-grained deposits.

3.2.1.3 Spring Valley Site

3.2.1.3.1 Physiography

The Spring Valley Site is located in the southwestern portion of Spring Valley, a closed alluvial basin bounded on the east by the Snake Range and on the west by the Schell Creek Range. The topographic surface at the site decreases in elevation from west to east toward the axis of the valley. Elevations along the western boundary of the site range from 5980 to 6030 feet, while along the eastern boundary elevations vary from 5780 to 5810 feet. Average slope gradients range from 2.5 percent to 0.5 percent in the western and eastern portions of the site, respectively.

3.2.1.3.2 Geology

Young and older alluvial fan deposits are the predominant geologic units exposed at the Spring Valley Site. The older alluvial fan unit, present over nearly the entire western half of the site, is characterized by a dissected, sloping surface with a well-developed dendritic drainage system. Surface soils consist of weakly to moderately cemented sand, sandy silt, and gravel. Overlying this unit in the west-central portion of the site is a young alluvial fan deposit that appears to be of mudflow origin. The head of this fan is located west of the site at the mouth of a steep-sided, deep channel that drains an extensive area of the Schell Creek Range. The deposit is characterized by intergranular voids with clay fillings and exhibits the classic lobate form of mudflows with well-defined edges. The deposit is approximately five feet thick at its distal end and may approach 15 feet thick at its head.

The eastern part of the site is characterized by fine-grained deposits of alluvial, lacustrine, and aeolian origin. The predominant surface unit is a mixed young and older alluvial fan deposit. Surface soils consist mainly of weakly cemented silty sand, silt, and sand. A soil boring drilled into this unit shows that this material is probably a relatively thin veneer that overlies much finer-grained deposits that are probably of lacustrine origin. Surface exposures of lacustrine deposits are present only in the southeastern portions of the site but probably underlie most of the eastern half of the site. Small areas of aeolian sand dunes are present in the northeastern portion of the site. These deposits are stabilized with vegetation and are underlain by alluvial deposits at depths of probably no more than ten feet.

3.2.1.3.3 Seismicity

Seismicity is a regional phenomenon and is discussed in a regional context in Section 3.1.1.3.

3.2.1.3.4 Geologic Hazards

The Spring Valley fault zone is the closest major fault zone to the Spring Valley Site (Figure 3-2). Discontinuous surface traces of this fault zone occur within the boundaries of the Spring Valley Site (Figure 3-13). Considering the length of the fault zone (approximately 80 miles), this fault zone may be capable of generating an earthquake greater than Magnitude 7. However, recurrence intervals for large earthquakes on this type of fault are estimated to be a few thousand to several thousand years long. Therefore, the potential for strong ground motion to occur at the site within the next 50 years is low.

Several surface faults and lineaments are present in the central and western portions of the Spring Valley Site (Figure 3-13). These features are interpreted to be part of the Spring Valley fault zone which extends for a total distance of about 80 miles. Surface fault traces in the site vicinity are discontinuous but these apparent discontinuities are probably related to deposition of a young alluvial unit across portions of the fault zone following the most recent fault movement. Faults scarps in the vicinity of the site reach 20 feet in height, but the actual amount of surface fault displacement cannot be estimated due to scarp modification by groundwater seepage along the fault planes. The numerous lineaments on the site consist mainly of vegetation alignments with no evidence of surface displacements. Although these linear features could be interpreted as the result of nontectonic processes, the similar orientation of these features relative to the fault traces suggests that they are most likely tectonic in origin. Due to the presence of a zone of faults and lineaments across the site, the potential for surface fault rupture is considered low to moderate.

Preliminary geotechnical investigations did not encounter any extensive deposits which would be susceptible to liquefaction or dynamic settlement. However, the depth to groundwater beneath the site varies from about one to six feet, and some local occurrences of soils in the areas of shallow groundwater may be susceptible to liquefaction. In addition, some loose silty sand present in mudflows may be susceptible to dynamic settlement and/or hydrocompaction. Due to the limited thickness of this deposit, removal or compaction of this unit should minimize the potential hazard.

The surfaces of the intermediate age fan units will probably not be susceptible to flooding. These surfaces are highly dissected and the incised drainages should channel flow and promote infiltration into the generally coarse-grained deposits. The fine-grained young alluvial fan in the west-central portion of the site is considered to be prone to mudflows. The eastern portion of the site contains mixed lacustrine, aeolian, and alluvial deposits and may be subject to ponding after high-intensity rainfall.

3.2.2. Air Resources

Site-specific meteorology and air quality data for the three WPPP sites were gathered during a one-year monitoring survey conducted at five locations in the County from January 1982 to February 1983. The five monitoring sites were operated in accordance with an EPA-approved monitoring plan. A primary monitoring station was located on each of the three WPPP sites. In addition, secondary stations were located in mountain passes between Butte Valley and Steptoe Valley (Grass Springs) and between Steptoe Valley and Spring Valley (Connors Pass).

Doppler acoustic radar systems (DARS) for measuring wind speed and horizontal and vertical wind direction sigmas and direction of 30-meter increments from 10 meters to 600 meters and for determining the mixing height were installed at primary stations. A ten-meter tower was also used to measure surface winds and ambient temperature. SO_2, TSP, lead (Pb), and beryllium (Be) were monitored at all three primary stations with nitrogen dioxide (NO_2) and mercury (Hg) also being monitored at the North Steptoe Valley Site. Each of the secondary stations included a ten-meter tower to measure surface winds and an SO_2 monitor.

Atmospheric stability at the three WPPP sites was characterized using the standard deviation of vertical wind direction fluctuation (sigma-phi) to estimate the atmospheric stability class. This was in turn estimated from the standard deviation of vertical wind speed (sigma-w) divided by the mean horizontal wind speed according to EPA recommendations.

3.2.2.1 <u>Butte Valley Site</u>

3.2.2.1.1 <u>Meteorology</u>

Temperature data gathered at the monitoring station on the Butte Valley Site indicate that, for the period February 1982 through January 1983, December was the coldest month and August the warmest. The annual average temperature was 45°F, and the average diurnal temperature range was 24°F. Temperature extremes ranged from -8°F in December to 91°F in July.

Wind speed and direction frequencies were determined at four elevations above the ground surface and resulted in the following characteristics of the local wind regime:

- o Prevailing winds are generally southerly at all levels. A higher frequency of southwest to south-southwest winds at the ten-meter level is probably caused by topographic features.

- o Winds with a westerly component are more frequent than winds with an easterly component, reflecting the prevailing westerlies in the mid-latitudes.

- o Mean wind speeds are greater from westerly directions than from easterly directions.

- The mean wind speed increases with height, more than doubling from 7.4 mph at 10 meters to 16.6 mph at 570 meters.

- A diurnal variation in wind speed occurs at the 10-meter and 60-meter levels where afternoon wind-speeds almost double the nighttime speeds, particularly after midnight.

The secondary monitoring station at Grass Springs, a mountain pass between Butte Valley and Steptoe Valley, was established to document cross-valley wind and SO_2 exchange. Winds at Grass Springs are generally westerly, indicating that the dominant air exchange in this area is from Butte Valley to Steptoe Valley. The mean overall wind speed is about 8 mph, and wind speeds less than 2.2 mph occur less than 4 percent of the time. Wind speeds are greatest from southerly directions where they average 12 to 13 mph.

At the 210-meter level, unstable conditions (Class A, Class B, and Class C) are most frequent in the daytime, and stable conditions (Class E and Class F) are most frequent at night. Neutral (Class D) conditions occur about 25 percent of the time throughout the day.

At the ten-meter level, unstable conditions are most frequent in the 6 a.m. to noon time period. However, in the afternoon, Class E conditions are dominant at the ten-meter level.

Since vertical motion increases in the afternoon, the afternoon maximum of stable conditions is not representative of a stable vertical temperature structure. Rather, it is indicative of vertical dispersion conditions as a function of downwind distance. Increased wind speeds give less time for dispersion to occur for a given downwind travel distance.

Hourly mixing heights for the Butte Valley Site also were determined from DARS data. Mixing heights were greater than the DARS 600-meter limit approximately 69 percent of the time. Mixing height data for Ely should be considered representative of conditions in Butte Valley.

3.2.2.1.2 Air Quality

Pollutants measured at the Butte Valley Site include SO_2, TSP, Pb, and Be. Maximum measured concentrations were substantially less than NAAQS.

SO_2 concentrations were caused primarily by emissions from the McGill smelter. The low measured concentrations indicate that relatively little air is transported from the McGill smelter to the Butte Valley Site. TSP concentrations were most likely caused by wind-blown dust during high wind speed conditions.

SO_2 was the only pollutant measured at the Grass Springs station. Measured concentrations were substantially less than NAAQS. The Grass Springs area, which is located in the SO_2 nonattainment area (Figure 3-3), was in attainment for SO_2 during the period from February 1982 through January 1983.

3.2.2.2 North Steptoe Valley Site

3.2.2.2.1 Meteorology

Temperature data gathered at the monitoring station on the North Steptoe Valley indicate that, for the period

February 1982 through January 1983, December was the coldest month and August the warmest month. The annual average temperature was 47°F, and the average diurnal temperature range was 22°F. Temperature extremes ranged from -11°F in February to 94°F in July.

Wind speed and direction frequencies were determined at four elevations above the ground surface and resulted in the following characteristics of the local wind regime:

- Prevailing winds are generally south-southeasterly at all levels, corresponding to the general orientation of Steptoe Valley in the vicinity of the site.

- Winds with a westerly component are more frequent than winds with an easterly component, reflecting the prevailing westerlies in the mid-latitudes.

- Mean wind speeds are greater from westerly directions than from easterly directions.

- The mean wind speed increases with height, from 8 mph at 10 meters to 13 mph at 570 meters.

- The percentage of calm winds (that is, less than 2.2 mph) decreases with height from 10.1 percent at 10 meters to 1.8 percent at 570 meters.

- A strong diurnal variation in wind speed occurs at the 10-meter and 60-meter levels. Afternoon speeds at 10 meters are approximately 70 percent greater than the nighttime speeds particularly after midnight.

At the 210-meter level, unstable conditions (Class A, Class B, and Class C) are most frequent in the daytime, and stable conditions (Class E and Class F) are most frequent at night. Neutral (Class D) conditions occur an average of 19 percent of the time throughout the day.

At the ten-meter level, the pattern of unstable daytime conditions and stable nighttime conditions is also evident. The dominance of Class E conditions in the afternoon at the Butte Valley Site is not found at the North Steptoe Valley Site.

Hourly mixing heights at the North Steptoe Valley Site also were determined from DARS data. Mixing heights were greater than the DARS 600-meter limit approximately 77 percent of the time. Mixing height data for Ely should be considered representative of conditions in North Steptoe Valley.

3.2.2.2.2 Air Quality

Pollutants measured at the North Steptoe Valley Site include SO_2, TSP, NO_2, Pb, Be, and Hg. Maximum measured concentrations were substantially less than NAAQS.

SO_2 concentrations were caused primarily by emissions from the McGill smelter. The measured concentrations indicate that the SO_2 attainment designation for this area is appropriate. TSP concentrations were most likely caused by wind blown dust during high wind speed conditions and from TSP emissions at the smelter.

Because there are no significant sources of NO_x in the County, annual average NO_2 concentrations measured at the North Steptoe Valley Site were virtually nonexistent.

3.2.2.3 Spring Valley Site

3.2.2.3.1 Meteorology

Temperature data gathered at the monitoring station on the Spring Valley Site indicate that, for the period February 1982 through January 1983, December was the coldest month and July and August were the warmest months. The average diurnal temperature range was 26°F, and the average annual temperature was 45°F. Temperature extremes ranged from -13°F in February to 93°F in July.

Wind speed and direction frequencies were determined at four elevations above the ground surface and resulted in the following characteristics of local wind regime:

- Prevailing winds are generally southerly at all levels. This and a secondary maximum of northerly winds reflect the orientation of Spring Valley in the vicinity of the site.

- Winds with a westerly component are more frequent than winds with an easterly component, reflecting the prevailing westerlies in the mid-latitudes.

- Mean wind speeds from the southeast are much greater at the 570-meter level than at lower levels.

- The mean wind speed increases with height, more than doubling from 7.4 mph at 10 meters to 15.9 mph at 570 meters.

- The percentage of calm winds (that is, less than 2.2 mph) decreases with height from 11.1 percent at 10 meters to 1.5 percent at 570 meters.

- A strong diurnal pattern in wind speed at the 10-meter and 60-meter levels occurs at this site. Afternoon speeds at 10 meters are approximately 70 percent greater than the nighttime speeds, particularly after midnight. At the 570-meter level, wind speeds are highest in the final quarter of the day.

The secondary monitoring station at Connors Pass, a mountain pass between Spring Valley and Steptoe Valley, was established to document cross-valley wind and SO_2 exchange. Winds at Connors Pass are generally westerly, indicating that the dominant air exchange in this area moves from Steptoe Valley to Spring Valley. Wind speeds are greatest from westerly directions where they average 11 to 12 mph. The mean overall wind speed is about 10 mph, and wind speeds less than 2.2 mph occur less than one percent of the time.

At the 210-meter level, unstable conditions (Class A, Class B, and Class C) and neutral conditions (Class D) are most frequent in the daytime, and stable conditions (Class E and Class F) are most frequent at night.

At the ten-meter level, unstable conditions are most frequent in the 6 a.m. to noon time period. However, in the afternoon Class E conditions are dominant at the ten-meter level.

Hourly mixing heights at the Spring Valley Site were also determined from DARS data. Mixing heights were greater than the DARS 600-meter limit approximately 81 percent of the time. Mixing height data for Ely should be considered representative of conditions in Spring Valley.

3.2.2.3.2 Air Quality

Pollutants measured at the Spring Valley Site include SO_2, TSP, Pb, and Be. Maximum measured concentrations were substantially less than NAAQS.

SO_2 concentrations were caused primarily by emissions from the McGill smelter. The low measured concentrations indicate that relatively little air is transported from McGill to the Spring Valley Site. TSP concentrations were most likely caused by wind blown dust during high wind speed conditions.

SO_2 was the only pollutant measured at the Connors Pass station. Measured concentrations were substantially less than NAAQS.

3.2.3 Water Resources

3.2.3.1 Butte Valley Site

Available information on the site-specific geology and groundwater occurrence in Butte Valley is limited. Logs for three wells drilled within the valley fill materials suggest that the subsurface characteristics vary significantly depending on the proximity to either the central playa or the perimeter edges of the valley. The valley itself contains approximately 1000 feet of unconsolidated sediments. During the Pleistocene, a lake occupied the valley resulting in the deposition of a thick sequence of lacustrine deposits. These fine-grained deposits may be underlain by unconsolidated Tertiary units. Alluvial and colluvial sand and gravel are found along the valley sides. These sands and gravels appear to have been deposited contemporaneously with the lacustrine deposits resulting in interfingering of the coarse and finer materials. Alluvial aprons exist along most of the valley edges and are the principal sources of groundwater within the valley. Their high permeabilities yield moderate to large amounts of water to wells.

The mountains forming the Butte Valley drainage basin consist mainly of Paleozoic carbonate rocks and some Tertiary volcanics. The east side of the valley consists primarily of limestone, with smaller amounts of dolomite, shale, and quartzite. A few remnants of Tertiary volcanics are also present and are predominant in the southern part of the basin. Limestone of Paleozoic age, with smaller amounts of dolomite and carbonaceous shale and sandstone, is found mainly in the western portion of the valley. The carbonate rocks on the sides of the valley are generally more permeable than the volcanics and quartzites. This is due to the presence of solution cavities and jointing.

Butte Valley is a closed groundwater basin. Precipitation is the sole source of recharge within the 730-square-mile drainage basin. The mean annual recharge is estimated by the USGS and NDCNR to be on the order of 15,000 afy. The mean annual discharge and perennial yield for the basin are estimated to be 12,000 afy and 14,000 afy, respectively. Current groundwater appropriations total about 1600 afy, leaving approximately 12,000 afy available for development. The volume of water in storage in the upper 100 feet of the saturated section is estimated to be 1.5 million acre-feet. Only one known thermal spring is present in the valley.

3.2.3.2 North Steptoe Valley Site

Steptoe Valley includes a drainage area of approximately 1975 square miles. The valley is elongated in a north-south direction and extends from the southern boundary of the County into Elko County to the north.

The bedrock geology of the mountains surrounding Steptoe Valley can be divided into four main units based on their hydrogeologic characteristics.

The first unit is Upper Precambrian to Lower Cambrian and consists of quartzose sedimentary rocks. Weathered and fractured zones, where they occur within a few hundred feet of the land surface, transmit groundwater and are potentially capable of providing limited water supplies. These rocks supply much of the late-season flow to tributaries of Duck Creek, one of the few perennial streams within Steptoe Valley.

The second hydrogeological unit consists of Paleozoic carbonates which include some elastic and other undifferentiated rocks. The carbonate rocks supply water to most of the larger springs in Steptoe Valley. The carbonates are fractured and contain solution cavities.

The other two hydrogeological units are relatively impermeable and consist of Cretaceous and Tertiary intrusive granitic rocks and Mesozoic and Tertiary volcanics with some consolidated sedimentary deposits. These hydrogeologic units stratigraphically overlie the Paleozoic carbonate unit. Locally, the volcanics may yield small amounts of water to springs.

The unconsolidated deposits are at least 4000 feet thick in the northern end of Steptoe Valley and up to 10,000 feet thick in the central and southern portions. The older valley fill deposits consist of unconsolidated to poorly-consolidated silt, sand, and gravel of moderate to low permeability, except near the sides of the valley where the alluvial aprons are of relatively high permeability. The more recent valley fill materials consist of silt, sand, and gravel along the valley floor and flood plain segments of tributary channels. In the northern end of Steptoe Valley where the lowland broadens, the younger fill may also contain lacustrine silt and clay.

Steptoe Valley is essentially a closed groundwater basin and, therefore, precipitation is the sole source of groundwater recharge. Steptoe Valley, however, is located within the recharge area for the eastern Nevada regional carbonate aquifer. The USGS has estimated the mean annual groundwater recharge and discharge to be approximately 85,000 afy and 70,000 afy, respectively.

Springs are numerous on both sides of the valley and originate from carbonate and volcanic rocks, as well as gravity springs within the alluvium. Thirteen known thermal springs occur within the valley. The springs originating in the mountains are the source of many of the intermittent streams. The flow from many of the streams originating in the mountains, however, reaches the valley floor only during periods of snowmelt and following periods of heavy rainfall. Duck Creek and Steptoe Creek are two of the few perennial streams within the valley. The combined discharge from these two streams represents about half of the estimated 78,000 afy of runoff from the mountains.

In the central portion of the valley, the water table is at, or close to, the ground surface throughout much of the year. This area supports wetland vegetation and is the principal area of groundwater discharge. A few small lakes and dry lakebeds are found along the central axis of the valley.

Existing groundwater development in Steptoe Valley is concentrated in three areas: 1) south of Ely to Comins Lake; 2) between McGill and Monte Neva Hot Springs; and 3) in the northern part of the valley near the Elko County/White Pine County line.

In the area south of Ely to Comins Lake, the valley is narrow with numerous streams forming small alluvial fans on the valley floor. No lacustrine deposits are known to exist within the southern portion of Steptoe Valley.

The area between McGill and Monte Neva Hot Springs is dominated by extensive deposits of the Duck Creek alluvial fan, which extends into the valley from Gallagher Gap. Well logs from this area indicate that the upper 200 feet of sediments in the fan area consist mainly of sand and gravel. (In the central parts of the valley, the sediments consist mainly of silts and clays.) A number of high-production irrigation wells are located within the area between Ely and McGill. The wells in this area are typically 125 to 250 feet deep with reported yields in excess of 2000 gpm.

North of McGill, well yields tend to decrease with the depth of wells and resultant drawdowns due to pumping increases. Well depths north of McGill typically range from 400 to 500 feet or deeper, with yields from individual wells between 600 gpm and 750 gpm.

In the northern part of the valley near the County line, numerous wells are concentrated within a five-square-mile area near the east side of the valley. Most of the wells in this area are 200 to 400 feet deep, with a few reported to be as deep as 900 feet.

Available groundwater quality data for Steptoe Valley indicate high levels of sulfate. These analyses, however, are for samples mostly taken from springs and may not be typical of the groundwater quality within the valley fill. It is anticipated that the groundwater quality within the valley fill materials varies, depending on location, from fresh with low concentrations of dissolved solids to brackish in areas of groundwater discharge.

Calculated transmissivities for existing wells completed within the alluvium in Steptoe Valley range from about 400 gallons per day per foot (gpd/ft) to 160,000 gpd/ft. Reported yields from individual wells range from about 100 gpm to 1500 gpm.

Current groundwater withdrawals are estimated to be approximately 32,000 afy. Major uses include irrigation (19,500 afy), mining and energy development (9600 afy), and urban/industrial use (2900 afy). The estimated consumptive use, which includes evapotranspirational losses from irrigated and non-irrigated lands, is 84,500 afy.

3.2.3.3 Spring Valley Site

Spring Valley is essentially a closed groundwater basin and includes a drainage area of approximately 1700 square miles in the eastern part of the County. The valley also overlies the eastern Nevada carbonate aquifer. The valley is bounded on the west by the Schell Creek Range and by the Snake Range on the east. The Schell Creek Range consists of predominantly Paleozoic limestone and dolomite with isolated remnants of Tertiary lava flows common. The carbonates contain solution cavities and are jointed which contribute to groundwater movement. The Snake Range consists primarily of Precambrian quartzite with some granodiorite stocks occurring in different locations. Both the quartzite and granodiorite are relatively impervious.

The depth of the unconsolidated alluvial, colluvial, and lacustrine materials which comprise the valley fill in Spring Valley is unknown, but is likely to be in excess of 1000 feet. In the geologic past, Spring Valley contained a large lake. Clay and other fine-grained sediments which were deposited in the lake can be found at a considerable depth below the present valley floor. The fine lacustrine deposits in Spring Valley are as much as 300 feet thick and are underlain by poorly-consolidated Tertiary and Quaternary sand, silt, and gravel which comprise a potentially good aquifer.

Several small intermittent streams occur in the southern half of Spring Valley. These streams have their origin in the mountains and are fed by springs and direct surface runoff during snowmelt and periods of heavy rainfall. The only perennial stream in Spring Valley is Cleve Creek, located in the northern part of Spring Valley. The mean annual discharge of Cleve Creek is estimated to be approximately 6350 afy. Some thermal springs occur in Spring Valley, but none are classified as hot springs. The Shoshone Ponds in the southern portion of Spring Valley support important threatened and endangered species and, therefore, are a potentially sensitive area.

Both confined and unconfined conditions exist within the valley. Several flowing wells occur within the area to the east of Baking Powder Flat in the southern part of the valley and at least one flowing well in the northern part of the valley.

The depth to the groundwater table within the valley floor varies from less than 10 feet to 100 feet or more. Much of the valley floor areas consist of playas. The

USGS and the NDCNR have estimated both groundwater recharge and discharge to be approximately 75,000 afy. The estimated mean annual discharge includes approximately 4000 afy and flows from Spring Valley to Hamlin Valley. The perennial yield of the basin is estimated to be approximately 100,000 afy. This includes an estimated mean annual runoff from the mountains of 90,000 afy and an estimated 10,000 afy of direct precipitation on the alluvial fans. The apparent difference between the estimated mean annual recharge and the perennial yield includes some 25,000 acre-feet of rejected recharge that flows onto the playas and evaporates. Calculated transmissivities for existing wells range from about 3500 gpd/ft to 16,900 gpd/ft. Well yields range from about 400 gpm to 525 gpm.

Existing groundwater development in Spring Valley is concentrated around the periphery of the valley, particularly along the east side of the valley south of U.S. Highway 6 and along the west side of the valley north of U.S. Highway 6. The wells in both areas typically range in depth from 300 to 500 feet, although a few wells may exceed 900 feet. The majority of wells yield 450 gpm to 500 gpm. Only a few wells are located within the central portion of the valley.

Estimated groundwater withdrawals are approximately 18,500 afy, and the major uses include irrigation (16,500 afy) and mining and energy development (1700 afy).

3.2.4 Ecological Resources

3.2.4.1 Butte Valley Site

3.2.4.1.1 Soils

Soils of the Butte Valley Site occur on gentle, northeast trending slopes at elevations between 6200 and

6500 feet. The six soil mapping units that occur on the Butte Valley Site are shown on Figure 3-14. Information on soils associated with these mapping units is included in Table 3-16.

3.2.4.1.2 Vegetation

The vegetation of the Butte Valley Site consists primarily of black sagebrush, Wyoming big sagebrush, winterfat and shadscale-dominated communities with pinyon and juniper on hillsides.

Information on ecologicsl sites is included in Table 3-16. The five ecological sites (and their associated plant species) on the Butte Valley Site are as follows:

a. Loamy 5-8 (shadscale)
b. Shallow Calcareous Loam 8-12 (black sagebrush)
c. Silty 8-10 (winterfat)
d. Loamy 8-10 (Wyoming big sagebrush)
e. Shallow Loamy Slope 12-16 (pinyon-juniper)

Each ecological site has a diagnostic potential plant community and species composition which is an expression of all the environmental factors. However, due to disturbance (primarily heavy grazing), only a few of the potentially dominant species are present in the existing plant communities. Therefore, existing vegetative composition may only marginally resemble the potential of an ecological site.

Loamy 8-10 occurs predominantly on terraces, fans, flats and slopes between about 5000 and 7000 feet in elevation, and covers about 43 percent of the Butte Valley Site. Annual plant production is estimated to range from 400 to 800 pounds per acre with a median value of 600 pounds per acre in an average year. The existing vegetation is composed primarily of big sagebrush, with lesser amounts of bud sagebrush and shadscale. Sandberg bluegrass, bottlebrush squirreltail, Indian ricegrass, and pinnate tansy mustard are interspersed among the shrubs.

About 26 percent of the entire Butte Valley Site is mapped as Shallow Calcareous Loam 8-12 and is represented by a black sagebrush community, mainly on well-drained knolls, with Wyoming big sagebrush, low rabbitbrush and scattered plants of Green rabbitbrush, bud sagebrush, halogeton, wallflower, winterfat and pinnate tansy mustard as the main associates. Annual production ranges from 400 pounds per acre in a dry year to 950 pounds per acre in a moist year. Average production is estimated at 700 pounds per acre.

Silty 8-10 occupies flats, basins and level fans and comprises about seven percent of the Butte Valley Site. Silty 8-10 contains primarily winterfat-dominated communities with only shadscale, halogeton, and pinnate tansy mustard as associates. Annual production is estimated at 550 pounds per acre in a median year, but can range from 300 to 800 pounds per acre depending upon climatic conditions.

Loamy 5-8 occurs on lower valley fans and terraces on about 16 percent of the Butte Valley Site. A shadscale community dominates, but bud sagebrush, Wyoming big sagebrush, and winterfat communities are also present. Less abundant species include Sandberg bluegrass, bottlebrush squirreltail, Indian ricegrass, and pinnate tansy mustard. Production is estimated to range from 600 pounds per acre to 250 pounds per acre with a value of 450 pounds per acre for normal years.

The remaining 8 percent of the Butte Valley Site is represented by Shallow Loamy Slope 12-16. It is usually located on slopes betweeen 6500 and 8500 feet elevation and is dominated by stands of pinyon-juniper woodland. The shrub understory is usually black sagebrush but varies considerably in composition, depending upon aspect, slope, elevation, and soil conditions.

3.2.4.1.3 Terrestrial Wildlife

No big game species are known to consistently use shrub-steppe habitats on the Butte Valley Site. However, the site is within an area under consideration for pronghorn introduction. Additionally, mule deer winter range occurs on adjacent benches, and bands of wild horses frequent the area. Though sage grouse are found, no leks or wintering areas have been located on the site. A ferruginous hawk nest is present in the southwest corner of the site, and one wintering bald eagle was known to use the portion of Butte Valley within the County.

3.2.4.1.4 Aquatic Ecology

No aquatic species or potential aquatic habitat are known to occur on, or immediately adjacent to, the Butte Valley Site.

3.2.4.2 North Steptoe Valley Site

3.2.4.2.1 Soils

Soils of the North Steptoe Valley Site occur on a gently sloping valley at elevations between 5900 and 6000 feet. The five soil mapping units that occur on the North Steptoe Valley Site are shown on Figure 3-15. Information on soils associated with these mapping units is included in Table 3-16.

3.2.4.2.2 Vegetation

Big sagebrush and black greasewood-dominated communities characterize most of the vegetation of the North Steptoe Valley Site, with shadscale and saline meadows occurring as minor constituents. A transition of upland to lowland vegetation occurs from east to west on the site. This transition in vegetation follows a gradient of increased salinity and poor soil drainage.

Information on ecological sites is included in Table 3-16. The seven ecological sites (and their associated plant species) on the North Steptoe Valley Site are as follows:

a. Sodic Terrace 6-8 (greasewood/shadscale)
b. Sodic Terrace 8-10 (greasewood/big sagebrush)
c. Loamy 5-8 (shadscale)
d. Loamy 8-10 (Wyoming big sagebrush)
e. Saline Bottom 5-12 (alkali sacaton, inland saltgrass, basin wildrye)
f. Saline Meadow 5-12 (alkali sacaton)
g. Sodic Flat 5-12 (greasewood)

Sodic Terrace 6-8 and Sodic Terrace 8-10 are the most abundant, occurring on about 42 percent of the North Steptoe Valley Site. Black greasewood is characteristic, along with rubber rabbitbrush and shadscale. Low rabbitbrush, cheatgrass brome, alkali cordgrass, and claspingleaf pepperweed are the major understory species. Depending on growing conditions, annual production ranges from 300 to 600 pounds per acre for Sodic Terrace 6-8 and 350 to 800 pounds per acre for Sodic Terrace 8-10. Soils are saline and may have a water table near the surface.

Wyoming big sagebrush is the potentially dominant species of Loamy 8-10, but occurs on only about two percent of the North Steptoe Valley Site. Existing vegetation, however, contains a high percentage of greasewood and low rabbitbrush. Less abundant species of both the shrub and herbaceous strata are black sagebrush, gooseberry-leaf mallow, milkvetch, and claspingleaf pepperweed.

Shadscale dominates Loamy 5-8, which covers about 13 percent of the North Steptoe Valley Site. Winterfat should be associated with shadscale on Loamy 5-8, but grazing has substantially reduced its occurrence. Instead, halogeton, bottlebrush squirreltail, and claspingleaf pepperweed are the primary associates. Annual production ranges from 250 to 700 pounds per acre with a median value of 450 pounds per acre.

Sodic Flat 5-12, Saline Meadow 5-12, and Saline Bottom 5-12 are associated with poorly drained, sodic soils and are mapped as one unit. Sodic Flat 5-12 is associated with black greasewood communities on slightly elevated and better drained areas and include alkali sacaton and inland saltgrass. Associates of black greasewood in the existing communities include littleleaf horsebrush, rubber rabbitbrush, gray molly, bud sagebrush, shadscale, and Green rabbitbrush. Basin wildrye, claspingleaf pepperweed, and thelypody are scattered under protective shrubs. Annual production ranges from 200 to 600 pounds per acre. Saline Meadow 5-12 is primarily represented by alkali sacaton, alkali cordgrass and inland saltgrass. Other grass-like species (e.g., sedges and bulrushes) are differentially important. Black greasewood, fourwing saltbush, and rubber rabbitbrush are scattered throughout the community. Annual production ranges from 700 to 3000 pounds per acre. Saline Bottom 5-12 is closely associated with Saline Meadow 5-12 but is generally less productive (500 to 2000 pounds per acre). Saline Bottom 5-12 and Saline Meadow 5-12 also encompass marshes and shallow alkaline wetlands that support cattails, rushes, alkali grasses, and saltgrass. These areas are classified as palustrine emergent wetlands composed of inland saline flats.

3.2.4.2.3 Terrestrial Wildlife

Areas on and adjacent to the North Steptoe Valley Site are inhabited by pronghorn and mule deer. Winter range for both species exists on the benches southeast and west of the site. Wild horses also occur in Steptoe Valley and may frequent the site. During the winter of 1981-1982 bald eagles were observed in Steptoe Valley. In addition, one Peregrine falcon was observed in Goshute Canyon west of the site in 1980.

3.2.4.2.4 Aquatic Ecology

No aquatic species or potential habitat are known to exist on, or immediately adjacent to, the North Steptoe Valley Site. However, Goshute Creek, which is inhabited by a population of relatively pure strain Bonneville (Utah) cutthroat trout, is located approximately five miles northwest of the site.

3.2.4.3 Spring Valley Site

3.2.4.3.1 Soils

Soils of the Spring Valley Site occur on a gently sloping valley at elevations between 5800 and 6000 feet. The six soil mapping units that occur on the Spring Valley Site are shown on Figure 3-16. Information on soils associated with these mapping units is included in Table 3-16.

3.2.4.3.2 Vegetation

Much of the vegetation on the Spring Valley Site consists of big sagebrush, black greasewood, and rubber rabbitbrush.

Information on ecological sites is included in Table 3-16. The six ecological sites (and their associated plant species) on the Spring Valley Site are as follows:

a. Loamy 8-10 (Wyoming big sagebrush)
b. Loamy 5-8 (shadscale)
c. Shallow Calcareous Loam 8-12 (black sagebrush)
d. Silty 8-10 (winterfat)
e. Sodic Terrace 8-10 (greasewood/big sagebrush)
f. Saline Bottom 5-12 (alkali sacaton)

Loamy 8-10 supports a Wyoming big sagebrush/Indian ricegrass community and also contains bottlebrush squirrel-tail, black sagebrush, and winterfat. Loamy 8-10 is characteristic of terraces, flats, benches, and toe slopes at elevations of 5000 to 7000 feet. Annual production ranges from 400 to 800 pounds per acre with a median value of 600 pounds per acre.

Shadscale is prominent on Loamy 5-8 which, characteristically, includes a higher soil salinity. Subordinate species are Sandberg bluegrass, Indian ricegrass, needle-and-thread, pinnate tansy mustard, and claspingleaf pepperweed. Loamy 5-8 occurs on the same topographic features as does Loamy 8-10 but at lower elevations. Median production of the Loamy 5-8 is 450 pounds per acre.

Shallow Calcareous Loam 8-12 is associated with a black sagebrush community, which includes low rabbitbrush, Green rabbitbrush, rubber rabbitbrush, and scattered occurrences of Indian ricegrass. Shallow Calcareous Loam 8-12 occurs on benches, terraces and slopes at an elevation of 5000 to 7000 feet and produces 700 pounds per acre in a median year.

Winterfat is associated with Silty 8-10. Halogeton is a prominent associate of the winterfat community in Spring Valley. Silty 8-10 occurs on flats, basins, and fans. Median production is approximately 550 pounds per acre.

Sodic Terrace 8-10 is associated with flats, gentle inclines and basins which lie just above playas and valley bottoms at elevations of 4500 to 7000 feet. Vegetative cover is relatively diverse and is composed primarily of greasewood, big sagebrush and rabbitbrush. Annual production is estimated to be 350 to 800 pounds per acre with a median value of 600 pounds per acre. Portions of Sodic Terrace 8-10 have been seeded to crested wheatgrass, Siberian wheatgrass, and Russian wildrye.

Saline Bottom 5-12 occurs in low-lying areas which are occasionally flooded or have water levels near the surface. Although typically alkaline, productivity is selectively high at 500 to 2000 pounds per acre, with a median of 1000 pounds per acre. Alkali sacaton and rabbitbrush are dominant species and are accompanied by inland saltgrass, alkali muhly and alkali cordgrass.

3.2.4.3.3 Terrestrial Wildlife

The Spring Valley Site is within a year-round range for pronghorn. Winter and spring range for mule deer occurs northwest of the site on the east slope of the Schell Creek Range. Several wetland areas exist north and south of the site. Bald eagles were observed in Spring Valley during the winter of 1981-1982.

3.2.4.3.4 Aquatic Ecology

No aquatic species or potential habitat are known to occur on or immediately adjacent to the Spring Valley Site. However, Pine Ridge Creek, which is inhabited by Bonneville (Utah) cutthroat trout, is located within approximately five miles east of the site and the Shoshone Ponds, which are inhabited by the Pahrump killifish, are located approximately six miles southeast of the site.

3.2.4.4 Transmission Line Corridors

3.2.4.4.1 Soils

Transmission line corridors traverse 22 soil mapping units in the County. The 22 units can be grouped into six broad categories related to land use and reclamation properties.

Group 1 soils are deep, well-drained, moderately permeable soils associated with Loamy 8-10 and occur on alluvial fans. Group 2 soils are all shallow with moderately rapid permeability and good drainage. Also found on alluvial fans, they are associated with Shallow Calcareous Loam 8-12. Group 3 soils are deep, slow to moderately-slow draining, and are found on basin-filled plains in association with Silty 8-10 and Loamy 8-10. Group 4 are deep, well-drained soils with moderately slow permeability. They are found on basin-filled plains and are associated with Sodic Terrace 6-8 and Sodic Terrace 8-11. Group 5 contains soils associated with

Saline Meadow 5-12 and Saline Bottom 5-12. The soils are poorly to well-drained, have moderately slow permeability, and are found on basin-filled plains. Group 6 contains soils which are associated primarily with foothills and low mountains. They are well-drained, have moderate to moderately-rapid permeability, and are associated with Shallow Loamy Slope 12-16.

3.2.4.4.2 Vegetation

The transmission line corridors primarily cross northern desert shrub and salt desert transitional shrub vegetation complexes. The northern desert complex contains big sagebrush and black sagebrush, while the salt desert complex contains shadscale, black greasewood, and winterfat communities. Exceptions include corridor segments in Steptoe Valley which cross about five miles of saline meadows. Where corridors extend above about 6800 feet, pinyon-juniper woodland is encountered, along with areas of basin big sagebrush.

South of the County, corridors continue to cross the big sagebrush complex, although salt desert shrub communities of shadscale and black greasewood occur in valleys below about 5500 feet. Creosote bush communities of the Mojave Desert become increasingly more prominent south of the Lincoln County/Clark County line, but interface with shadscale and blackbrush communities at the higher elevations (5300 feet). Range ratany, bursage, brittlebush, and spiny hopsage combine with creosote bush to form several plant communities. Summer and winter flowering annuals also characterize this hot desert vegetation. The Mojave Desert vegetation is crossed by 35 miles of corridor segments.

3.2.4.4.3 Terrestrial Wildlife

Shrub-steppe and pinyon-juniper habitats occurring along the transmission line corridors provide winter habitat for mule deer and year-round habitat for wild horses. The coniferous forest habitat characteristic of higher elevation passes is inhabited during the summer by mule deer and elk.

Three sage grouse leks occur in Jakes Valley south of the Butte Valley Site, while another lek occurs west of Gonder Substation. The northerly corridor segment between the Butte Valley Site and Newark Valley includes three ferruginous hawk nest sites and two sage grouse leks and crosses mule deer summer and winter range in the Butte Mountains. Continuing west and entering Eureka County, the corridor passes through the Diamond Range which is predominantly pinyon-juniper woodlands and sagebrush shrubland. This mixed coniferous forest provides seasonal habitat for mule deer and winter sage grouse. In addition, four sage grouse brooding areas and a mule deer migration corridor occur within the corridor in the Diamond Range.

Corridors in northern Steptoe Valley, cross pronghorn winter range and mule deer winter and spring ranges, while sage grouse leks and pronghorn year-round range are included in the Spring Valley corridors. One sage grouse lek and two ferruginous hawk nests, and critical elk habitat (Cooper Canyon) occur within corridors in southern Steptoe Valley.

Mule deer winter range also occurs within the corridors which cross year-round mule deer range and a mule deer migration route. Further south, in Lincoln County, pronghorn antelope year-round range and bighorn sheep range are crossed by corridors, while in Nye County, a corridor segment passes adjacent to a ferruginous hawk nest.

3.2.4.4.4 Aquatic Ecology

The majority of the transmission line corridors cross arid areas without aquatic habitat. Exceptions include Steptoe Creek in Steptoe Valley, Pinto Creek in the Diamond Range, and springs near Preston and Lund in White River Valley. The corridor southeast of Ely is adjacent to Steptoe Creek, which is inhabited by brown trout, rainbow trout, cutthroat trout and relict dace. Pinto Creek, which is inhabited by rainbow trout, is crossed by a corridor segment extending westerly toward Eureka County.

Corridors in the southern part of the County are adjacent to isolated springs and ponds which provide habitat for endemic fish species in the White River Valley. These fish species include the White River speckled dace, Preston White River springfish, White River spinedace, and White River desert sucker.

3.2.4.4.5 Threatened and Endangered Species

Listed and candidate threatened and endangered species that occur in or near the transmission line corridors are shown on Figure 3-17.

3.2.4.5 Well Fields and Pipeline Corridors

3.2.4.5.1 Soils

Soil properties associated with the well fields and pipeline corridors are similar to those discussed in Section 3.2.4.4.1.

3.2.4.5.2 Vegetation

The well fields and water pipeline corridors are located primarily in Wyoming big sagebrush, black sagebrush and shadscale-dominated communities. Important associates of big sagebrush communities are rubber rabbitbrush, low rabbitbrush, bud sagebrush, prickly pear, and Indian ricegrass. Black sagebrush communities occur on upland benches (6200 feet) and include low rabbitbrush, bud sagebrush, Wyoming big sagebrush, and winterfat. Shadscale communities, in association with winterfat and black greasewood, occur where well fields are located on upland benches (6200 feet). Saline meadow vegetation occurs on several of the well fields located in Steptoe Valley. Well fields on the east side of Spring Valley include "swamp cedar" stands.

3.2.4.5.3 Terrestrial Wildlife

Sage grouse leks occur south of the Butte Valley well fields and west of the Butte Valley Site. The well field northwest of the site is within sage grouse winter range, and ferruginous hawk nests.

Mule deer winter range is present on the well fields to the west of the North Steptoe Valley Site, while pronghorn winter range is present on the well fields immediately east and south of the site. A ferruginous hawk nest exists on the well field area immediately east of the site.

Spring Valley well fields encompass mostly shrub-steppe (year-round pronghorn habitat) and intermittently border on pinyon-juniper woodlands. The well field immediately northeast of the Spring Valley Site is within sage grouse winter range while mule deer winter range occurs on the southeast benches of the Schell Creek Range near the well fields.

3.2.4.5.4 Aquatic Ecology

No aquatic habitat exists on or near the well fields located in Butte Valley. However, aquatic habitat does occur near a portion of a well field in Steptoe Valley. The aquatic habitat consists of the Cordano Ranch Springs (located approximately six miles northeast of the well field), and Warm Springs (railroad station) near Monte Neva Hot Springs (located approximately ten miles south of the well field). Both of these spring complexes are on private land and provide habitat for relict dace. The pipeline corridor connecting the Steptoe Valley well field with the Butte Valley Site parallels Egan Creek, which supports approximately 2.8 miles of habitat for rainbow trout. Egan Creek has recently been considered a viable stream for transplanting Bonneville (Utah) cutthroat trout from the self-sustaining Goshute Creek population.

Small streams and numerous springs occur on or adjacent to Steptoe Valley well fields and pipeline corridors. The northern Steptoe Valley streams include Cherry Creek and Big Indian Creek (West Schell Bench). Fish species of Cherry Creek primarily consist of rainbow trout, while Big Indian Creek is inhabited by both brook trout and rainbow trout. Springs adjacent to the pipeline corridors include Cordano Ranch Springs and Warm Springs (railroad station) which are inhabited by relict dace. Relict dace habitat is present in numerous springs along the eastern base of the Cherry Creek Range.

Major aquatic habitats in the vicinity of the Spring Valley well fields include two stream fisheries, Bastian Creek and Willard Creek, Pine-Ridge Creek and Shoshone Ponds.

Bastian Creek originates at 6800 feet on the eastern edge of the Schell Creek Range and flows approximately two miles before entering the Spring Valley well fields. Bastian Creek is inhabited by rainbow trout and brown trout. Willard Creek, inhabited by cutthroat trout and rainbow trout, begins its four mile descent into eastern Spring Valley from approximately 7000 feet on the western slopes of the Snake Range. Pine Ridge Creek is located near Wheeler Peak on the west bench of the Snake Range. Originating at 8600 feet, Pine Ridge Creek flows approximately six miles and is inhabited by a native population of Bonneville (Utah) cutthroat trout, the original source for the transplanted population in Goshute Creek. The Shoshone Ponds, a preserve consisting of three ponds, is located approximately ten miles southeast of the southernmost proposed well fields. The Shoshone Ponds are inhabited by one of only two known endangered Pahrump killifish populations. The relict dace also inhabits the Shoshone Ponds.

3.2.4.6 Railroad Corridors

3.2.4.6.1 Soils

Railroad corridors traverse 16 soil mapping units in the County. These soils range from well to poorly drained, slow to moderately rapid permeability, and slight to severe erosion potential. Land use and reclamation potential also varies between each unit.

3.2.4.6.2 Vegetation

The vegetation of the northern railroad corridors is essentially an extension of the patterns described for the three WPPP sites and surrounding areas. Shadscale and black greasewood comprise most of the valley floor vegetation, while big sagebrush, rubber rabbitbrush, and black sagebrush occur on the upland benches and lower valley. Pinyon-juniper woodland occurs in many of the passes above about 6800 feet.

The NNRy right-of-way is adjacent to saline meadows and ponds in Steptoe Valley. Alternate southern railroad corridors encompass numerous wetland areas including seeps, small ponds, and saline meadows.

3.2.4.6.3 Terrestrial Wildlife

Shrublands are the main habitat types associated with the railroad corridors. The corridor in the Egan Creek Pass also crosses pinyon-juniper woodland habitat representing higher elevations. Wetlands are crossed by corridors in Steptoe Valley and Spring Valley. These habitats support a variety of terrestrial wildlife including ferruginous hawk (nesting areas), sage grouse (leks and wintering grounds), pronghorn (migration routes, kidding areas and year round range), mule deer (migration routes, and spring and summer range), wild horse year-round range, and an important bald eagle wintering area in Antelope Valley.

3.2.4.6.4 Aquatic Ecology

Aquatic habitat of importance adjacent to the railroad corridors within the County is confined to corridors in Butte Valley and Spring Valley. This habitat consists of numerous springs inhabited by relict dace. In the White River Valley, a corridor passes near numerous springs and the White River, which are inhabited by White River spinedace, White River desert sucker, Preston White River springfish, and White River speckled dace.

Outside the County, important aquatic habitat occurs adjacent to railroad corridors in Butte Valley, White River Valley, Condor Canyon, Meadow Valley Wash, Independence Valley, and Clover Valley. The White River in Nye County contains habitat for White River springfish. In Lincoln County, Condor Canyon contains habitat for Meadow Valley Wash (White River) desert sucker and Big Springs spinedace. Meadow Valley Wash is inhabited by Meadow Valley Wash speckled dace. In Elko County, Independence Valley supports habitat for Independence Valley speckled dace and Independence Valley tui chub. Clover Valley speckled dace inhabits springs in Clover Valley.

3.2.4.6.5 Threatened and Endangered Species

Listed and candidate threatened and endangered species that occur in or near the railroad corridors are shown on Figure 3-18.

3.2.5 Cultural and Paleontological Resources

3.2.5.1 Butte Valley Site

Prior to investigations associated with WPPP, little archaeological work had been done on the Butte Valley Site. The recorded sites indicated a low potential for NRHP eligibility. Subsequent partial reconnaissance of the Butte Valley Site revealed three prehistoric sites, one historic site, and one site with both periods represented. When combined with other baseline information, this suggests that prehistoric site density in the area is low. Historic sites, including known trails, are present and represent a large portion of the identified cultural resources. Variability in site types is limited. Cultural resource sites are more prevalent in the southern portion of the Butte Valley Site, on the flatter alluvial areas between the hills to the west, and on the playa to the northeast. None of the sites located to date appear eligible for inclusion in NRHP.

The northwest corner of the Butte Valley Site is situated on Lower Pennsylvanian to Lower Permian strata and has a moderate paleontological potential. The remainder is on sediments mapped as Quaternary alluvium and is of low potential.

3.2.5.2 North Steptoe Valley Site

Only two surveys were conducted on the North Steptoe Valley Site prior to WPPP investigations. Most prehistoric sites found date to the Archaic and the Post-Fremont Periods and indicate a moderate potential for eligibility to NRHP. A partial reconnaissance of the North Steptoe Valley Site revealed 27 archaeological sites. Most are isolated prehistoric period finds or small artifact scatters. Survey results suggest that site density is highest in areas dominated by sand dunes and lowest in hardpan areas. Dunes are found in a broad band running diagonally through the North Steptoe Valley Site from northeast to southwest. Hardpan and playa areas are found in the northwest corner of the North Steptoe Valley Site. Archaeological site density on the piedmont in the southeast corner of the site is moderate. Several sites have been identified as potentially eligible to the NRHP.

The North Steptoe Valley Site is located on sediments mapped as Quaternary alluvium. Paleontological potential is low. Fossils from nearby highlands may be present, but only as float.

3.2.5.3 Spring Valley Site

The Spring Valley Site received a large amount of archaeological attention prior to WPPP investigation. The recorded archaeological sites indicated a high potential for eligibility to NRHP. Prehistoric use of the area was highest during Archaic times. Fremont period sites are also likely. During a partial reconnaissance of the Spring Valley Site, 12 prehistoric sites and 1 historic site were recorded. Three periods (Archaic, Fremont, and Post-Fremont) are represented by large base camps containing numerous artifacts and features. About one-third of the cultural resource sites recorded on the Spring Valley Site to date may be eligible to the NRHP.

The Spring Valley Site lies entirely within an area mapped as Quaternary alluvium. Potential for fossil occurrence other than float from adjacent Paleozoic rocks is low.

3.2.5.4 Transmission Line Corridors

Information on cultural resources within transmission line corridors is based on literature and previous projects. Most of the corridor segments have sites that indicate a low to moderate potential for eligibility to NRHP. Additional information on corridor segments with high potential is provided below.

The corridor segment in Spring Valley has abundant water along the western edge of the valley, and sites of all prehistoric periods should be numerous, with some quite large. Archaic and Post-Fremont Period sites should predominate. Ethnograhic period sites have been recorded and local Native American interest in the corridor may be moderate to high. Historic period sites in the area are numerous and include several townsites dating to the 1870s and 1880s. Numerous archaeological projects have been undertaken along the corridor. As expected, a majority of the sites located in the County date to the historic period. Numerically, most of the recorded sites have been located in the Lincoln County where more work has been done. Prehistoric sites vary in size and no Fremont Period sites have been found within the corridor segment.

The corridor segment in Dry Lake Valley in Lincoln County has recorded prehistoric sites that exhibit a distinct distributional pattern. The sites, which tend to be small, cluster around the edges of the valley. Site density in this area is high. The central portion of Dry Lake Valley has a much lower site density. In contrast with better-watered areas, such as Moapa Valley, sites are more frequent along the banks of the stream course in the central part of the valley.

In addition to the above, the corridor segment between Steptoe Valley and Butte Valley via Egan Basin crosses several areas of projected high site density. These occur along the margins of the pinyon-juniper vegetation zone and thermal springs associated with Egan Creek. Sites are present that may be significant to Native Americans.

None of the transmission corridors contain properties listed on or determined eligible for NRHP. The transmission corridor segment in Long Valley is adjacent to a district listed on the NRHP. The White River Narrows NRHP site is located several miles outside of a corridor segment.

The potential for significant paleontological areas to occur in transmission line corridors is primarily low or moderate. The highest potential for paleontological localities to occur is in Lake Valley.

3.2.5.5 Well Fields and Pipeline Corridors

Baseline data suggest that the well fields located in Butte Valley are in zones of low prehistoric site density. Historic site density will vary (highest in the southern well field, lowest in the northwest field). Existing data show that, although a moderate amount of work has been completed in the three well field areas, few sites have been identified. The recorded sites confirm low prehistoric site density and moderate historic site density.

Five well fields are located in Steptoe Valley. Springs, present in the northernmost well field, should increase the prehistoric site density of the area. In addition, these springs may be of significance to contemporary Indian people. The next well field to the south is partially covered by stabilized sand dunes which are high in site density. Dunes are not as prevalent in the southern three well fields. The NNRy right-of-way is adjacent to the next well field south and the southernmost well field is located in an agricultural zone. The amount of previous work in the five well fields is inconsistent. The data suggest that site density decreases from north to south in Steptoe Valley.

The pipeline corridor between the North Steptoe Valley Site and the Butte Valley Site passes through several areas of projected high site density. These are along the margins of the pinyon-juniper vegetation zone, areas with thermal springs along Egan Creek, and the Hamilton to Cherry Creek stageline route. Sites are present that will be of possible significance to local Native Americans. The majority of previous archaeological research along the pipeline corridor is focused in Butte Valley, and numerous historic sites have been recorded.

Four well fields are located in Spring Valley. A review of existing data shows that few projects have been conducted, but a fair number of sites have been recorded. Data reveal that site density is variable and seems to be highest in the northwest field and lowest in the southwest field. Fremont Period sites may be present in the northwest field.

The well fields and pipeline corridors have a low potential for significant paleontological areas.

3.2.5.6 Railroad Corridors

Information on cultural resources within railroad corridors is based on literature and previous projects. Most of the corridors have sites that indicate a low to moderate potential for eligibility to NRHP. Additional information on railroad corridors with moderate to high potential is provided below.

Cultural resources found along the railroad corridor south of the Butte Valley Site will be varied. Pre-Archaic and Archaic Period site density around the margin of Jakes Valley should be high. Fremont Period sites may be found adjacent to the White River. The railroad corridor crosses the Hamilton to Cherry Creek stageline route. White River Valley should contain numerous sites related to agricultural use. Preston, one of the first agricultural communities in the County, is adjacent to the railroad corridor. Several archaeological investigations along the railroad corridor have located numerous sites. These data suggest that site density may be moderate and that the majority of sites encountered will not be large or complex. Larger sites, either individually or in clusters, will be found around major water sources. Historic period sites appear to be frequent. The railroad corridor passes well to the north of the White River Narrows NRHP site and is immediately adjacent to the Bristol Wells Townsite National Register Site. Historic properties on and eligible to the NRHP are present in and around Pioche, the southern terminus of the railroad corridor.

The railroad corridor north of the Spring Valley Site should have a wide range of cultural resources. The railroad corridor crosses, and often runs parallel to, pluvial beach terraces. Site density on these terraces should be higher than for other portions of the railroad corridor and Pre-Archaic Period sites are more likely here. At the northern end of Spring Valley, the railroad corridor nears stands of pinyon-juniper, and Archaic and Post-Fremont sites should predominate. The railroad corridor crosses the Pony Express route, and the site of the Spring Valley station is within the corridor. The railroad corridor runs along the edge of the Osceola mining district and may contain small historic sites dating to the period from 1870 to the early 1900s. The possible site at which a number of Indians were killed by a cavalry unit from Fort Ruby (1863) is situated within the bounds of the railroad corridor.

The highest potential for significant paleontological areas is associated with the railroad corridor near Pioche.

3.2.6 Visual Resources

3.2.6.1 Butte Valley Site

The Butte Valley Site is located in the southern portion of Butte Valley between the Butte Mountains and the Egan Range. The site is located on an alluvial fan formed by intermittent streams originating in the Butte Mountains to the west. Elevations at the site range from about 6200 to 6400 feet. The site is characterized by a natural landscape with a sparse distribution of scrub and brush vegetation. The Butte Valley Site is on land that is classified under the BLM VRM Program as interim Class 3. Elevations in the ranges to the west, northeast, east, and southeast of the site reach 9000 feet.

3.2.6.2 North Steptoe Valley Site

The North Steptoe Valley Site is located at the northern end of Steptoe Valley between the Cherry Creek Range and Schell Creek Range. Elevations at the site range from approximately 5800 to 6000 feet. The North Steptoe Valley Site slopes gently to the northwest and is characterized by a landscape in a natural dominance condition, with a sparse distribution of scrub and brush vegetation. The site is on land that is classified under the BLM VRM Program as interim Class 3.

U.S. Highway 93 travels in a northeast-southwest direction adjacent to the eastern boundary of the site. In addition, U.S. Alternate Highway 50, State Highway 35, and the NNRy are located in the vicinity of the site.

The mountain ranges to the east and west of the site are characterized by elevations exceeding 10,000 feet and coniferous forest cover. The Goshute Canyon Natural Study Area and the Goshute Canyon Wilderness Study Area are located to the west of the site in the Cherry Creek Range.

Historic features in the vicinity include the Pony Express Trail which travels in an east-west direction approximately 10.5 miles south of the site, and Fort Schellbourne located adjacent to the Pony Express Trail.

3.2.6.3 Spring Valley Site

The Spring Valley Site is located within the south-central portion of Spring Valley between the Schell Creek Range and Snake Range. Elevations at the site range from approximately 5800 to 6000 feet. The Spring Valley Site is relatively flat and is located in a landscape in a natural dominance condition containing a sparse distribution of scrub and brush vegetation. The Spring Valley Site is on land that is classified under the BLM VRM Program as Class 4.

U.S. Highway 93 travels in a north-south direction west of the site. U.S. Highway 6/50 is located about four miles north of the site.

Elevations climb steeply in the mountain ranges located to the east and west of the site. Wheeler Peak, at 13,063 feet, is located approximately eight miles to the east of the site boundary. This dramatic change in topography creates an especially compelling scenic landscape. Coniferous forest (bristlecone pine) covers many areas in the Schell Creek Range and Snake Range above 8000 feet in elevation. Wheeler Peak WSA and Highland Ridge WSA are located in the Snake Range.

3.2.6.4 Transmission Line Corridors

Generally, landscapes crossed by the transmission line corridors are in a natural condition, except near highways and existing transmission facilities which modify the landscape to a natural dominance condition. Sources of population exposure within the transmission corridors include U.S. Highway 50, U.S. Highway 6, and U.S. Highway 93, and State Highway 38 and State Highway 7. The corridors do not contain major permanent or recreational population sources.

The transmission line corridors cross areas classified as interim Class 3, Class 3, and Class 4 under the BLM VRM Program.

3.2.6.5 Well Fields and Pipeline Corridors

The well fields and pipeline corridors are located in natural and/or natural dominance landscapes, characterized by sparsely distributed scrub and brush vegetation. The well fields and corridors are in areas that have been classified under the BLM VRM Program as Class 3 and Class 4.

3.2.6.6 Railroad Corridors

The railroad corridors cross landscapes in natural and natural dominance conditions, characterized by sparsely-distributed scrub and brush vegetation. The railroad corridors cross lands designated as interim Class 3, Class 3, and Class 4 under the BLM VRM Program.

3.2.7 Socioeconomics

General socioeconomic information for the County is included in Section 3.1.7. Specific information associated with the three WPPP sites is primarily related to land productivity.

The rangelands of the County have provided grazing for domestic livestock since the first entry of sheep and cattle into the area. In order to standardize the evaluation of rangelands, it has become common practice by ranchers, administering agencies, and others having interest in land use, to measure rangeland production in animal unit months. An animal unit is the equivalent of a mature beef cow, weighing 800 or more pounds, with or without an unweaned calf. An animal unit month (AUM) is the amount of forage or feed required by an animal unit for one month. This requirement (when based on forage consumed per day totaling 26 pounds) equals approximately 800 pounds per AUM.

Shallow Calcareous Loam (representative for the County) in an average year has a potential production average of 400 pounds per acre, of which an estimated three-fourths will be useable and available as livestock forage. An acre of Shallow Calcareous Loam would therefore provide approximately 300 pounds of livestock forage under proper stocking and range management. In keeping with the needs of the rangeland, only 50 percent, or 150 pounds per acre, should be removed by livestock. The 150 pounds remaining on the grazing lands will serve to protect soils from erosion, recycle nutrients, add to organic matter, conserve the vigor of the key forage species, and generally enhance plant growth conditions. The 150 pounds of useable forage per acre divided into the 800 pounds per AUM results in an acre per AUM requirement equal to 5.3.

Available data from the Soil Conservation Service (SCS) and field surveys were used to estimate the land productivity of the three WPPP sites. These estimates are listed in Table 3-17. Compared with the 5.3 acre per AUM requirement for the representative ecological site occurring in the County (Shallow Calcareous Loam), the three WPPP sites are lower in potential productivity.

A similar evaluation was used to estimate land productivity associated with railroad corridors. The AUM values for the corridors represent a range of land productivity for the ecological sites affected by railroad corridor development in the County. The SCS values are representative of an average stocking rate of 18.75 acres per AUM. Applying this data, the AUMs (and acres) associated with the preferred northern railroad corridors for the Butte Valley Site, North Steptoe Valley Site, and Spring Valley Site are 25 (465), 6 (105), and 56 (1042), respectively. Similar information for the southern railroad corridors are 94 (1106), 33 (620), and 16 (302), respectively.

4.0 ENVIRONMENTAL CONSEQUENCES

The purpose of this chapter is to present the environmental consequences that could occur from construction and operation of WPPP. Both the proposed action and alternatives to the proposed action, as described in Chapter 2, are included. Potential impacts are related to the affected environment as described in Chapter 3. For air resources, water resources, and socioeconomics, only impacts from construction and operation of the power generation system on any of the three WPPP sites is discussed. For earth resources, ecological resources, cultural resources, and visual resources, the discussion of impacts is expanded to include construction and operation of the power transmission system, water supply system, and coal transportation system.

A detailed discussion of environmental impacts and proposed mitigative measures is included in Section 4.1. Subsequent sections discuss unavoidable adverse impacts, irreversible environmental changes, and the comparison of short-term uses with long-term effects.

4.1 ENVIRONMENTAL IMPACTS AND MITIGATIVE MEASURES

4.1.1 Earth Resources

Construction and operation of the power generation system and water supply system could have the following impacts on earth resources:

a. Increased erosion due to modification of existing drainages and soil compaction.

b. Subsidence due to groundwater withdrawal from proposed well fields.

In the County, sediments are eroded from the mountainous areas, transported by fluvial processes, and deposited in the valleys on the surfaces of alluvial fans or in the playa areas. This occurs at the Butte Valley Site and Spring Valley Site. In addition, erosion in the form of sheet and rill wash occurs when soils have been compacted. However, erosion should not be considered a significant impact. Planned drainage control design measures should be sufficient to mitigate erosion in the site vicinity or along transmission line and railroad corridors.

Ground subsidence can occur whenever groundwater, oil, or minerals are extracted from subsurface strata. Groundwater will be withdrawn from local aquifers to satisfy WPPP water requirements. Information obtained from groundwater investigations indicates that the potential for ground subsidence from groundwater withdrawal is minimal and exists only in the immediate vicinity of the well fields.

4.1.2 Air Resources

Construction and operation of the WPPP Generating Station will result in various air emissions. Because WPPP is a new major stationary source with the potential to emit more than 100 tons per year of a pollutant subject to regulation under the Clean Air Act, a PSD Approval to Construct will be required from EPA. Registration certificates and operating permits will also be required from DEP. By final rulemaking published in the Federal Register for June 21, 1983 (48 FR 28269), EPA Region IX has delegated full authority to DEP to implement and enforce the federal PSD program. However, DEP and EPA Region IX will have dual concurrence responsibility on WPPP.

The application for the PSD Approval to Construct has been submitted to both EPA Region IX and DEP. The application is currently being reviewed by both agencies. The following sections summarize information related to air resources, identified impacts, and proposed mitigation.

4.1.2.1 Air Quality Standards

Air quality is a prime factor affecting the siting of WPPP and requires the greatest amount of time in the regulatory and licensing process under the Clean Air Act. As discussed in Section 3.1.2.2.1, this act provides for the establishment of NAAQS to protect public health and welfare. These standards require the prevention of signficant deterioration of air quality in regions that attain NAAQS. These attainment areas are designated as Class I (pristine air), Class II (where moderate industrial development is allowed), and Class III (areas that could accommodate more intensive industrial growth). Regions exceeding NAAQS for a given pollutant are defined as nonattainment areas.

Emission standards, based on Best Available Control Technology (BACT), were set to keep pollutant concentrations below NAAQS. Control technology requirements that fulfill BACT are determined case-by-case considering the type of source, precedent BACT determinations, potential energy penalties associated with stringent control measures, and local economic impact factors. BACT must always be at least as stringent as the New Source Performance Standards (NSPS) delineated by law, but the latitude allowed in the case-by-case determination provides room for negotiation of specific requirements.

Current regulations require that any new source of air pollution in a nonattainment area (or outside the area, but causing a significant impact on the area) must produce a net air quality benefit in that area. This net air quality benefit is obtained using emission offsets (reductions in air pollutant emissions from existing sources in the nonattainment area) of sufficient magnitude to result in the required net air quality benefit. In addition, the new source would be required to use Lowest Achievable Emission Rate (LAER) control technology. LAER is more stringent than BACT and NSPS and is defined as the lowest emission rate allowed or achieved anywhere without regard to cost or energy use.

At the time of the Site Selection Study, siting the WPPP Generating Station at the North Steptoe Valley Site was not feasible without emission offsets from the McGill smelter, the only significant source of SO_2 in Steptoe Valley. In addition, a generating station at the Butte Valley Site or Spring Valley Site would require SO_2 emission control levels higher than NSPS to prevent significant impacts on Steptoe Valley. Because of this, discussions with Kennecott were initiated in an attempt to ease or eliminate constraints posed by the SO_2 nonattainment area by reducing emissions from the McGill smelter.

4.1.2.2 <u>White Pine County Air Proposal</u>

During discussions with EPA representatives in the summer of 1982, an opportunity to permit WPPP under an alternative permitting process was identified. This alternative became known as the White Pine County Air Proposal and was based primarily on the concept that construction and subsequent operation of WPPP could result in an improvement in existing air quality. This improvement would result from WPPP contributing to the financing of an SO_2 reduction program at the McGill smelter rather than controlling SO_2 emissions at the WPPP Generating Station at levels above NSPS. Several meetings were held with Kennecott representatives to discuss the concept and subsequently a proposal was formulated.

In summary, the principal components of the White Pine County Air Proposal are as follows:

a. Savings from reducing the SO_2 emission control level at the WPPP Generating Station to NSPS would be contributed toward an SO_2 emission reduction program at the McGill smelter. This would produce an air quality trade-off on the order of one pound additional SO_2 emissions from the the WPPP Generating Station for every three pounds SO_2 reduction at the McGill smelter.

b. BACT for the WPPP Generating Station would be at levels defined by NSPS plus contribution by WPPP toward SO_2 emission reductions at the McGill smelter and would be applicable at any of the three WPPP sites.

c. The northern part of Steptoe Valley would be redesignated to "unclassified" status for SO_2 to allow permitting of the North Steptoe Valley Site under PSD regulations.

d. Reasoned judgment, instead of air quality impact modeling, would be used to determine if the WPPP Generating Station significantly impacts the redesignated Steptoe Valley nonattainment area.

e. Kennecott would implement a multi-point rollback (MPR) plan at the McGill smelter to define allowable emissions to bring the remaining nonattainment area into compliance.

An April 16, 1982 letter, signed by the EPA Assistant Administrator for Air, Noise and Radiation, gave conceptual approval to the White Pine County Air Proposal. A July 7, 1982 letter, signed by the DEP Administrator, also endorsed the proposal.

4.1.2.2.1 Steptoe Valley Redesignation

At the time of the Site Selection Study, the SO_2 nonattainment area designation for Steptoe Valley placed a clear restriction on siting in Steptoe Valley and severely constrained sites adjacent to the valley. Siting in an area where the WPPP Generating Station could significantly impact the air quality of the nonattainment area would also trigger the requirement for LAER technology.

Redesignation of the northern part of Steptoe Valley was required to create a condition whereby WPPP could apply under PSD permitting procedures. The plan, as outlined by EPA, was to request redesignation of a part of Steptoe Valley that could be shown, by air quality modeling, not to exceed NAAQS. Reclassification to attainment status would have required monitoring to demonstrate with empirical data that the area is in attainment. However, unclassified status could be reached through theoretical studies. Modeling studies using Kennecott emission data and an EPA-approved air quality model were conducted. The results were submitted to DEP, which in turn requested redesignation from EPA using the modeling studies as the technical demonstration required for reclassification. The final rulemaking was published in the May 14, 1982 issue of the Federal Register (47 FR 20772). Figure 3-3 shows the new limits of the Steptoe Valley nonattainment area in relation to the three WPPP Sites. As shown on the figure, an east-west boundary approximately 20 miles south of the North Steptoe Valley Site is the new northern limit of the nonattainment area.

By moving the nonattainment area boundary south from the North Steptoe Valley Site, "reasoned judgment" can be used to determine that no significant impacts occur. This, in turn, will allow EPA to apply the BACT standard rather than the LAER standard to determine the control technology for the power plant.

4.1.2.2.2 Emission Control

Both EPA Region IX and the State of Nevada have, at various times, attempted to bring the McGill smelter into compliance. Continued litigation has allowed Kennecott to continue to operate with a supplemental control system for detecting periods of adverse meteorology and modifying operations accordingly. No emission control system has ever been operated at the McGill smelter. Not only is the permit for operating the smelter confusing, but different values for allowable emissions are in effect. The EPA has set emission levels of 10,150 lb/hr at the smelter while, until recently, DEP permitted 65,000 lb/hr.

To evalute the basic feasibility of the White Pine County Air Proposal, the degree of SO_2 emission control and the cost associated with such controls had to be estimated for both the WPPP Generating Station and the McGill smelter. The basic concept of the White Pine County Air Proposal is that an effective trade-off can be made by dedicating the savings at the WPPP Generating Station to emission controls at the McGill smelter. The results of studies indicated that the White Pine County Air Proposal was feasible.

4.1.2.2.3 Option Agreement

Based on negotiations with Kennecott representatives, an Option Agreement was developed. Under the agreement, WPPP will buy, and Kennecott will grant, an irrevocable option authorizing WPPP to implement provisions of the White Pine County Air Proposal, which would require Kennecott to reduce SO_2 emissions by approximately 60 percent at the McGill smelter, thereby providing an air quality increment sufficient to enable permitting of WPPP. The Option Agreement was executed by Kennecott and the County in March 1983.

4.1.2.3 Air Monitoring Plan

In order to provide ambient air quality and meteorological data to support the PSD permit application, an air monitoring plan was submitted to EPA Region IX for approval in October 1981. The plan, which was based on discussions with EPA and on EPA ambient monitoring guidelines, was approved by letter dated December 10, 1981.

The monitoring guidelines specify monitoring of various criteria and noncriteria pollutants based on background concentrations and expected impacts. Monitoring of a given pollutant is not required if certain tests of significant impact are satisfied. A list of significant air quality concentrations for regulated pollutants is included in the PSD regulations. If existing air quality or the impact of the proposed source is less than these concentrations, then monitoring will generally not be required.

Monitoring will be required only for those pollutants subject to the PSD regulations. Source applicability to PSD regulations is determined by comparing emissions with a list of significant emission rates contained in the PSD regulations. The source is exempt from PSD review for any pollutant with emissions less than the significant rate.

After reviewing all applicable pollutants, it was determined that SO_2, NO_2, TSP, Pb, Be, and Hg should be monitored. Carbon monoxide (CO), ozone, asbestos, vinyl chloride, fluorides, sulfuric acid mist, total reduced sulfur and reduced sulfur, and hydrogen sulfide would not be monitored either because they would not have significant emission rates or because there was no acceptable monitoring techniques available.

Erection of meteorological and air quality monitoring stations began in November 1981 and was completed in January 1982. A primary station was located on or near each of the three WPPP Sites. Secondary stations were also located in mountain passes between Steptoe Valley and Butte Valley (Grass Springs) and between Steptoe Valley and Spring Valley (Connors Pass). The monitoring was terminated on January 31, 1983, and the stations were dismantled. After reviewing all collected data, a one-year period from February 1, 1982 through January 31, 1983 was selected as the baseline monitoring period. No violations of NAAQS were recorded during the one-year period. Maximum measured concentrations were substantially less than NAAQS.

4.1.2.4 Air Quality Models

Air quality impact estimates were made with the COMPLEX I, MPTER, and ISC dispersion models made available by EPA. The COMPLEX I model was used to calculate concentrations due to steam generator emissions for receptors at or above stack heights. The MPTER model was used to calculate concentrations for receptors below stack height.

Emissions were modeled as SO_2. Concentrations of TSP, NO_2, and CO were determined by multiplying the resulting SO_2 concentrations by the ratio of the applicable emission rate to the SO_2 emission rate on a site-by-site basis. In modeling NO_2 concentrations, all oxides of nitrogen (NO_x)

emissions were assumed to be converted to NO_2 by the time they reached ground level. This is a conservative assumption because NO_x emissions are primarily in the form of NO upon leaving the source and are converted to NO_2 in the atmosphere through chemical reactions. This conversion may take several hours and total conversion may not be reached in the vicinity of the source.

The ISC model was used to calculate concentrations due to fugitive and low-level TSP emissions caused by materials handling. This model was selected because it can simulate area sources such as coal storage and reagent store piles. Because of low-level release characteristics, maximum impacts from fugitive sources would occur within the flat areas surrounding storage sites. Maximum concentrations in flat areas were conservatively estimated by adding maximum fugitive-related concentrations to maximum steam generator-related concentrations on a receptor-by-receptor basis without regard to whether these concentrations occurred concurrently.

Modeling results for criteria and noncriteria pollutants demonstrated that WPPP would comply with NAAQS and all PSD increments for facilities at any of the three sites. Because monitored or modeled levels of Pb, Hg, and fluorides do not exceed the exemption level, these pollutants were not included in the PSD application. Emission control will be required for SO_2, NO_2, TSP, CO, and Be. Based on the composite coal, emission control for SO_2 would be 70 percent as defined by NSPS. However, PSD increment constraints will require control at approximately 75 percent removal.

4.1.2.5 Air Emissions

4.1.2.5.1 Construction Impacts

Pollutant emissions during the construction period will result primarily from heavy duty, diesel-powered and gasoline-powered construction equipment. These activities will result in the emission of NO_x, sulfur oxides, CO, hydrocarbons and TSP emissions from equipment exhaust. In addition, paving work and painting would result in the release of some hydrocarbons. Localized increases in TSP would result from grading activities.

Emission rates would depend on the level of construction activity and weather conditions. In general, pollutant emissions would occur on an intermittent basis for short periods of time and would therefore not produce significant long-term adverse impacts on local and regional air quality.

The EPA has generally concluded that construction-related emissions do not have a significant air quality impact since their impacts on ambient air quality are "short-lived." Therefore, EPA has exempted construction-related impacts from review.

Dust control measures, primarily water sprays, will be used where appropriate to minimize TSP emissions. Although the emission rate for TSP would be higher than the emission rates of other pollutants, TSP is not expected to substantially increase beyond the site boundary, and no significant adverse impact is anticipated.

4.1.2.5.2 Operation Impacts

The major source of pollutant emissions during the operation period will result from the combustion of coal in the two steam generators. Other emission sources include the coal handling system vents, coal storage piles, limestone storage piles, waste landfill, auxiliary boiler, limestone calciner, emergency diesel-fueled generator, and fuel oil storage.

The total annual emissions of all pollutants that will be a significant PSD source are listed in Table 4-1 for each of the WPPP sites. BACT will be required for those pollutants which exceed the significance level. (It should be noted that the amounts listed in Table 4-1 are based on BACT described in the following section.)

4.1.2.6 Permit Application

The application for the PSD Approval to Construct was submitted to both EPA Region IX and DEP by letter dated June 27, 1983. The application defines BACT for SO_2 as NSPS levels at the WPPP Generating Station concurrent with SO_2 emission reductions at the McGill smelter (the White Pine County Air Proposal). WPPP emissions will be controlled by the use of a dry-type flue gas desulfurization (FGD) system. The application includes one year of meteorological data and air quality modeling necessary to demonstrate maintenance of the PSD increment. (In order to prevent ground level concentrations of emissions adjacent to the McGill smelter from exceeding the PSD increment, emission limits slightly higher than NSPS will be required.)

In addition, the application includes reference to the Option Agreement under which Kennecott guarantees to control emissions at the McGill smelter to the level of the MPR plan plus additional increment necessary to include WPPP emissions without exceeding NAAQS.

For NO_x, BACT is defined as combustion controls designed to limit emissions to 0.55 pounds NO_x per million Btu. Low NO_x steam generators will be used to provide staged combustion of the fuel to minimize the formation of NO_x.

Particulates will be controlled by a fabric filter system with a limit of 0.03 pounds per million Btu at full load. In addition, WPPP will be designed and operated with materials handling equipment that will produce a minimum quantity of TSP emissions.

The fabric filter/dry-type FGD system will also be BACT for Be, Hg, fluorides, and sulfuric acid mist. The production of CO will be limited by use of a combustion control system in conjunction with an environmental flue gas monitoring system.

4.1.2.7 Related Impacts

The soils of the County are highly alkaline. Deposition of sulfates and nitrates, which may form from SO_2 and NO_x emissions, would have a neutralizing effect on alkaline soils and no adverse impacts are anticipated.

Air emissions (including NO_x and SO_2) have the potential to adversely affect plant species such as pinyon and juniper which are sensitive to changes in air quality. However, air quality models do not indicate concentration levels that would cause injury to plant species. Therefore, this secondary impact is not expected to occur.

Visibility impacts from a new source are of primary concern in PSD Class I areas. There are no PSD Class I areas within 100 kilometers of any of the three WPPP sites. EPA Region IX requirements do not require a quantitative assessment of visibility impacts in Class I areas beyond 100 kilometers.

On occasion, the power plant plumes may be visible within a short distance of the stacks due to emissions of SO_2, NO_x and TSP. However, because of the type of air pollution control equipment to be used, it is expected that the visible plume will be confined to the site vicinity.

4.1.3 Water Resources

Construction and operation of the power generation system and water supply system could have direct impacts on water resources due to the following:

a. Groundwater withdrawals to meet the project water requirements.

b. The disposal of fly ash, bottom ash, and FGD products.

Secondary impacts could occur due to disturbance of the land surface and natural drainage patterns during construction and operation. In addition, the potential exists for degradation of surface water and groundwater quality due to runoff and leachate from the coal storage areas. The latter will be mitigated because the plant will be designed for "zero liquid discharge" from the site.

The construction and operation of the power transmission system will have no major impacts on water resources.

Potential hydrologic impacts will be minimized or eliminated through the implementation and maintenance of a drainage and erosion control program on the transmission line rights-of-way.

The construction and operation of the coal transportation system will have no major impacts on water resources. Disturbance during construction and induced changes in the natural surface drainage patterns may increase the potential for wind and water erosion and sedimentation. These potential problems, however, will be mitigated through the implementation of drainage and erosion control programs.

It is estimated that WPPP will require up to 25,000 afy of water, primarily for cooling requirements. This amount could vary depending on the final plant design, quality of the water, and type of cooling system selected. The water has been secured through the groundwater appropriation process. The following sections summarize information related to water resources, identified impacts, and proposed mitigation.

4.1.3.1 Groundwater Withdrawals

In order to estimate potential impacts to existing water resources, a three-phase groundwater investigation was conducted in the County. A summary of the groundwater investigations is included in Section 2.2.4.2.

4.1.3.2 Computer Modeling

The Phase 3 studies included computer modeling to assess the magnitude and extent of possible groundwater level changes due to WPPP groundwater withdrawals. Groundwater modeling studies were conducted in two stages. During the first stage, preliminary estimates of the drawdowns due to pumping were made for each of the three WPPP sites and the associated well fields.

The second stage of the studies involved detailed model predictions using a two-dimensional, finite-element computer model of the potential drawdowns due to groundwater withdrawals in Steptoe Valley and Spring Valley. The model predictions and the assigned aquifer characteristics for the computer predictions were based on the results of pumping tests in those valleys and other available information on the geology and existing groundwater conditions. Butte Valley was not modeled because of its low potential for impacts on existing users or sensitive species.

The procedure used in the modeling of the drawdown effects due to pumping entailed model calibration, model verification, and prediction. Calibration of the finite-element model involved the trial and error adjustment of both the areal distribution and magnitude of aquifer parameters and boundary conditions. The calibration criteria were based on the predicted versus observed groundwater surface elevation for each of the two valleys modeled.

Both Steptoe Valley and Spring Valley were modeled as "confined" aquifer systems with uniform aquifer thickness. In essence, the valley-fill aquifer was treated as a horizontal layer, both overlain and underlain by "low" permeability or confining strata. The predicted drawdowns as a result of WPPP groundwater withdrawals, therefore, reflect the decrease in the pore pressure (or head) within the aquifer system and not a lowering of the water table.

The transmissivity and storage coefficients were varied spatially, depending on location, with respect to the central playa areas and more permeable alluvial fan areas on the margins of the valley floor. A constant head boundary condition, which effectively holds the pore pressure or head along the perimeter of the calculation domain constant, was employed in all model predictions. The perimeter of the calculation domain generally corresponded to the limits of the in-filled valley floor.

Leakage from the material overlying and underlying the previously modeled confined aquifer system was not considered and, therefore, the predicted drawdowns are greater than those that would occur if leakage were taken into consideration. The specification of a fixed boundary condition on the perimeter of the calculation domain will result in an underestimation of actual drawdowns near the outer edges of the valley floor. This assumption with regard to boundary conditions, however, would not significantly affect the predicted drawdowns in the central portion of the valley which, from an environmental perspective, tend to be the most sensitive.

Drawdowns were computed for various development scenarios over the 36-year life of WPPP. The three principal scenarios analyzed for both Spring Valley and Steptoe Valley are:

a. Case I - Current agricultural withdrawals plus 20,000 afy for WPPP.

b. Case II - Current agricultural withdrawals plus 25,000 afy for WPPP.

c. Case III - Current agricultural withdrawals plus 15,000 afy for future agriculture use and 25,000 afy for WPPP.

Case I represents the "most likely" case in which the actual groundwater withdrawals for WPPP would be approximately 20,000 afy. Case II represents the "permitted" level of groundwater withdrawal for WPPP. Both Case I and Case II are based on the assumption that groundwater withdrawals for agriculture would remain constant (and at their current levels) over the life of the project. Case III is the "worst case" scenario in which the groundwater withdrawals for agricultural use are increased by approximately 15,000 afy above their current level.

The predicted drawdowns at the end of 36 years of pumping for Case II are shown on Figure 4-1 and Figure 4-2 for Steptoe Valley and Spring Valley, respectively. Preliminary drawdown estimates for Butte Valley shown on Figure 4-3 are based on a simplified finite difference model and assumed aquifer characteristics.

Comparison of Figure 4-1 and Figure 4-2 indicates that the predicted drawdowns for Spring Valley are significantly greater, both in areal extent and in magnitude, than those predicted for Steptoe Valley. The greater drawdown effects in Spring Valley are due to the lower transmissivity values used in the model. The predicted drawdowns in those elements adjacent to the wells average 15 to 20 feet for Steptoe Valley compared to 30 to 40 feet for Spring Valley. Similarly, predicted drawdowns in individual wells in Steptoe Valley range from about 125 to 135 feet as compared to 120 to 240 feet for individual wells in Spring Valley.

Existing wells within the radius of influence (i.e., the area affected by drawdown due to groundwater withdrawal) of the well fields will be impacted. The degree to which existing wells are impacted will depend on their location relative to the well field, their depth and construction, and if they are completed in the same zone as the WPPP production wells.

The drawdown predictions for Steptoe Valley and Spring Valley are based on a total project water requirement of up to 25,000 afy for the estimated 36-year life of the project. The total project demands represent approximately 30 percent and 36 percent of the estimated perennial groundwater yield for Steptoe Valley and Spring Valley, respectively. This does not include "salvage" of surface runoff that currently wastes to the central playa areas and evaporates because the aquifer is full. In Spring Valley, for example, the USGS and NDCNR estimate that as much as 25,000 afy of "rejected" recharge is lost to evaporation from the playas. At least a portion of this could be salvaged by induced recharge as a result of increased pumping.

As shown on Figure 4-1 and Figure 4-2, the drawdown cones due to groundwater withdrawals for WPPP extend into the central portions of both Steptoe Valley and Spring Valley. As a result, the position of the groundwater table will be lowered locally and may impact those vegetative communities dependent on maintenance of high water table conditions. The associated impacts on soils and vegetations are discussed in Section 4.1.4.3. Areas such as the saline meadows (shown on Figure 4-1 and Figure 4-2) may be impacted, resulting in a shift in species composition and a change in forage value.

Based on the predicted drawdowns for Steptoe Valley, no direct impacts on the several thermal springs located on the west side of the valley in the vicinity of Cherry Creek will occur.

As shown on Figure 4-2, the predicted drawdowns in the vicinity of the Shoshone Ponds in southern Spring

Valley are less than five feet. Because the ponds are within the radius of influence of the well fields, a potential does exist that these ponds could be impacted as a result of groundwater withdrawals for WPPP. Additional site-specific investigations, however, would be required to assess the probable nature and severity of any impacts. The available information indicates that the primary source of water for the Shoshone Ponds is obtained from a flowing artesian well which is screened at a depth of 421 to 441 feet. Any reduction in pore pressure or head in the production well as a result of groundwater withdrawal for WPPP or by others for mitigation will result in a decrease in the discharge from the Shoshone Ponds water supply well. Depending on the magnitude of this decrease, a reduction in the flow could potentially impact Shoshone Ponds. The impact on aquatic habitat in Shoshone Ponds is discussed in Section 4.1.4.3.

Predicted drawdowns in individual wells in Butte Valley are approximately 50 feet. Because of the depth to the groundwater table, however, increased drawdowns due to pumping will not likely have a significant environmental impact. Similarly, the drawdowns due to WPPP will have minimal impact on other users.

4.1.3.3 Water Permit

The Nevada Division of Water Resources has the responsibility of administering Nevada water rights procedures and policies. In order to appropriate groundwater, an application must be made to the State Engineer. If sufficient water is available and if no unreasonable infringement with existing water rights is apparent, a permit may be issued to develop the water for beneficial use. A permit to appropriate water grants the right to use water from a particular source at a definite location for a specified purpose. The permitted right becomes a legal and complete appropriation (a certificated right) upon compliance with the following conditions:

a. Completing works of diversion.

b. Placing the water to beneficial use.

c. Filing the proofs of completion and of beneficial use.

The general policy of the State Engineer is to limit groundwater withdrawals from a basin or valley to the average annual recharge to the groundwater basin. Interbasin transfers are not prohibited and several transfers have been approved by the State Engineer. The State Engineer also has the authority to "designate" a preferred use of water from a groundwater basin or valley in order to establish better control of groundwater sources in the area. Application to appropriate water for purposes consistent with the designated preferred use are given priority over other applications.

On August 17, 1983, a public hearing was held in Ely, Nevada, to discuss the preferred use designation for Steptoe Valley and the pending WPPP applications in Steptoe Valley. At the conclusion of the hearing, the Nevada State Engineer ruled that industrial use (power generation) would be the preferred use for the Steptoe Valley Groundwater Basin, excluding the Groundwater Curtailment Area. In addition, the State Engineer granted water permits to WPPP subject to the following conditions:

a. The total duty will not exceed 25,000 afy.

b. The siting of WPPP will be in Steptoe Valley.

c. WPPP will continue to participate in a surface water and groundwater monitoring program to determine the effects of withdrawal of groundwater granted under the permits.

d. WPPP will exercise reasonable diligence to perfect the appropriation.

e. Totalizing meters will be installed on each well and accurate measurements of all water placed to beneficial use will be submitted to the State Engineer.

f. The final determination of limit and extent of rights granted will be based on the actual amount of water placed to beneficial use.

The surface water and groundwater monitoring program began in December 1982. The purpose of the monitoring program is to establish baseline data for current seasonal groundwater level fluctuations in Steptoe Valley. Levels in selected existing wells and flow rate measurements in selected springs will be monitored. The information from the monitoring program will be used to identify impacts before they become significant in order to apply the appropriate mitigative measure. Typical mitigative measures could include variable operation of the well fields to compensate for localized seasonal fluctuations and installation of additional wells to supplement water supplies.

4.1.3.4 Water Quality

The potential for degradation of surface water and groundwater quality in Butte Valley from solid waste management and disposal activities is considered moderate. In general, the water table is moderately deep under the Butte

Valley Site although locally the surficial soils may be of moderate to high permeability.

The North Steptoe Valley Site is located within an area of groundwater discharge. As a result, there is a pronounced upward component of groundwater flow, as well as a lateral flow component toward the center of the valley. The upward flow condition within the site will minimize the potential for downward migration of any contaminant. The potential for leachate generation within the ash disposal area is low under the prevailing climatic regime.

Potential impacts in Spring Valley would be similar to those for the Butte Valley Site and North Steptoe Valley Site.

The potential for degradation of water quality will be minimized in the design of the waste disposal area through the use of a suitable leachate liner, if necessary, and capping of the waste materials with a suitable cover.

4.1.4 Ecological Resources

Development of WPPP will affect ecological resources in several ways. Construction of WPPP will disturb soils and vegetation, thus eliminating the habitat and grazing they currently provide. The quality and quantity of such resources, as well as the significance of impacts to these resources, varies with location within the WPPP region.

Other aspects of WPPP may cause less immediate effects to the ecosystem. For example, wetlands and aquatic systems could be affected over time by decreased soil moisture content due to lowering the water table, or alteration of water sources for important aquatic habitat as a result of groundwater withdrawals. A secondary impact anticipated during construction is the potential for weedy species to invade disturbed areas. The spread of weedy species could reduce the amount of forage available near site and corridor boundaries.

Sensitive plant species may be affected by air emissions from the WPPP Generating Station. Such secondary impacts are difficult to quantify and may vary from reduced organism growth to complete changes in habitat structure and composition. These impacts are discussed in Section 4.1.2.7. In addition, impacts associated with land productivity are discussed in Section 4.1.7.9.

Impacts to ecological resources as well as mitigation are discussed in the following sections.

4.1.4.1 Power Generation System

4.1.4.1.1 Butte Valley Site

There is a potential for disturbance of approximately 2480 acres of land on the Butte Valley Site. Table 4-2 lists the potential disturbance to soils and ecological sites associated with the Butte Valley Site.

Most of the impacts on the Butte Valley Site are anticipated to be insignificant. This is due primarily to the low reclamation potential of most of the soils on the site.

Construction of the WPPP Generating Station at the Butte Valley Site would primarily affect Wyoming big sagebrush and black sagebrush communities that occur on the Loamy 8-10 and Shallow Calcareous Loam 8-12 ecological sites. However, ecological sites which produce desirable forage such as winterfat and Indian ricegrass would also be affected. Annual vegetation production losses could range from 150 to 950 pounds per acre depending on the ecological site. The removal of wildlife and livestock forage and habitat is considered a long-term impact.

Halogeton is currently a problem in Butte Valley and the potential exists for this, and other invader species (e.g., Russian thistle, thistles, and annual mustards) to colonize disturbed areas.

Construction and operation at the Butte Valley Site would disturb a ferruginous hawk nest located in the southwest corner of the site. Limited sage grouse use of the site would be preempted and minor reductions in use of mule deer winter range on benches adjacent to the site would occur. Butte Valley is being considered for introduction of pronghorn by the NDOW and WPPP may reduce the value of the site for pronghorn range.

In response to increased human activity, the potential exists for increased harassment and possible poaching of overwintering bald eagles. In addition, construction and operation at the remotely located Butte Valley Site will increase vehicular traffic between Ely and the site, thereby increasing the potential for wildlife road fatalities and poaching. The increase in human activity will also temporarily impact local wild horse herds in the County. However, these impacts are expected to be insignificant as the herds usually relocate to avoid human encroachment.

No major direct impacts to aquatic ecology are anticipated due to development of the Butte Valley Site. However, indirect impacts include the potential for impacting relict dace habitat due to increased human activity in Butte Valley.

4.1.4.1.2 North Steptoe Valley Site

There is a potential for disturbance of 2250 acres of land on the North Steptoe Valley Site. Table 4-2 lists the potential disturbance to soils and ecological sites associated with the North Steptoe Valley Site.

Construction-related impacts to soils on the North Steptoe Valley Site are expected to be insignificant in terms of existing land use and ability to support agriculture. For the most part, these soils are generally low in vegetative production and are difficult to reclaim due to a high pH, moderate salinity, and highly sodic characteristics. However, reclamation difficulty of some of the soils on the North Steptoe Valley Site may magnify initial losses that occur during construction and may render these soils susceptible to erosion.

Construction of the WPPP Generating Station at the North Steptoe Valley Site would primarily affect shadscale and black greasewood-dominated plant communities of the Sodic Terrace 6-8, Sodic Terrace 8-10, and Loamy 5-8 ecological sites. However, smaller acreages of big sagebrush and saline meadows could also be removed. Annual vegetation production losses could range from 200 to 3000 pounds per acre depending on the ecological site. The removal of wildlife and livestock forage and habitat is considered a long-term impact.

Development of the North Steptoe Valley Site will eliminate only a small percentage of the year-round pronghorn habitat in Steptoe Valley. Additionally, utilization of winter range for pronghorn and mule deer on benches adjacent to the site may be reduced due to increased human activity. However, winter range is not the limiting factor for either species and, therefore, neither population should be adversely affected. Existing industrial and agricultural development in Steptoe Valley have already impacted wildlife in the area. Therefore, the potential exists for only minor increases in wildlife road fatalities and poaching in response to increased human activity associated with WPPP.

Direct impacts to aquatic ecology resulting from development of the North Steptoe Valley Site are anticipated to be negligible. However, possible indirect impacts due to increased human activity could adversely affect the Bonneville (Utah) cutthroat trout population in Goshute Creek located northwest of the site. Stream-dwelling cutthroat trout are vulnerable to angling pressure and unregulated or unrestrained exploitation could suppress the reproducing sector of the population to an unrecoverable level.

4.1.4.1.3 Spring Valley Site

There is a potential for disturbance of 2380 acres of land on the Spring Valley Site. Table 4-2 lists the potential disturbance to soils and ecological sites associated with the Spring Valley Site.

Construction of the WPPP Generating Station at the Spring Valley Site would primarily affect plant communities dominated by black sagebrush (Shallow Calcareous Loam 8-12) and winterfat (Silty 8-10). Areas of Wyoming big sagebrush (Loamy 8-10) would also be disturbed during construction, although this community covers the least amount of the potentially affected area. Annual vegetation production losses could range from 300 to 950 pounds per acre depending on the ecological site. The removal of wildlife and livestock forage and habitat is considered a long-term impact.

Direct impacts to wildlife at the Spring Valley Site will include removal of less than one percent of the Spring Valley year-round pronghorn range within the County and reductions in mule deer usage of winter and spring range located on benches adjacent to the site. Population levels are not expected to be reduced significantly by these direct impacts. However, in response to increased human activity associated with WPPP in Spring Valley, the potential exists for increased harassment and possible poaching of pronghorn and overwintering bald eagles. Increased vehicular traffic between Ely and the site will increase the potential for wildlife road fatalities.

No major direct impacts to aquatic ecology are anticipated due to development of the Spring Valley Site. However, indirect impacts due to increased human activity could affect stream and reservoir fisheries in Steptoe Valley and could adversely affect the Bonneville (Utah) cutthroat trout population in Pine Ridge Creek. An increase in human activities could also increase the potential for vandalism of Shoshone Ponds as well as impact relict dace populations.

4.1.4.2 Power Transmission System

Impacts on ecological resources associated with the power transmission system are shown on Figure 4-4.

Construction of access roads along the power transmission system and the clearing of areas for tower erection will be the principal activities that would disturb soils. Construction and continued use of access roads will result in long-term impacts to the soil resource, although most soil types have a fair potential to be successfully reclaimed.

The types of vegetation affected by construction of the power transmission system will depend upon the actual location of the towers and access roads. Clearing operations for transmission towers and access roads would result in removal or burial of vegetation. The long-term impact would be limited to the access road and the area around the transmission tower footings.

Although northern desert shrub, salt desert shrub and Mojave desert communities would primarily be affected, pinyon-juniper woodland would be traversed in areas above 6000 feet.

Direct impacts on wildlife are expected to be insignificant and will occur only during construction. Mule deer, elk, and pronghorn ranges are traversed by transmission line corridors. South of the County, desert bighorn sheep range and restricted distributional range of desert tortoise are also traversed by transmission line corridors. Impacts on these areas are expected to be limited to minor disturbances during construction. Additional potentially minor impacts could also include disturbances of sage grouse leks and ferruginous hawk nesting areas. Electrocution of raptors is highly improbable because conductor phase spacing of the transmission lines will be greater than the wing span of any raptor.

Potential secondary impacts to wildlife from the power transmission system are related to increased road access and the resulting increase in human encroachment. Establishment of construction and maintenance roads along transmission lines will potentially increase desert tortoise road fatalities, particularly along the southernmost corridors where the desert tortoise is more abundant. Additional impacts will include the potential for increased poaching of game species and harassment of desert bighorn sheep, ferruginous hawks, elk, and pronghorn.

The construction of the power transmission system will temporarily disturb soils in the area. The establishment of transmission lines adjacent to springs in White River Valley, which are inhabited by several candidate fish species, and across Steptoe Creek, which is inhabited by game fish in Steptoe Valley, may create increased erosion and sedimentation in the stream and springs until the disturbed areas become revegetated. Impacts to streams are expected to be minor and temporary because of spring flushing, which rids the stream substrate of silt and sediment thereby providing conducive habitat for production of fish food organisms. However, in springs not influenced by flushing, sedimentation due to construction activities could inhibit forage productivity. Overall, sedimentation impacts are anticipated to be minor and temporary.

4.1.4.3 Water Supply System

Impacts on ecological resources associated with the water supply system for each of the three WPPP sites are shown on Figure 4-5, Figure 4-6, and Figure 4-7.

Soils will be disturbed by trenching and other water pipeline construction activities. This impact is considered short-term if reclamation can be quickly implemented on the pipeline berm. Pipeline access and maintenance roads will result in long-term impacts on soils resources. However, in most cases, this should only occur in areas where reclamation potential of soils is considered fair.

Soils could sustain varying degrees of impacts from the watertable drawdowns due to groundwater pumping. If drawdown causes a reduction in soil moisture at subirrigation levels, soils will dry out and render them susceptible to wind erosion. Another potential impact is associated with the reduction of organic matter input in the soil as plant growth in saline meadows decreases. Conversely, beneficial impacts to saline-alkaline soils could occur by lowering the water table through increased downward leaching of soluble salts. A reduction in salinity could result in increased plant growth rates.

Trenching for the pipeline and clearing for adjacent roads and the electrical supply system will remove a certain amount of vegetation. This removal is considered to be a short-term impact because revegetation could be quickly implemented on the berm. Impacts associated with water supply system roads would be long-term.

Water table drawdown due to well field operation has the potential to affect Saline Meadows 5-12, Saline Bottoms 5-12, and Sodic Flats 5-12 ecological sites. Groundwater modeling indicates a moderate potential exists for subirrigation levels to be reduced in Steptoe Valley and a high potential for subirrigation levels to be reduced in Spring Valley. These impacts would occur only in the immediate vicinity of the well fields.

Construction of the Butte Valley well field could impact a sage grouse wintering area and a ferruginous hawk nesting area in Butte Valley. Wintering areas are frequently essential to sage grouse populations and disturbances related to construction activities could render these areas less desirable for sage grouse. Activities associated with access road traffic may force ferruginous hawks to abandon nests near the well fields and pipelines.

Additional well fields associated with the Butte Valley Site occur in Steptoe Valley and are located adjacent to a Saline Meadow area which provides wetland habitat for wildlife. Wetlands increase the biological diversity of the area and provide staging and breeding habitat for many species of waterfowl and shorebirds. Based on groundwater modeling, groundwater withdrawal could potentially affect a portion of the wetlands in the vicinity of the well fields. Wetlands traversed by the pipeline would be adversely affected during construction. Although effects such as siltation could be severe, the duration would be short.

In addition to the well fields, the water supply system will incorporate transmission lines to transmit power for operation and control of the pump station and well fields. Wildlife impacts associated with the establishment of these transmission lines include the potential for inflight collisions with the lines by raptors, particularly when visibility is reduced. Raptor electrocutions on these low voltage lines are also a potential impact.

Sage grouse may abandon leks and brooding grounds in response to increased activities near the well fields and a mule deer migration route may be slightly altered due to the establishment of a well field in Steptoe Valley. A ferruginous hawk nest located adjacent to the well field would be impacted if construction occurred during the nesting period.

The North Steptoe Valley Site well fields involve areas in Steptoe Valley discussed above plus additional areas to the north and south. As discussed previously, water withdrawals could potentially impact wetland habitat located adjacent to the well field. Because the North Steptoe Valley Site requires a large well field in the northern part of

Steptoe Valley, a relatively larger wetland area could be affected.

The Spring Valley well fields and water pipelines will impact sage grouse and wetlands. Sage grouse leks and a wintering area, both important to maintaining sage grouse abundance, could be disturbed by construction activities. Predicted drawdown of the Spring Valley well field indicates that most of the wetland north of Highway 50 and within the BLM-Spring Valley Wetland Habitat Management Area could potentially be affected. The primary objective of the BLM Spring Valley Waterfowl Management Plan centers around preserving, maintaining, and improving wetland habitats. Lowering the water levels of the Spring Valley wetlands could jeopardize existing Canada geese, sandhill crane, cinnamon teal, American pintail, gadwall, common mallard, pied billed grebe, and American egret nesting habitat.

The water supply system development in Steptoe Valley or Spring Valley could impact existing important aquatic habitats. Potential impacts in Steptoe Valley include minor alterations of relict dace habitat within the springs, ponds, and intermittent lakes resulting from reduced groundwater supplies. Limited relict dace populations occur throughout Ruby Valley, Butte Valley, Goshute Valley, Spring Valley, and Steptoe Valley and the minor disturbances of isolated habitats in one valley would probably not jeopardize the continued existence of the species. This, however, should not preclude the implementation of measures designed to preserve existing habitat potentially affected by groundwater withdrawal in Butte Valley, Steptoe Valley, or Spring Valley. Any reduction of population numbers or habitat could justify listing the relict dace as threatened or endangered.

Although groundwater modeling results indicate WPPP groundwater withdrawals may potentially lower existing water levels near the Shoshone Ponds by two to three feet, actual water level fluctuations within the ponds should not deviate appreciably from normal seasonal fluctuations. The surrounding natural subirrigated substrate and the water source contribute to maintaining the presently favorable conditions for the federally listed, threatened and endangered Pahrump killifish within the Shoshone Ponds.

The Shoshone Ponds water source consists of a flowing artesian well which originates approximately 400 feet below the ground surface. A relatively impermeable layer of clay beneath the Shoshone Ponds, in combination with the upward hydraulic gradient within the groundwater system, supports the zone of natural subirrigated substrate and inhibits downward movement of surface water. A majority of the subirrigated water loss is attributed to evapotranspiration which will occur regardless of WPPP development. The anticipated two to three foot drawdown could potentially lower the hydrostatic pressure in the deep aquifer.

The potential also exists for reducing groundwater pressure within zones which are hydrologically connected with and overlie the deep aquifer. Reducing the hydrostatic pressure in the deep aquifer or within any interconnecting zones by withdrawing groundwater will reduce the artesian pressure and, in response, the discharge into the Shoshone Ponds. The predicted magnitude of drawdown is small compared to existing pressure levels and, therefore, the associated impact to the Shoshone Ponds is also expected to be minimal. However, any alteration in waters inhabited by the Pahrump killifish should be regarded as undesirable.

Corresponding to the potential for a minor decrease in flow and the resulting lower water volume within the Shoshone Ponds, water temperatures may also decrease slightly during winter months thereby creating a potentially less than optimal (76°F) environment for the Pahrump killifish. The Pahrump killifish has been known to survive for limited periods in waters considerably lower than 76°F. However, the long-term effects on viability in waters below 76°F are not known. Because winters are likely to be more severe near the Shoshone Ponds than in southern Nevada, the cooling influence on the Shoshone Ponds is expected to be greater and temperatures within the pond may decrease for extended periods should the existing thermal influence be altered.

4.1.4.4 Coal Transportation System

Impacts on ecological resources associated with the coal transportation system are shown on Figure 4-8.

Due to its permanent nature and difficulty in reclaiming the fill, construction of a new railroad for coal transportation would be a major, long-term impact on soils. A permanent withdrawal of soils from existing and potential uses would occur. Minor impacts are anticipated if the existing NNRy right-of-way is used.

Railroad construction will necessitate long-term removal of vegetative cover on about 18 acres per linear mile. Exact location of the right-of-way will determine the specific type of plant communities and species that would be affected.

Railroad corridors primarily traverse northern desert shrub, salt desert shrub, and Mojave Desert communities. Exceptions occur where corridors extend above 6000 feet and pinyon-juniper woodland is encountered. Because the plant communities are well represented, this long-term loss of vegetation is not considered significant. The least amount of disturbance would occur if the existing NNRy right-of-way is used.

The railroad corridors contain or traverse numerous habitats important to wildlife species and, as a result, potential impact of varying significance can be expected. Sage grouse wintering areas, leks, and brood areas, and ferruginous hawk nesting areas sporadically occur within the railroad corridors. If these habitats are crossed by the raiload, a reduction in the abundance of these species can be expected. Because availability of habitat and seasonal use by pronghorn and mule deer are not limiting herd size, and existing migration routes would not be disrupted, potential impacts to these species from new railroad corridors are considered negligible. Wetlands occurring in the corridors have limited potential to be adversely impacted.

Numerous sage grouse leks occur in Clover Valley and disturbance of one or more of these leks is possible. The numerous ferruginous hawk nesting areas and the major bald eagle and golden eagle wintering area in Antelope Valley creates the potential for raptor disturbance in response to activities associated with railroad construction and operation. Access roads along railroad rights-of-way would provide vehicular access to new areas, increasing the potential for poaching.

Use of an electrified rail system will create the potential for additional wildlife impacts, including inflight collisions with electric lines, electrocutions, and increased predation. The potential for raptor transmission line collisions will increase, particularly during low visibility and in areas where raptors frequently forage. Raptor electrocutions can be minimized with proper catenary support arm design. This would provide raptors with artificial perches which would be beneficial. However, additional raptor perches would adversely impact sage grouse in Clover Valley because it would increase sage grouse predation.

The development of the coal transportation system may affect habitats for important aquatic species in the County as well as in Elko County, Nye County, and Lincoln County. These impacts would be related to construction activities in Clover Valley, White River Valley, Spring Valley, and Butte Valley, all of which are inhabited by fish species under consideration for federal listing as threatened or endangered species. The construction of railroads adjacent to the springs in these valleys will temporarily disturb minor quantities of soils in the area. Accelerated erosion due to soil disturbance may reach adjacent springs causing sedimentation and a slight decrease in forage productivity.

4.1.4.5 Threatened and Endangered Species

4.1.4.5.1 Listed Species

Two species listed as threatened and endangered have been identified by USFWS to be potentially affected by WPPP. These species are the bald eagle and Pahrump killifish.

Major potential WPPP-related impacts to the bald eagle include unlawful shootings and transmission line electrocutions. Although the bald eagle is federally protected, increased human activity in the County resulting from the influx of the WPPP construction and operation work force will increase the potential for unlawful shootings of bald eagles in the area. (Unlawful shooting is the largest contributor to mortality rates for the bald eagle.) The establishment of low voltage lines associated with the well fields, or an electrified rail system, will also increase the potential for bald eagle electrocution. However, with proper tower design, electrocutions can be minimized. Transmission line towers established in treeless valley bottoms would benefit bald eagles by providing perches for observing prey species over a wide radius and for more efficient use of air currents for flight. An additional impact associated with the power transmission system includes the potential for collisions with wires and towers, especially during periods of poor visibility.

Pahrump killifish inhabit the Shoshone Ponds of Spring Valley. The extraction of groundwater from sources associated with the Shoshone Ponds could potentially result in alteration of the water level and temperature within these ponds which provide essential habitat for the Pahrump killifish.

4.1.4.5.2 Candidate Species

Twelve fish species, six terrestrial wildlife species, and nineteen plant species within the WPPP region are under review by USFWS for consideration as threatened or endangered (Section 3.1.4.5). Potential impacts to plant species would occur primarily during construction. The Bonneville (Utah) cutthroat trout, relict dace, and ferruginous hawk are the only candidate species with the potential to be adversely affected by WPPP activities. Impacts to the remaining species would primarily be associated with railroad and transmission line construction activities and should be minor and short-term.

Direct WPPP-related impacts to the transplanted Goshute Creek and Pine Ridge Creek population of Bonneville

(Utah) cutthroat trout should be negligible. However, possible indirect impacts, such as increased angling pressure created by the construction and operation work force, could adversely affect both populations. Stream-dwelling cutthroat trout are vulnerable to angling pressure, and unregulated or unrestrained exploitation could suppress the reproducing sector of the population to an unrecoverable level.

Potential impacts to the relict dace include alteration of habitat within the springs, ponds, and intermittent lakes resulting from reduced groundwater supplies. Limited relict dace occur throughout Ruby Valley, Butte Valley, Goshute Valley, Spring Valley, and Steptoe Valley and the disturbance of isolated habitats in one valley would probably not jeopardize the continued existence of the species. This, however, does not preclude the implementation of measures designed to preserve existing habitat potentially affected by groundwater withdrawal in Butte Valley, Steptoe Valley, or Spring Valley. Any reduction of population numbers or habitat could justify listing the relict dace as threatened or endangered.

Potential impacts to ferruginous hawks could result from human encroachment and include increased nest disturbance by curious observers and increases in unlawful shooting. Development of low-voltage transmission lines will also increase the potential for collision and electrocution of ferruginous hawks.

4.1.4.6 Mitigation

Although some impacts are irreversible, effective mitigation planning can reduce the magnitude of impacts to ecological resources. Reclamation of areas cleared during construction will reduce the duration of impacts to soils, vegetation and wildlife species. The following actions could mitigate potential impacts to soils and vegetation:

a. Where feasible, WPPP facilities could be located on areas with the least productive soils and vegetation. For example, Saline Bottom and Saline Meadow ecological sites could be avoided.

b. Topsoil could be salvaged and stockpiled during construction for later reclamation use. Stockpiled soil could be seeded and fertilized to reduce erosion losses.

c. The inclusion of native species in the revegetation seed mix could help establish a viable vegetative cover that provides wildlife habitat as well as livestock forage and help reduce the amount of time needed to offset soil and vegetation losses. Fertilizer and soil amendments that neutralize salinity could assist with soil development and vegetation establishment.

d. Areas susceptible to erosion, such as steep slopes beneath transmission line towers, could be reinforced or otherwise shored-up and revegetated as quickly as possible to reduce soil loss. Surface stability could be increased in certain areas by using erosion control mats, nets, or other soil-binding mechanisms.

e. Railroad rights-of-way and tower footings could be located outside areas of known distributions of candidate plant species to minimize construction impacts.

Site-specific impacts to terrestrial wildlife involves minor losses of wildlife habitat which will not significantly impact existing wildlife populations. However, significant impacts to terrestrial wildlife are primarily associated with transmission lines, railroads, well fields, water pipelines, and accompanying access roads. The following actions could mitigate potential impacts to terrestrial wildlife:

a. Increased enforcement of laws protecting the federally listed bald eagle and ferruginous hawk from poaching would reduce raptor losses.

b. Selecting transmission line corridors and access roads less likely to affect sensitive species, locating the route within the selected corridor to avoid nesting areas, and curtailing construction activities near nests and during nesting seasons would reduce raptor impacts.

c. Employing adequate engineering design practices for low-voltage transmission lines or the electrified railroad would reduce electrocutions of bald eagles, ferruginous hawks, and other raptors.

d. Final transmission route selections could accommodate areas with existing natural perches, such as in trees and along valley edges.

The major potential impacts to aquatic species are primarily related to groundwater withdrawal and increased angling pressure on vulnerable species. The following actions could mitigate potential impacts to aquatic species:

a. Maintenance of the existing conditions of Shoshone Ponds, and possibly identifying additional suitable habitat for establishing new Pahrump killifish populations could reduce impacts, and could also contribute to improving the current population.

b. Closure of Goshute Creek or Pine Ridge Creek to fishing during construction, and enforcement of special regulations by NDOW during WPPP operation, could minimize impacts from increased angling pressure on the Bonneville (Utah) cutthroat trout. (Complete enforcement of stream closure or special regulations is frequently infeasible, and further mitigative procedures, such as assisting in the establishment of additional cutthroat trout populations in streams identified by NDOW for population expansion, may be necessary.)

c. Modified NDOW stocking programs could offset impacts to aquatic species.

4.1.5 Cultural and Paleontological Resources

The following sections include a comparative evaluation of the probable effects on cultural resources and paleontological resources due to construction and operation of WPPP. Also included is a generic discussion of mitigative measures that could offset these effects. The evaluation involved the review of baseline data and the application of cultural resource and paleontological rating systems.

4.1.5.1 Power Generation System

4.1.5.1.1 Butte Valley Site

Cultural resource site density on the Butte Valley Site is low with a definite emphasis on smaller task sites. Sites are more prevalent in the southern portion of the Butte Valley Site, on the flatter alluvial areas between the hills to the west and the playa to the northeast. No sites dating to the Pre-Archaic Period were observed. Historic period sites are more abundant with most relating to ranching activities, particularly sheepherding.

Linear transformation of survey data suggests that as many as 34 cultural resource sites may exist on the Butte Valley Site. The quantity of data is low, due to the small size of the sites and the variety of data is moderate. The absence of complex sites indicates that sites in the area can be readily mitigated if necessary. Cultural resources on the site appear to have only a limited research potential. The Butte Valley Site is the least sensitive of the three WPPP sites and has a moderate potential for cultural resources impacts.

The Butte Valley Site is mostly on Quaternary alluvial sediments of low paleontological potential. If fossils are encountered, they will occur in the extreme northwest corner of the site. To date, no fossil localities from that area have been recorded. The Butte Valley Site, therefore, has a low potential for paleontological resource impacts.

4.1.5.1.2 North Steptoe Valley Site

The North Steptoe Valley Site has more recorded cultural resource sites than the other two WPPP sites. Sites date to a variety of periods and, with one exception, are all prehistoric in age. Many of the sites are small and diffuse in nature. Baseline data suggest that site density is highest in areas dominated by sand dunes and low hummocks and lowest in hardpan and alluvial areas. Dunes are found in a broad band running diagonally through the North Steptoe Valley Site from northeast to southwest. Hardpan and playa areas occur in the northwest corner of the site. Site density on the alluvial fans and piedmont in the southeast corner is moderate.

Linear transformation of survey data results suggests that as many as 177 sites may exist on the North Steptoe Valley Site. The quantity and variability of data is high due to the number of sites, the moderate abundance of field and base camp sites, and the number of periods represented. The number of base and field camp sites and their dune context may require a somewhat involved mitigation program. Data integrity is high and the research potential of the area is high. The North Steptoe Valley Site is the most sensitive of the three WPPP sites and has a high potential for cultural resource impacts.

The North Steptoe Valley Site is on sediments mapped as Quaternary alluvium and playa deposits. No fossil localities have been recorded in the area, and the impact potential on paleontological resources is low.

4.1.5.1.3 Spring Valley Site

With one exception, all recorded cultural resource sites on the Spring Valley Site are located along its eastern edge. Most are prehistoric in age and all prehistoric periods except Pre-Archaic are represented. Observed site density falls between that recorded on the other two WPPP sites. Of interest is the number of large base camp sites found. The quantity and complexity of the data contained in these sites will be fairly high.

Linear Transformation of survey data suggests that as many as 93 cultural resource sites may exist on the Spring Valley Site. The Spring Valley Site has high research potential, primarily due to the presence of large base camps representing three separate cultural periods. Resource site density is moderate, but integrity tends to be somewhat lower than in the other two WPPP sites due to more intensive agricultural activities. The Spring Valley Site has a moderate potential for cultural resource impacts.

The Spring Valley site lies entirely within an area mapped as Quaternary alluvium, and no fossil localities have been recorded to date. The impact potential on paleontological resources is low.

4.1.5.2 Power Transmission System

The potential for impacts on cultural resources from construction of a transmission line on corridor segments associated with the three WPPP sites is shown on Figure 4-9. Similar information related to paleontological resources is included on Figure 4-10.

4.1.5.3 Water Supply System

The potential for impacts on cultural resources from construction of the water supply system associated with the three WPPP sites is shown on Figure 4-11, Figure 4-12, and Figure 4-13. Similar information for paleontological resources is shown on Figure 4-14, Figure 4-15, and Figure 4-16.

4.1.5.4 Coal Transportation Systems

The potential for impacts on cultural resources from construction of a railroad on corridor segments associated with the three WPPP sites is shown on Figure 4-17. Similar information related to paleontological resources is shown on Figure 4-18.

4.1.5.5 Mitigation

4.1.5.5.1 Memorandum of Agreement

Mitigative measures associate with cultural resource impacts will be included in a Memorandum of Agreement (MOA) which is currently being prepared. The MOA, which will be an agreement with the Advisory Council on Historic Preservation (ACHP), and generic mitigative measures are discussed below.

Before project-related effects can be assessed, cultural resource properties must be located and evaluated as to their NRHP eligibility. It should be noted that mitigation is unnecessary if significant resources are preserved and/or protected from destruction or alteration. When mitigation is required, its scope will be determined through negotiation. Parties to this negotiation will be WPPP, the BLM, the Nevada State Historic Preservation Officer (SHPO), the ACHP, and, possibly, interested citizen groups and Native American representatives. The result of this negotiation will be an MOA developed in accordance with ACHP procedures and relevant guidelines. The MOA will serve as the focus for all cultural resource mitigation activities.

The MOA and detailed project design will serve as the focus for all cultural resource phases including identification, evaluation, and mitigation activities. The MOA will address: 1) standards for site identification; 2) testing, evaluation, and protection or data recovery; 3) emergency site discovery procedures; 4) control of indirect impacts; 5) responsibilities for monitoring and compliance; 6) project review and project design refinement procedures; and 7) other aspects of the cultural resources program.

There is no similar detailed legal and procedural structure for the consideration of WPPP effects on paleontological resources and Native American interests. Draft guidelines dealing with paleontology have been developed for the BLM, and the National Park Service has issued guidelines on the treatment of Native American interests in specific matters. Avoidance and protection are proposed as the preferred policy when such sites are located. When this is not possible, paleontological resources and sites of concern to Native Americans will be managed in a manner procedurally similar to that employed for cultural resources.

Various pieces of legislation address the issue of Native American consultation during the preparation of major environmental statements. In order to ensure early identification of potential Native American concerns with regard to the WPPP, letters were sent to Indian groups in eastern Nevada. This program of consultation will be continued to ensure full participation during project effect and mitigation negotiations. Access to identified Native American traditional use areas will be considered during these negotiations.

4.1.5.5.2 Generic Mitigation

It is anticipated that development on the WPPP site will have the greatest effect on cultural resources due to the size of the site, the difficulty of avoiding cultural resource sites through project design, and the long-term nature of the effect. Generic mitigative measures which will be a part of the MOA include the following:

a. Conduct a Class III intensive survey (to BLM standards) of selected site area.

b. Determine NRHP eligibility of identified resources in accordance with established procedures.

c. Develop a data recovery plan for significant resources in the site area.

d. Implement data recovery program.

e. Report the data recovery program in a professionally acceptable and timely manner.

f. Prepare a document for public distribution that presents the findings of the survey and data recovery.

In addition to direct impacts on cultural resources, there will also be indirect effects on resources in the surrounding area, primarily due to the increased number of people living and working in the area. Generic mitigative measures for indirect effects will also be included in the MOA.

Generic mitigative measures associated with lineal facilities include the following:

a. Conduct a Class III intensive survey (to BLM standards) of the selected corridor routes.

b. Develop an avoidance plan whereby resources in the corridors are not impacted by tower or access road construction.

c. If impossible to avoid a resource, determine its NRHP eligibility, develop a data recovery program, consult with all appropriate agencies, and implement the data recovery program.

d. Report the survey and data recovery activities in a professionally acceptable and timely manner.

If the NNRy right-of-way is used, the present rail bed (to be upgraded) should be traveled in order to identify features or associated sites that date to the period during which the route was constructed. A limited intuitive survey should also be conducted of areas adjacent to the route where resource denisty is known or suspected to be high.

The NNRy, as an entity, is eligible for the NRHP. For planning purposes, however, it is necessary to define the most essential elements of that entity. A NRHP nomination should be prepared for the NNRy which clearly spells out those portions of the total system that are the most vital in documenting its technological and historical role in the County. This would provide a baseline against which to assess the significance of sites or features found along the path of the existing rail bed. For those deemed significant, a mitigation program could be developed, consultation undertaken, the plan implemented, and the results reported in a professionally acceptable and timely manner.

4.1.6 Visual Resources

The introduction of WPPP will add new elements to the existing landscape, with the potential to alter the aesthetics or visual character of the region. These facilities will be constructed on public lands which, as required by the Federal Land Policy and Management Act of 1976, must be managed in a manner that protects scenic values.

The assessment of potential visual impacts was based on two separate methodologies. The first methodology is typically employed by Dames & Moore on similar projects. The second methodology is the VRM program developed by the BLM and discussed in Section 3.1.6.2.

The basis of the Dames & Moore methodology is the derivation of visual sensitivity ratings (ranging from minimum to maximum) for each proposed major facility. Additional consideration is given to the expected number of potential viewers of the facility and to any landscape which has outstanding or unusual visual appeal.

The basis of the VRM program is the assignment of management classes to the landscape potentially affected by the proposed facility. Each proposed facility is evaluated based on conformance or nonconformance to guidelines established by the BLM according to the management class assigned to the landscape containing the facility. The WPPP Generating Station, due to its prominence in the landscape, is evaluated by completion of visual contrast rating worksheets. These forms (included in the Visual Resources Baseline Technical Report) describe the degree of contrast the facility would introduce into the landscape from key viewing locations and recommend mitigative or stipulative measures to reduce potential contrast.

The following sections describe the expected impacts on visual resources and mitigative measures that could be used to reduce the impacts. Information related to the visibility impact of plumes is included in Section 4.1.2.7.

4.1.6.1 Power Generation System

The following sections discuss visual resource impacts using both visual sensitivity ratings and VRM conformance for the WPPP Generating Station located at the three WPPP sites. The viewshed associated with these sites is shown on Figure 4-19.

4.1.6.1.1 Butte Valley Site

Based on the information included in Table 4-3, the derived visual sensitivity rating at the Butte Valley Site is moderate. The Butte Valley Site is located in a natural landscape containing relatively few man-made modifications. Such modifications are limited mainly to dirt roads, wells, and a telephone line in the southern portion of the valley. Therefore, introduction of the WPPP Generating Station would alter existing landscape conditions.

Although the WPPP Generating Station would alter the natural landscape condition, the absence of residences, highways, and recreational areas would severely restrict the number of affected viewers. Permanent residents within the viewshed would be limited to a few families occupying ranches in Butte Valley. Travel on dirt roads within the valley is light, often less than ten vehicles per day. Therefore, the WPPP Generating Station would have a visual impact of moderate significance.

The Butte Valley Site is located in a landscape designated as VRM interim Class 3. VRM Class 3 guidelines state that, although any contrast introduced by the facility may be evident, it should remain subordinate to the existing landscape.

Conformance of the WPPP Generating Station was evaluated by estimating the amount of visual contrast to be introduced. Based on observations made during a field visit to the Butte Valley Site, a VRM visual contrast rating worksheet was prepared.

The landscape surrounding the Butte Valley Site is characterized by a gently-sloping valley floor ringed by angular dissected mountains. Vegetation, primarily scrub and brush, is low in profile and green, gray-green, and yellow in color. Texture of vegetation ranges from coarse in the foreground to smooth in the background. Man-made structures within the landscape are limited to dirt roads and a water well and are minor parts of the visual landscape.

The WPPP Generating Station would introduce generally weak to moderate changes in existing land and vegetative elements, caused by grading, removal of natural vegetation, and land exposure. The WPPP structures would strongly contrast with the existing visual character of Butte Valley. The contrast created by WPPP structures is rated at 30. BLM guidelines state that in any Class 3 area, the maximum allowable element (form, line, color, or texture) contrast is a moderate rating, and the maximum feature (land/water body, vegetation or structures) contrast rating is 16. Therefore, WPPP structures would exceed these VRM guidelines.

The VRM Class 3 designation within Butte Valley is interim, since detailed scenic quality and user sensitivity analyses have not yet been undertaken by the BLM. Based on a comparison of the scenic quality and visual exposure of the valley with other areas in east-central Nevada, the designation is conservative. Butte Valley resembles other Class 4 areas in scenic quality and diversity and is subject to minimal visual exposure by residents or travelers. Therefore, a full VRM analysis of Butte Valley would probably result in adoption of a Class 4 designation, rather than Class 3. In such a case, a maximum structural contrast rating of 20 would be allowed (rather than the more restrictive 16 applied to Class 3 areas).

4.1.6.1.2 North Steptoe Valley Site

Based on information included in Table 4-3, the derived visual sensitivity rating at the North Steptoe Valley Site is moderate. The landscape, characterized by a natural dominance condition, contains minor man-made modifications, including U.S. Highway 93, other local roads, transmission and telephone lines, and structures in the small community of Cherry Creek.

The WPPP Generating Station would be visible to a limited number of viewers. Population exposures may occur in a background context to persons living in scattered ranch houses in and near the community of Cherry Creek, and to travelers on U.S. Highway 93. The population of Cherry Creek is less than 100 persons. The 1980 ADT volume along U.S. Highway 93 between Ely and McGill was 2250 vehicles. The 1980 ADT volume on Cherry Creek Road west of U.S. Highway 93 was 65 vehicles. The WPPP Generating Station may be faintly visible from either the Pony Express Trail or Fort Schellbourne historic site at U.S. Highway 93, but only in a background context.

Based on the moderate sensitivity rating and the restricted number of potential viewers, the WPPP Generating Station would have a visual impact of moderate significance.

The North Steptoe Valley Site is located in a landscape designated as VRM interim Class 3. Based on observations made during a field visit to the North Steptoe Valley Site, two visual contrast rating worksheets were prepared. The greatest contrast of the WPPP Generating Station would occur from U.S. Highway 93 at the eastern edge of the site where most facilities would be located within two miles from observers. Therefore, the following discussion of contrasts applies only to this observation point.

The landscape surrounding the North Steptoe Valley Site, as viewed from the highway, is characterized by a gently-sloping valley bounded on the south and east by overlapping pyramidal, dissected mountains. Vegetation, primarily scrub, brush, and grasses, is low in profile and gray-green in color, with some streaks of yellow in the valley. Some irregular banding in the form of vegetation occurs due to changes in composition in the background. Texture of vegetation ranges from tufted in the foreground to smooth in the background. From the viewpoint, the highway is the only apparent visible man-made structure.

The WPPP Generating Station would introduce generally weak to moderate changes in existing land and vegetative elements, caused by grading and removal of natural vegetation. WPPP structures would strongly contrast with the existing visual character of the North Steptoe Valley. The contrast created by WPPP structures is rated at 30. BLM guidelines state that, in any Class 3 area, the maximum allowable element contrast is a moderate rating, and the maximum feature contrast score is 16. Therefore, WPPP structures would exceed VRM guidelines.

The VRM Class 3 designation within North Steptoe Valley is interim in nature, since detailed scenic quality and user sensitivity analyses have not yet been undertaken by the BLM. Based on a comparison of the scenic quality and visual exposure of the northern part of Steptoe Valley with other areas in east-central Nevada, the designation is conservative. The northern part of Steptoe Valley resembles other Class 4 areas in scenic quality and diversity and is subject to a relatively low level of visual exposure by residents and travelers. Therefore, a full VRM analysis of the area probably would result in adoption of a Class 4 designation, rather than Class 3. In such a case, a maximum structural contrast of 20 would be allowed (rather than the more restrictive 16 applied to Class 3 areas).

4.1.6.1.3 Spring Valley Site

Based on information included in Table 4-3, the derived visual sensitivity rating at the Spring Valley Site is high. The landscape, characterized by a natural dominance condition, contains minor man-made modifications, including U.S. Highways 93 and 6/50, other local roads, telephone lines, fences, and scattered ranches.

The affected portion of Spring Valley is one of high scenic quality. Wheeler Peak (13,063 feet), located in the Snake Range east of the site, provides a scenic backdrop to Spring Valley to travelers on U.S. Highway 93 and Highway 6/50 at Connors Pass. The WPPP Generating Station would significantly reduce the quality of those views. In the vicinity of Majors Place junction, the 1980 ADT volume was 515 vehicles traveling east on U.S. Highway 6/50, 875 north on U.S. Highway 93, and 440 south on U.S. Highway 93.

Based on the high sensitivity rating and the restricted and transitory nature of potential viewers, the Spring Valley Site would have visual impacts of moderate to high significance.

The Spring Valley Site is located in a landscape designated as VRM Class 4. According to VRM guidelines, any contrast introduced into a Class 4 landscape may be dominant and attract attention, but should repeat the form, line, color, and texture of the characteristic landscape.

Based on observations made during a field visit to the Spring Valley Site, three visual contrast rating worksheets were prepared. The worksheets were completed from three observation points. The greatest contrast of the WPPP Generating Station would occur from U.S. Highway 93 at the western edge of the site. Therefore, the following discussion of contrasts applies only to this observation point.

The landscape surrounding the Spring Valley Site, as viewed from the highway, is characterized by a flat valley bounded on the east by an abruptly rising, precipitous mountain range. Vegetation, primarily scrub and brush, is low in profile, gray-green in color, and forms some irregular bands in the valley. Texture of vegetation ranges from stippled and tufted in the foreground to smooth in the background. Visible structures include Highway 93, telephone poles and wires, and low wire fences.

The WPPP Generating Station would introduce generally weak to moderate changes in existing land and vegetative elements due to grading and removal of natural vegetation. WPPP structures would strongly contrast with the existing visual character of Spring Valley. The contrast created by WPPP structures is rated at 30. BLM guidelines state that in any Class 4 area, the total contrast rating for any feature should not exceed 20. Therefore, WPPP structures would exceed VRM guidelines.

4.1.6.2 Power Transmission System

The transmission line corridors cross landscapes primarily in natural and natural dominance conditions. Visual sensitivity ratings based on landscape condition and visual exposure are shown on Figure 4-20. Because any segment of the power transmission system might be seen under different viewing situations, the worst-case sensitivity rating for each segment is shown on Figure 4-20.

The number of potential observers of the facilities would be limited mainly to transitory viewers traveling on major highways. Visual impact ratings would be greatest (maximum rating) where corridors cross highways, resulting in foreground, open superior views to travelers on the highway. However, such views would be of relatively short duration and would affect limited numbers of people.

The transmission line corridors cross lands predominantly classified as VRM interim Class 3, Class 3, and Class 4. Approximately four miles of corridor crosses Class 2 lands.

4.1.6.3 Water Supply System

The water supply system well fields and corridors are located in natural dominance landscapes. Worst-case visual sensitivity ratings are summarized in Table 4-4. The Butte Valley and Spring Valley systems are rated low in sensitivity, while the Steptoe Valley system is rated minimum.

The pipeline corridors cross lands classified as VRM interim Class 3 and Class 4. Because of the low profile nature of pumps, wells, and valves and the fact that pipelines will be buried underground, it is expected that the proposed systems would remain subordinate to the surrounding landscapes. Therefore, the system would conform to VRM Class 3 and Class 4 guidelines.

4.1.6.4 Coal Transportation System

The coal transportation system would include both existing railroads and a new railroad connecting the WPPP Generating Station to existing facilities. Because the railroads would be ground level facilities, the discussion of visual sensitivity is qualitative and no sensitivity ratings were derived.

The railroad corridors cross landscapes in natural and natural dominance conditions. Within flat valleys, the visibility of the railroads would be restricted to about a half-mile distance. Long-range visibility is primarily dependent on vegetative clearing and bed grading performed during rail construction. The low profile of existing vegetation and gentle topographic slope along much of the corridors would reduce the effect of these two elements. However, where the corridor ascends from valley floors through mountain passes, extensive cut and fill may be required. In these cases, the railroad may introduce strong linear forms into the natural landscape. Therefore, the visual analysis emphasizes graded segments.

The number of potential observers of the railroad would be mainly limited to transitory viewers traveling on major highways. The systems would be most visible to those persons where the rail climbs grades or where it crosses highways. Population exposure sources and expected levels of visual impacts for the coal transportation system are listed in Table 4-5.

The preferred Northern Transportation System from the Butte Valley Site would cross Egan Creek Pass, requiring heavy rock cuts. However, this segment, located about ten miles west of U.S. Highway 93, would not be visible from major population sources. The alternate Northern Transportation System would be visible from U.S. Highway 93 at the grade crossing and as the rail loops south of Spruce Mountain. The Southern Transportation System would be visible from U.S. Highway 93, U.S. Highway 6 and U.S. Highway 50 and State Highway 318 where the railroad would approach and cross those highways.

The Southern Transportation System would parallel and be visible from U.S. Highway 93 for approximately 15 miles. For the remainder, the railroad would cross State Highway 38 twice and U.S. Highway 6 and U.S. Highway 50 once. Cut and fill would be required near the crossings at U.S. Highway 6 (Jakes Wash) and U.S. Highway 50, leaving the grades visible from those highways.

Because of the limited number of population sources and the short duration of views, any railroad alignments associated with the Butte Valley Site would have visual impacts of low significance.

The preferred Northern Transportation System from the North Steptoe Valley Site will include approximately five miles of railroad linking the existing NNRy railroad with the site. This segment would not be visible to significant population sources and, therefore, would have impacts of negligible significance. The alternate Northern Transportation System would require rock cuts through the Antelope Range and would be visible from U.S. Highway 50. The railroad would again be visible from U.S. Highway 50 at the road grade crossing approximately five miles north of the site.

The Southern Transportation System would be visible from U.S. Highway 93 which it would parallel and cross north of Pioche. Heavy sidehill cuts and fill north of Dutch John Mountain and through Muleshoe Pass would not be visible to motorists on U.S. Highway 93. Within the pass between Cave Valley and Lower Steptoe Valley, the railroad would cross between WSA NV-040-168 and WSA NV-040-169. However, no main source of recreational population exposure exists in those areas. The railroad would again cross U.S. Highway 93 in two spots, north and south of Ely.

The alternate Southern Transportation System would parallel and be visible from a portion of U.S. Highway 93. The railroad would cross U.S. Highway 6 and U.S. Highway 50 and may be visible in an inferior position from U.S. Highway 50 in the vicinity of the site.

Because of the limited number of population sources and the short duration of views, any railroad alignments associated with the North Steptoe Valley Site would have visual impacts of low significance.

The preferred Northern Transportation System from the Spring Valley Site would require rock cuts through the Antelope Range and near the source of Spring Valley Creek. In these areas, the railroad would cross and/or be visible from U.S. Highway 50. The railroad would cross U.S. Highway 50 again at grade aproximately six miles northeast of the site. The alternate Northern Transportation System is identical along most of its length to the preferred route and would cross U.S. Highway 50 in the locations noted above. Portions of the Southern Transportation System and its alternate would be visible in an inferior position from U.S. Highway 93.

Because of the limited number of population sources and the short duration of views, any railroad alignments associated with the Spring Valley Site would have visual impacts of low signficance.

The coal transportation system will cross lands designated as VRM interim Class 3, Class 3, and Class 4. VRM guidelines state that contrasts introduced into Class 3 lands should remain subordinate to the existing landscape. Because it is a ground-level facility, railroads generally remain subordinate to their surrounding landscape. Therefore, it is expected that the coal transportation system would conform to VRM Class 3 and Class 4 guidelines.

If an electrified railroad were constructed along the NNRy right-of-way, there would be visual impacts associated with the overhead facilities. These impacts would be similar to those of a low-voltage transmission line.

4.1.6.5 Mitigation

Mitigative measures could be employed to reduce the contrast introduced by WPPP to the land and vegetation. Careful grading and landscaping would shield the less prominent facilities to reduce contrast in form, line, color, and texture. This measure could be used at the North Steptoe Valley Site, where the contrast would be apparent from both U.S. Highway 93 and Cherry Creek. Revegetation of grasses and/or shrubs onto disturbed unused areas would reduce color and texture contrasts.

Use of carefully developed color schemes in painting and concrete preparation could substantially reduce contrast in all elements. The materials used in constructing some structures could be mixed or colored in a way that would let them blend more easily into the background landscape.

The above measures would reduce structural contrast to moderate ratings for the elements of line, color, and texture. Due to the prominence of some WPPP structures (including the stacks, steam generator buildings, air quality control system buildings, and cooling towers) it may not be possible to substantially mitigate the contrast in form introduced by those structures. The broad open valley landscape characteristic of the three WPPP sites does not allow opportunities for siting the facilities to reduce visual impacts. Therefore, significant structural contrasts in form and, possibly in line and texture, will lead to unavoidable visual impacts.

With regard to the power transmission system, general mitigative measures could be adopted for the system as a whole. Towers could be painted in low-reflective pigments which would blend with the dark brown color of the natural landscape. Transmission line conductors could also be dulled or painted to decrease reflectivity. Within its general corridor, the power transmission system could be aligned to take advantage of backdrops and local topographic features to reduce visibility. Towers could be spaced at broad intervals at highway crossings and other points of public exposure.

4.1.7 Socioeconomics

Construction and operation of WPPP will affect the lives and interests of many people, including County residents, transient workers in-migrating from other areas, and visitors passing through the County. Of primary concern to these people, particularly the permanent residents of the County, is that the impacts resulting from construction and operation of WPPP be minimized and that the desirable qualities of the County be maintained.

There are no absolute criteria for measuring the quality of life or adequacy of amenities in a locale and, ultimately, these are subjectively determined. The focus of this discussion is on the degree to which changes in socioeconomic characteristics due to WPPP may cause significant changes in the local environment. A corollary concern is to identify requirements for mitigative measures to avoid adverse long-term impacts and to enhance beneficial effects.

The socioeconomic impacts of WPPP will result primarily from the introduction of new workers and new spending in the County. New population and additional income are the primary causes of change in social structures. These, in turn, generate changes in requirements for private and public infrastructures (i.e., housing, utilities, public health and safety, education, and cultural amenities).

The following sections summarize information related to socioeconomic impacts and proposed mitigative measures. The latter are incorporated in the Impact Alleviation Plan (Section 4.1.7.12), developed as part of the WPPP community development program (Section 4.1.7.11).

4.1.7.1 Employment

4.1.7.1.1 Direct Employment

WPPP will involve two distinct employment and development phases, the construction period and the operation period. Construction is scheduled to commence in the first quarter of 1985 and terminate during the first quarter of 1991. Work force requirements are listed in Table 4-6 and are shown on Figure 4-21. Peak construction employment would occur during the third quarter of 1988 with a total of 2345 persons. Workers associated with operation would begin in the third quarter of 1985, but continue at low levels until major facilities were in place. The majority of the operation work force staffing would occur after 1988, and reach a maximum of 530 persons during the second quarter of 1990. Total employment is estimated to peak at 2610 persons during the first quarter of 1989, when the construction work force begins to decline and the operation work force increases to over 50 percent of the total operation work force requirements.

The work force requirements can be compared to employment forecasts of the County to the year 2000. These data show that, without WPPP, approximately 3200 to 3300 persons (covered by unemployment compensation) would be employed in the County between 1985 and 1990. Work force requirements for WPPP will exceed the local employed work force by approximately 80 percent. The majority of the WPPP work forces will have to be imported.

At the construction peak, the WPPP construction force is estimated to include six percent local daily commuters, 54 percent nonlocal weekly commuters, and 40 percent relocating workers (of which 60 percent would be married and 40 percent would be single status). During operation, the operation work force is estimated to include 20 percent local and 80 percent nonlocal (of which 84 percent would be married and 16 percent would be single status).

During construction, the WPPP labor requirements will greatly exceed the local supply of construction workers, and local businesses may encounter delays in carrying out building projects. Labor turnover on WPPP and stimulation of secondary, or indirect employment, from local construction payroll spending will mitigate temporary shortages in locally-available building skills.

If patterns observed at other large construction projects are indicative, a more general labor shortage may result in the community. This would be due to higher wages paid to WPPP construction workers relative to existing local wage scales which could attract workers from existing jobs in the County. The impact would be short-term and could be insignificant should local workers perceive that returning to their old jobs after WPPP construction ended would be difficult.

4.1.7.1.2 Indirect Employment

The financial stimulus of a large construction project to nearby communities often results in an induced expansion of local business and employment opportunities. Studies of power plant projects in the western states suggest that, during the construction phase, an average of one indirect job results from every five direct jobs on a power plant project in rural areas. During operation, the ratio increases to one to two, due to the more settled nature of the project work force. The ratios are based on the proportion of direct project jobs filled by nonlocal workers who will contribute heavily to changing the equilibrium of local employment and income levels.

Based on the average indirect to direct job ratio of power projects in the western states, it is estimated that a maximum of about 440 new indirect jobs would be generated in the County during peak construction. These indirect jobs, however, will diminish as construction employment decreases. It is anticipated that the majority of the indirect construction period jobs would be filled by local residents, typically unemployed and under-employed people (e.g., spouses, students, and people between jobs). The peak number of indirect jobs to be filled by local residents is projected at 310 (70 percent of the total). The remaining 30 percent (130 jobs) would be filled by in-migrants newly attracted to the area.

During the operation period, indirect employment is estimated to stabilize at one job for every two direct operation jobs, or a total of 215 indirect jobs. The majority of indirect jobs (60 percent) would be filled by local residents, with the balance being filled by relocating in-migrants.

4.1.7.2 Population

Population changes are the principal socioeconomic impacts of a major development project. The impacts are precipitated by changes in local employment as in-migrants relocate their households to the project area, either temporarily during construction or permanently during operation. The population changes in turn affect the area as a whole.

Table 4-7 lists County population projections with and without WPPP for each year of construction and the first year of full operation. At peak construction, it is estimated that 13,515 persons will reside in the County with WPPP compared to 9160 without WPPP. Therefore, at peak construction, there will be 47 percent greater population due to WPPP. This large, but temporary, increase will result from three factors:

a. Nonlocal workers commuting on a weekly basis to the County from other parts of the region and residing in transient accommodations near the WPPP site during the work week.

b. In-migrating nonlocal workers relocating to the County to work on WPPP, settling into more or less permanent housing, and bringing their dependents.

c. In-migrating workers with dependents filling non-WPPP jobs resulting from the economic stimulus of the project.

In addition, WPPP could attract an unknown number of transients, including people unable or unqualified to secure either direct or indirect jobs. Such people would drift in and out of the community from before construction begins until after it ends.

Figure 4-22 shows the projected trends of WPPP-related employment and population from initiation of construction to full commercial operation. The nonlocal weekly commuting and relocating in-migrant personnel will generate population changes, while daily commuters from the local area will be part of the permanent, baseline population.

Table 4-7 indicates that, at full operation, the WPPP-related population increase is estimated to be about 1300 persons, or 14 percent greater than the expected population without WPPP. The largest component of the new population will be due to families of married operating personnel.

4.1.7.3 <u>Income</u>

Table 4-8 details the annual payments and identifies the portions of gross and net payrolls spent within the County. Construction of WPPP will entail direct wage and salary payments estimated to be approximately $200 million. Net local spending from the construction payroll is estimated to be approximately $60 million, of which half is projected to be spent in 1988 and 1989. The operation payroll will gradually expand, reaching a peak during the operation period. Of the estimated annual gross payroll of $14.73 million, about $7.7 million per year is projected to be spent in the County.

Local inflows of spending will add to total local personal income. At the peak of construction, the County will experience an increment of 51 percent over baseline personal income levels (approximately $42 million) due to WPPP-related spending.

4.1.7.4 Housing

The demand for housing is a primary impact associated with in-migration of WPPP work forces. Because of the importance of mitigating these impacts, a project housing strategy was developed (Section 4.1.7.11.3). Because of the housing strategy, actual housing impacts related to population growth associated with the project will be substantially reduced.

Figure 4-23 shows the cumulative housing demand as a result of WPPP. A heavy demand for housing will occur during the 1985 to 1990 time-frame followed by a decline due to the rapid out-migration of the construction work force after 1990.

The peak demand for housing is expected to occur in the fourth quarter of 1988. The temporary housing demand is expected to reach approximately 2100 by late 1988, and the permanent housing demand will reach approximately 500 by 1990.

Temporary units will be required to accommodate construction workers for approximately six years. After construction, the demand for housing will be zero since the work force is expected to leave the area.

The present County housing stock does not provide an adequate supply of excess housing to meet the projected temporary demand, even though the County is experiencing a relatively high vacancy factor due to out-migration associated with decreased mining activities in the area. However, there may be enough excess housing to accommodate the permanent demand of operation workers, although a substantial number of these units are in need of major rehabilitation.

It is anticipated that there will be an adequate number of units in the County to accomodate the WPPP operation work force. Potential impacts will be mitigated by implementing the project housing strategy.

4.1.7.5 Education

The increase in school age children associated with the WPPP population will impact the WPCSD. Table 4-9 summarizes occupancy with and without WPPP by grade level for the peak years of employment and the first year of full operation. Children associated with WPPP work forces are assumed to be enrolled in WPCSD schools although there are several private and parochial schools in the County. Impacts on County educational facilities are significant because of the relatively marginal physical condition of the school facilities and because of the relationship between population growth and school enrollment.

Sufficient capacity exists in the high school to fulfill the needs of both baseline and WPPP-related students during the operation period, although the physical quality of the facility will ultimately require its replacement. The capacity of the junior high school, however, is insufficient to accommodate total projected enrollment with WPPP-related students. The capacities of the elementary schools in Ely are insufficient to accommodate baseline enrollment projections. Therefore, additional capacity will have to be developed regardless of WPPP-related enrollment.

WPCSD staffing needs will also increase due to WPPP. There will be a permanent need for 20 more teachers, with twice the number needed at the peak of construction. About the same number of support staff will be necessary in each case. These needs and the need for any additional school facilities are addressed in the Impact Alleviation Plan.

4.1.7.6 Public Health and Safety

4.1.7.6.1 Law Enforcement

Law enforcement needs due to WPPP are summarized in Table 4-10. A total of six new police officers will be required during the operation period. At the construction peak, nine new officers will be required. There will also be impacts on custodial facilities. Both the County jail and the juvenile detention center will require relatively substantial expansion, especially during WPPP construction.

4.1.7.6.2 Fire Protection

The existing fire station is located on the west side of Ely. It is anticipated that most of the population growth will occur along the McGill Highway or the Pioche Highway, outside the satisfactory response time. A new station or substation in East Ely is anticipated to reduce the response time to the above areas and still provide adequate service to the west side of Ely, thereby mitigating these impacts.

The WPPP site will have its own fire protection services. However, in emergency situations, assistance will be needed from various local fire departments. On a localized level, and depending on the location of housing, existing water distribution systems may have to be expanded or otherwise improved.

4.1.7.6.3 Health Services

Public health services needs due to WPPP are summarized in Table 4-11. The projections in this table indicate that long-term impacts related to WPPP will occur in the areas of nurses and paramedical personnel. WPPP will also generate a need for two more ambulances (over the four now in the County) at the peak of construction. WPPP will not significantly impact existing in-patient facilities.

4.1.7.6.4 Social Services

Based on comparison of current case load per staff service level with projected serice levels, the principal impacts on the delivery of social services in the County will occur during peak construction employment. In the area of state and County general welfare, assistance to transients and others needing financial and medical support may significantly increase. This could include support in the form of food stamps and aid for dependent children. Also at the peak of construction, day care needs are projected at about 38 new slots above the 134 slots presently existing in the County. In the area of mental health, counseling hours are expected to increase by more than 50 percent, requiring two additional full-time counselors. Similar impacts are expected on home health care and aging services. At the peak of construction, clients served by public health nurses are expected to almost double, requiring an additional registered nurse.

Because many of the County services are funded by state and federal government budgets, it is difficult to predict whether all social services impacts can be mitigated through conventional funding sources.

4.1.7.7 Community Infrastructure

4.1.7.7.1 Transportation

At the peak of construction, a total of 2570 employees will be on the WPPP site. Assuming that the plant will be constructed on an eight-hour day, five-day-a-week schedule and that the operating and maintenance personnel will be on the same shift as the construction workers, 2570 people will be arriving or leaving the site at approximately the same time (i.e., peak hour). Assuming the construction worker housing units are fully occupied, 1620 people will be commuting from beyond the immediate area of the plant site. Because of the remoteness of the three WPPP sites, approximately 50 percent of the workers are assumed to carpool to the site. Assuming two people per car and no busing or vanpooling, the maximum number of vehicles going to or leaving the site would be approximately 1200. In addition, WPPP-related traffic is anticipated to be 60 to 75 trucks per week.

The total workers employed at the site during the operation period will be 530, spread over three, eight-hour shifts per day. The number of vehicles headed toward or leaving the site at any one time should not exceed 200 vehicles.

The additional peak hour traffic generated during WPPP construction could result in a significant temporary impact on portions of the County transportation system. This would depend on the WPPP site and the location of WPPP-related housing. For the North Steptoe Valley Site, capacity constraints on U.S. Highway 93 through McGill are likely to cause peak hour congestion regardless of where in Ely the housing is located. Traffic flow will need to be improved through McGill to accommodate through traffic. This may be accomplished by: 1) constructing a new bypass route; 2) widening U.S. Highway 93, especially in the southern part of McGill; 3) implementing parking restrictions during peak traffic hours; and/or 4) providing two lanes for traffic in direction of peak flow on the three-lane road by use of cones or lights. In addition, increased peak hour traffic through East Ely has the potential to become a safety problem unless improvements are made to the existing intersection of Avenue F, 15th Street, and U.S. Highway 93.

There may be impacts due to local commuter trips (e.g., shopping and school). Improvements to city streets such as paving, striping, signing, and installation of traffic control devices may be necessary.

4.1.7.7.2 Water and Sewer Systems

The combined service capability of the community water storage systems for Ely, McGill, and Ruth is 17,050 persons, which represents a total excess service capacity for 6038 persons in the three communities at peak WPPP employment. The condition of the water and sewer systems is generally poor and may have to be improved or replaced.

4.1.7.8 Recreation

Population entering the County as a result of WPPP will utilize community recreational facilities. However, guidelines used to quantify impacts generally show the number of recreational facilities in the County to be adequate to accomodate population growth. The guidelines do indicate a deficiency in the number of playlots, both with and without WPPP. The guidelines also project some deficiencies in park acreage, basketball and miscellaneous court game areas, and multi-purpose facilities. Table 4-12 summarizes the expected shortfall of facilities by recreation type for the peak year of employment and the first year of full operation, both with and without WPPP. Many of the existing facilities are substandard and in need of improvement or replacement.

Dispersed outdoor recreation uses will also be impacted by the project-related population. For example, the influx of construction workers may increase angling pressure on fishing areas popular with County residents. These areas include Comins Lake Reservoir, Bassett Lake, upper Duck Creek, Cave Lake, and Illipah Reservoir. There would also be increased competition for already over-subscribed deer, antelope, and elk tags. Significant impacts will be temporary (during construction), but is likely to affect the quality of life for outdoor sportsmen in the County, as discussed in Section 4.1.7.10.

4.1.7.9 Agriculture

Potential impacts on the livestock industry in the County were initially identified during the WPPP community development program. Ranching interests were represented in this program. Two significant agricultural issues that emerged were the potential impact of WPPP on agricultural water resources (discussed in Section 4.1.3.1.2) and the effect of WPPP on livestock grazing maintenance and management as the result of removing land from forage production. This impact is addressed in the following sections in a general manner to allow individual ranchers (permittees), the lessor (BLM), and WPPP flexibility in determining the extent to which specific mitigative measures to be identified will be necessary and acceptable.

4.1.7.9.1 Land Productivity

Section 3.2.7 discusses the existing land productivity associated with the three WPPP sites and railroad corridors in terms of AUMs. It should be noted that actual impacts could extend beyond the AUMs withdrawn due to impacts on a ranch operation as a whole. However, it is not possible to accurately calculate affected AUMs associated with migratory-type operations. Field observations by trained range management personnel were used to estimate the percentage of each allotment potentially subject to impact.

The total of potentially affected AUMs due to actual site development is relatively small when compared to the total AUMs of the BLM grazing allotments that are leased by individual ranch operations. These AUMs need not be an irretrievable loss. They could be recovered by importation of feed for the livestock or developing areas in each allotment to produce feed, hay, or alfalfa, for the livestock. Therefore, impacts related to AUMs, or land productivity, are anticipated to be insignificant. However, it is recognized that the significance may vary, depending on the detailed use of the affected portions of an allotment. Impacts on individuals will be a part of the Impact Alleviation Plan.

4.1.7.9.2 Livestock Management

Impacts associated with the three WPPP sites and railroad corridors are directly related to the change in land use from leased rangeland to WPPP use. The impacts extend beyond simple loss of land acreage and its productivity value because placement of facilities may also obstruct existing ranch operations in the following ways:

a. The movement and migration of livestock may be restricted.

b. The access to watering places for range livestock may be impaired.

c. The cost of ranch management may be increased.

These impacts are prmiarily related to railroad corridor development. However, the magnitude of impacts cannot be accurately assessed until the actual route alignment is selected. Mitigative measures that could alleviate corridor-related impacts include:

a. Strategic placement of livestock railroad underpasses.

b. The development of watering places easily accessible to livestock without crossing the railroad.

c. Fencing the railroad right-of-way where livestock will concentrate and be endangered.

Actual mitigative measures applicable to each specific case will be developed as a part of the Impact Alleviation Plan.

4.1.7.10 Quality of Life

During the WPPP construction period, the County may experience: 1) a short (one to two year) period of intense housing demand and some temporary shortages; 2) an influx of persons who are not integrated into the community; 3) a temporary increased demand for goods and services; and 4) a probable increase in unemployed transients, whose economic plight may strain local health and welfare services. These would be the most likely impact on the quality of life in the County.

There will be about 4400 new residents at the peak of construction, not including an unknown number of transients. The County population will expand by over 50 percent of current levels. These in-migrants may not be fully incorporated into the local community setting. As newcomers, the may not be accustomed to the nuances of life in the County. Therefore, they are likely to be somewhat different from County residents. The in-migrants will include construction workers (and their families) who are accustomed to living in a place only two or three years, and who probably will not try to involve themselves in local community activities. On the other hand, supervisory personnel are likely to be well-educated, bring their families, and participate in the local community. These people have become adept at integrating themselves into a community.

A relatively large number of "strangers" coming into the community will affect the small town atmosphere which is important to many persons in the County. The dramatic increases in the incidences of impersonal contacts could result in unease and suspicion. Changes in the community which locals consider undesirable are likely to be blamed on the newcomers.

Any increase in crimes, such as theft, burglary, and assault and battery, will weaken the local perception that Ely is safe and secure. As a result, another characteristic of "small town atmosphere" may be affected.

The influx of newcomers unknown to local merchants is likely to result in many businesses experiencing more demand than can be handled, given preconstruction levels of business. As a consequence, personalized service may deteriorate. In addition, the likelihood of an increase in the cost of goods and services due to increased demand may impact existing residents who are on fixed income or who are underemployed and unemployed.

The dispersed recreation assets of the County, highly valued by local residents, could be impacted by newcomers. Poaching and illegal trespass of public and private lands may increase. Increased competition for fishing sites and hunting tags may also occur. In addition, remote wilderness areas could experience increased usage.

Although the adverse effects discussed above are possible, they are not inevitable. Mitigative measures could prevent some of these effects. However, it is still likely that many people, particularly those who are not benefitting directly from WPPP, will perceive both Ely and the County as a less pleasant place to live during the construction period.

The adverse effects during the operation period will be of a much longer duration than those during construction period, but will involve fewer in-migrants, and, in general, will be less significant. In fact, the introduction of operation personnel more or less permanently into the community can be more positive than negative. For example, as the local business community adjusts to newcomer preferences, a wider variety of goods and services may be expected.

In the worst case, the stress and strife between newcomers and "oldtimers" could become so severe as to incapacitate local decision-making. Such a situation would be readily obvious and would result in loss of confidence by local residents that the community could solve its problems. As a consequence, satisfaction with life would decline even further.

Conversely, the construction and operation of WPPP could be seen by many as positive for the community and as one step toward stabilizing the County economy. Unless the economy is stabilized, the current satisfaction with life in the area will continue to deteriorate. Unfortunately, the construction and operation of WPPP alone may not reverse the declining economic trend. Unless there is other economic development, the dissatisfaction with the local economic situation probably will grow. In this sense, the proposed facility may not seriously affect the declining quality of life trend in the County. WPPP may even provide a needed boost in confidence as the community pursues additional avenues of economic development.

4.1.7.11 Community Development Program

In order to assess the socioeconomic impact of WPPP and establish the necessary mitigation strategies to alleviate the adverse impacts, community planning studies were begun early in 1981. Because of the importance of the community and financial planning problems associated with WPPP, socioeconomic considerations were included as a major consideration in the site selection studies.

After the selection of the three WPPP sites, the community planning studies focused on the community development program, which included the preparation of an impact alleviation plan as required by the WPPP Development Work Agreement.

In order to identify the socioeconomic impacts on the communities, determine mitigation methods, and alleviate the social impacts of WPPP, a community impact alleviation planning process was developed. The community impact alleviation planning process consisted of: 1) collecting and analyzing data on baseline conditions; 2) forecasting employment, households, school enrollments, fiscal requirements, and population growth; 3) determining a housing strategy; 4) assessing socioeconomic impacts; 5) developing solutions or mitigation strategies necessary to alleviate any adverse impacts; and 6) preparing a plan to monitor any changes from projections.

The community impact alleviation planning process was intended to be a dynamic process within the impacted community. There are four basic steps in the process: 1) impact analysis; 2) impact assessment; 3) mitigation strategies; and 4) monitoring. The first three steps have been completed. The fourth step will allow future review of identified socioeconomic needs and mitigation strategies and updates, as necessary. The results of the community impact alleviation planning process are included in the following sections.

4.1.7.11.1 Socioeconomic Baseline

The first step of the community impact alleviation planning process was the collection of baseline data on social and economic systems in the County. The data was presented in the White Pine County Socioeconomic Baseline 1982. This report contains information in the following areas:

- o Demographic Characteristics
- o Employment and Economic Base
- o Income
- o Housing
- o Community Infrastructure
- o Public Health and Safety
- o Education
- o Cultural and Recreation Facilities
- o Land Use
- o Government and Finance

The baseline was endorsed by the City of Ely, the County Board of School Trustees, and the County Regional Planning Commission in May 1982. In addition, the Board of County Commissioners endorsed the baseline in July 1982. (It should be noted that the baseline report has been updated as a part of the preparation of the EIS. Future updates will be made as necessary to incorporate any significant changes.)

The socioeconomic baseline represents a "snapshot" of the community at the time the data was gathered.

4.1.7.11.2 Labor Requirements

Data from the socioeconomic baseline were used in forecasting employment, households, school enrollment, fiscal requirements, and population growth. The construction and operation of WPPP will require the employment of a large number of workers new to the County. These people will most likely be located near their respective work area during the time they are associated with WPPP. This, in turn, will require that specific accommodations such as housing, schools, social services, water and sewage facilities, medical services, and law and fire protection be provided if they do not already exist. The estimated labor force requirements are discussed in Section 4.1.7.1.

4.1.7.11.3 <u>Housing Strategy</u>

A proposed housing strategy was developed using data from the socioeconomic baseline and work force profiles. The strategy has three primary objectives:

- o Minimize the socioeconomic impact on the communities in and near the County.
- o Attract and keep both construction workers and permanent operating personnel.
- o Keep WPPP-related costs from becoming excessive.

As part of forecasting, an estimate of the number of housing units required to meet the needs of the direct construction and operation workers and their families, as well as the indirect workers and their families, was made. These estimates are discussed in Section 4.1.7.4.

Several aspects of personnel housing needs associated with the direct WPPP construction and operation worker, as well as the indirect population, were addressed in the preparation of a housing strategy. These included the availability, attractiveness, type, and affordability of the housing. The factors affecting the affordability of housing are:

- o The level of family income
- o The cost of housing
- o The ability to finance or rent the housing unit

A major concern was that desirable housing could not be provided without some type of external adjustment to either the worker salary, the cost of the housing, or the cost of borrowing money. Without some adjustment or involvement by WPPP, the necessary housing to attract and maintain a stable work force would not exist until a significant improvement occurred in economic conditions. Therefore, in order to meet the anticipated housing demand and provide available, attractive, and affordable housing, it was proposed that WPPP would be responsible for financing and constructing all housing for the direct relocating construction work force above that provided by the private sector.

Meeting the demand for housing will be accomplished by: 1) accomodating up to 950 single-status workers at the WPPP site (700 in motel-style rooms and 250 in recreational vehicle spaces); 2) renting up to 400 existing vacancies in Ely; 3) constructing, or having constructed, up to 400 mobile home spaces; and 4) constructing, or having constructed, up to 400 recreational vehicle spaces. Where possible, temporary housing facilities for direct construction workers will be designed and constructed for conversion to permanent usage by both permanent WPPP employees and the general public. For the indirect construction work force relocating to Ely, WPPP will not be responsible for constructing, or providing incentives to construct, any housing.

In order to assure attractive, affordable, and quality housing for permanent employees during the operation period, WPPP will provide the assurance of affordable mortgage financing, transitional housing accommodations upon relocation, access to converted temporary work force housing, and possible guarantees to local developers to initiate construction. Other innovative incentives to assure affordable, attractive, and quality housing will also continue to be sought.

To the extent necessary to implement the housing strategy, land will be purchased within the City of Ely (or on adjacent land acceptable for annexation to Ely) to be used to meet the housing demands.

The anticipated distribution of the WPPP work force, based upon the housing strategy, is listed in Table 4-14. The distribution was based on a gravity model modified to allow for available services in each community.

4.1.7.11.4 Community Involvement Program

The second step in the community impact alleviation planning process, impact assessment, allowed the community to assess the potential impacts on public and private facilities and services, taking into account the current conditions and projected changes identified in the impact analysis. Based on this assessment, the most appropriate and adequate programs could be developed to minimize any negative impacts.

In order to meet the objectives of having public participation in the community impact alleviation planning process, the County, under its Power Plant Advisory Committee, established the following 13 subcommittees:

- Agriculture
- Business and Human Resources
- Education
- Fire Protection
- Housing
- Law Enforcement
- Outdoor Sportsman

- o Public Health
- o Recreation
- o Social Services
- o Transportation
- o Utilities
- o Water, Sewer, Solid Waste, and Storm Drains

These subcommittees were active in the impact analysis process, as well as the impact assessment and development of mitigation strategies. As part of the process, each subcommittee also reviewed and approved the socioeconomic baseline, demographic projections, and the housing strategy. This information was used in the preparation of the impact on the community (the needs assessment) and mitigation alternatives.

Each subcommittee assessed the potential impacts on public and private facilities and services within its specific area of expertise. First, each subcommittee developed a list of issues and concerns. These issues and concerns were focused into specific community needs. Using appropriate guidelines, these needs were projected during the construction period, at the peak of construction, and during the first year of operation. These projections were compared with the existing condition or baseline and with the projected condition through 1990 without the WPPP in order to determine if a need existed. Needs were further identified as being WPPP-related or non-WPPP-related and temporary or permanent. The subcommittees then ranked the needs in order of importance.

As a result of their work, the subcommittees identified a total of 109 socioeconomic needs which were included in a draft report. Comments by the City of Ely, the County Board of School Trustees, the County Regional Planning Commission, and the County were incorporated and the final White

Pine County Socioeconomic Needs Assessment in 1982 was presented to, and adopted by, the Power Plant Advisory Committee in October 1982. The Socioeconomic Needs Assessment was subsequently endorsed by the City of Ely and the Board of School Trustees.

The remaining work of the 13 subcommittees was to identify alternate plans related to the various needs identified in the Socioeconomic Needs Assessment. This process was initiated in October 1982. Each subcommittee was assigned the task of identifying: 1) the lead agency responsible for alleviating or providing for the need; 2) alternative methods of providing for the need; and 3) alternative financing methods.

For each need, it was determined whether or not the need was WPPP-related or whether the need was temporary (i.e., a need to be met only during the construction period) or permanent. This information, along with alternative mitigation measures and estimated costs, was compiled in the White Pine County Proposed Socioeconomic Mitigation Alternatives 1982 which was adopted by the Power Plant Advisory Committee in December 1982.

4.1.7.12 <u>Impact Alleviation Plan</u>

Work began on the development of the Impact Alleviation Plan in March 1982. This plan is defined in the WPPP Power Supply Development Agreement as the plan "for the alleviation of Social Impacts whereby (i) there shall be determined, or a means shall be established for determining, the Social Impacts and (ii) the County, from the proceeds of notes or Bonds (and only from such proceeds) shall provide timely financial or other assistance to alleviate such Social Impacts." Social Impacts are defined as the "financial demands that will be placed by the Project upon the population of, or services furnished by, the State of Nevada, the County, any other county, any city or town or any political subdivision, agency or district therof or created thereby."

Under the WPPP Power Supply Development Agreement and the Development Work Agreement, the County has the right to establish a Project Coordination Office to assist the County in carrying out its duties, responsibilities, and obligations. As part of Development Work, Development Manager and the Project Coordination Office have the authority to separately hire, if necessary, an Impact Consultant to participate in preparing the plan. However, because of the successful implementation of the community impact alleviation planning process, this was not necessary and the same consultants assisted both the Development Manager and the Project Coordination Office in developing the Impact Alleviation Plan.

Two negotiating teams were established to prepare the Proposed Impact Alleviation Plan. One team represented the Development Manager and the WPPP participants. The other team, which consisted of persons from the Project Coordination Office, the County (and its Special Legal Counsel), the City of Ely, and WPCSD represented affected parties in White Pine County.

The Proposed Impact Alleviation Plan is in the form of an agreement between WPPP and the County, the City of Ely, and WPCSD. The agreement establishes a detailed process which the two negotiating teams have used to agree on social impacts and will continue to use to negotiate and resolve the issues relating to the existence of socioeconomic needs that result in social impacts in the future. As approporiate, the agreement identifies specific needs for which a social impact has been identified. In addition, the agreement identifies: 1) socioeconomic needs for which it is known a social impact will exist but for which mitigation methods and resulting social impacts have not yet been determined; 2) socioeconomic needs for which WPPP is solely responsible and 3) socioeconomic needs for which WPPP has no responsibility for providing any financial assistance. The agreement provides a mechanism for funding and financing of these social impacts identified to date or in the future.

The agreement identifies the percent of each socioeconomic need that is the responsibility of WPPP and the preferred mitigation alternative for alleviating each need. Much of the mitigation is based on a revenue expenditure model that has been developed by the Development Manager for the affected parties.

The net financial liabilty to the County, the City of Ely, and WPCSD are shown on Figure 4-24, Figure 4-25, and Figure 4-26, respectively. (It should be noted that these projections are based on present demographic projections as well as the Nevada tax laws as they existed in December 1982.) Based on current projections of revenues and expenditures, there will be sufficient revenues to offset costs associated with the Impact Alleviation Plan. Because of the lag time in generating the revenues, WPPP may have to advance some monies. However, credits against future taxes could be provided by the affected entities. The only potential liability to WPPP would be the commitment to guarantee certain school expenditures should WPPP construction be initiated but terminated before completion. In order to maintain flexibility, the Impact Alleviation Plan includes provisions to monitor the effectiveness of the mitigative measures and to detect any unexpected community impacts.

After the Development Manager and the Project Coordination Office agreed to the Impact Alleviation Plan, it was submitted to the County, the City of Ely, the School District, and to the Management Committee for their respective approvals. These approvals occurred during August 1983. In October 1983, the Impact Alleviation Plan was sent to the WPPP Management Committee for action.

4.2 UNAVOIDABLE EFFECTS

This section addresses the unavoidable effects which will remain after mitigative measures are implemented. Only those resources with unavoidable effects are discussed.

Soil compaction during construction and modification of existing drainages could increase the potential for erosion on the site or along the corridors.

There will be a temporary deterioration of ambient air quality during construction even if dust control measures are implemented. Additional power plant emissions (still within federal standards) will result if the White Pine County Air Proposal cannot be implemented.

Construction of WPPP facilities will remove soil and vegetation from the site and corridors, thereby reducing wildlife and livetock forage and habitat. Weedy species could invade disturbed areas.

Groundwater withdrawal and human encroachment could result in impacts to nearby springs and ponds, some of which are inhabited by sensitive aquatic species. Groundwater withdrawal could reduce soil moisture in wetland areas (specifically in productive saline meadows) thereby causing a successional change to less productive vegetation.

Even after a detailed archaeological field survey is conducted prior to construction, inadvertent damage to undiscovered sites could still occur.

The introduction of the WPPP Generating Station and lineal facilities will affect the scenic values of the natural landscape by creating a visual intrusion.

The County will experience a 47 percent increase in population during peak construction and a 13 percent increase in population during operation. The additional population could impact local services not covered by the Impact Alleviation Plan. Increased human activity could impact recreational areas. Impacts on the agricultural community will result from the removal of grazing land.

WPPP may unavoidably and adversely impact the perceived quality of life of some of the residents of the County, especially during the construction period. This will be due to the influx of people, many of whom possess values, customs, and personal economic situations different from certain segments of the local population.

Although stricter enforcement may mitigate some of the anticipated increases in poaching and in trespass uses of private or public land, full mitigation is not possible, and instances of these activities will be unavoidable.

4.3 SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This section compares the lasting short-term uses associated with construction and operation of WPPP to the long-term productivity beyond the 6-year construction period and the 35-year operation period.

The unavoidable effects after mitigation associated with short-term uses are described in Section 4.2. Irreversible environmental changes, primarily the commitment of existing resources, are described in Section 4.4. The latter represent impacts that will extend beyond the life of the project. In addition, up to 25,000 afy of water appropriated to WPPP would be unavailable for other uses during the life of the project.

In exchange for short-term uses, electrical energy will be available to consumers in Nevada and California. Generation of electricity from coal will help conserve other fossil fuels. In addition to energy, employment and economic benefits will accrue to the County during the construction period and the operation period.

4.4 IRREVERSIBLE ENVIRONMENTAL CHANGES

This section discusses changes that will remain after the WPPP operation period. These changes are primarily due to commitment of existing resources.

Approximately 140 million tons of coal will be consumed over the life of the project. Water evaporated as a part of WPPP Generating Station cooling and not returned to the Steptoe Valley hydrologic basin could also be considered as consumed.

Existing soil integrity at the location of the WPPP facilities will be destroyed during construction ultimately resulting in irretrievable soil losses. In addition, it will take time for soil composition, including horizon characteristics, to return to their original state after WPPP facilities are removed.

Existing vegetation will be removed at the location of the WPPP facilities during the initial stages of construction. Complete restoration of the floral and structural composition of the plant community is not expected. Therefore, the loss of existing vegetation diversity will be irretrievable. In addition, it will take time to reestablish the orginal ecosystem after groundwater withdrawals stop.

Other irreversible changes could result from the visual impact of construction scars or any facilities that are not removed at the end of the operation period. Increased population due to WPPP and increased access to remote areas could impact future use of recreational resources. There could be inadvertent destruction of cultural resources during construction.

5.0 CONSULTATION AND COORDINATION

This chapter includes information on state, federal, and local government agencies and private interest groups who were consulted during the preparation of the Draft EIS. Responses were solicited from special interest groups regarding particular environmental issues addressed in the Draft EIS. Communication regarding issues of concern varied from written comments to formal meetings and consultation. In addition, the Development Manager conducted numerous public meetings to keep the County informed of WPPP progress. As a highly visible project, WPPP received extensive coverage by local media.

In addition to information received during the scoping process (Section 1.3), the following agencies and groups provided information, data, consultation, and comments during preparation of the Draft EIS:

- Environmental Protection Agency (Region IX) - Dames & Moore and LADWP worked closely with EPA to develop a strategy for addressing the potential air quality impacts in the Draft EIS. Strategies included implementation of computer modeling techniques to predict air emissions from WPPP. A significant result of the coordination with EPA is the White Pine County Air Proposal (Section 4.1.2.2).

- State of Nevada, Division of Environmental Protection - DEP was an integral member of the team developing strategies to offset air emissions impacts from WPPP. DEP provided consultation during formulation of the White Pine County Air Proposal.

- Interstate Commerce Commission (ICC) - Meetings were held with representatives of ICC to address issues related to coal transportation by rail.

- U.S. Fish and Wildlife Service - A Biological Assessment, as required by Threatened and Endangered Species Act regulations, was prepared in consultation with USFWS to address potential impacts to federally listed threatened and endangered species and candidate species. As a result of the consultation, USFWS provided a list of species for inclusion in the Draft EIS.

- Soil Conservation Service - In response to the need for third order soil maps of Spring Valley, SCS agreed to map the Spring Valley Site as part of its regular mapping program. SCS also provided data on ecological sites for the ecological resources and socioeconomic impact analyses.

- Nevada Employment Security Department - ESD provided labor force and employment data and projections for use in the socioeconomic impact analysis.

- Nevada Planning Coordinator's Office - PCO provided population growth projections for White Pine County for use in the socioeconomic impact analysis.

- As part of the Native American consultation process, written comments were solicited from the following groups:

  Ely Colony Council
  Western Shoshone Sacred Lands Association
  Inter-Tribal Council of Nevada

Duckwater Shoshone Tribe of the Duckwater Reservation
Confederated Tribes of the Goshute Reservation
Wells Indian Colony
Moapa Band of Paiute Indians
Odgers Ranch, South Fork Reservation

The following is a list of entities, organizations, agencies, companies, and individuals that have received the Draft EIS for review and comment:

FEDERAL AGENCIES

U.S. Fish and Wildlife Service
U.S. Forest Service
National Park Service
U.S. Weather Service
Federal Aviation Administration
Soil Conservation Service
U.S. Environmental Protection Agency
U.S. Department of Energy
Bureau of Land Management Nevada District Offices and Salt Lake City, Richfield, and Cedar City Utah District Offices
U.S. Bureau of Mines
Bureau of Indian Affairs
U.S. Geological Survey
Rural Electrification Administration
Interstate Commerce Commission
U.S. Bureau of Reclamation

STATE AGENCIES AND ENTITIES

Nevada State Clearinghouse
Nevada Department of Wildlife
Nevada Division of Historic Preservation and Archaeology
Nevada Division of State Parks
Nevada Department of Conservation and Natural Resources
Nevada Division of Community Services
Nevada Department of Transportation
Nevada Division of State Lands
Nevada State Water Engineer
County Extension Agents, Clark, Elko, Nye, White Pine, and Lincoln counties

LOCAL AGENCIES/OFFICIALS

Boards of County Commissioners - White Pine, Elko, Nye, Eureka, Lincoln, and Clark counties
Planning Commissions - White Pine and Lincoln counties
Central Nevada Development Authority
Superintendent, White Pine County Schools
President, White Pine County School Board
Mayor, City of Ely
Chairpersons - Preston/Lund, McGill, and Ruth Town Councils
City Manager, City of Henderson

LIBRARIES

White Pine County Library
Washoe County Library
Lincoln County Library
Elko County Library
Clark County Library
Eureka County Library
Nye County Library
University of Nevada libraries, Reno and Las Vegas
Nevada State Library

STATE/FEDERAL OFFICIALS

U.S. Senator Paul Laxalt
U.S. Senator Chic Hecht
Congressman Harry Reid
Congresswoman Barbara Vucanovich
Governor Richard Bryan
State Senator Richard Blakemore
State Assemblyman Virgil Getto

ADVISORY GROUPS

Bureau of Land Management - Ely District Grazing Advisory Board
Bureau of Land Management - Ely District Advisory Council
Lincoln County CRMP
White Pine Power Project Advisory Committee and Subcommittee Chairpersons

INDIAN TRIBES

Confederated Tribes of the Goshute Reservation
Duckwater Tribe
South Fork Reservation, Odgers Ranch
Ely Colony Council

OTHER GROUPS, FIRMS AND INDIVIDUALS

Amselco Minerals
Boundy and Foreman, Inc.
Kennecott Corporation
Mt. Wheeler Power Company
White Pine Chamber of Commerce
Wild Horse Organized Assistance
Resource Concepts, Inc.
The Wilderness Society
International Society for the Protection of Wild Horses and Burros
Nevada Cattlemen's Association
Nevada Mining Association
Nevada Woolgrowers Association
Sierra Club

NEWS MEDIA

Lincoln County Record
Ely Daily Times
KELY Radio
Wells Progress
Elko Daily Free Press
Elko Independent

In addition to the above, the Draft EIS (or a summary) was sent to other organizations, firms, and individuals (including grazing licensees).

6.0 PREPARATION

The Draft EIS for WPPP was prepared by Dames & Moore, Environmental Consultant, under a Memorandum of Understanding (MOU) between the County, Dames & Moore, and BLM. Dames & Moore was responsible for conducting environmental studies under BLM direction. The following individuals had direct responsibility for the preparation and development of the technical reports and the Draft EIS.

DAMES & MOORE

Project Management

- John H. Robinson, Partner. Project Director. Bachelor of Architecture, California State Polytechnic University at San Luis Obispo. Graduate studies in Urban Design, University of California, Los Angeles.

- Donna J. McClay, Project Manager. B.S., geology, University of Southern California.

Earth Resources

- Robert E. Troutman, Staff Geologist. Principal Investigator. B.A., geology, University of California, Santa Barbara.

Air Resources

- Douglas H. Brewer, Senior Engineer. Principal Investigator. B.S., chemical engineering, California State Polytechnic University.

- Alexander W. Bealer, Project Meteorologist. B.S., mathematics, University of Georgia. M.S., atmospheric sciences, University of California, Los Angeles.

Water Resources

- Richard L. Harlan, Senior Hydrogeologist. Principal Investigator. B.A., geology, University of Colorado. M.S., Ph.D., hydrology, Michigan State University.

Ecological Resources

- Loren R. Hettinger, Senior Ecologist. Principal Investigator - vegetation. B.S., botany, Fort Lewis College. M.S., plant ecology, New Mexico State University. Ph.D., plant ecology, University of Alberta.

- Peter Davis, Staff Wildlife Ecologist. Principal Investigator - terrestrial wildlife. B.S., M.S., biological sciences, Michigan Technological University. Ph.D., zoology, University of Wyoming.

- Robert L. Quinlan, Staff Biologist. Principal Investigator - aquatic ecology. A.S., biology, Casper College. B.S., zoology and fisheries management, University of Wyoming. M.S., zoology and aquatic biology, University of Wyoming.

- Quentin P. Bliss, Staff Biologist. B.S., fisheries, University of Nebraska. M.S., fisheries, Utah State University.

- Thomas K. Eaman, Range Scientist. Principal Investigator - soils. B.S., range management, Colorado State University. M.S., range management, Texas A&M University.

- Debrah Sherman, Range/Reclamation Scientist. B.S., zoology, Colorado State University. M.S., range ecology, Colorado State University.

Visual Resources

- Daniel D. Moreno, Project Planner. Principal Investigator. B.A., geography, California State University, Northridge. M.A., geography, University of California, Los Angeles.

- George M. Kurilko, Associate. Principal Investigator. S.B., architecture, University of Cincinnati. M.C.P., city planning, Massachusetts Institute of Technology. Ph.D., city and regional planning, Massachusetts Institute of Technology. Fulbright Fellow.

- Patricia L. Nelson, Staff Planner. B.S., conservation of natural resources, University of California, Berkeley. Certificate in urban and regional planning, University of California, Berkeley.

INTERMOUNTAIN RESEARCH

Cultural and Paleontological Resources

- Robert G. Elston, Director of Research. Principal Investigator - cultural resources. B.A., anthropology, San Francisco State University. M.A., anthropology, Washington State University. Ph.D., anthropology, Washington State University.

- Charles D. Zeier, Staff Archaeologist. B.A., sociology/anthropology, Montana State University. M.A., anthropology, University of Nebraska.

- James R. Firby, Research Associate. Principal Investigator - paleontology. B.A., geology, San Francisco State College. M.A., paleontology, University of California, Berkeley. Ph.D., paleontology, University of California, Berkeley.

BUREAU OF LAND MANAGEMENT REVIEW TEAM

- Edward E. Tilzey, Environmental Coordinator. Responsible for overall coordination at state office.

- George C. Cropper, Chief, Division of Resources. Responsible for overall coordination at Ely District Office.

- Mark Barber - Wildlife/Threatened and Endangered Animals.

- Bert Bresch - Socioeconomics.

- Hal Bybee - Wild horses.

- C. Wayne Howle - Wilderness.

- Dick Jewell - Water Resources.

- Duane Ketterling - Water Resources.
- Steve Kiracofe - Soils.
- Kathy Lindsey - Vegetation/Range/Threatened and Endangered Plants.
- Dave Loomis - Socioeconomics.
- Shela McFarlin - Cultural Resources/Native American Concerns/Paleontology.
- Shaaron Netherton - Recreation/Visual Resources.
- Peter Porfido - Water Resources.
- Jake Rajala - Recreation/Visual Resources/Overall review.
- Harry Rhea - Woodland Resources.
- Bill Robison - Earth Resources.
- Ron Sjogren - Lands.

SOIL CONSERVATION SERVICE

- Craig Plummer - Vegetation/Habitat Types.

LOS ANGELES DEPARTMENT OF WATER AND POWER

Technical information on need for the project, description of the project, and alternatives to the project were provided by LADWP, the Development Manager for WPPP.

Ronald P. Merlo, WPPP Environmental Engineer, provided coordination between Dames & Moore and BLM in areas not covered by the MOU.

7.0 BIBLIOGRAPHY

PRELIMINARY STUDIES

Ecological Analysts, Inc. Constraints to Power Plant Siting in White Pine County, Nevada. December 1978.

North American Weather Consultants. An Electric Generating Plant Siting Analysis for White Pine County, Nevada. May 1979.

University of Nevada, Reno, Bureau of Business and Economic Research. Socioeconomic Analysis of the White Pine Power Project. July 1979.

SITE SELECTION STUDIES

Dames & Moore. Candidate Site Ranking Analysis. May 29, 1981.

Los Angeles Department of Water and Power and Dames & Moore. Site Recommendation Report. May 1, 1981.

Los Angeles Department of Water and Power and Dames & Moore. Site Selection Report. September 25, 1981.

WATER SUPPLY STUDIES

Leeds, Hill and Jewett, Inc. Groundwater Investigation Phase 1. April 1981.

Leeds, Hill and Jewett, Inc. Groundwater Investigation Phase 2. August 1981.

Leeds, Hill and Jewett, Inc. Groundwater Investigation Phase 3. May 1983.

AIR QUALITY STUDIES

Dames & Moore. Prevention of Significant Deterioration Air Monitoring Plan. October 12, 1981.

Dames & Moore. Air Quality and Meteorology Data Report for the Prevention of Significant Deterioration Permit Application January, February, March, 1982. May 1982.

Dames & Moore. Air Quality and Meteorology Data Report for the Prevention of Significant Deterioration Permit Application April, May, June, 1982. September 1982.

Dames & Moore. Air Quality and Meteorology Data Report for the Prevention of Significant Deterioration Permit Application October, 1983 - January, 1983. March 1983.

Dames & Moore. Prevention of Significant Deterioration Permit Application. June 27, 1983.

COAL SUPPLY AND TRANSPORTATION STUDIES

Black & Veatch Consulting Engineers. Coal Source and Transportation Study (four volumes). September 1981.

Black & Veatch Consulting Engineers. Coal Source and Transportation Study (Executive Summary). September 1981.

TRANSMISSION STUDIES

Teshmont Consultants, Inc. Consultant System Configuration Load Flow and Stability. December 14, 1981.

ENVIRONMENTAL STUDIES

Dames & Moore. Final Technical Work Plan Environmental Impact Statement Phase. April 30, 1982.

Dames & Moore. Biological Assessment. October 1983.

Intermountain Research. The White Pine Power Project: Cultural Resource Considerations (two volumes). September 1981.

Intermountain Research. The White Pine Power Project: Paleontological Considerations. February 1983.

PRELIMINARY ENGINEERING STUDIES

Stearns-Roger Engineering Corporation. Unit Size Study. April 24, 1981.

Stearns-Roger Engineering Corporation. Unit Size Study (Supplement). August 17, 1981.

Stearns-Roger Engineering Corporation. Smelter Pollution Control Cost Study. May 25, 1982.

Black & Veatch Consulting Engineers. Sulfur Dioxide Removal Cost Study. May 1982.

Ertec Western, Inc. Preliminary Geotechnical Studies. October 1, 1982.

Black & Veatch Consulting Engineers. Power Plant Replication. November 1982.

Los Angeles Department of Water and Power. Feasibility Report for the White Pine Power Project (six volumes). To be published.

COMMUNITY PLANNING STUDIES

Dames & Moore. White Pine County Socioeconomic Baseline 1982. June 1982.

Dames & Moore and Valeu & Associates. White Pine Power Project Construction and Operation Work Force Profiles, Population Impact Estimates, and Proposed Housing Strategy. 1982.

Los Angeles Department of Water and Power, Dames & Moore, and Valeu & Associates. White Pine County Socioeconomic Needs Assessment 1982. October 1982.

Los Angeles Department of Water and Power, Dames & Moore, and Valeu & Associates. White Pine County Proposed Socioeconomic Mitigation Alternatives 1982. December 1982.

Dames & Moore and Valeu & Associates. Delphi Workshop Results White Pine County Socioeconomic Needs 1982. January 1983.

BASELINE REPORTS

Dames & Moore. Air Resources Baseline. October 1983.

Dames & Moore. Water Resources Baseline. October 1983.

Dames & Moore. Ecological Resources Baseline. October 1983.

Dames & Moore. Cultural Resources Baseline. October 1983.

Dames & Moore. Visual Resources Baseline. October 1983.

Dames & Moore. Socioeconomics Baseline. October 1983.

OTHER REFERENCES

HDR. Environmental Characteristics of Alternative Designated Deployment Areas: Water Resources. Report prepared for U.S. Air Force, Ballistic Missile Office, Norton Air Force Base, California. M-X-ETR-12. 1980.

HDR. Environmental Characteristics of Alternative Designated Deployment Areas: Geology and Mining. Report prepared for U.S. Air Force, Ballistic Missile Office, Norton Air Force Base, California. M-X-ETR-11. 1980.

Hose, R. K. et al. Geology and Mineral Resources of White Pine County, Nevada. Nevada Bureau of Mines and Geology Bulletin 85. 1976.

Ryall, A. Earthquake Hazard in the Nevada Region. Bulletin of the Seismological Society of America. Vol. 67, No. 2. April 1977.

Stewart, J. H. Geology of Nevada. Nevada Bureau of Mines and Geology Special Paper No. 4. 1980.

Stewart, J. H. Basin and Range Structure in Western North America - a review. In Smith, R. B. and Eaton, G. P., eds. Cenozoic tectonics and regional geophysics of the western cordillera: Geological Society of America Bulletin, Vol. 79, No. 10. 1978.

U.S. Department of the Interior, Fish and Wildlife Service. Pahrump Killifish Recovery Plan. 1980.

8.0 ABBREVIATIONS AND GLOSSARY

ac - alternating current

ACHP - Advisory Council on Historic Preservation

ACSR - Aluminum cable, steel-reinforced

ADT - Average daily traffic

afy - acre-feet per year

AUM - animal unit month

BACT - Best Available Control Technology

Be - beryllium

BIA - Bureau of Indian Affairs

BLM - Bureau of Land Management

Btu - British thermal unit

cfs - cubic feet per second

CO - carbon monoxide

County - White Pine County

CWH - construction worker housing

DARS - Doppler acoustic radar system

dc - direct current

DEP - State of Nevada, Department of Environmental Protection

DEISM - Demographic/Economic Impact Simulation Model

DOE - Department of Energy

EIS - Environmental Impact Statement

EPA - Environmental Protection Agency

ESD - State of Nevada, Employment Security Department

°F	-	degrees Fahrenheit
FAA	-	Federal Aviation Administration
FGD	-	flue gas desulfurization
gpd/ft	-	gallons per day per foot
gpm	-	gallons per minute
HAGS	-	Harry Allen Generating Station
Hg	-	mercury
ICC	-	Interstate Commerce Commission
IPP	-	Intermountain Power Project
Kennecott	-	Kennecott Corporation
kv	-	kilovolt
LADWP	-	Los Angeles Department of Water and Power
lb/hr	-	pounds per hour
LAER	-	Lowest Achievable Emission Rate
Magnitude	-	Richter magnitude
McGill smelter	-	Kennecott copper smelter in McGill, Nevada
MCR	-	maximum continuous rating
MOA	-	Memorandum of Agreement
MOU	-	Memorandum of Understanding
mph	-	miles per hour
MPR	-	multi-point rollback
MW	-	megawatts
NAAQS	-	National Ambient Air Quality Standards
NDCNR	-	Nevada Department of Conservation and Natural Resources
NDOW	-	Nevada Department of Wildlife

NNRY	-	Nevada Northern Railway
NO_x	-	oxides of nitrogen
NO_2	-	nitrogen dioxide
NPC	-	Nevada Power Company
NRHP	-	National Register of Historic Places
NSPS	-	New Source Performance Standards
Pb	-	lead
PCO	-	State of Nevada, Planning Cooridinator's Office
PSD	-	Prevention of Significant Deterioration
SCS	-	Soil Conservation Service
SHPO	-	State Historic Preservation Office
SO_2	-	sulfur dioxide
SP	-	Southern Pacific Railroad
SPPC	-	Sierra Pacific Power Company
SRC	-	solvent refined coal
TSP	-	total suspended particulates
UP	-	Union Pacific Railroad
USFS	-	U.S. Forest Service
USFWS	-	U.S. Fish and Wildlife Service
USGS	-	U.S. Geological Survey
VRM	-	visual resource management
WP	-	Western Pacific Railroad
WPCSD	-	White Pine County School District
WPPP	-	White Pine Power Project
WSA	-	Wilderness Study Area

Active fault	-	A fault that can be shown to have experienced movement within the Holocene, or can be demonstrated to have undergone recurrent movement within the late Pleistocene.
Aeolian	-	Refers to processes associated with, or sediments deposited by, the wind.
Alkalinity	-	The relative concentrations of alkaline substances in water or soils sufficient to raise the pH value above 7.0 (alkaline).
Alluvial valley floor	-	The base of an alluvial valley, usually occupied by stream channels and wetlands.
Alluvium	-	A general term for deposits laid down by fluvial processes in relatively recent geologic time.
Archaic Period	-	The second, and longest, of four periods into which the prehistoric and archaeological record of the County is divided.
Artesian	-	Synonymous with confined. An artestian well derives its water from an artesian or confined water body.
Attainment Area	-	The area in which the National Ambient Air Quality Standards are being met.
Bad order track	-	Railroad track upon which rail cars are stored until fixed.
Base load	-	The minimum amount of electrical power delivered at a given point in a stated period of time.
Basins	-	Generally, the valley between mountain ranges or areas receiving drainage from surrounding areas.

Benches	- Level topographic feature characteristic of valley slopes; usually a remnant of prehistoric water bodies or wind blown deposits.
Biological diversity	- Numerous diverse living organisms together compiling a complex in which each organismal type has a role or occupies a niche, thereby sustaining balance throughout the biological community.
Biome	- A major ecological community type, such as shrubland or grassland.
Blimo	- A soil with the classification coarse-loamy, mixed mesa, Xerollic Camborthids.
Boofus	- A soil with the classification clayey over loamy, montmorillonitic, (calcareous) mesic, Typic Halaquepts.
Brachiopods	- A phylum of marine, shelled animals with two unequal shells or valves.
Calcareous soils	- Soils containing sufficient free calcium carbonate or magnesium carbonate to effervesce carbon dioxide visibly when treated with cold 0.1 normal hydrochloric acid.
Cambrian Period	- The oldest of the periods of the Paleozoic Era.
Candidate species	- A species being considered for listing as threatened or endangered but, because of insufficient information about its occurrence or taxonomy, has not been declared as threatened or endangered.
Capacity Factor	- The ratio of the average load on the generating unit to the capacity rating of the generating unit for the period of time considered.
Carboniferous	- The period of the Paleozoic Era between the Devonian and the Permian.

Cenozoic Era	-	The latest of the four eras into which geologic time is divided.
Colluvium	-	Rock detritus and soil accumulated at the foot of a slope.
Cordillera	-	A group of mountain ranges that trend along one general direction.
Cretaceous	-	Last period of the Mesozoic era.
Crinoids	-	A type of echinoderm which attaches itself to the sea bottom.
Debris flow	-	A mass movement involving rapid flowage of coarse grained material.
Dendritic drainage	-	An arrangement of drainage or streams that, on a map or viewed from the air, resembles the branching habit of certain trees, such as oaks or maples.
Dera	-	A soil with the classification loamy-skeletal, carbonatic, mesic, Aquic Calciorthids.
Devonian Period	-	A geologic period within the Paleozoic Era. Sometimes called the age of fishes.
Distal	-	The outer portions of an alluvial fan or other sedimentary unit positioned farthest away from the source area.
Diurnal	-	Occurring during the daytime.
Dominant species	-	Species which, due to their size and/or abundance, have the most influence on a plant community or habitat.
Duffer, Flooded	-	A soil with the classification fine-silty, carbonatic, mesic, Aquic Calciorthids.
Dynamic settlement	-	Ground settlement in response to the dynamic process of seismic shaking.

Ecological sites - An area capable of supporting a characteristic native plant community typified by an association of species different in kind or proportion, or in total production, from other ecological sites.

Ecosystem - The complex of a community and its environment functioning as an ecological unit in nature.

Eocene - Earliest period of the Tertiary division of the Cenozoic era.

Equis - A soil with the classification fine, carbonatic, mesic, Typic Halaquepts.

Ethnographic - Description of native lifestyles at time of first contact.

Evapotranspiration - Loss of water from soil by both evaporation and by transpiration of vegetation.

Fault scarp - A steep slope or cliff formed by movement along a fault. Most fault scarps have been modified by erosion since the initial faulting.

Fauna - The animals or animal life of any stated latitude, region, or age.

Float - A rock or fossil that has been separated from the parent material and transported some distance away.

Flood plain - Nearly level land situated on either side of a channel which is subject to overflow flooding.

Flora - The plants of any particular country, region, or period.

Fluvial - Pertains to processes associated with, or sediments deposited by, rivers.

Fontreen - A soil with the classification loamy-skeletal, carbonatic, frigid, Aridic Calcixerolls.

Fremont Period - The third of four periods into which the prehistoric archaeological record of the County is divided.

Fugitive sources - Those emissions which could not reasonably pass through a stack, chimney, vent or other functional equivalent opening.

Gateway - Location where the proposed WPPP coal transportation railroad would connect to existing railroads.

Gravity model - Mathematical model which depicts a spatial distribution of the population attracted to an area by a project based upon various physical factors.

Great Basin Physiographic Province - Part of the Rocky Mountain - Sierra Nevada intermountain area which lies west of the Colorado Plateau and extends to the Sierra Nevada Mountains.

Groundstone - A stone tool used by prehistoric man, shaped by grinding and abrasion rather than by chipping off pieces.

Guilmette Formation - A local geologic unit that dates to the Devonian Period of the Paleozoic Era. The unit contains numerous fossils.

Hardpan - A hard impervious layer of clay cemented by relatively insoluble materials.

Holocene - Pertaining to the Recent epoch and the development of man from the neolithic stage onward.

Hummock - A small mount or knoll.

Hydrocompaction - A non-seismic phenomenon whereby saturated earth materials collapse causing local subsidence.

Hyzen - A soil with the classification loamy-skeletal, carbonatic, frigid, Lithic Haploxerolls.

Igneous - One of the three basic rock types characterized by an aggregate of interlocking silicate minerals formed by the cooling and solidification of magma.

Joana Formation - A local geologic unit that is fossiliferous. Dates to the Mississippian Period of the Paleozoic Era.

Jurassic - The period of the Mesozoic era between the Triassic and Cretaceous.

Kidding areas - Areas traditionally used by pronghorn to give birth to young.

Lacustrine - Pertaining to, or produced by, a lake or lakes.

Lek - An assembly area where sage grouse carry on display and courtship behavior.

Linear transformation - Extrapolation of data based on a sample population.

Liquefaction - The sudden transformation of loosely consolidated sediments into a fluid mass, generally triggered by seismically-induced strong ground motion.

Load cycling - Changing turbine generator electrical energy output to match electrical load demand.

Lusetti - A soil with the classification coarse-loamy, mixed, mesic, Typic Camborthids.

Major stationary source	-	A stationary source of air pollutants which emits, or has the potential to emit, 100 tons per year or more of any pollutant subject to the Clean Air Act. Includes fossil fuel-fired steam-electric plants of more than 250 million Btu per hour.
Mesozoic Period	-	The third of four eras into which geologic time is divided.
Metamorphic	-	One of the three basic rock types characterized by a change in the constitution of any rock produced by heat, pressure and/or chemically active fluids after its original formation.
Metates	-	Stones with a concave upper surface used as the nether millstone for grinding grains.
Migeosyncline	-	A long, narrow downwarping in which the strata dip inward from both sides toward the axis and volcanic rocks are rare or absent.
mil	-	One thousandth of an inch.
mill	-	One tenth of a cent.
Miocene Epoch	-	The fourth of the five epochs into which the Tertiary geologic period is divided.
Mississippian Period	-	The fifth of seven periods into which the Paleozoic Era is divided.
Mud flow	-	Similar to a debris flow, except that at least 50 percent of the material is sand sized or finer.
Nonattainment area	-	Area in which National Ambient Air Quality Standards are not being met.

Non-preferred use	-	A term which is used to identify uses of water resources which are of lower priority.
Noxious weeds	-	Plant species that have the potential to cause economic loss via toxicity or mechanical injury to livestock or reduction in agricultural productivity.
Numic Period	-	An alternate name used to designate the post-Fremont prehistoric period.
Oupico	-	A soil with the classification coarse-loamy, mixed, mesic, Xerollic Durorthids.
Opacity	-	The state or quality of being opaque.
Paleozoic	-	Pertaining to an era of geological history from the proterozoic to the Mesozoic.
Paludal	-	Pertaining to a marsh.
Palustrine	-	Relating to marshes or fens.
Pediment	-	An erosional surface that lies at the foot of a receded slope.
Pennsylvanian Period	-	The site of seven periods into which the Paleozoic Era is divided.
Perennial stream	-	A stream which flows continually.
Permian Period	-	The last of the seven periods into which the Paleozoic Era is divided.
Piedmont	-	Formed at the base of mountains.
Plant community	-	A grouping of plant species that reoccur due to composition and structural similarities discreet from surrounding vegetation.
Plant production	-	The amount of plant material produced during one year of growth.

Playa	-	The flat, generally vegetation-free surface of a former lake. May contain water for a short period of time after precipitation.
Pliestocene	-	The earliest of the two epochs into which the Quaternary Period is divided.
Pliocene	-	Pertaining to the latest period of the Tertiary division of the Cenozoic era.
Pluvial	-	Due to action of rain. A period of increased rainfall and decreased evaporation.
Pogonip Group	-	A local geologic unit that contains numerous marine invertebrate fossils. Dates to the Ordovician Period of the Paleozoic Era. livestock or reduction in agricultural productivity.
Post-Fremont Period	-	The latest of four periods into which the prehistoric archaeological record of the County is divided.
Potentially active fault	-	A fault which has moved within the late Pleistocene but cannot be demonstrated to be still active.
Power Sales Contracts	-	Agreements between the WPPP owners and the WPPP participants that provide for the purchase of electrical energy.
Pre-Archaic Period	-	The first of four periods into which the prehistoric archaeological record of the County is divided.
Precambrian Period	-	The earliest unit of geologic history. Includes all rocks formed before the onset of the Cambrian Period.

Quaternary Period	- The youngest of the two geologic periods into which the Cenozoic Era is divided.
Radius of Influence	- The distance from the center of the well field to the limit of the cone of depression or drawdown cone due to groundwater withdrawal.
Raph	- A soil with the classification fine-loamy, mixed, mesic, Typic Camborthids.
Raptor	- A bird of prey.
Reclamation potential	- A measure of the ease or difficulty of stabilizing the soil and revegetating a site.
Recurrence interval	- Average time between earthquake of a certain magnitude on a particular fault.
Riepe	- A soil with the classification fine, montmorillonitic, mesic, Haplic Nadurargids.
Rill wash	- One of the first and smallest channels formed by runoff.
Salinity	- The relative concentration of salts, usually sodium chloride, commonly expressed as parts per million.
Sanpete	- A soil with the classification loamy-skeletal, carbonatic, mesic, Xerollic Calciorthids.
Sedimentary	- One of three basic rock types formed from accumulations of sediment which may consist of rock fragments of various sizes, the remains or products of animals or plants, products of chemical action or of evaporation or mixtures of these.

Sensitive species	-	Species that may be removed from their habitat. Includes rare, threatened or endangered species, and those prone to be intolerant of disturbance.
Sheet wash	-	Laminar flow of water runoff generally on unobstructed uniform slopes.
Silurian	-	Pertaining to that period of the Paleozoic era between the Ordovician and Devonian.
Shorebirds	-	A variety of wading birds frequenting marshes, wet meadows, streamsides and shores of ponds and lakes.
Soil mapping units	-	A delineated area on a map that contains a single soil type and phase or an association of soil types and phases.
Soil permeability	-	The quality of a soil horizon that enables water or air to move through it.
Soil series	-	The basic unit of soil classification where soils are separated on the basis of similar profile characteristics and assigned a nationally approved name.
Spring Range	-	Areas used for cover and forage by migratory species from March through May.
Stimca	-	A soil with the classification fine-loamy, mixed, mesic, Typic Calciorthids.
Storage coefficient	-	The volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in heads.
Subaerial	-	Formed, existing, or taking place on land.

Summer range - A relatively higher elevational area utilized during summer by a seasonally migratory species usually providing seclusion for birthing and escape from summer temperatures.

Tectonic - Of, pertaining to, or resulting from deformation of the earth's crust.

Terrace - Component of river valleys and formed during times of high flow, parallel to the active channel.

Terrestrial - Relating to land as distinct from air or water.

Tertiary - Pertaining to the earlier principal division of the Cenozoic era.

Threatened or endangered species - Any species which is likely to become or is in danger of extinction throughout all or a significant portion of its range.

Transmissivity - The rate at which water is transmitted through a unit width of the aquifer under a unit hydraulic gradient.

Triassic - Earliest period of Mesozoic era.

Trilobites - Extinct marine arthropods that lived during the Paleozoic era.

Unclassified - Associated with Clean Air Act, refers to the situation where insufficient information or data exists to determine if an area is attainment or nonattainment with respet to the National Ambient Air Quality Standards.

Ursine - A soil with the classification loamy-skeletal, carbonatic, mesic, shallow, Xerolic Durorthids.

Uwell - A soil with the classification fine-loamy, mixed, mesic, Xerollic Camborthids.

Viewshed - The area that can be seen from a given point.

Virgin Branch Anasazi Period - A prehistoric archaeological period whose distribution extends into the southern portion of Nevada.

Water table - The upper surface of a saturated zone, where the body of ground water is not confined by an overlying body of groundwater.

Wetlands - Lands where saturation by water is the dominant factor determining the nature of soil development and the types of plant and animals living in the soil and on its surface; includes marshes, swamps, and bogs.

Winter range - A relatively lower elevational area utilized during winter by a seasonally migratory species and usually providing refuge from adverse winter elements and greater access to food.

Zero liquid discharge - A term associated with the Clean Water Act referring to the management of liquid wastes using methods which preclude the point discharge of the liquid wastes from the project boundaries.

TABLES

Table 1-1

White Pine Power Project
Participation and Entitlement Share

Participant	Entitlement Share	
	Percentage	Megawatts[a]
Nevada Entities		
Boulder City	2.500	37.50
Lincoln County Power District No. 1	2.530	37.95
Mt. Wheeler Power, Inc.	3.000	45.00
Nevada Power Company	25.000	375.00
Overton Power District No. 5	2.530	37.95
Sierra Pacific Power Company	10.000	150.00
Valley Electric Association	2.440	36.60
Wells Rural Electric Company	1.000	15.00
California Municipalities		
Anaheim	3.621	54.32
Burbank	1.938	29.07
Glendale	1.836	27.54
Los Angeles	39.117	586.75
Pasadena	1.836	27.54
Riverside	2.652	39.78

[a] Based on nominal 1500 megawatt output excluding transmission system losses.

Table 1-2

Nevada Participants Annual Load Growth
Actual and Projected Peak Demand Requirements
(Megawatts)

Year	NPC	SPPC	Boulder	Lincoln	Wheeler	Overton	Valley	Wells	Total
1970	640	288	11.0	7	NA	7.0	7.5	4.0	964.5
1971	718	309	14.1	7	NA	10.5	6.8	4.2	1069.6
1972	828	349	12.5	6	NA	8.4	9.5	4.3	1217.7
1973	898	371	13.1	7	27.7	9.0	10.0	5.6	1341.4
1974	945	389	15.0	10	31.5	9.0	10.7	5.8	1416.0
1975	1007	418	14.6	12	24.0	10.2	12.2	6.4	1505.4
1976	1060	453	15.8	11	36.3	12.3	13.2	6.7	1608.3
1977	1147	494	17.1	15	42.2	11.2	15.4	7.5	1749.4
1978	1254	531	20.6	15	32.9	13.2	17.4	7.4	1891.5
1979	1315	562	22.7	16	26.5	14.0	20.4	9.3	1985.9
1980	1403	590	25.3	14	30.1	13.7	24.1	9.6	2109.8
1981	1423	625	27.2	16	34.9	15.0	26.8	11.1	2179.0
1982	1420	628	27.7	16	30.5	16.4	22.3	12.9	2173.8
1983	1493	670	28.9	16	33.1	16.8	23.8	16.5	2298.1
1984	1536	684	28.0	16	39.9	17.4	25.0	20.2	2366.5
1985	1579	714	28.9	17	48.0	17.7	26.2	23.8	2454.6
1986	1622	740	29.7	17	57.9	18.5	27.6	27.4	2540.1
1987	1665	762	30.6	17	69.8	19.0	28.9	31.0	2623.3
1988	1708	789	31.4	18	84.1	19.8	30.4	34.0	2714.7
1989	1751	824	32.2	18	101.4	20.7	31.9	37.0	2816.2
1990	1794	857	33.1	19	122.1	21.3	33.5	40.0	2920.0
1991	1837	890	33.9	20	147.2	22.2	35.2	43.0	3028.5
1992	1880	922	34.8	20	149.4	23.1	37.0	46.0	3112.3
1993	1923	954	35.6	21	151.7	24.0	38.8	49.0	3197.1
1994	1966	986	36.5	21	153.9	25.0	40.7	52.0	3282.1
1995	2009	1018	37.3	22	156.3	26.0	42.8	55.0	3366.4
1996	2052	1053	38.2	23	158.6	27.0	44.9	58.0	3454.7
1997	2095	1087	39.1	23	161.0	27.9	47.2	61.0	3541.2
1998	2138	1122	39.9	24	163.4	28.9	49.5	64.0	3629.7
1999	2181	1156	40.7	24	165.9	30.0	52.0	67.0	3716.6
2000	2224	1190	41.6	24	168.3	31.0	54.6	70.0	3803.5

Note: Actual data through 1982.
One megawatt equals one thousand kilowatts.

Table 1-3

California Participants Annual Load Growth
Actual and Projected Peak Demand Requirements
(Megawatts)

Year	LADWP	Anaheim	Burbank	Glendale	Pasadena	Riverside	Total
1970	3107	168	169	142	157	184	3927
1971	3439	173	183	168	177	219	4359
1972	3630	206	192	168	177	232	4605
1973	3679	236	187	175	174	229	4680
1974	3500	286	174	165	167	233	4525
1975	3594	305	168	168	169	229	4633
1976	3809	330	184	185	181	249	4938
1977	3778	328	180	178	175	253	4892
1978	4144	348	197	195	193	278	5355
1979	4090	396	197	190	197	297	5367
1980	4070	396	203	189		313	5368
1981	4364	424	220	211	212	319	5750
1982	4456	431	210	207	208	299	5811
1983	4358	473	222	217	215	328	5765
1984	4433	496	228	224	221	337	5898
1985	4507	515	235	231	228	346	6016
1986	4561	532	241	237	235	356	6118
1987	4656	547	247	245	242	366	6263
1988	4729	562	253	252	249	376	6385
1989	4811	576	259	260	257	386	6513
1990	4878	590	266	267	264	396	6625
1991	4965	603	273	275	272	408	6760
1992	5055	615	279	284	280	419	6896
1993	5132	627	286	292	289	430	7020
1994	5220	639	293	301	298	442	7157
1995	5302	652	301	310	307	454	7289
1996	5384	663	308	319	316	468	7421
1997	5449	674	316	329	325	482	7538
1998	5547	686	324	339	335	496	7689
1999	5629	697	332	349	345	511	7825
2000	5715	708	340	359	356	526	7966

Note: Actual data through 1982.
One megawatt equals one thousand kilowatts.

Table 1-4

Nevada Participants Annual Load Growth
Actual and Projected Energy Requirements
(Gigawatt-Hours)

Year	NPC	SPPC	Boulder	Lincoln	Wheeler	Overton	Valley	Wells	Total
1970	3235	1928	46.5	34	NA	32	39	20	5335
1971	3602	2123	52.0	30	NA	36	37	22	5902
1972	3925	2315	53.5	31	NA	37	39	24	6425
1973	4275	2516	60.5	33	118	43	40	28	7114
1974	4394	2591	60.8	58	182	47	46	30	7409
1975	4560	2800	63.5	66	178	47	53	32	7800
1976	4602	2900	68.0	54	159	47	55	35	7920
1977	4719	3130	70.0	71	212	51	63	37	8353
1978	5198	3217	71.5	81	148	51	69	37	8873
1979	5793	3509	85.5	80	124	59	86	43	9780
1980	5657	3618	85.2	81	140	60	104	49	9814
1981	6238	3839	88.5	85	166	67	127	58	10,669
1982	6209	4093	97.1	78	144	73	109	65	10,868
1983	6539	4123	99.4	77	158	74	124	69	11,263
1984	6728	4180	103.0	79	191	76	130	73	11,560
1985	6916	4351	106.2	80	230	77	137	77	11,974
1986	7104	4479	109.3	82	277	81	144	81	12,357
1987	7293	4587	112.4	84	334	83	151	85	12,729
1988	7481	4736	115.4	86	402	87	159	95	13,161
1989	7669	4905	118.4	90	485	91	166	105	13,629
1990	7858	5078	121.6	94	584	94	175	114	14,119
1991	8046	5247	124.8	97	704	97	184	124	14,624
1992	8234	5416	128.1	101	715	101	193	134	15,022
1993	8423	5579	131.1	103	725	105	203	144	15,413
1994	8611	5742	134.2	105	736	110	212	154	15,804
1995	8799	5905	137.3	107	747	114	223	164	16,196
1996	8988	6098	140.5	109	750	118	234	174	16,612
1997	9176	6283	143.8	111	770	122	246	184	17,036
1998	9264	6473	146.8	113	781	127	258	194	17,457
1999	9553	6662	149.9	116	793	131	271	204	17,880
2000	9741	6852	153.1	118	805	136	285	213	18,303

Note: Actual data through 1982.
One gigawatt-hour equals one million kilowatt-hours.

Table 1-5

California Participants Annual Load Growth
Actual and Projected Energy Requirements
(Gigawatt-Hours)

Year	LADWP	Anaheim	Burbank	Glendale	Pasadena	Riverside	Total
1970	17,049	978	850	656	750	815	21,098
1971	17,803	1009	843	685	782	896	22,018
1972	18,800	1119	857	700	790	936	23,202
1973	18,879	1210	864	729	794	961	23,437
1974	16,818	1429	745	675	730	918	21,315
1975	17,652	1512	733	693	761	906	22,257
1976	18,800	1582	747	732	793	946	23,600
1977	18,497	1647	753	746	796	959	23,398
1978	19,462	1714	820	778	833	1047	24,654
1979	19,535	1822	855	786	855	1095	24,948
1980	19,505	1828	875	774	844	1078	24,904
1981	20,695	1834	892	807	887	1125	26,240
1982	20,853	1842	855	788	877	1059	26,274
1983	20,627	1837	876	813	899	1149	26,201
1984	20,961	1884	898	835	931	1196	26,705
1985	21,167	1941	921	857	955	1226	27,067
1986	21,383	1998	944	880	978	1256	27,439
1987	21,814	2062	967	904	1003	1288	28,038
1988	22,191	2132	992	929	1028	1319	28,591
1989	22,504	2192	1016	954	1054	1352	29.072
1990	22,772	2247	1042	980	1080	1386	29,507
1991	23,157	2299	1068	1006	1107	1422	30,059
1992	23,629	2349	1094	1033	1135	1457	30,697
1993	23,887	2398	1122	1061	1163	1493	31,124
1994	24,279	2447	1150	1090	1192	1529	31,687
1995	24,623	2496	1179	1119	1222	1568	32,207
1996	25,074	2544	1208	1149	1252	1615	33,842
1997	25,364	2591	1238	1180	1284	1663	33,320
1998	25,785	2636	1269	1245	1316	1764	33,982
1999	26,171	2684	1301	1245	1349	1764	34,514
2000	26,662	2733	1334	1279	1383	1818	35,209

Note: Actual data through 1982.
One gigawatt-hour equals one million kilowatt-hours.

Table 1-6

WPPP Participants Reserve Margins With WPPP
(Megawatts)

	Nevada Entities			California Municipalities		
Year	Total Capability	Total Peak Demand	Reserve Margin	Total Capability	Total Peak Demand	Reserve Margin
1983	2899	2298	601	8020	5765	2225
1984	2918	2367	551	7709	5898	1811
1985	3039	2455	584	7745	6016	1729
1986	3103	2540	563	7530	6118	1412
1987	3158	2623	535	8002	6263	1739
1988	3162	2715	447	8364	6385	1979
1989	3337	2816	521	8386	6513	1873
1990	3457	2920	537	8637	6625	2012
1991	3575	3029	546	9032	6760	2272
1992	3693	3112	581	9005	6896	2109
1993	3740	3197	543	9021	7020	2001
1994	3868	3282	586	8932	7157	1775
1995	3917	3366	551	9011	7289	1722
1996	4047	3455	592	9086	7421	1665
1997	4101	3541	563	9126	7538	1588
1998	4173	3630	543	9207	7689	1518
1999	4281	3717	564	9112	7825	1287
2000	4391	3804	587	9162	7966	1196

Table 2-1

White Pine Power Project
Construction and Operation Personnel

Year	1985				1986				1987				1988				1989				1990					
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	Total Labor-Hours	% of Total
Boilermakers						26	120	180	260	300	330	350	350	370	370	350	340	330	325	300	230	135	20		2,038,410	16.1
Brick & Cement Masons		1	1	6	7	9	10	12	12	12	12	12	12	12	10	10	10	10	10	10	5				79,605	0.1
Carpenters		5	35	70	110	130	130	130	150	150	150	150	145	135	135	135	125	125	110	100	70	15	5	5	1,007,025	7.9
Electricians		2	5	35	80	110	150	195	270	330	375	420	440	460	480	480	470	460	450	420	360	190	60	15	2,721,795	21.5
Iron Workers	2	10	25	50	60	85	85	85	90	105	125	130	125	120	115	115	115	110	95	85	60	25	10		794,745	6.2
Laborers	14	55	90	115	130	155	175	175	180	185	195	190	185	175	175	175	160	155	150	145	120	80	40	10	1,404,615	11.1
Millrights								10	23	43	63	73	83	93	100	100	120	120	110	85	70	45	15	5	503,730	4.0
Operating Engineers	25	48	65	75	95	105	105	95	100	105	115	115	115	115	110	110	105	105	85	70	50	40	15		856,080	6.7
Painters							10	15	20	25	25	25	25	25	20	20	20	20	20	20	10	5	5		134,850	6.7
Pipefitters		2	5	25	45	65	160	220	275	325	370	390	410	420	430	430	445	425	400	380	330	175	35	5	2,508,645	19.8
Sheet Metal									5	10	10	10	10	10	10	10	15	20	15	10	10	5			65,250	0.5
Teamsters	4	7	15	12	25	42	45	45	45	45	45	45	45	50	50	50	50	50	50	50	40	30	15	10	356,700	2.8
Others			4	12	13	13	15	13	20	30	30	30	30	35	35	35	35	35	35	35	30	25	10	5	213,150	1.7
Subtotal	45	130	245	400	565	740	1005	1175	1450	1665	1845	1940	1980	2020	2040	2020	2010	1965	1855	1695	1370	740	220	40	12,684,600	100.0
Non-Manual	5	20	40	60	85	110	150	175	215	250	275	290	300	300	305	300	300	295	280	255	205	110	35	5		
Total Construction	50	150	285	460	650	850	1155	1350	1665	1915	2120	2230	2280	2320	2345	2320	2310	2260	2135	1950	1575	850	255	45		
Total Operation			10	10	25	25	25	25	45	65	85	105	145	185	225	265	300	330	365	400	465	530	530	530		
Overall Totals	50	150	295	470	675	875	1180	1375	1710	2205	1980	2335	2425	2505	2570	2585	2610	2590	2500	2350	2040	1380	785	575		

Table 2-2

WPPP Participants Reserve Margins Without WPPP
(Megawatts)

	Nevada Entities			California Municipalities		
Year	Total Capability	Total Peak Demand	Reserve Margin	Total Capability	Total Peak Demand	Reserve Margin
1990	2956	2920	36	7900	6625	1275
1991	3074	3029	45	8295	6760	1535
1992	3192	3112	80	8268	6896	1372
1993	3239	3197	42	8284	7020	1264
1994	3367	3282	85	8195	7157	1038
1995	3416	3366	50	8274	7289	985
1996	3546	3455	91	8349	7421	928
1997	3600	3541	59	8389	7538	851
1998	3672	3630	42	8470	7689	781
1999	3724	3717	7	8475	7825	650
2000	3778	3804	(26)	8425	7966	459

Table 3-1

Major Historic Earthquakes
Great Basin and Vicinity

Date		Magnitude	Area	Maximum Displacement[b] (feet)	Length of Surface Rupture[b] (miles)
-	1847	-	West-central Utah	Unknown	Unknown
December 28,	1869	6.7[a]	Olinghouse, NV	12	14
March 26,	1872	8.0[a]	Owens Valley, CA	21	68
December 5,	1887	5.7[a]	Kanab, UT	Unknown	Unknown
November 17,	1902	6.3[a]	Pine Valley, UT	Unknown	Unknown
Autumn	1903	-	Wonder, NV	1	12
October 2,	1915	7.6	Pleasant Valley, NV	18	36
December 21,	1932	7.2	Cedar Mountain, NV	3	38
January 30,	1934	6.3	Excelsior Mountain, NV	0.3	>1
March 12,	1934	6.6	Hansel Valley, UT	1.6	3.3
December 14,	1950	5.6	Fort Sage Mts., CA	2	5
July 6,	1954	6.8	Rainbow Mountain, NV	1	20
August 24,	1954	6.8	Fallon-Stillwater, NV	2.6	19
December 16,	1954	7.2	Fairview Peak, NV	18	55
December 16,	1954	7.1	Dixie Valley, NV	10	38
March 23,	1959	6.3	Dixie Valley, NV	0	0
July 21,	1959	5.7	Kanab, UT	0	0
August 16,	1966	6.1	Clover Mountain, NV	0	0
May 25-27,	1980	6.0	Mammoth Lakes, CA	Cracking	10

[a] Estimated Magnitude for earthquakes occurring before establishment of seismograph networks.

[b] Surface ruptures and surface displacement, which may have been associated with pre-instrumental earthquakes but not reported, are listed as "Unknown". Recent earthquakes which apparently had no surface expression are listed as "0".

Table 3-2

Plant Species in the WPPP Region

Family and Common Name	Scientific Name
Pinaceae	
Bristlecone pine	Pinus aristata
Douglas fir	Pseudotsuga menziesii
Engelmann spruce	Picea engelmannii
Limber pine	Pinus flexilis
Ponderosa pine	Pinus ponderosa
Singleleaf pinyon	Pinus monophylla
White bark pine	Pinus albicaulis
White fir	Abies concolor
Cupressaceae	
Rocky mountain juniper	Juniperus scopulorum
Swamp cedar	Juniperus scopulorum var.
Utah juniper	Juniperus osteosperma
Typhacase	
Cattail	Typha spp.
Gramineae (Poaceae)	
Alkali muhly	Muhlenbergia asperifolia
Alkali cordgrass	Spartina gracilis
Alkali sacaton	Sporobolus airoides
Basin wildrye	Elymus cinereus
Bottlebrush squirreltail	Sitanion hystrix
Cheatgrass brome	Bromus tectorum
Indian ricegrass	Oryzopsis hymenoides
Inland saltgrass	Distichlis spicata
Needle-and-thread	Stipa comata
Russian wildrye	Elymus junceus
Sandberg bluegrass	Poa sandbergii
Western wheatgrass	Agropyron smithii
Crested wheatgrass	Agropyron desertorum
Siberian wheatgrass	Agropyron sibericum
Juncaceae	
Rushes	Juncus spp.
Liliaceae	
Joshua tree	Yucca brevifolia
Salicaceae	
Aspen	Populus tremuloides
Chenopodiaceae	
Black greasewood	Sarcobatus vermiculatus
Fourwing saltbush	Atriplex canescens
Gardner saltbush	Atriplex gardneri
Gray molly	Kochia americana
Halogeton	Halogeton glomeratus
Shadscale	Atriplex confertifolia
Spiny hopsage	Grayia spinosa
Winterfat	Ceratoides lanata

Table 3-2 (continued)

Cruciferae (Brassicaceae)	
Claspingleaf pepperweed	*Lepidium perfoliatum*
Pinnate tansy mustard	*Descurainia pinnata*
Thelypody	*Thelypodium sagittatum*
Wallflower	*Erysimum* spp.
Rosaceae	
Blackbrush	*Coleogyne ramosissima*
Leguminosae (Fabiaceae)	
Milkvetch	*Astragalus* spp.
Range ratany	*Krameria parvifolia*
Zygophyllaceae	
Creosote bush	*Larrea divaricata*
Malvaceae	
Gooseberryleaf mallow	*Sphaeralcea grossulariaefolia*
Cactaceae	
Prickly pear	*Opuntia* spp.
Solanaceae	
Wolfberry	*Lycium* spp.
Compositae (Asteraceae)	
Basin big sagebrush	*Artemisia tridentata tridentata*
Big sagebrush	*Artemisia tridentata*
Black sagebrush	*Artemisia nova*
Brittlebush (Encelia)	*Encelia* spp.
Bud sagebrush	*Artemisia spinescens*
Green rabbitbrush	*Chrysothamnus greenei*
Littleleaf horsebrush	*Tetradymia glabrata*
Low rabbitbrush	*Chrysothamnus viscidiflorus*
Low sagebrush	*Artemisia arbuscula*
Rubber rabbitbrush	*Chrysothamnus nauseosus*
Wyoming big sagebrush	*Artemisia tridentata wyomingensis*
Bursage	*Ambrosia (franseria)* spp.

Table 3-3

Terrestrial Wildlife Species in the WPPP Region

Common Name	Scientific Name	Habitat Preference[a]	Season of Use[b]
Birds			
Eared grebe	*Podiceps nigricollis*	W	S, B
Snowy egret	*Egretta thula*	W	S, B
White-faced ibis	*Plegadis chihi*	W	S, B
Mallard	*Anas platyrhynchos*	W	R, B
Cinnamon teal	*Anas cyanoptera*	W	C, B
Cooper's hawk	*Accipiter cooperii*	PJ, C	S, B
Ferruginous hawk	*Buteo regalis*	S, PJ	S, B
Red-tailed hawk	*Buteo jamaicensis*	S, PJ	R, B
Goshawk	*Accipter gentilis*		
Golden eagle	*Aquila chrysaetos*	S	R, B
Bald eagle	*Haliaeetus leucocephalus*	S, W	W, M
Swainson's hawk	*Buteo swainsoni*	S	S, B
American kestrel	*Falco sparverius*	S, PJ	S, B
Sage grouse	*Centrocercus urophasianus*	S	R, B
Sandhill crane	*Grus canadensis*	W, S	S, B
Long-billed curlew	*Numenius americanus*	W	S, B
American avocet	*Recurvirostra americana*	W	S, B
Horned lark	*Eremophila alpestris*	S	R, B
Scrub jay	*Aphelocoma coerulescens*	PJ	R, B
Stellar's jay	*Cyanocitta stelleri*	PJ	S
Sage thrasher	*Oreoscoptes montanus*	S	S, B
Mountain bluebird	*Sialia currucoides*	PJ, C	R, B
Loggerhead shrike	*Lanius ludovicianus*	S	R, B
Pine siskin	*Carduelis pinus*	C, PJ	S, B
Vesper sparrow	*Pooecetes gramineus*	S	S, B
Gray-headed junco	*Junco caniceps*	C	R, B
Brewer's sparrow	*Spizella breweri*	S	S, B
Sage sparrow	*Amphispiza belli*	S	S, B
Prairie falcon	*Falco mexicanus*		
Peregrine falcon	*Falco peregrinus*		
Mammals			
Spotted bat	*Euderma maculata*	S	
Muskrat	*Ondatra zibethica*	W	
Black-tailed jackrabbit	*Lepus californicus*	S	
Elk	*Cervus elaphus*	PJ, C	
Mule deer	*Odocoileus hemionus*	S, PJ, C	
Pronghorn	*Antilocapra americana*	S	
Bighorn sheep	*Ovis canadensis*	PJ	
Wild horse	*Equus caballus*	S	
Reptiles			
Desert tortoise	*Gopherus agassizi*		
Western rattlesnake	*Crotalus viridis*		
Western fence lizard	*Sceloporus occidentalis*		
Amphibians			
Leopard frog	*Rana pipiens*		

[a] Habitat Preference Key

S - Shrub-steppe
PJ - Pinyon-juniper
C - Coniferous Forest
W - Wetland

[b] Season of Use Key

R - Resident
S - Summer
W - Winter
M - Migrant
B - Breeds in area

Table 3-4

Aquatic Species in the WPPP Region

Common Name	Scientific Name
Bonneville (Utah) cutthroat trout	Salmo clarki utah
Cutthroat trout	Salmo clarki
Rainbow trout	Salmo gairdneri
Brown trout	Salmo trutta
Brook trout	Salvelinus fontinalis
Independence Valley tui chub	Gila bicolor isolata
Northern pike	Esox lucius
White River spinedace	Lepidomeda albivallis
Big Springs spinedace	Lepidomeda mollispinis pratensis
Clover Valley speckled dace	Rhinichthys osculus oligoporus
Independence Valley speckled dace	Rhinichthys osculus lethoporus
Meadow Valley Wash speckled dace	Rhinichthys osculus ssp
White River speckled dace	Rhinichthys osculus velifer
Relict dace	Relictus solitarius
White River desert sucker	Catostomus clarki intermedius
White River springfish	Crenichthys baileyi baileyi
Preston White River springfish	Crenichthys baileyi albivallis
Pahrump killifish	Empetrichthys latos

Table 3-5

Threatened and Endangered Species in the WPPP Region
(Listed and Candidate)

Plant Species	Scientific Name
Oneleaf Torrey milk-vetch	*A. calycosus* var. *monophyllidius*
Nye milk-vetch	*A. nyensis*
Monte Neva paintbrush	*Castilleja salsuginosa*
Clokey pincushion cactus	*Coryphantha vivipara* var. *rosea*
Draba	*Draba sphaeroides* var. *cusickii*
Darrow buckwheat	*Eriogonum darrovii*
Sunnyside green gentian	*Frasera gypsicola*
Lepidium	*Lepidium nanuum*
Hitchcock bladderpod	*Lesquerella hitchcockii*
Four-o-clock	*Mirabilus pudica*
Bicolored penstemon	*Penstemon bicolor* ssp. *bicolor*
Bicolored penstemon	*P. bicolor* ssp. *roseus*
Perityle	*Perityle megalocephala* var. *intricata*
A. nelson phacelia	*Phacelia anelsonii*
Parish phacelia	*P. parishii*
Great Basin fishhook cactus	*Sclerocactus pubispinus*
Thelypody	*Thelypodium laxiflorum*
Oval leaf thelypody	*T. sagittatum* var. *ovalifolium*
Camus	*Zigadenus vaginatus*
Terrestrial Wildlife	
Desert tortoise	*Gopherus* [*Scaptochelys*] *agassizi*
Ferruginous hawk	*Buteo regalis*
Spotted bat	*Euderma maculatum*
White-faced ibis	*Plegadis chihi*
Swainson's hawk	*Buteo swainsoni*
Long-billed curlew	*Numenius americanus*
Peregrine falcon[a]	*Falco peregrinus*
Bald eagle[a]	*Haliaeetus leucocephalus*
Aquatic Species	
White River spinedace	*Lepidomeda albivallis*
Big Springs spinedace	*Lepidomeda mollispinnis pratensis*
Relict Dace	*Relictus solitarius*
Bonneville (Utah) cutthroat trout	*Salmo clarki utah*
Clover Valley speckled dace	*Rhinichthys osculus oligoporous*
Independence Valley speckled dace	*Rhinichthys osculus lethosporous*
Independence Valley tui chub	*Gila bicolor isolata*
White River speckled dace	*Rhinichthys osculus velifer*
Preston White River springfish	*Crenichthys baileyii albivallis*
White River desert sucker	*Catostomus clarki intermedius*
Meadow Valley Wash speckled dace	*Rhinichthys osculus* spp.
Newark Valley tui chub	*Gila bicolor newarkensis*
Pahrump killifish	*Empetrichthys latos*

[a] Listed species.

Table 3-6

Population Changes (1940-1982)
White Pine County and the State of Nevada

							Percent Change		
	1940	1950	1960	1970	1980	1982[a]	60-70	70-80	80-82
City of Ely[b]	4140	3558	5814	6168	4882	5063	+6	-21	+4
Town of McGill	NA	2297	2195	2164	1419	1472	-1	-34	+4
Town of Ruth	NA	1244	NA	731	456	473	NA	-38	+4
County Balance	NA	2325	1799	1087	1410	1462	-40	+30	+4
White Pine County	12,377	9424	9808	10,150	8167	8470	+4	-20	+4
State of Nevada	110,247	160,083	285,278	488,738	800,493	886,543[bc]	+71	+64	+11

a Data from Regional Planning Commission, 1983, as derived from utility hook-ups.

b For years 1940 through 1970, data includes the population of East Ely which was annexed by the City of Ely in 1976.

c Data from Bureau of Business and Economic Research, University of Nevada, Reno, 1983.

NA: Not Available.

Sources (unless noted): U.S. Department of Commerce, Bureau of the Census, 1940, 1950, 1960, 1970 and 1980.

Table 3-7

Demographic Characteristics (1970-1980)
White Pine County and the State of Nevada

	White Pine County 1970	White Pine County 1980	Nevada 1980
Total Population	10,150	8167	800,493
Sex Distribution (percent)			
Males	50.5	50.4	50.0
Females	49.5	49.6	50.0
Age Distribution (percent)			
19 and under	41.2	36.0	34.0
20 to 39	25.6	28.0	35.0
40 to 59	21.5	21.0	19.0
60 and over	11.7	15.0	12.0
Race/Distribution (percent)			
White	97.3	93.3	87.4
Black	0.09	0.14	6.4
Native American	1.9	2.8	1.6
Other	0.7	3.8	4.5
Average Persons per Household	3.25	2.72	2.63
Educational Attainment of Persons 25 years and older (percent)			
Less than 5 years	2.0	NA	2.0
High school graduate	55.0	NA	65.0
Four or more years of college	7.0	NA	11.0

Source: State of Nevada, Office of Community Services, 1982.

Table 3-8

Population Projections (1980-2000)
White Pine County

Source	1980	1985	1990	1995	2000	1980-2000 Change(%)
PCO	8167	8237	8291	8345	8410	+3
ESD[a]	8167	8660	9285	9757	10,210	+25
ESD[b]	8167	9870	10,730	10,820	11,270	+38

[a] Projections assume no M-X basing.

[b] Projections assume M-X basing.

Sources: Nevada State Planning Coordinator's Office (PCO), 1979.
Nevada Employment Security Department (ESD), 1979.

Table 3-9

Employment Changes (1970-1982)
White Pine County and the State of Nevada

White Pine County	1970	1976	1980	1981	1982
Total Labor Force	4170	4040	3890[b]	4320	4820
Unemployment Rate (percent)	6.0	23.5	6.0	6.8	16.6
Total Employment	3910	3090	3610[a]	4030	4020
State of Nevada					
Total Labor Force	218,000	304,000	381,300	463,000	486,900
Unemployment Rate (percent)	6.0	9.0	7.0	7.1	12.2
Total Employment	205,100	276,900	354,400	429,900	427,700

a Number of employed White Pine County residents.

b 1980 labor force figures represent actual 1980 census count. 1976-1979 and 1982 figures are estimates prepared by Nevada State Employment Security Department.

Source: Nevada Employment Security Department, 1983.

Table 3-10

Housing Characteristics (1970-1980)
White Pine County and the State of Nevada

	Total Units		One Unit Structures		Multiple Units		Mobile Homes	
Area	1970	1980	1970	1980	1970	1980	1970	1980
White Pine County	3289	3566	2545	2790	345	435	399	341
Nevada	171,635	377,491	103,149	208,821	47,989	92,347	20,520	42,513

Source: U.S. Department of Commerce, Bureau of the Census, 1970 and 1980.

Table 3-11

General Community Information
White Pine County

	Ely	Ruth	McGill	Lund	Baker	Cherry Creek
A. Education						
1. Public Facilities: Capacity/enrollment						
a. Spec. Ed.	NA/140	-	-	-	-	-
b. Kndg/Elem	800/550	400/75	300/180	90/50	45/20	45/0
c. Secondary	1000/725	-	200/0	50/35	-	-
2. Private Facilities: Capacity/enrollment Total (Elementary)	NA/170	-	-	-	-	-
B. Health						
1. Hospital			Residents travel to Ely for medical care			
o Type: (43 short stay bed)						
o No. beds: (98 long-term bed)						
o Avg. utilization rate: (short stay 27%; long-term 92%) (std. is one doctor/2000 people)						
2. Health Labor:						
o Total Physicians	5	-	-	-	-	-
o Total Dentists	3	-	-	-	-	-
o Total Nurses	47	-	-	-	-	-
o Total Pharmacists	7	-	-	-	-	-
o Others - (Chiropractors, physical therapists, emergency medical technicians)	137	-	-	-	-	-
3. Ambulance Services: Total vehicles	6	-	-	-	-	-
C. Social Support Systems						
1. Child Care Programs/Slots	1/30	-	-	-	-	-
2. Pre-school Programs/Slots	6/70	-	-	-	-	-
D. Safety						
1. Resident police protection/ no. of officers (std. = 1/500)	Yes/22	-	-	Yes/1	Yes/1	-
2. Fire protection: Permanent (P)/ Volunteer (V)	P(6) V(39)	V	V	V	V	-

Table 3-12

1980 Traffic Volumes and Capacities
White Pine County

Roadway	1980 ADT[a]	Capacity	1980 ADT as a percent of capacity
Alt. U.S. 50 and U.S. 93, east of 7th St. in E. Ely	9730	13,000	75
U.S. 6 - Mill St. - in Ely south of U.S. 50 - Aultman St.	2660	10,750	25
U.S. 50, west of Ruth Hwy, in White Pine County	565	13,000	4
U.S. 50 and U.S. 93 between Ely and McGill	2250	13,000	17
U.S. 93, Pioche Hwy, south of U.S. 50	440	13,000	3
U.S. 50, west of Ely to Ruth turnoff	1430	13,000	11
U.S. 50, Aultman Ave. west of Nevada Ave.	9745	13,000	75
U.S. 6, 50, and 93 in E. Ely south of F Avenue	4410	13,000	34
Cherry Creek Road west of U.S. 93	65	NA	-
Major Place junction, U.S. 50 and U.S. 93 going east on U.S. 6, 50	515	NA	-
Major Place - north on U.S. 93	875	NA	-
Major Place - south on U.S. 93	440	NA	-

[a] Average daily traffic.

NA: Not available.

Source: Nevada Department of Transportation, 1982.

Table 3-13

Water and Sewer Characteristics
White Pine County

	Ely	Ruth	McGill	Lund	Baker	Cherry Creek
A. Water						
1. Jurisdiction	Municipal	Private	Private	Independent Wells	Independent Wells	Independent Wells
2. Pumping capacity	1800 gpm	100-300 gpm	-	-	-	-
3. Storage capacity (std.=300 gal. storage per capita)	6.05 mg	300,000 gal	600,000 gal	-	-	-
4. Source	Murry Springs North St. well East Ely well	Ward Mts. springs	Duck Creek, McGill well	-	-	-
5. Yield	4,700 gpm-present 14,476 ac.ft./yr.max. water rights	-	-	-	-	-
6. Per capita usage	400 gal/day	-	-	-	-	-
B. Sewer						
1. Jurisdiction	Municipal	(Private) Ruth/McGill Water	Private	-	-	-
2. Treatment/ Disposal method	aeration basin w/oxidation ponds (secondary)	oxidation ponds	oxidation ponds	septic tanks	septic tanks, cesspools or underground disposal	septic tanks, cesspools or underground disposal
3. Present rate/ Capacity	1.1 mgd/1.8 mg avg daily flow	-	-	-	-	-
4. Customers	2000	160	540	-	-	-
5. Population peak capacity	11000	-	-	-	-	-

Table 3-14

Land Management and Ownership Patterns
White Pine County

	Area (square miles)	Area (percent)
Public: Federal	8596	96.5
U.S. Bureau of Land Management	(6821)	(76.6)
U.S. Forest Service	(1648)	(18.5)
Reservations	(114)	(1.3)
National Wildlife Refuge	(13)	(0.15)
Public: State	3	0.05
Private	306	3.4
TOTAL	8905	100

Table 3-15

General Fund Revenue (1981-1982)
White Pine County
(percent of total budget)

	City of Ely	White Pine County	White Pine County School District
Property Tax	3.3	6.2	6.2
Base City/County Relief Tax	14.7	2.5	-
Special City/County Relief Tax	17.5	13.4	-
Local School Support Tax	-	-	12.9
Motor Vehicle Tax	3.9	2.8	2.6
Gasoline Tax	3.6	3.7	-
Cigarette Tax	5.5	1	-
Liquor Tax	1.5	0.2	-
Gaming License Fees	1.8	2.5	-
Federal In-Lieu Payments	-	5.9	-
Federal Revenue Sharing	1.9	2.5	-
Payments From Other Govs.	5.9	7.4	0.6
Other Tax, Licenses and Fees	14.9[c]	3.8	0.2
Grants	-	0.9	-
State Distributive Fund	-	-	65.7
Other Non-Tax	25.5[b]	47.2[a]	5.3
Federal Programs	-	-	6.5
Total budget (in percent)	100	100	100

[a] Includes money from the County Hospital which represents 36.4% of the County revenue for the year.

[b] Includes money from sewer fees and water fees which represent 17.5% of the City of Ely revenues for the year.

[c] Includes money from a landfill assessment collected by White Pine County and paid to the City of Ely.

Table 3-16

Soils and Ecological Sites
White Pine County

Mapping Unit	Soil Series	SCS Ecological Site Number	Ecological Site	Precipitation Zone	Range in Production Pounds/Acre Air Dry	
					Potential	Median[a]
1500	Blimo	028B010N	Loamy	8-10	400-800	600
1480	Boofus	028B020N	Sodic Flat	5-12	200-600	450
1080	Dera	028B017N	Loamy	5-8	250-700	450
1480	Duffer, Flooded	028B002N	Saline Meadow	5-12	750-3000	1500
1480	Equis	028B004N	Saline Bottom	5-12	500-2000	1000
2110	Fontreen	028B060N	Shallow Loamy Slope	12-16	100-600	300
2110	Hyzen	028B060N	Shallow Loamy Slope	12-16	100-600	300
2180	Lusetti	028B013N	Silty	8-10	300-800	550
1042	Oupico	028B010N	Loamy	8-10	400-800	600
1500	Raph	028B017N	Loamy	5-8	250-700	450
1840	Riepe	024X003N	Sodic Terrace	6-8	300-600	450
1040	Sanpete	028B010N	Loamy	8-10	400-800	600
1840	Stimca	024X022N	Sodic Terrace	8-10	350-800	600
2140	Ursine	028B011N	Shallow Calcareous Loam	8-12	400-950	700
1011	UN-one	024X022N	Sodic Terrace	8-10	350-800	600
1500	Uwell	028B010N	Loamy	8-10	400-800	600
2261	UN-three	028B004N	Saline Bottom	5-12	500-2000	1000

[a] Soil Conservation Service median values were used when available, otherwise, high and low values were averaged.

Table 3-17

Land Productivity

Ecological Site	Stocking Rate[a] (acres/AUM)	Butte Valley Site		North Steptoe Valley Site		Spring Valley Site	
		Acres	AUMs	Acres	AUMs	Acres	AUMs
Loamy 8-10	16	860	54	110	7	500	31
Shallow Calcareous Loam 8-12	22	443	20	--	--	1055	48
Silty 8-10	21	344	16	--	--	825	39
Loamy 5-8	19	833	44	744	39	--	--
Sodic Terrace 6-8	28	--	--	755	27	--	--
Sodic Terrace 8-10	24	--	--	619	26	--	--
Other[b]	12	--	--	22	2	--	--
Total		2480	134	2250	101	2380	118
Equivalent acres per AUM		18.5		22.3		20.2	

Note: AUM = animal unit month.

a Based on Fair Range Condition (upper stocking rate) SCS Technical Guide, Ely, Nevada.

b Saline Meadow 5-12, Saline Bottom 5-12, Sodic Flat 5-12.

Table 4-1

Air Emissions
WPPP Generating Station
(tons/year)

Pollutant	Butte Valley Site	North Steptoe Valley Site	Spring Valley Site	Significance Level
Sulfur dioxide	18,553	19,294	17,811	40
Oxides of nitrogen[a]	18,037	18,037	18,037	40
Total suspended particulates	1176	1176	1176	25
Carbon monoxide	3088	3088	3088	100
Volatile organic compounds	31	31	31	40
Beryllium	0.3	0.3	0.3	0.0004
Fluorides	106	106	106	3
Lead	0.2	0.2	0.2	0.6
Mercury	0.2	0.2	0.2	0.2
Sulfuric acid mist	442	460	424	7

[a] As nitrogen dioxide.

Table 4-2

Potential Disturbance to Soils and Ecological Sites

Mapping Unit Number	Soil Series	Ecological Site	Potential Disturbance (acres)
		Butte Valley Site	
1042	Oupico	Loamy 8-10	860
1500	Blimo		
1500	Uwell		
1500	Raph	Loamy 5-8	833
2110	Fontreen	Shallow Loamy Slope 12-16	-
2110	Hyzen		
2140	Ursine	Shallow Calcareous Loam 8-12	443
2180	Lusetti	Silty 8-10	344
		Total	2480
		North Steptoe Valley Site	
1040	Sanpete	Loamy 8-10	110
1080	Dera	Loamy 5-8	744
1480	Duffer, Flooded	Saline Meadow 5-12	22
1480	Equis	Saline Bottom 5-12	
1480	Boofus	Sodic Flat 5-12	
1840	Riepe	Sodic Terrace 6-8	755
1840	Stimca	Sodic Terrace 8-10	619
		Total	2250
		Spring Valley Site	
1011	UN-One	Sodic Terrace 8-10	-
1040	Sanpete	Loamy 8-10	500
1080	Dera	Loamy 5-8	-
2140	Ursine	Shallow Calcareous Loam 8-12	1055
2180	Lusetti	Silty 8-10	825
2261	UN-Three	Saline Bottom 5-12	-
		Total	2380

Table 4-3

Visual Sensitivity Ratings
Power Generation System

Visual Factors	Site			
	Butte Valley	North Steptoe Valley		Spring Valley
Population exposure source	No major source	Transitory (Hwy 93)	Permanent (Cherry Creek)	Transitory (Hwys 93 and 6/50)
Distance Zone	---	Middle-ground	Background	Middleground
Initial sensitivity rating	Minimum	Minimum		Minimum
Modifications to rating				
Visibility level	---	Open normal (+1)		Open normal (+1)
Landscape condition	Natural (+1)	Natural Dominance (+1)		Natural Dominance (+1)
Area of exceptional scenic quality	No (0)	No (0)		Yes (+1)
Net modification	---	+2		+3
Final rating	Moderate	Moderate		High

Table 4-4

Visual Sensitivity Ratings
Water Supply System

Visual Factors	Site		
	Butte Valley	North Steptoe Valley	Spring Valley
Population exposure source	Transitory (Hwy 93)	Transitory (Hwy 93)	Transitory (Hwy 93 and Hwy 6/50)
Distance Zone	Middleground	Middleground	Middleground
Initial sensitivity training	Minimum	Minimum	Minimum
Modifications to rating			
Visibility level	Open inferior (-1)	Open inferior (-1)	Open inferior (-1)
Landscape condition	Natural (+2)	Natural Dominance (+1)	Natural (+2)
Net modification	+1	Ø	+1
Final rating	Low	Minimum	Low

Table 4-5

Visual Impacts
Coal Transportation System

Visual Factors	Butte Valley Site				North Steptoe Valley Site				Spring Valley Site			
	NP	NA	SP	SA	NP	NA	SP	SA	NP	NA	SP	SA
Approximate length of new rail (miles)	25	80	160	--	5	50	160	170	120	100	70	70
Number of major highways crossed by new rail	1	1	4	0	2	1	1	3	3	3	0	0
Number of major highays not crossed, but from which new rail is visible	0	0	0	0	0	0	0	0	0	0	1	1
Expected significance of visual impact	Low	Low	Low	--	Min	Low	Low	Low	Low	Low	Low	Low

Note: NP - Northern Preferred; NA - Northern Alternate; SP - Southern Preferred; SA - Southern Alternate

Table 4-6

WPPP Work Force Requirements

Year/Quarter	Construction	Operation	Total
1985 - 1	50	0	50
2	150	0	150
3	285	10	295
4	460	10	470
1986 - 1	650	25	675
2	850	25	875
3	1155	25	1180
4	1350	25	1375
1987 - 1	1665	45	1710
2	1915	65	1980
3	2120	85	2205
4	2230	105	2335
1988 - 1	2280	145	2425
2	2320	185	2505
3	2345	225	2570
4	2320	265	2585
1989 - 1	2310	300	2610
2	2260	330	2590
3	2135	365	2500
4	1950	400	2350
1990 - 1	1575	465	2040
2	850	530	1380
3	255	530	785
4	45	530	575
1991 - 1	0	530	530

Peak Construction = 1988/3rd quarter (2345 workers)
Peak Operation = 1990/2nd quarter (530 workers)
Peak Employment = 1989/1st quarter (2610 workers)

Table 4-7

Population Projections With and Without WPPP

	1985		1986		1987		1988		1989		1990		1991	
	With WPPP	Without WPPP	With WPPP	Without WPPP	With WPPP	Without WPPP	With WPPP	Without WPPP	With WPPP	Without WPPP	With WPPP	Without WPPP	With WPPP	Without WPPP
County	9320	8660	10,970	8785	12,685	8910	13,365	9035	13,515	9160	10,630	9285	10,690	9410
Ely	5684	5196	6830	5271	8139	5346	8686	5421	8787	5496	6875	5571	6888	5646
McGill	1484	1472	1533	1493	1582	1515	1615	1536	1637	1558	1607	1579	1628	1600
Ruth	525	520	544	527	567	535	580	542	588	550	570	557	577	564

Note: Projections with WPPP are estimates for the fourth quarter, except for 1989 which is for the first quarter when WPPP employment peaks.

Table 4-8

Total Estimated WPPP Work Force Payrolls and Net Disposable Income
($1000)

	1985	1986	1987	1988	1989	1990
Construction Workforce						
Median Total Payroll	5408	21,701	44,778	53,175	57,320	15,648
Net Disposable Income						
- Weekly[a]	1439	7292	16,613	20,100	21,667	5696
- Daily/Relocatees[b]	2347	7899	14,732	17,123	18,457	5258
Total	3786	13,191	31,345	37,223	40,124	10,954
Net Disposable Income Spent in White Pine County:						
- Weeklies[c]	216	1094	2492	3015	3250	854
- Dailies & Relocatees[d]	1760	5924	11,049	12,842	13,843	3944
Total	1976	7018	13,541	15,857	17,093	4798
Operation Workforce						
Median Total Payroll	293	1066	1894	5216	8903	13,135
Net Disposable Income	205	746	1326	3651	6232	9194
Net Disposable Income Spent in White Pine County[d]	154	540	928	2738	4674	6896
Total Net Disposable Income Spent in White Pine County	2130	7578	14,469	18,595	21,767	11,694

a Based on average quarterly split of weekly commuters in the WPPP construction workforce.

b Based on average quarterly split of daily and relocating workers in the WPPP construction workforce.

c Based on 15 percent of net disposable income.

d Based on 75 percent of net disposable income.

Table 4-9

White Pine County School District
Occupancy With and Without WPPP

School	Current Occupancy (1981)	Capacity	Occupancy Without WPPP				Occupancy With WPPP				Year Capacity Exceeded
			87-88	88-89	89-90	90-91	87-88	88-89	89-90	90-91	
White Pine High	507	725	560	551	528	546	657	686	675	654	
White Pine Junior High	236	275	240	269	297	298	282	325	360	344	1987 with WPPP
Elementary											
East Ely	117	100	NA	NA	NA	NA	NA	NA	NA	NA	
Ely	464	500	NA	NA	NA	NA	NA	NA	NA	NA	
Murry Street	88	100	NA	NA	NA	NA	NA	NA	NA	NA	
Total Ely	669	700	774	776	778	780	1185	1245	1207	897	1986 w/o WPPP
Balance of County	234	900	258	259	260	261	274	277	279	265	

NA: Not available.

[a] Parentheses indicate increase due to WPPP.

Table 4-10

Law Enforcement Needs With WPPP

Areas of Concern	Projected Total Need With WPPP 1989	Projected Total Need With WPPP 1991	WPPP Related Need Only 1989	WPPP Related Need Only 1991
Personnel (existing)				
Patrol Officers (11 in County, 9 in Ely)	14.5-County 13.0-Ely 27.5-total	15-County 10-Ely 25-total	3.5-County 5.0-Ely 8.5 total	4-County 2-Ely 6 total
Administrators (deputized) (4)	4	4	0	0
Clerical (Sheriff's Dept.)	1	1	1	1
Jailers	6	6	0	0
Investigators (2 for several counties)	2	2	0	0
Juvenile Officers (1)	3	3	0.75	0.75
Juvenile Probation Officers (1.5)	2.25	2.25	.75	.75
Highway Patrol (3)	6[a]	5	2	1
State Patrol and Probation Officers (1 and 0.5 secretary)	2 1 secretary	1.5 1 secretary	1	0.5
District Attorney (1.5)	2.5	2	0.75	0.25
Vehicles				
Sheriff's Dept. (15 cars and 1 four wheel)	14 1-four wheel	13 1-four wheel	0 0	0 0
Highway Patrol (3)	6	5	2	1
Facilities				
County Jail (16 male and 4 female cells)	26 cells (male) 2 cells (female)	11 cells (male) 2 cells (female)	10 cells 0	0 0
Juvenile Detention Center (2 rooms)	13 cells	9 cells	7 cells	3 cells

[a] An additional officer may be needed during peak employment depending upon plant location and transit system.

Table 4-11

Public Health Services Needs With WPPP

Area of Concern	Existing Condition (1980)	Projected Total Need With WPPP 1989	Projected Total Need With WPPP 1991	WPPP Related Need Only 1989	WPPP Related Need Only 1991
Staffing					
Total Physicians	4.5	7.0	6.0	2.5	1.5
Physician Assistants	0	1.0	0	1.0	0
Dentists	3.0	3.5	3.0	0.5	0
Registered Nurses (RN)	29.0	39.0	34.0	12.5	7.5
Licensed Practical Nurses (LPN)	18.0	34.0	30.0	11.0	7.0
Pharmacists	7.0	9.0	8.0	2.0	1.0
Physical Therapists	1.0	1 physical therapist 1 aide	1 physical therapist 1 aide	0	0
Emergency Medical Technicians (EMT)	30 active	50 EMTs	43 EMTs	16.0	9.0
Facility Use					
Short Stay Beds	15,695 patient days or 43 beds	10,932 patient days or 30 beds	9508 patient days or 26 beds	0	0
Long-term Beds	98 (95% occup.)	91.0	79.0	0	0
Ambulance Service					
Total Ambulances	4 full-time 1 backup	7.0	6.0	2.0	1.0

Table 4-12

Recreation Facility Needs
With and Without WPPP

Facility (Existing)	Guideline	Year	With WPPP	Without WPPP
Playlots (8)	1/300 families	1989 1991	14 13	11 12
Neighborhood Parks (17 acres)	2 acres/1000 population	1989 1991	25 21	18 19
Indoor Community Recreation Centers (0)	1/25,000 population	1989 1991	0.5 0.5	0.5 0.5
Multi-Purpose Courts (6)	1/1000	1989 1991	12 10	9 9
Basketball Courts (8 indoor)	1/1000 population	1989 1991	12 10	9 9
Roller Skating Rinks (0.5) Raquetball Courts (0)	1/15,000 population	1989 1991	1 0	0 0
Tennis Courts (5)	1/2000 population	1989 1991	6 5	5 5

Note: The County also has a horse stable. No guidelines are available to determine if the facility is sufficient to accommodate demands for this facility.

Table 4-13

Impacts on Land Productivity

Site	Grazing Allotment	Total Allotment[a] (AUMs)	AUMS Affected By WPPP Site	Percent of Total
Butte Valley	Thirty Mile Spring	8755	263	3.0
North Steptoe Valley	Cherry Creek	5773	289	5.0
Spring Valley	Majors	12,535	626	5.0
	Willard Creek	1132	57	5.0

AUM = animal unit month.

[a] Source: Bureau of Land Management-Ely District Office.

Table 4-14

Distribution of Work Force by Community
(percent)

	Butte Valley Site	North Steptoe Valley Site	Spring Valley Site
Construction Period			
City of Ely	55.0	54.0	55.0
WPPP Site	43.0	43.0	43.0
Ruth	0.7	0.5	0.5
McGill	0.8	1.5	0.9
Lund	0.2	0.2	0.2
Baker	-	-	0.2
Cherry Creek	-	0.3	-
Eureka	0.3	-	0.2
Wells	-	0.5	-
Operation Period			
City of Ely	98.0	97.0	98.0
Ruth	1.0	0.5	0.5
McGill	1.0	2.0	1.0
Lund	-	-	-
Baker	-	-	0.5
Cherry Creek	-	0.5	-

Note: The indirect work force for all three sites for both construction and operation would be distributed as follows: City of Ely - 95 percent; McGill - 5 percent.

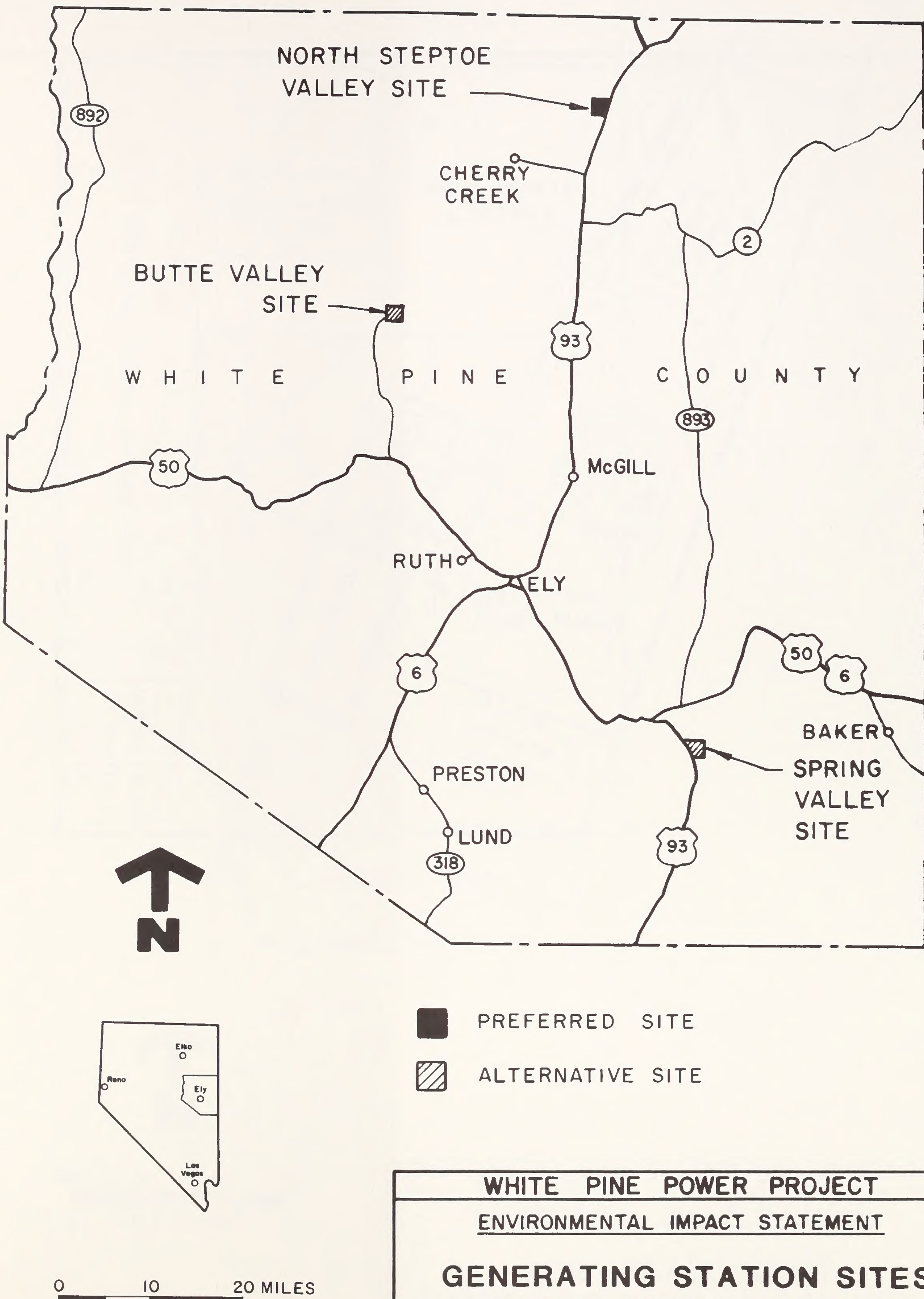
FIGURES

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

LOCATION MAP

FIGURE 1-1

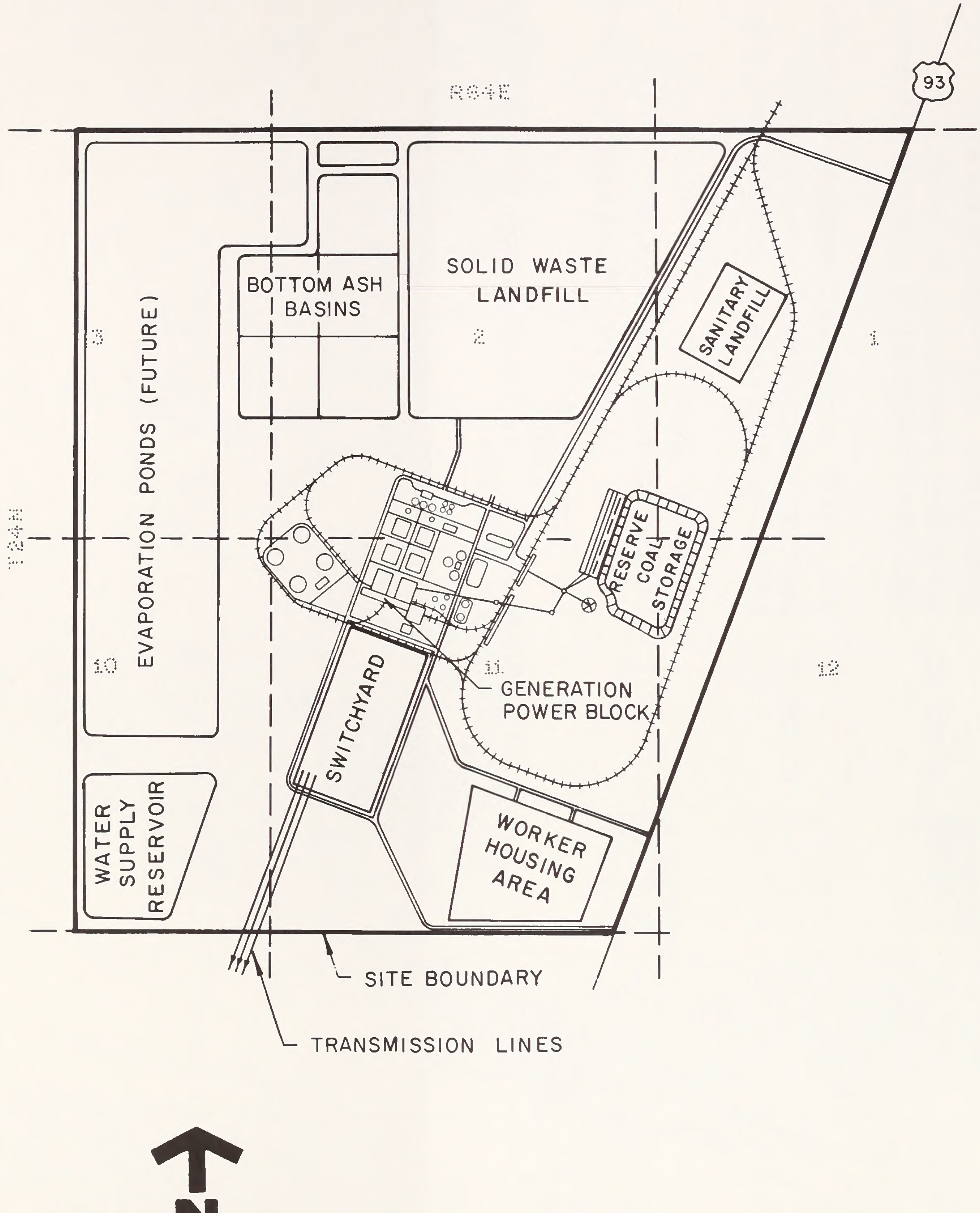


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

GENERATING STATION SITES
POWER GENERATION SYSTEM

FIGURE 2-1

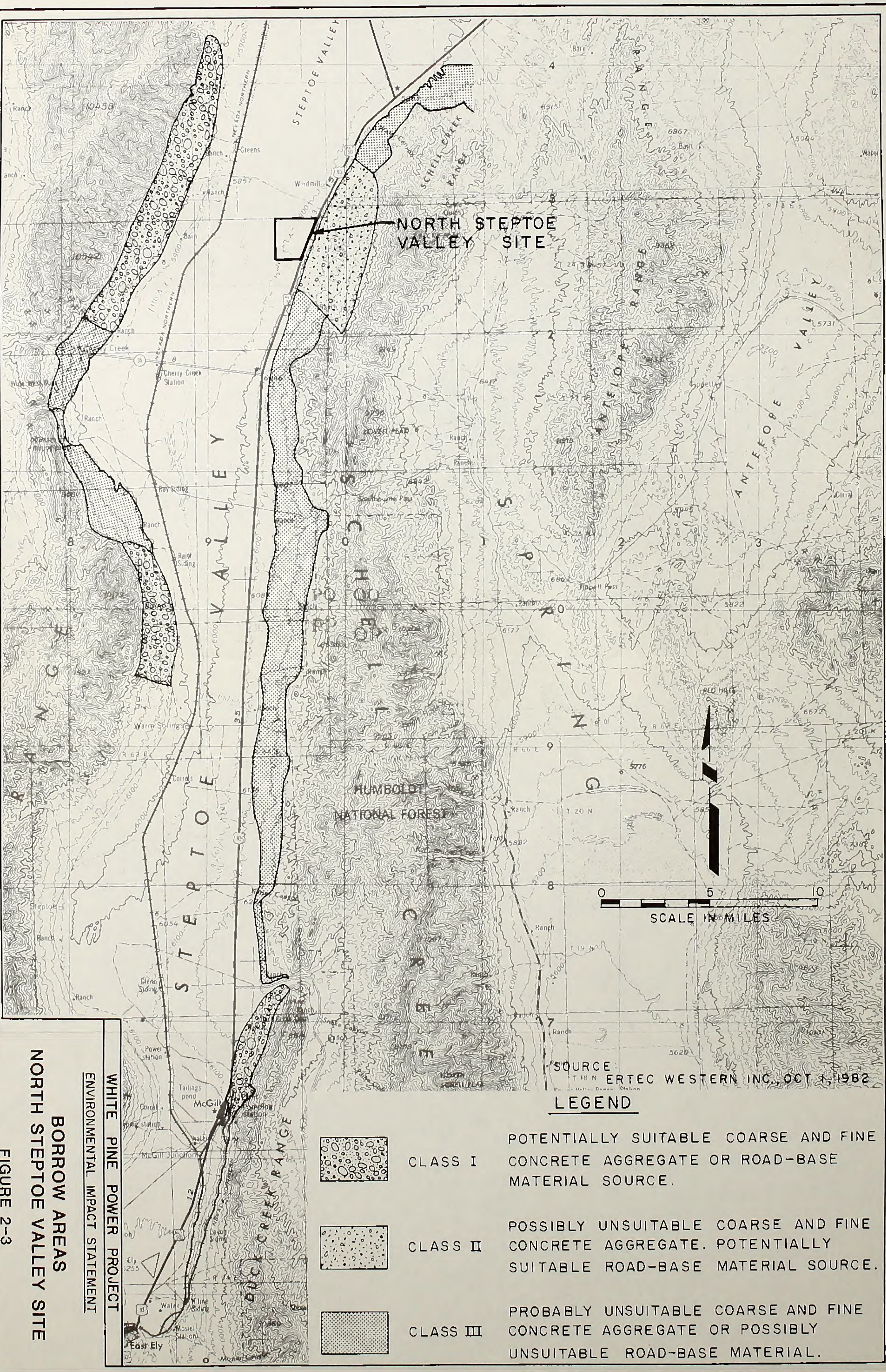


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

SITE ARRANGEMENT
NORTH STEPTOE VALLEY SITE

FIGURE 2-2



LEGEND

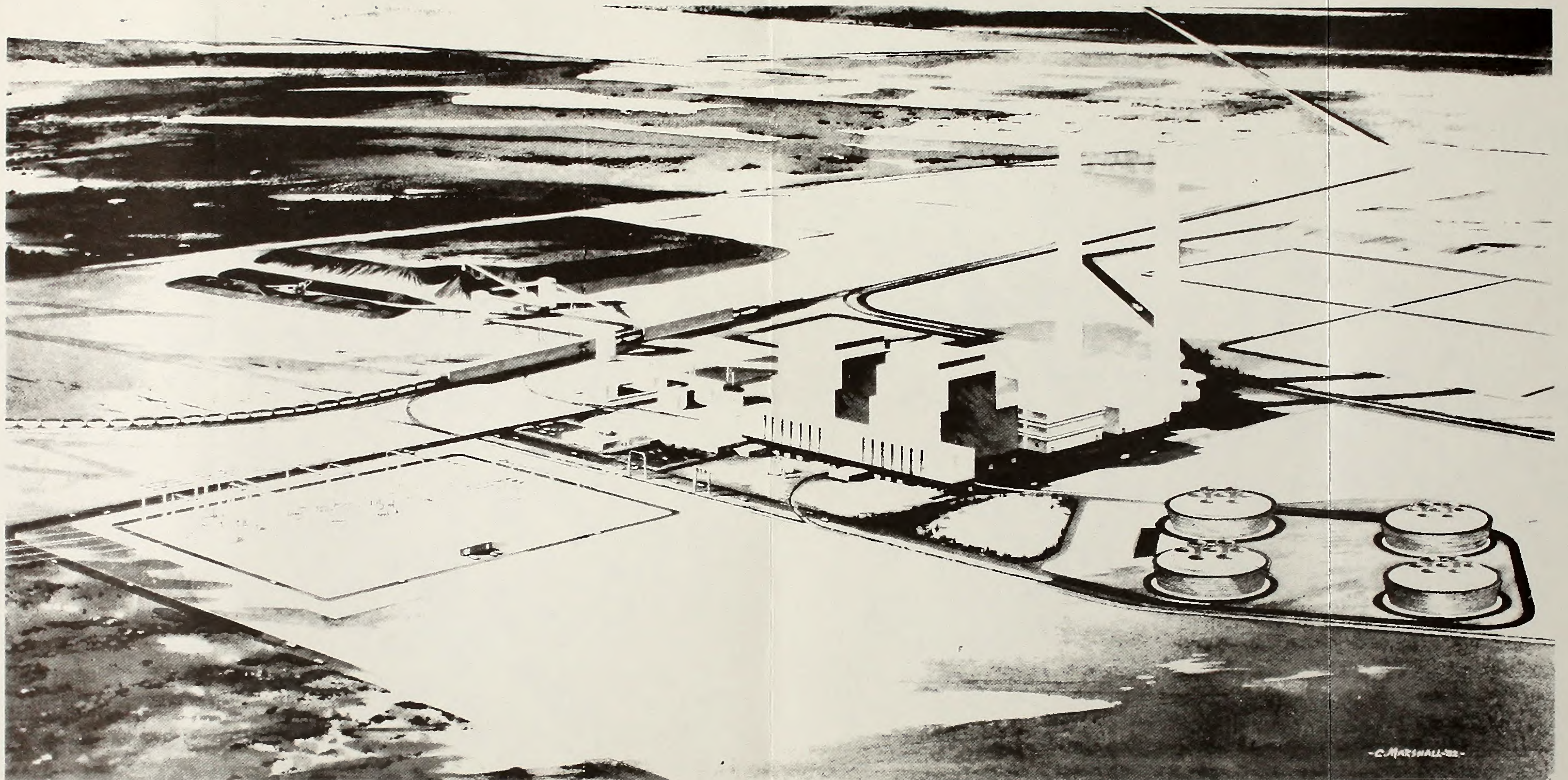
CLASS I	POTENTIALLY SUITABLE COARSE AND FINE CONCRETE AGGREGATE OR ROAD-BASE MATERIAL SOURCE.
CLASS II	POSSIBLY UNSUITABLE COARSE AND FINE CONCRETE AGGREGATE. POTENTIALLY SUITABLE ROAD-BASE MATERIAL SOURCE.
CLASS III	PROBABLY UNSUITABLE COARSE AND FINE CONCRETE AGGREGATE OR POSSIBLY UNSUITABLE ROAD-BASE MATERIAL.

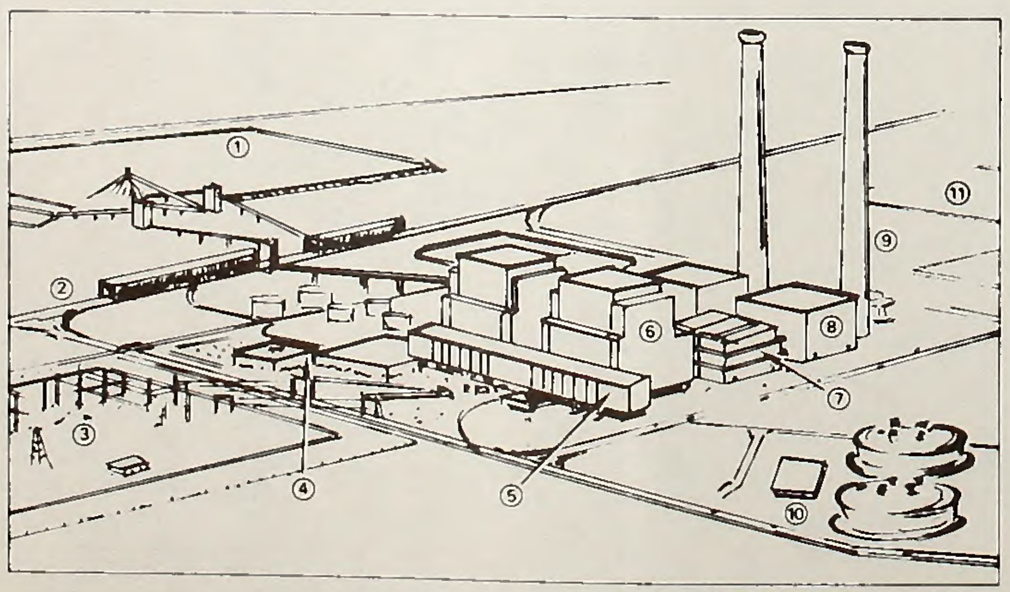
WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

BORROW AREAS
NORTH STEPTOE VALLEY SITE

FIGURE 2-3





WPPP FACILITIES

1. Coal storage area
2. Railroad coal handling area
3. Electrical switchyard
4. Administration building
5. Turbine generator building
6. Steam generator building
7. Fabric filter building
8. Scrubber building
9. 750-foot stack
10. Cooling towers
11. Bottom ash basins

NOTE:
RENDERING BASED ON FABRIC FILTER/WET LIMESTONE AIR QUALITY CONTROL SYSTEM. FOR A LIME SPRAY DRYER/FABRIC FILTER AIR QUALITY CONTROL SYSTEM, THE FABRIC FILTER BUILDING AND SCRUBBER BUILDING ARE REVERSED.

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

GENERATING STATION RENDERING

FIGURE 2-4

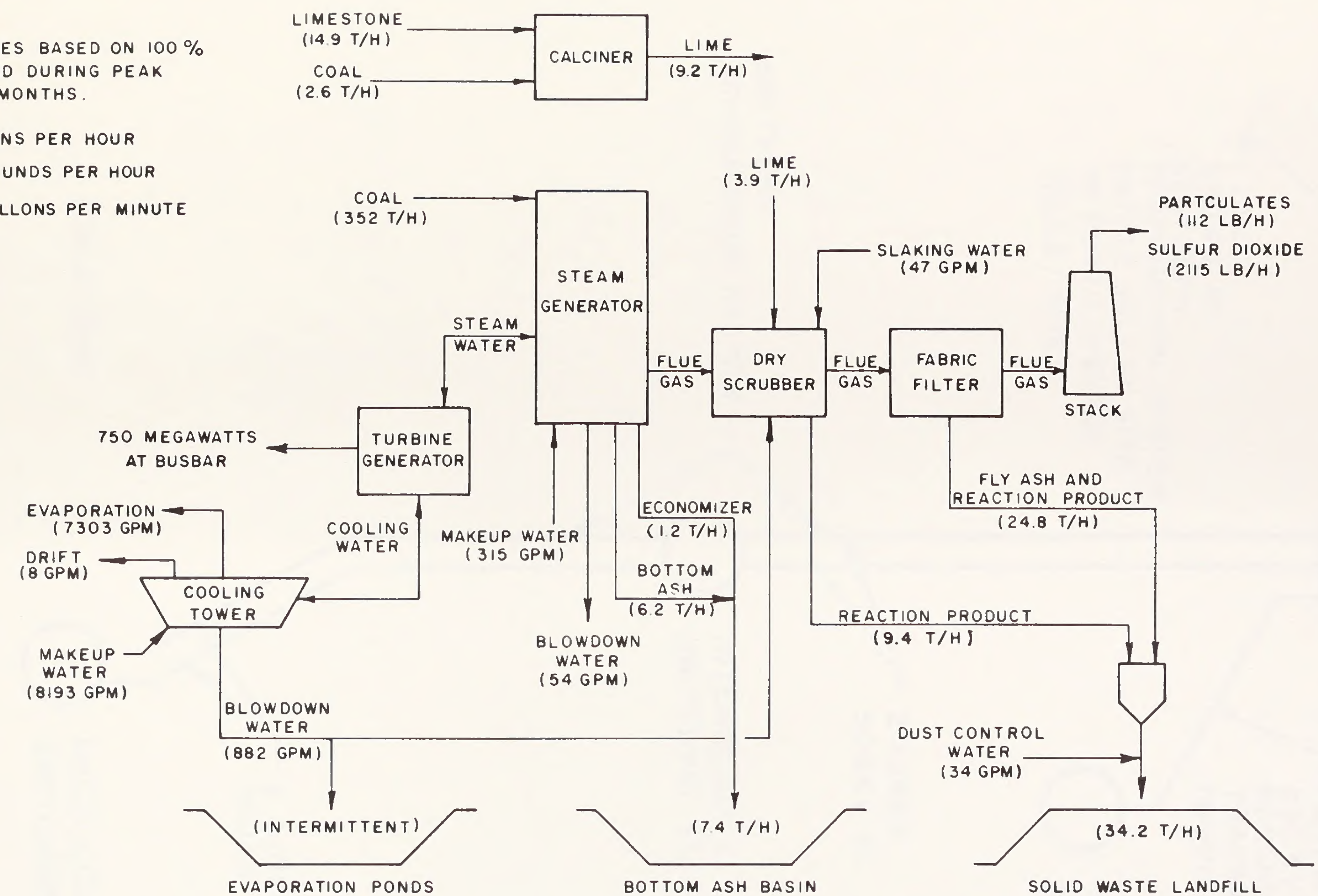
NOTE:

QUANTITIES BASED ON 100% FULL LOAD DURING PEAK SUMMER MONTHS.

T/H TONS PER HOUR

LB/H POUNDS PER HOUR

GPM GALLONS PER MINUTE

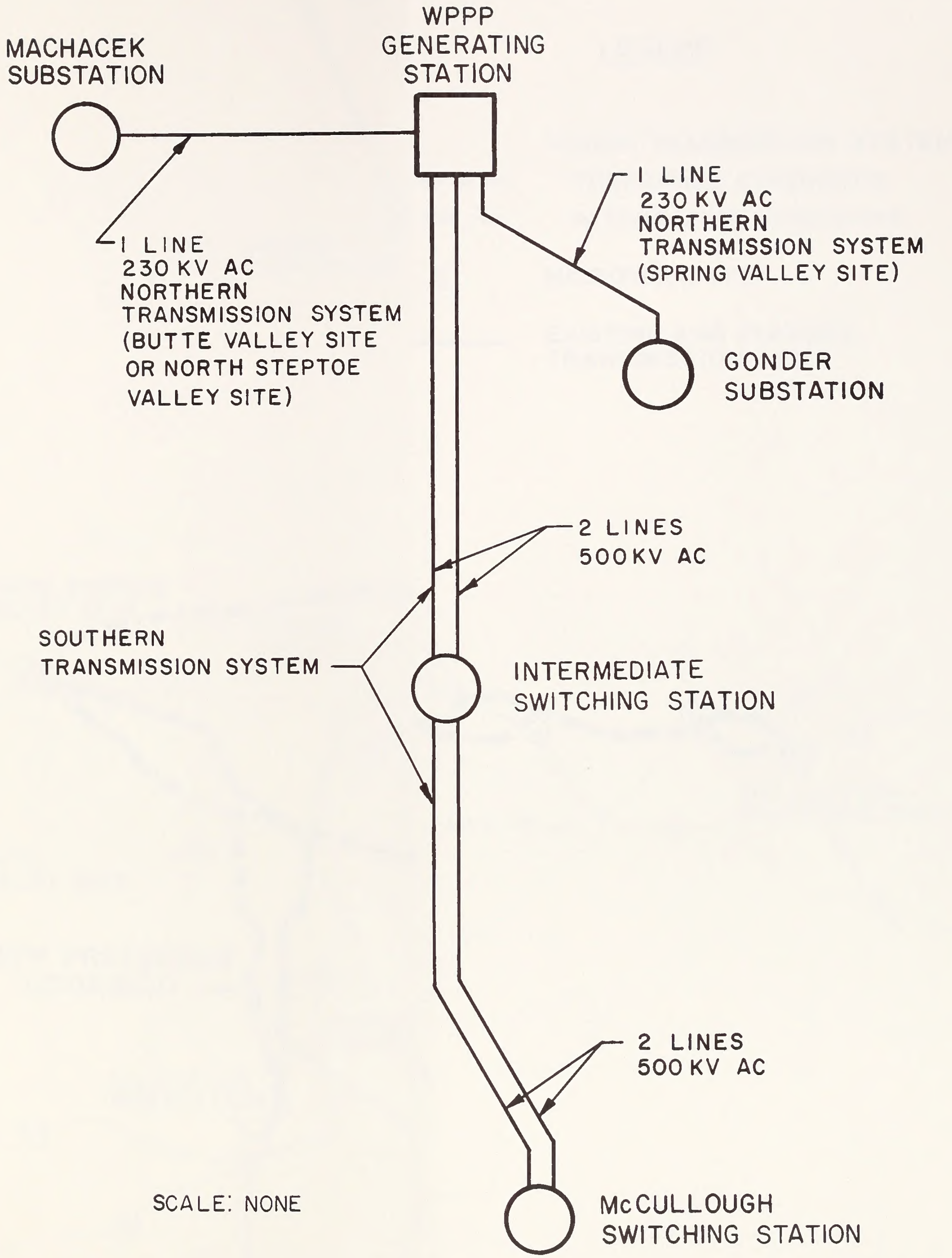


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

FLOW DIAGRAM PLANT CYCLE DATA

FIGURE 2-5

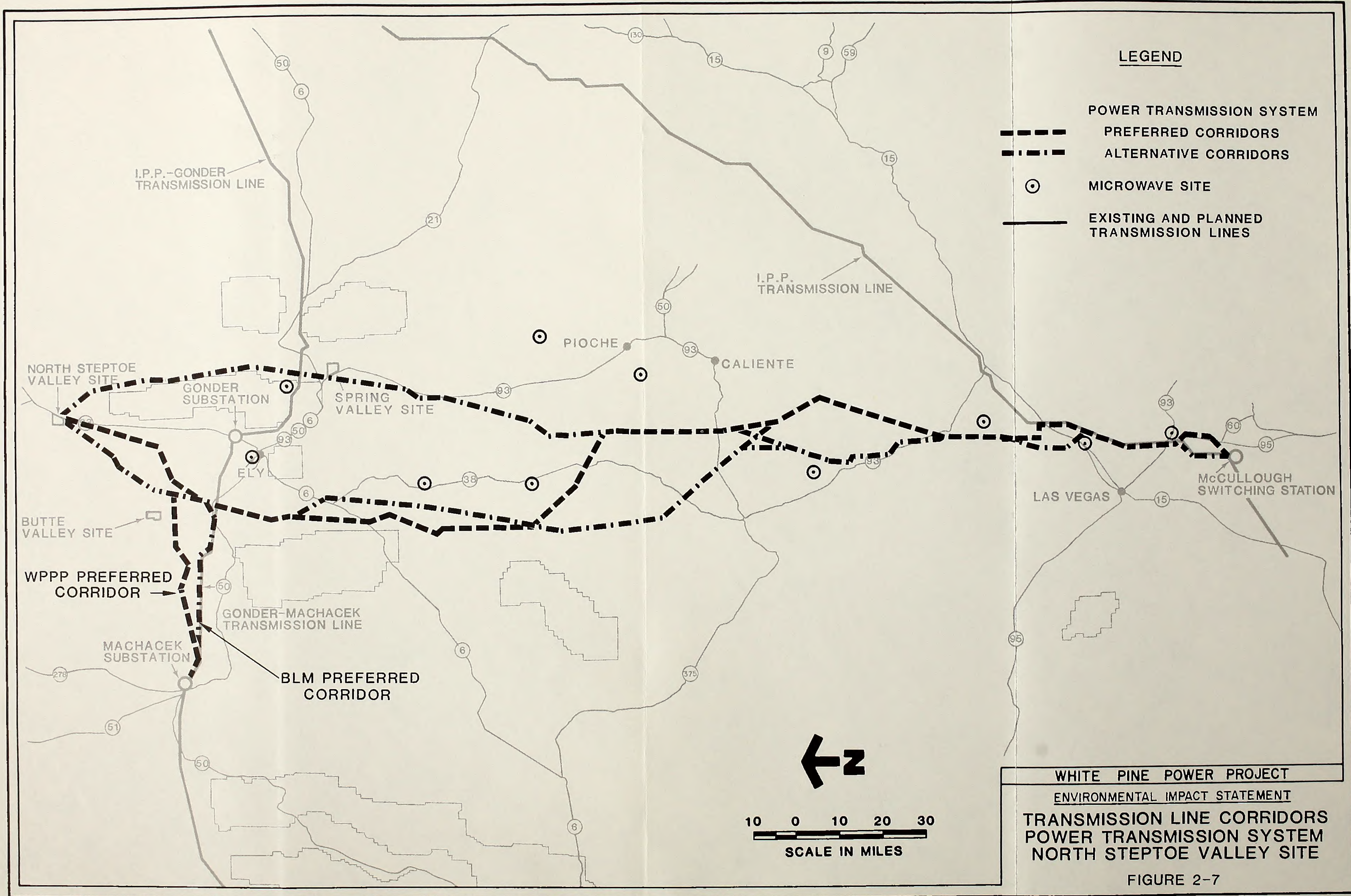


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

SCHEMATIC DIAGRAM
POWER TRANSMISSION SYSTEM

FIGURE 2-6

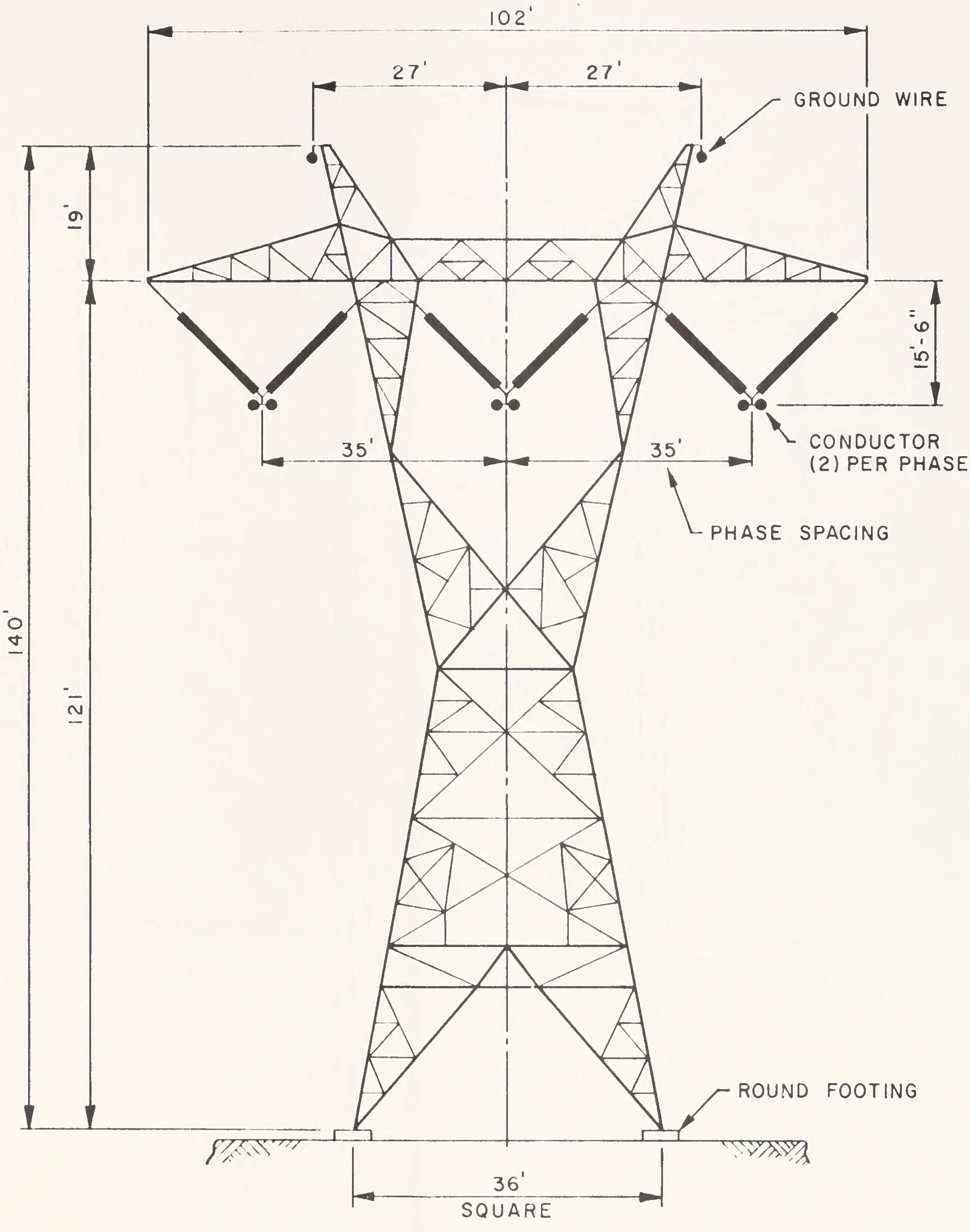


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

TRANSMISSION LINE CORRIDORS
POWER TRANSMISSION SYSTEM
NORTH STEPTOE VALLEY SITE

FIGURE 2-7



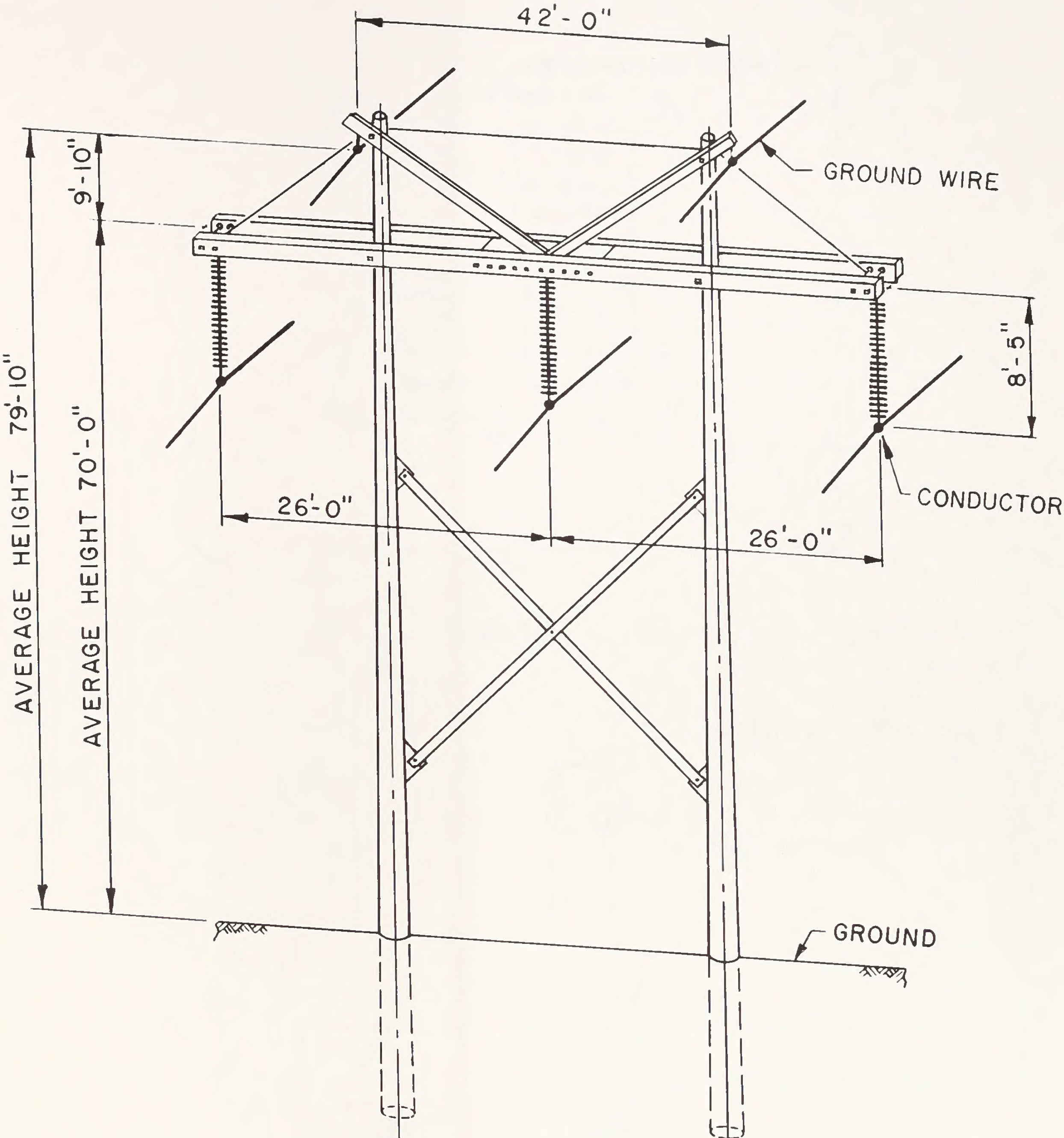
SCALE: NONE

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

TYPICAL SINGLE CIRCUIT
500 KV AC SUSPENSION TOWER

FIGURE 2-8

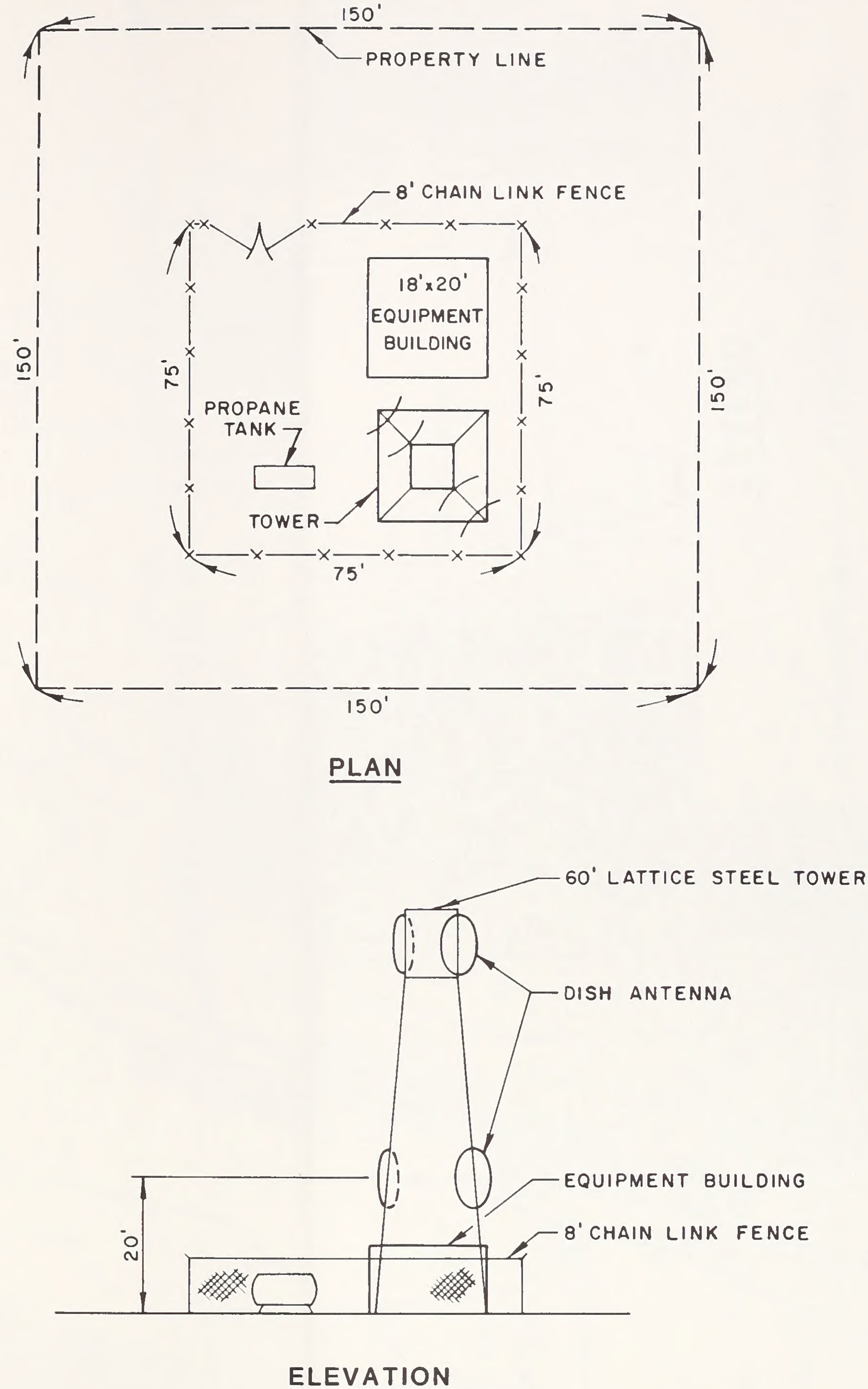


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

TYPICAL SINGLE CIRCUIT WOOD-POLE H-FRAME 230 KV AC SUSPENSION TOWER

FIGURE 2-9

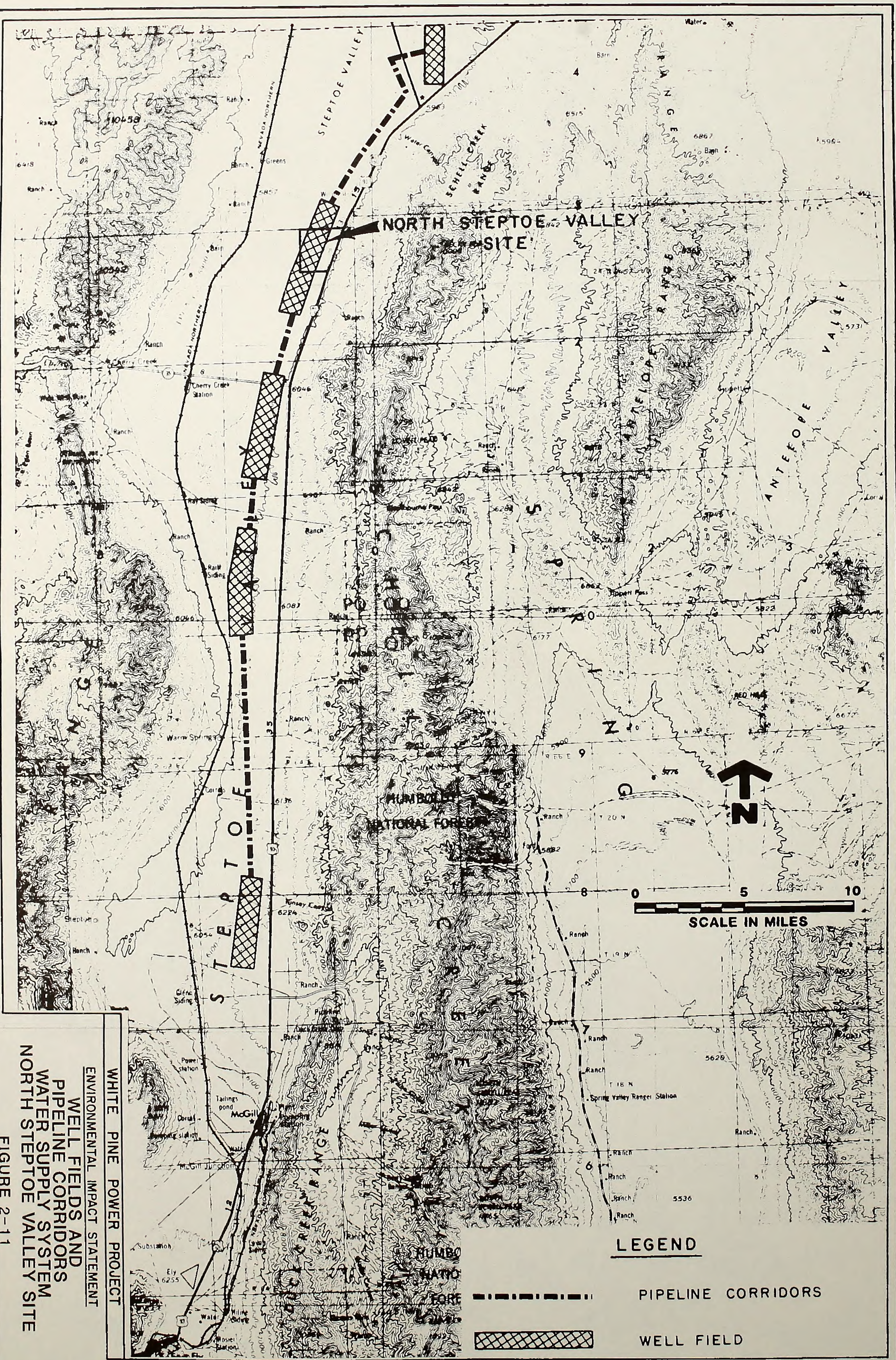


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

TYPICAL EQUIPMENT LAYOUT MICROWAVE REPEATER STATION

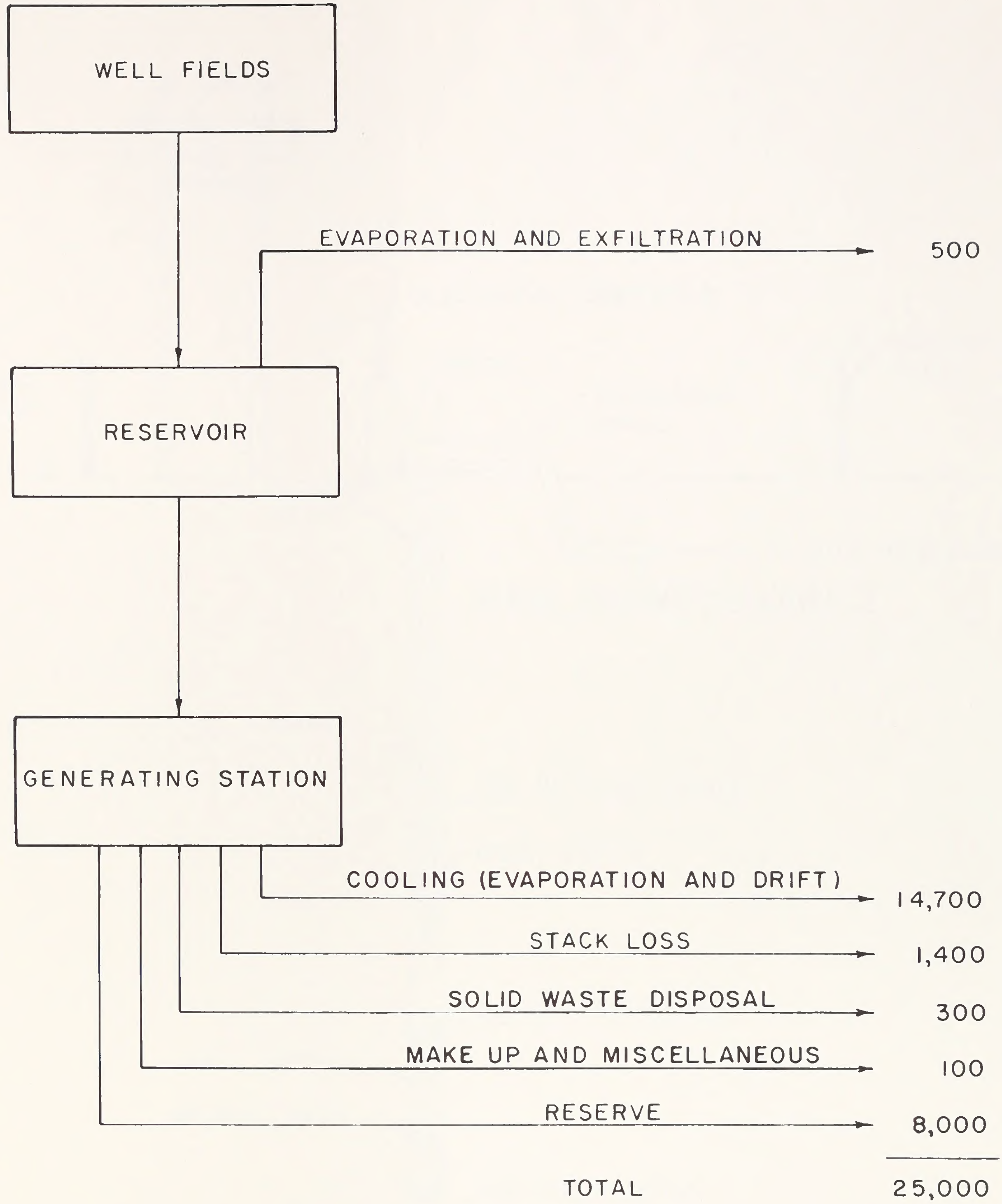
FIGURE 2-10



WHITE PINE POWER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

WELL FIELDS AND PIPELINE CORRIDORS WATER SUPPLY SYSTEM NORTH STEPTOE VALLEY SITE

FIGURE 2-11



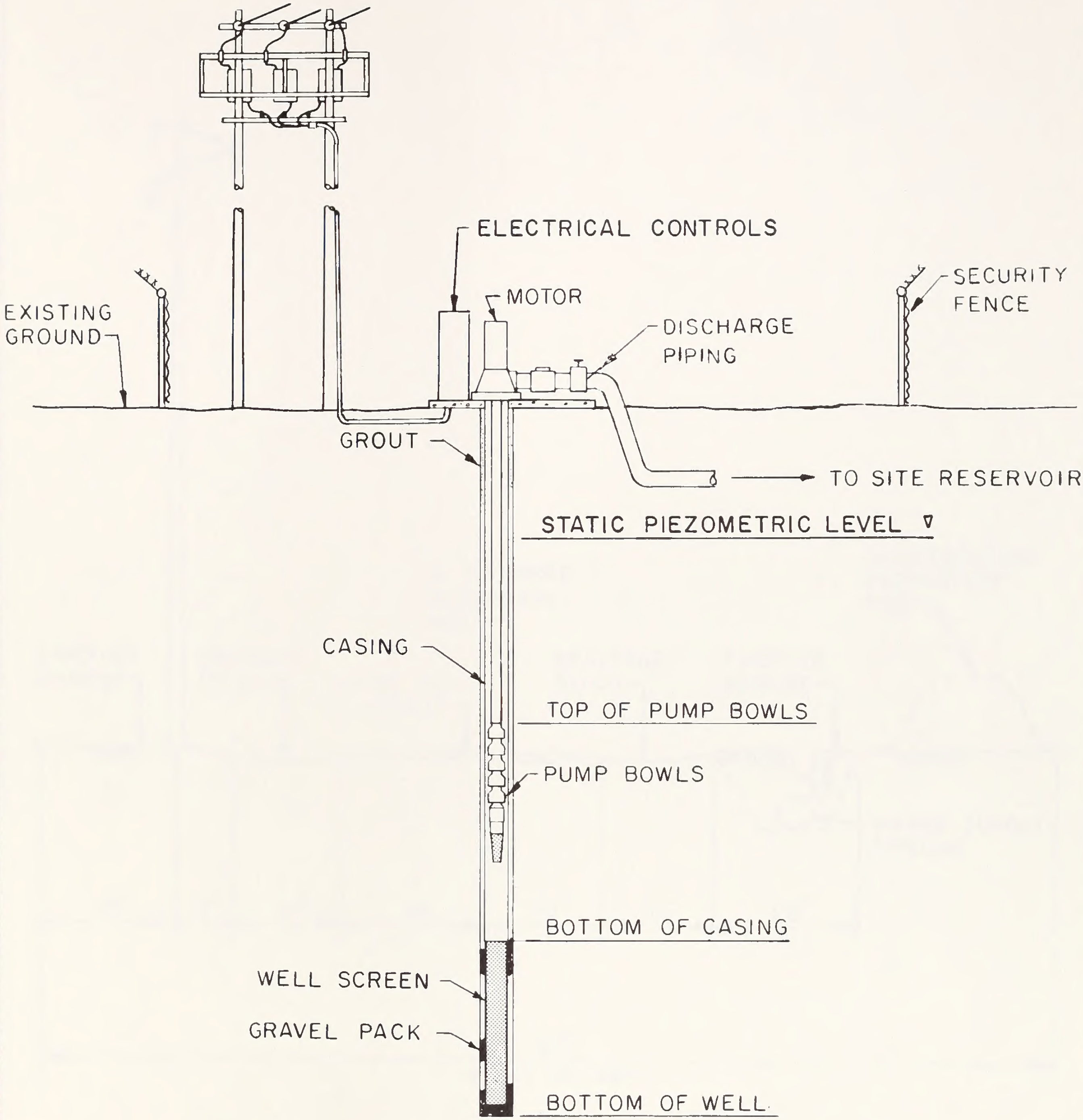
NOTES:
VALUES ARE IN ACRE-FEET PER YEAR. GENERATING STATION USAGE IS BASED ON NORMAL WEATHER CONDITIONS AND A 68 PERCENT CAPACITY FACTOR.

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

WATER BUDGET

FIGURE 2-12

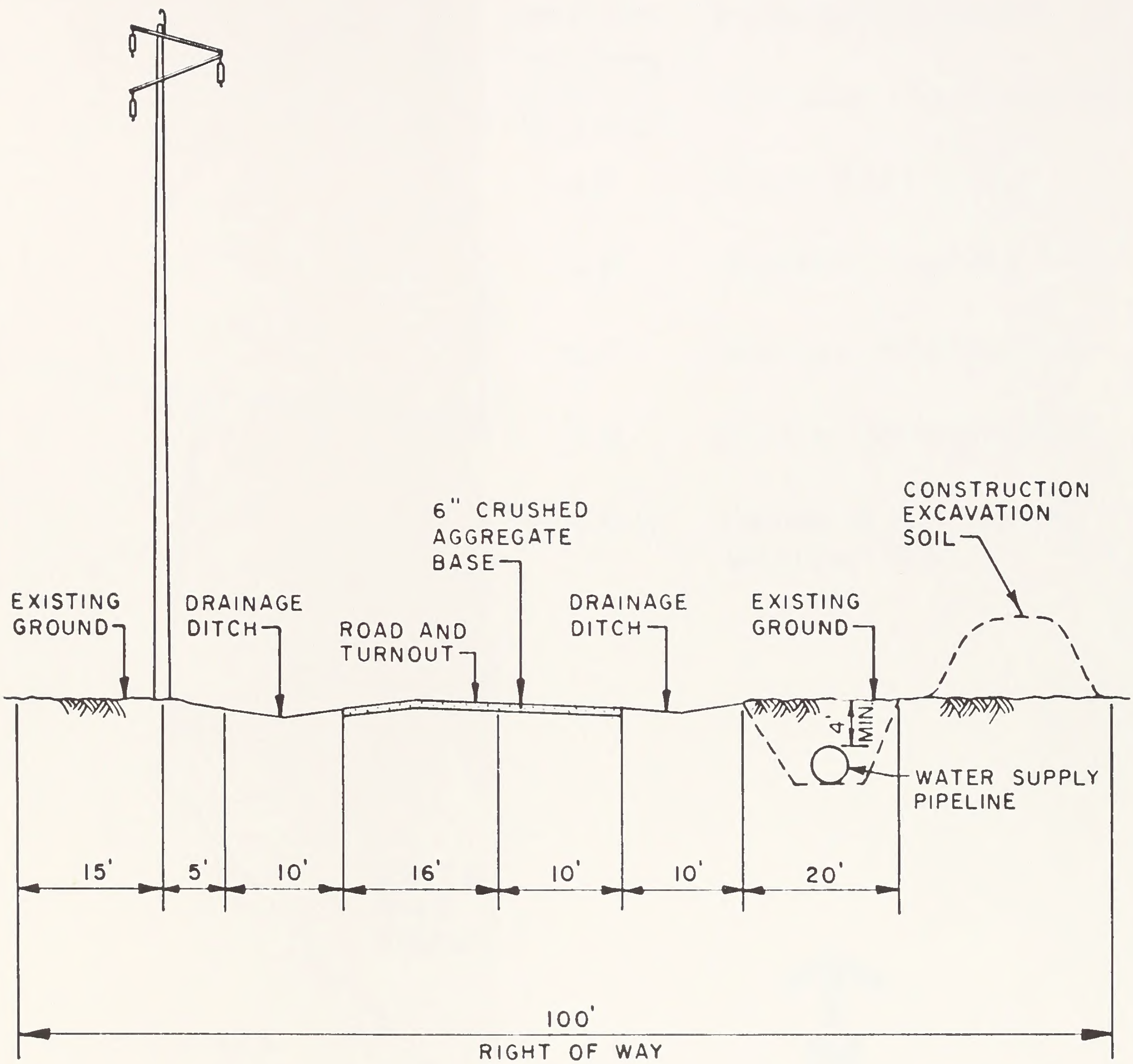


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

TYPICAL WELL PUMP INSTALLATION

FIGURE 2-13

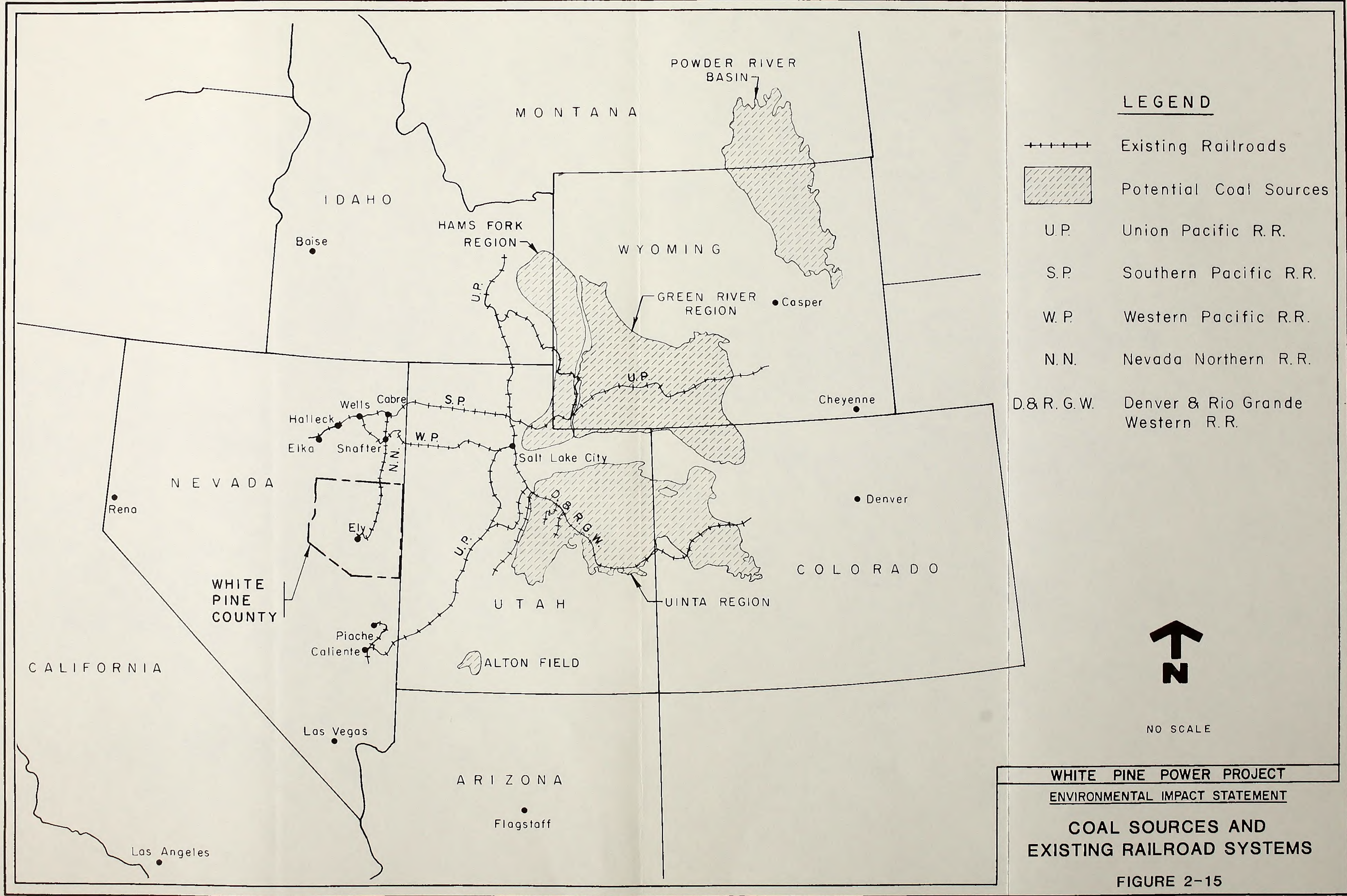


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

UTILITY CORRIDOR
WATER SUPPLY SYSTEM

FIGURE 2-14

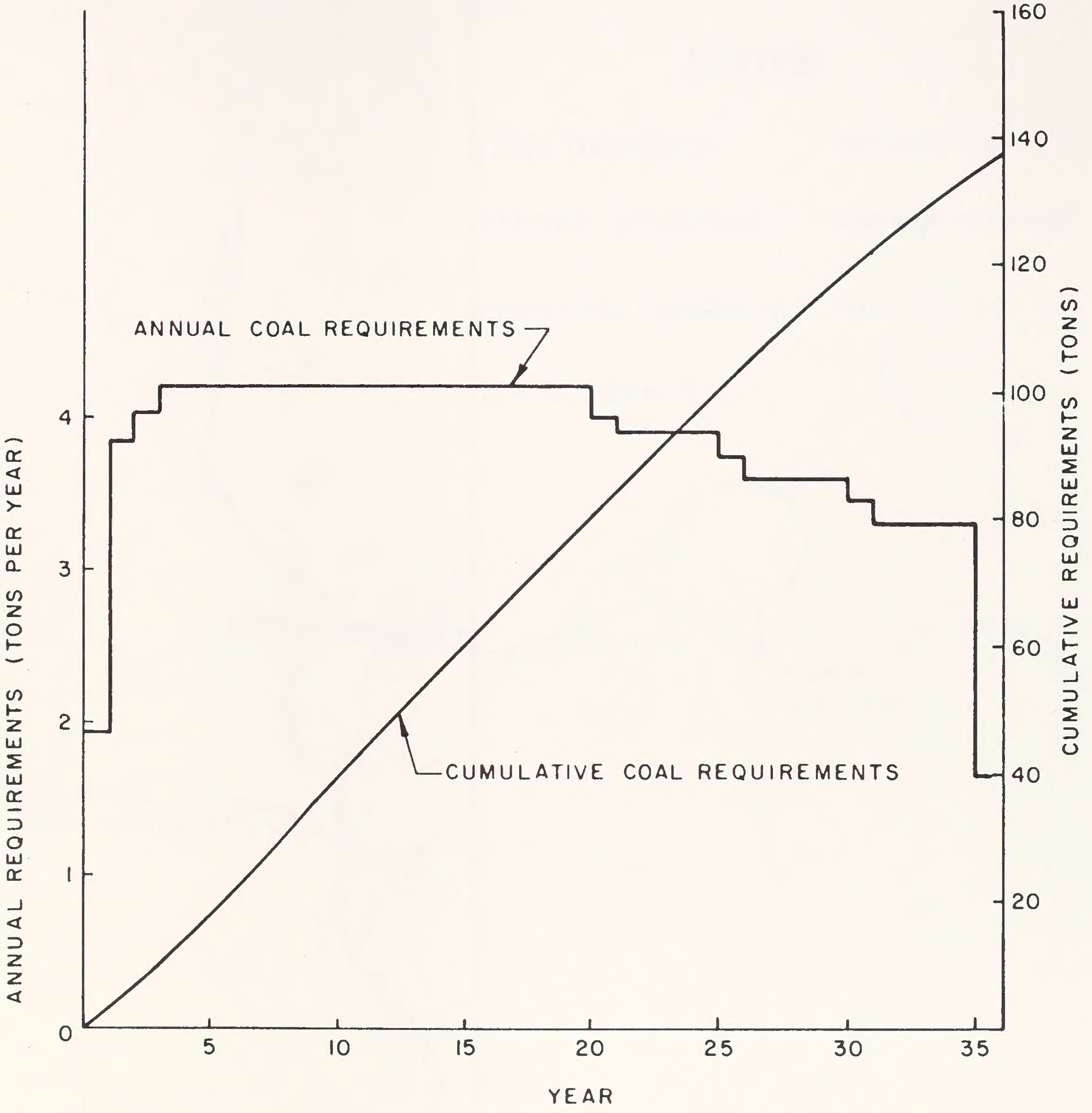


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

COAL SOURCES AND EXISTING RAILROAD SYSTEMS

FIGURE 2-15

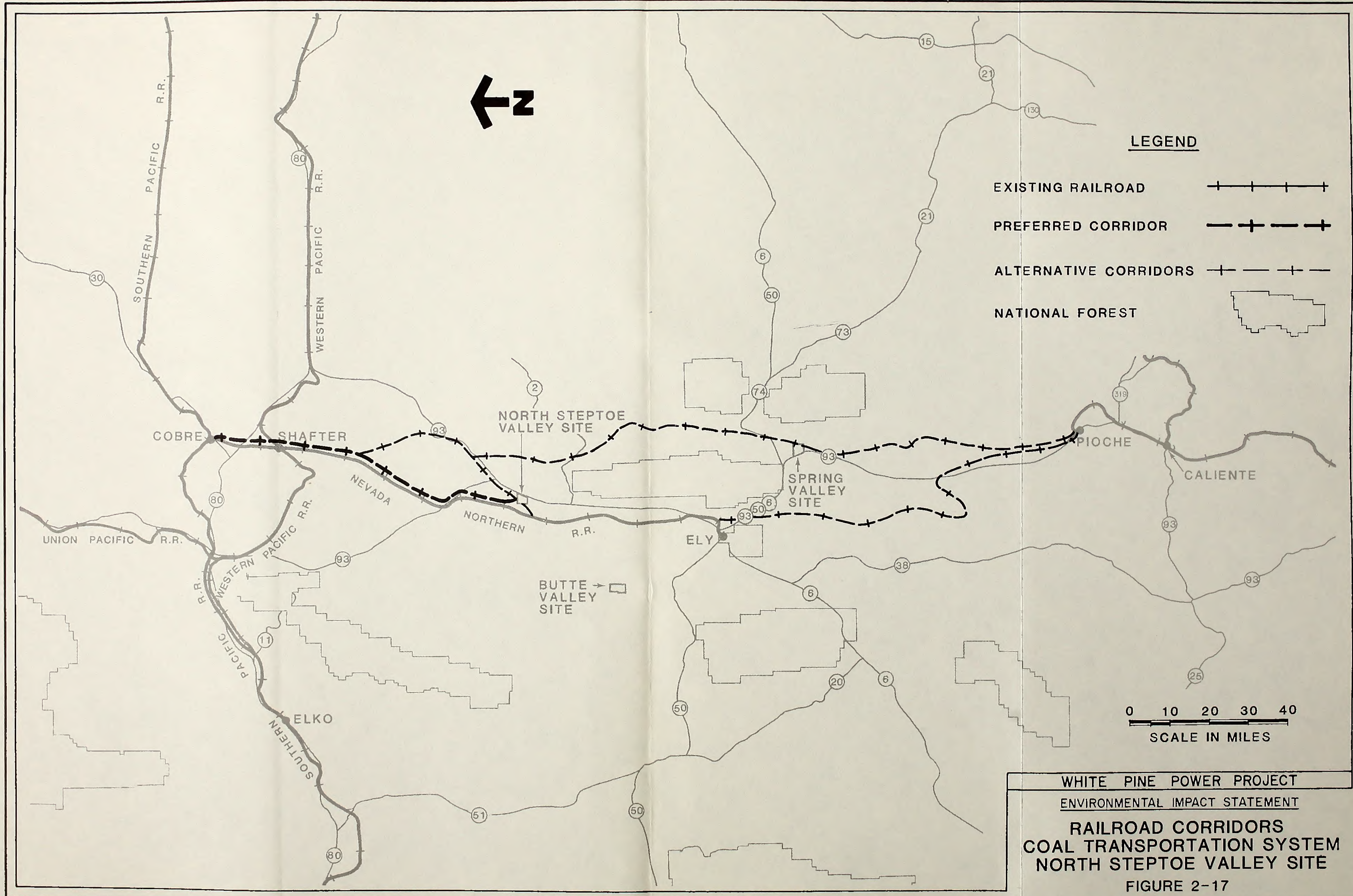


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

COAL REQUIREMENTS

FIGURE 2-16

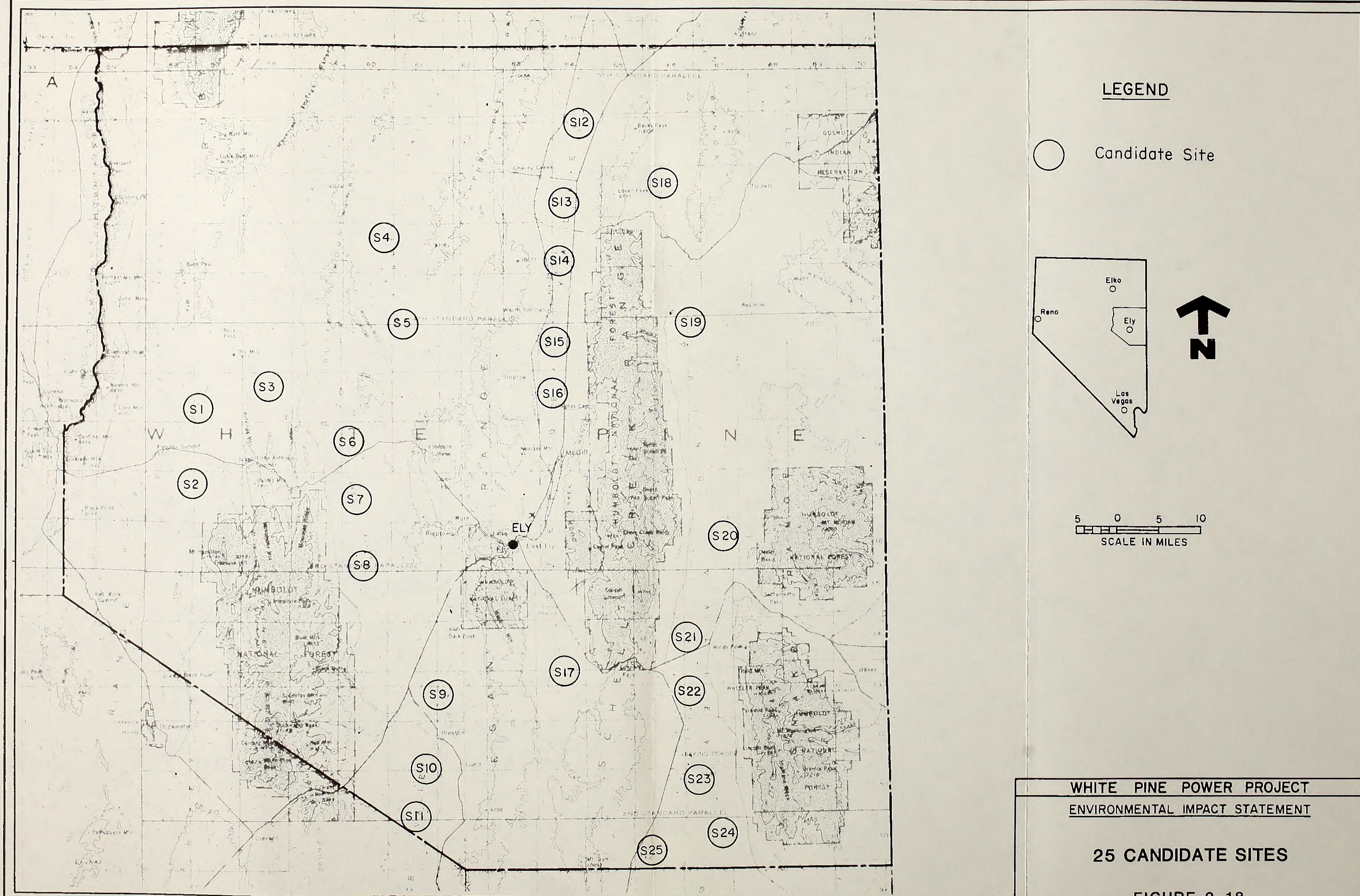


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

RAILROAD CORRIDORS
COAL TRANSPORTATION SYSTEM
NORTH STEPTOE VALLEY SITE

FIGURE 2-17

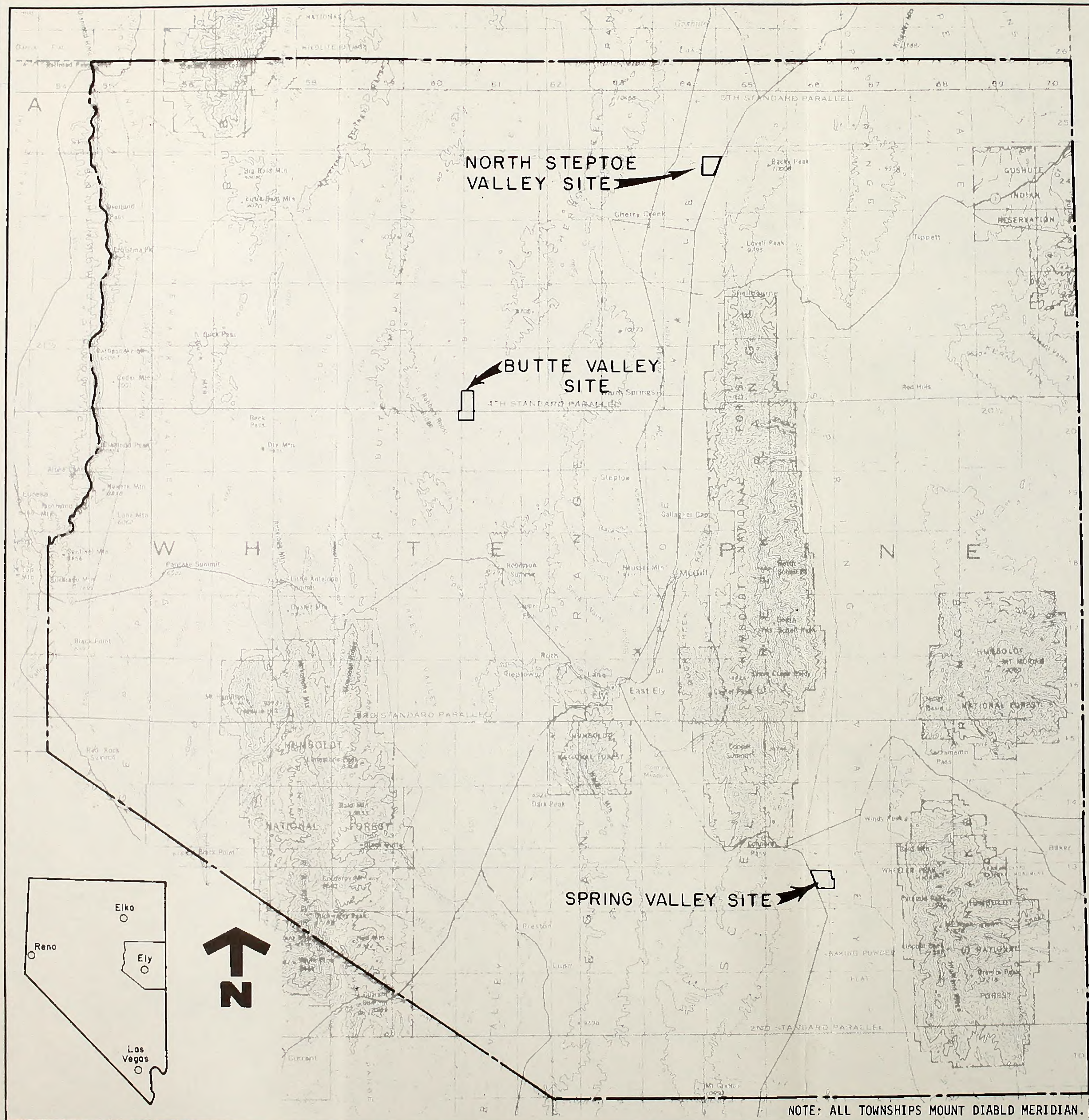


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

25 CANDIDATE SITES

FIGURE 2-18



5 0 5 10
SCALE IN MILES

LEGAL DESCRIPTION

BUTTE VALLEY SITE

TOWNSHIP 20 NORTH, RANGE 60 EAST – THE EAST $\frac{1}{2}$ OF THE NORTHEAST $\frac{1}{4}$ OF SECTION 1

TOWNSHIP 20 NORTH, RANGE 61 EAST – THE NORTH $\frac{1}{2}$ OF SECTION 5 AND NORTHWEST $\frac{1}{4}$ OF SECTION 6

TOWNSHIP 21 NORTH, RANGE 60 EAST – THE EAST $\frac{1}{2}$ OF SECTION 25 AND THE EAST $\frac{1}{2}$ OF SECTION 26

TOWNSHIP 21 NORTH, RANGE 61 EAST – THE WEST $\frac{1}{2}$ OF SECTION 30 AND THE WEST $\frac{1}{2}$ OF SECTION 31

NORTH STEPTOE VALLEY SITE

TOWNSHIP 24 NORTH, RANGE 64 EAST – SECTION 2, THE EAST $\frac{1}{2}$ OF SECTION 3 AND 10, AND THOSE PORTIONS OF SECTIONS 1, 11 AND 12 LYING WESTERLY OF THE WEST RIGHT-OF-WAY LINE OF U.S. HIGHWAY 93

SPRING VALLEY SITE

TOWNSHIP 13 NORTH, RANGE 66 EAST – SECTIONS 13 AND 24, AND THOSE PORTIONS OF SECTIONS 14, 15 AND 23 LYING EASTERLY OF THE EAST RIGHT-OF-WAY LINE OF U.S. HIGHWAY 93

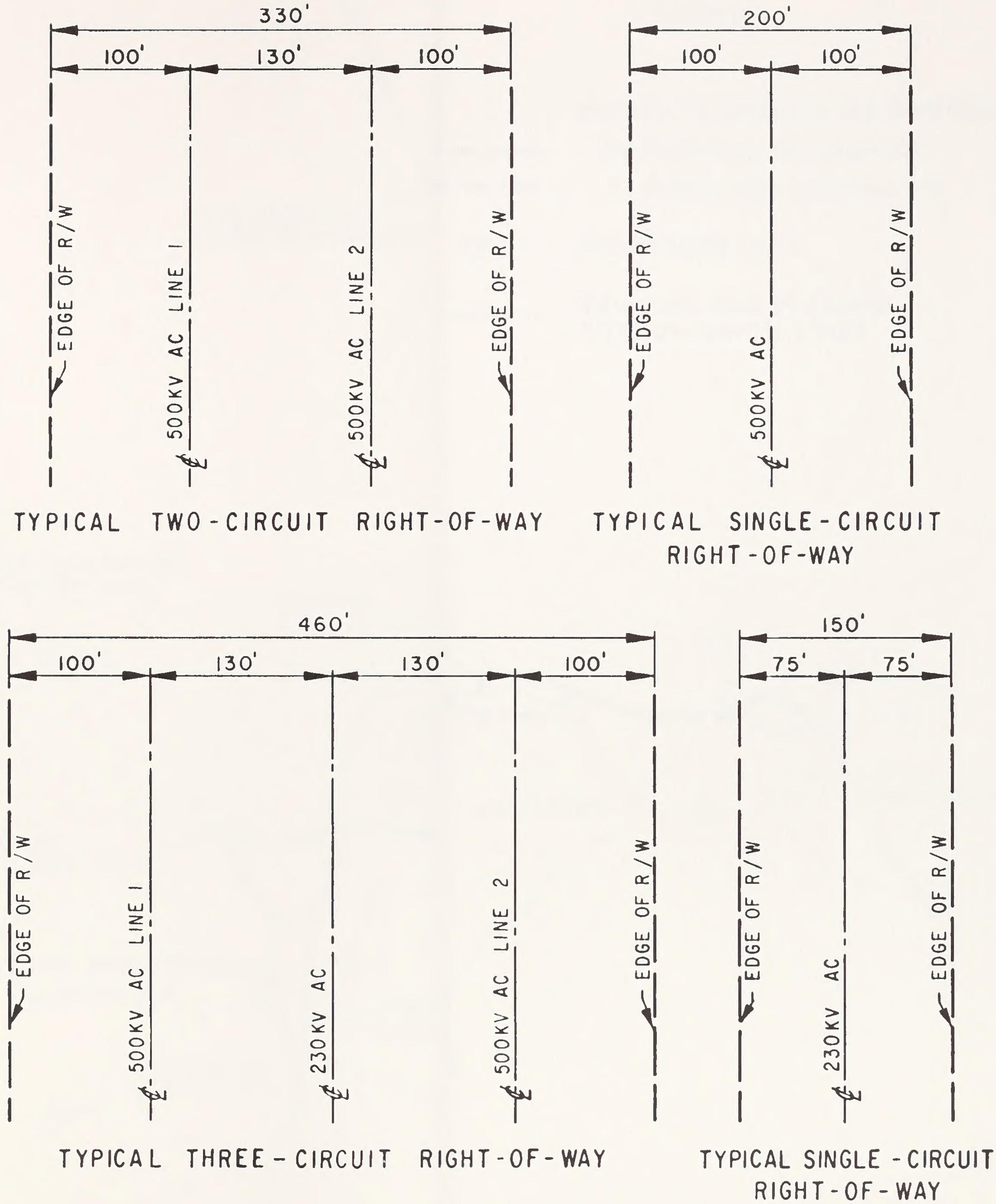
TOWNSHIP 13 NORTH, RANGE 67 EAST – THE WEST $\frac{1}{2}$ OF THE WEST $\frac{1}{2}$ OF THE WEST $\frac{1}{2}$ OF SECTION 19, AND THE WEST $\frac{1}{2}$ OF THE EAST $\frac{1}{2}$ OF THE WEST $\frac{1}{2}$ OF SECTION 19

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

RECOMMENDED SITES

FIGURE 2-19

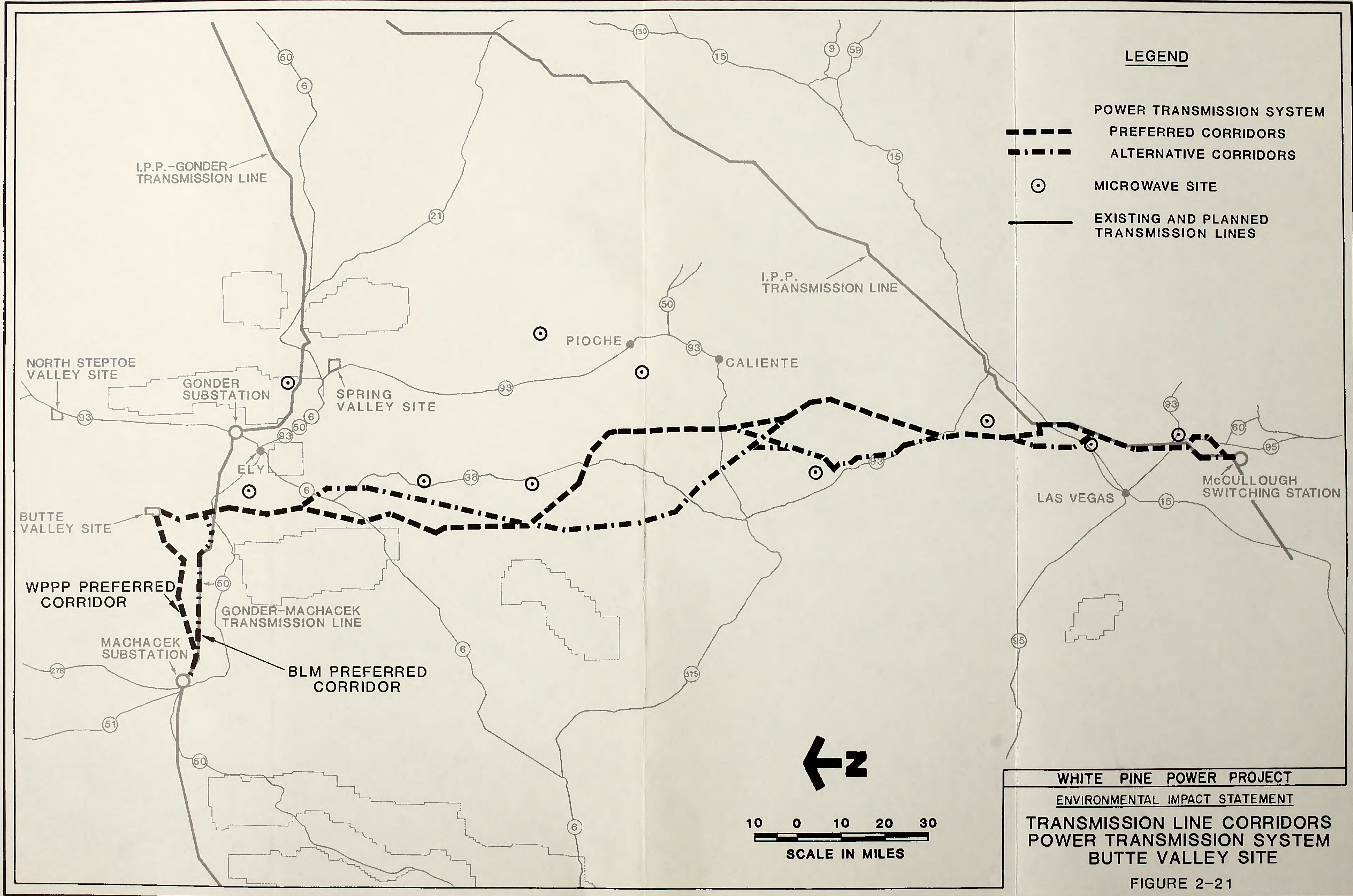


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

RIGHT-OF-WAY REQUIREMENTS POWER TRANSMISSION SYSTEM

FIGURE 2-20

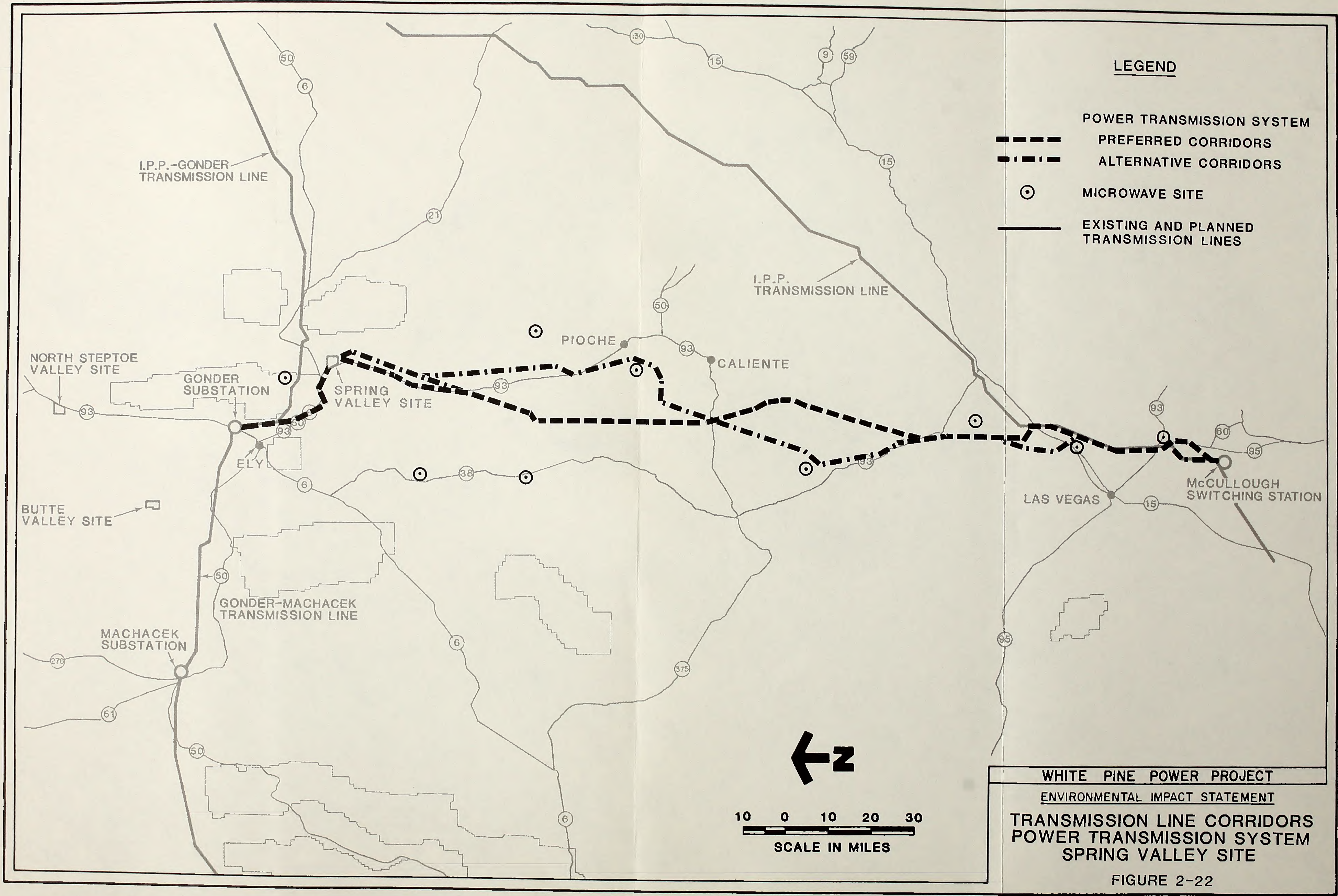


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

TRANSMISSION LINE CORRIDORS
POWER TRANSMISSION SYSTEM
BUTTE VALLEY SITE

FIGURE 2-21

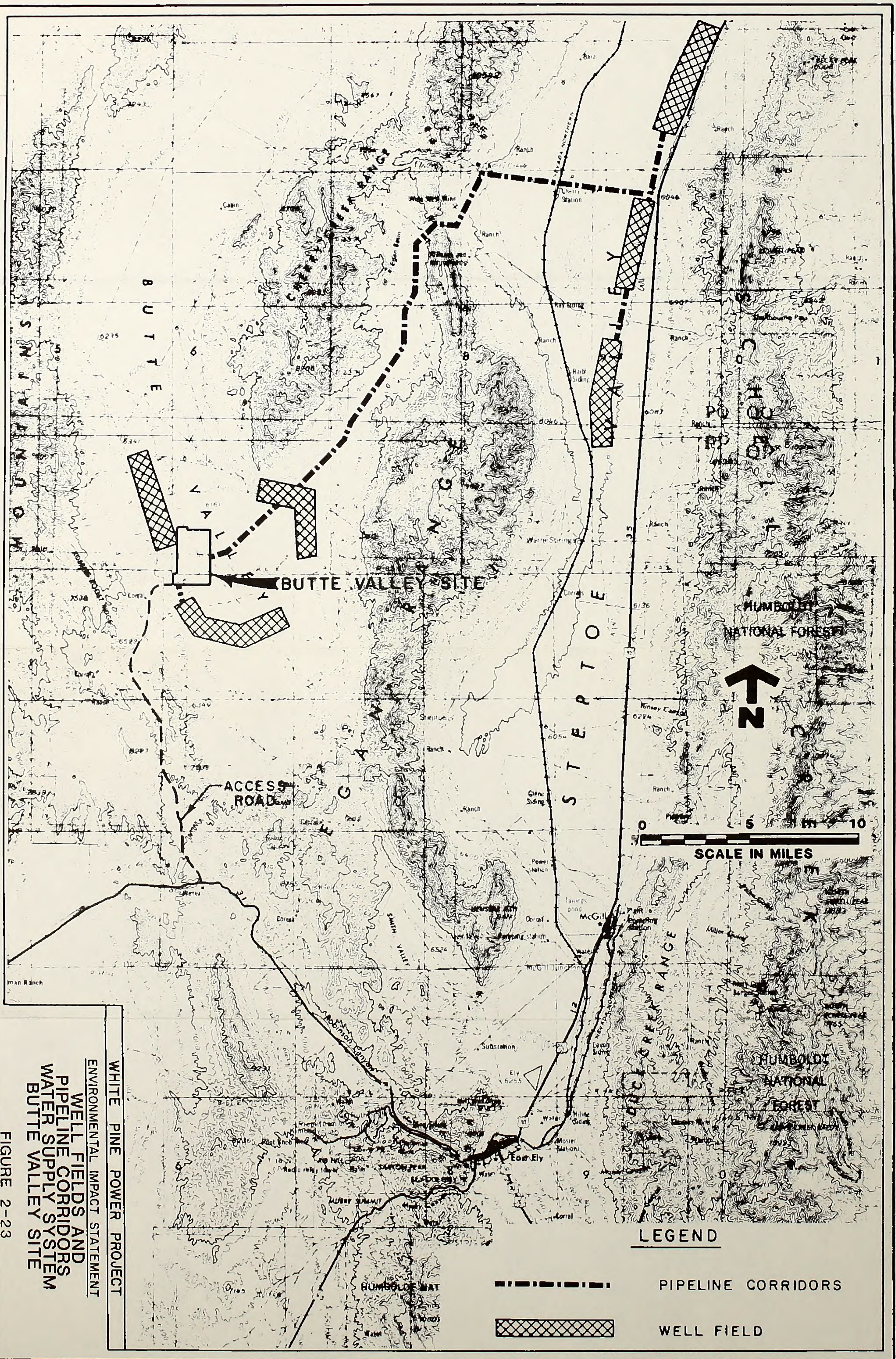


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

TRANSMISSION LINE CORRIDORS
POWER TRANSMISSION SYSTEM
SPRING VALLEY SITE

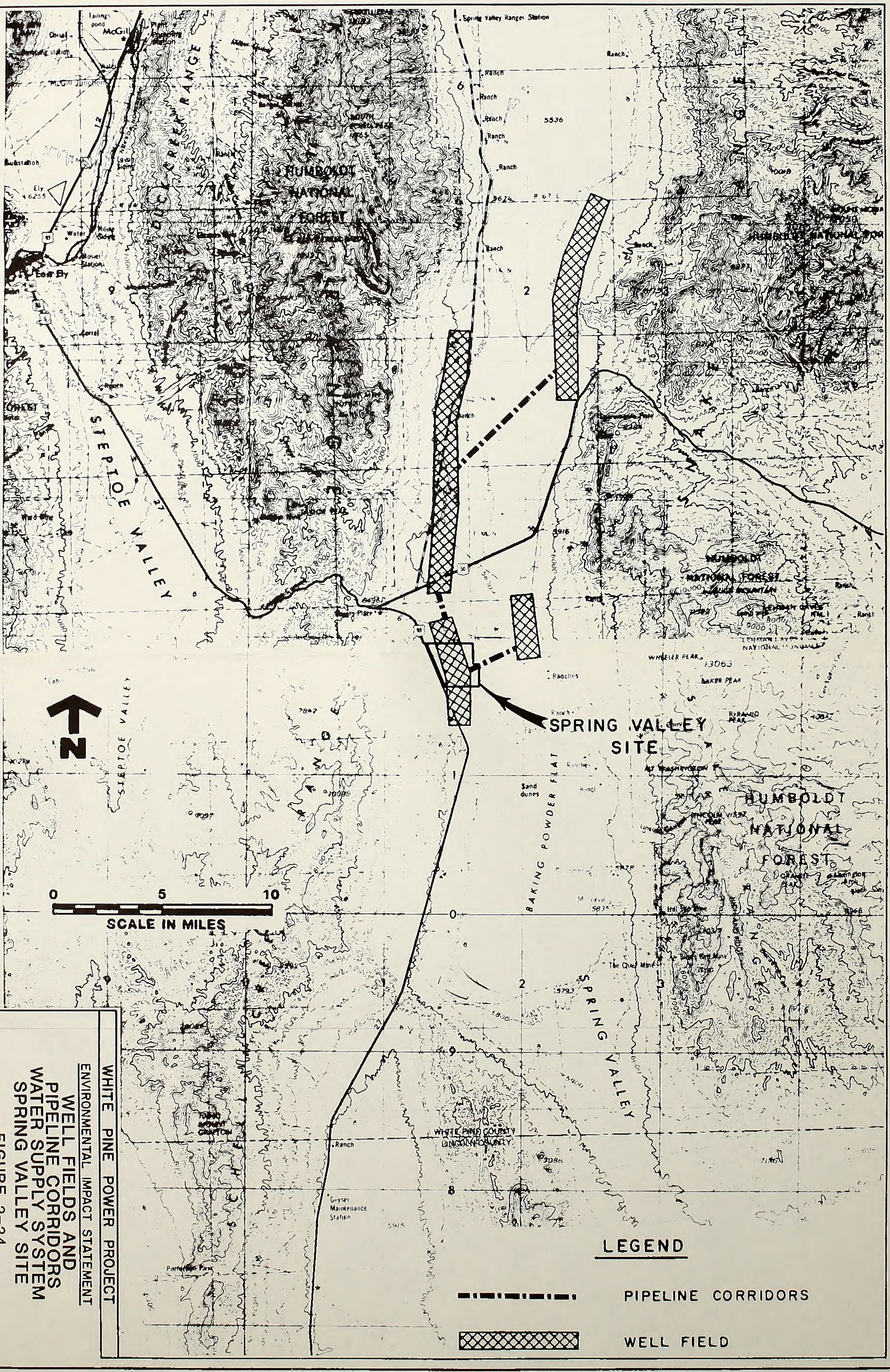
FIGURE 2-22



WHITE PINE POWER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

WELL FIELDS AND PIPELINE CORRIDORS WATER SUPPLY SYSTEM BUTTE VALLEY SITE

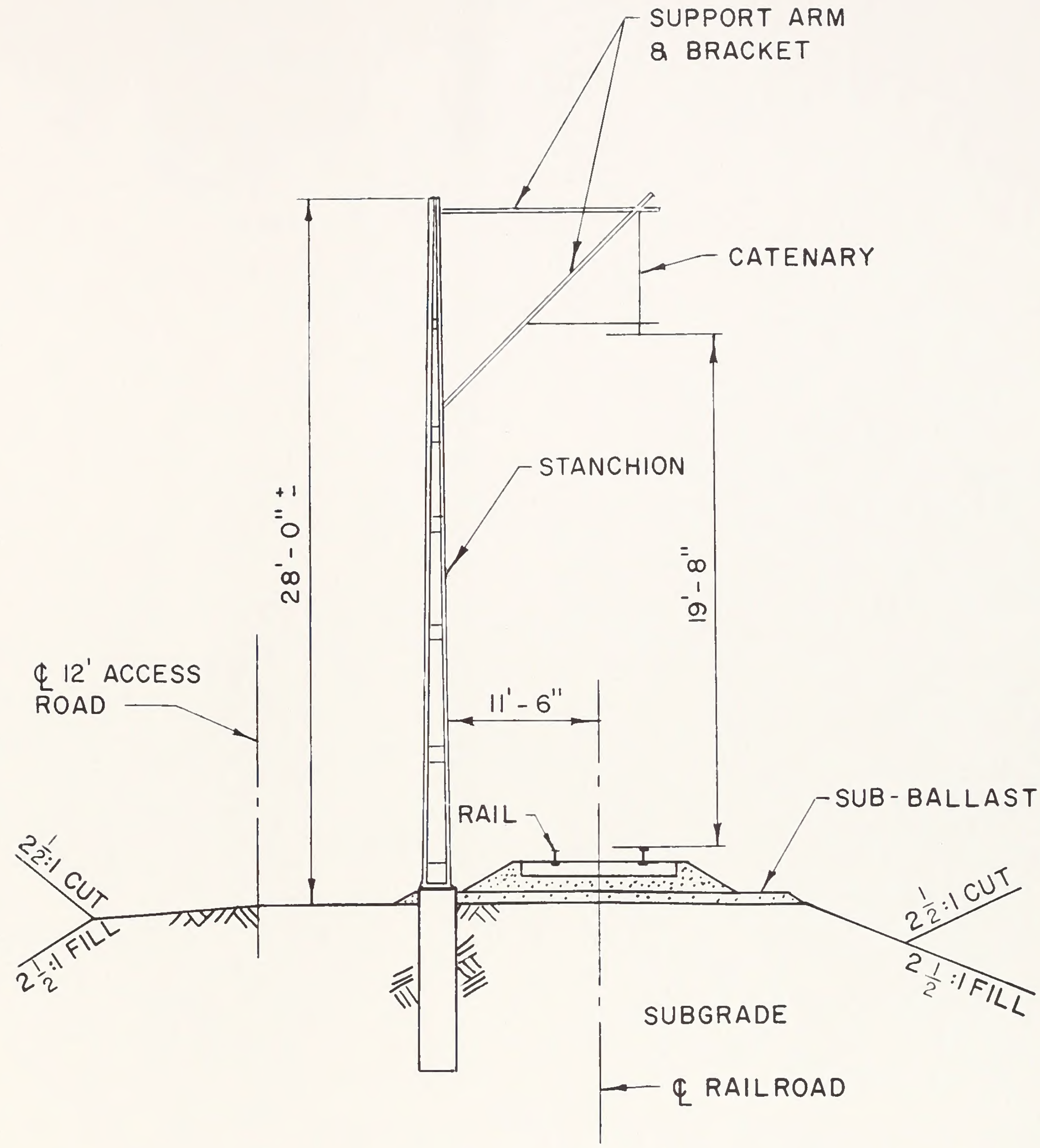
FIGURE 2-23



WHITE PINE POWER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

WELL FIELDS AND PIPELINE CORRIDORS WATER SUPPLY SYSTEM SPRING VALLEY SITE

FIGURE 2-24

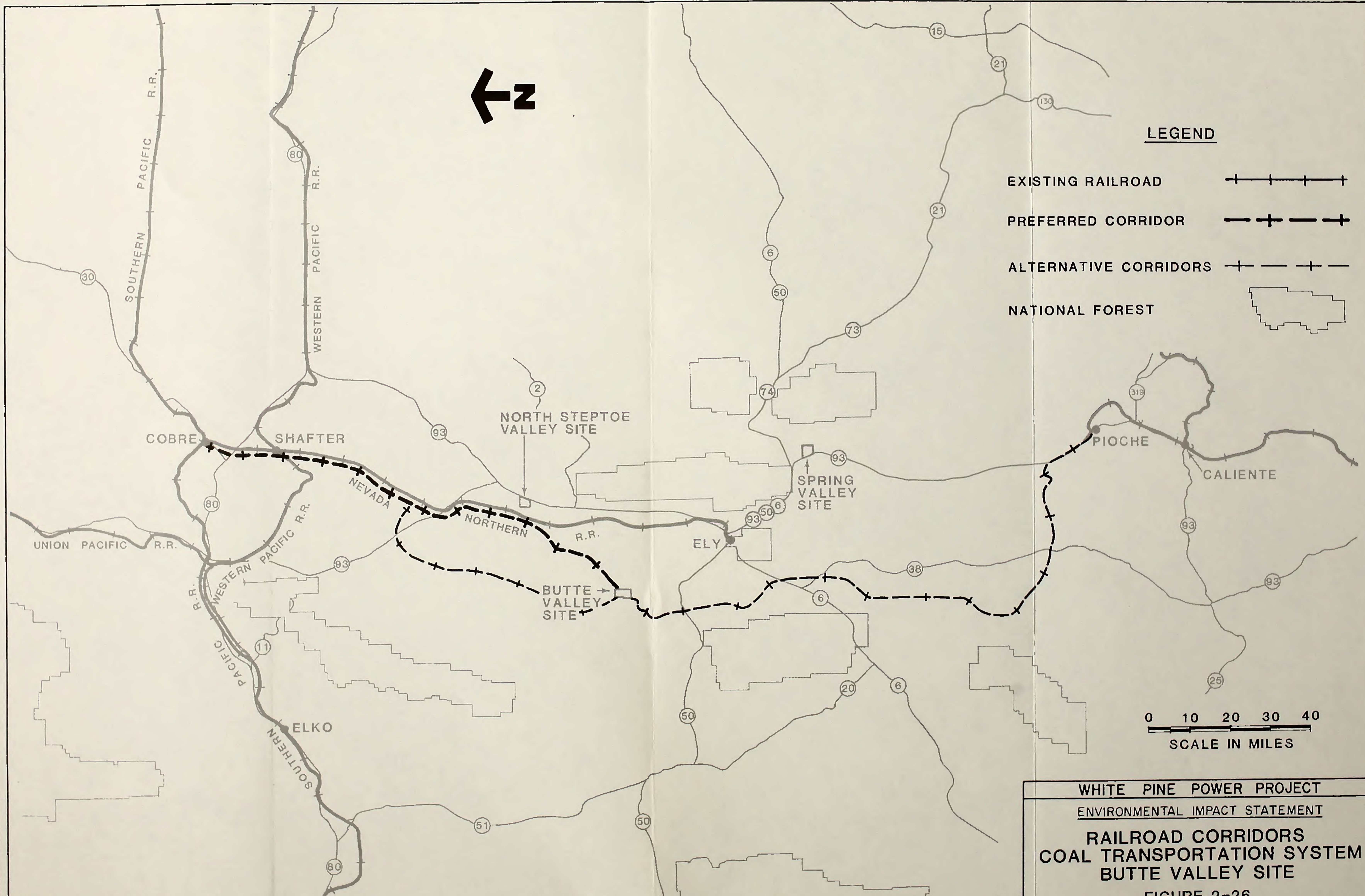


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

TYPICAL CROSS-SECTION ELECTRIFIED RAILROAD

FIGURE 2-25

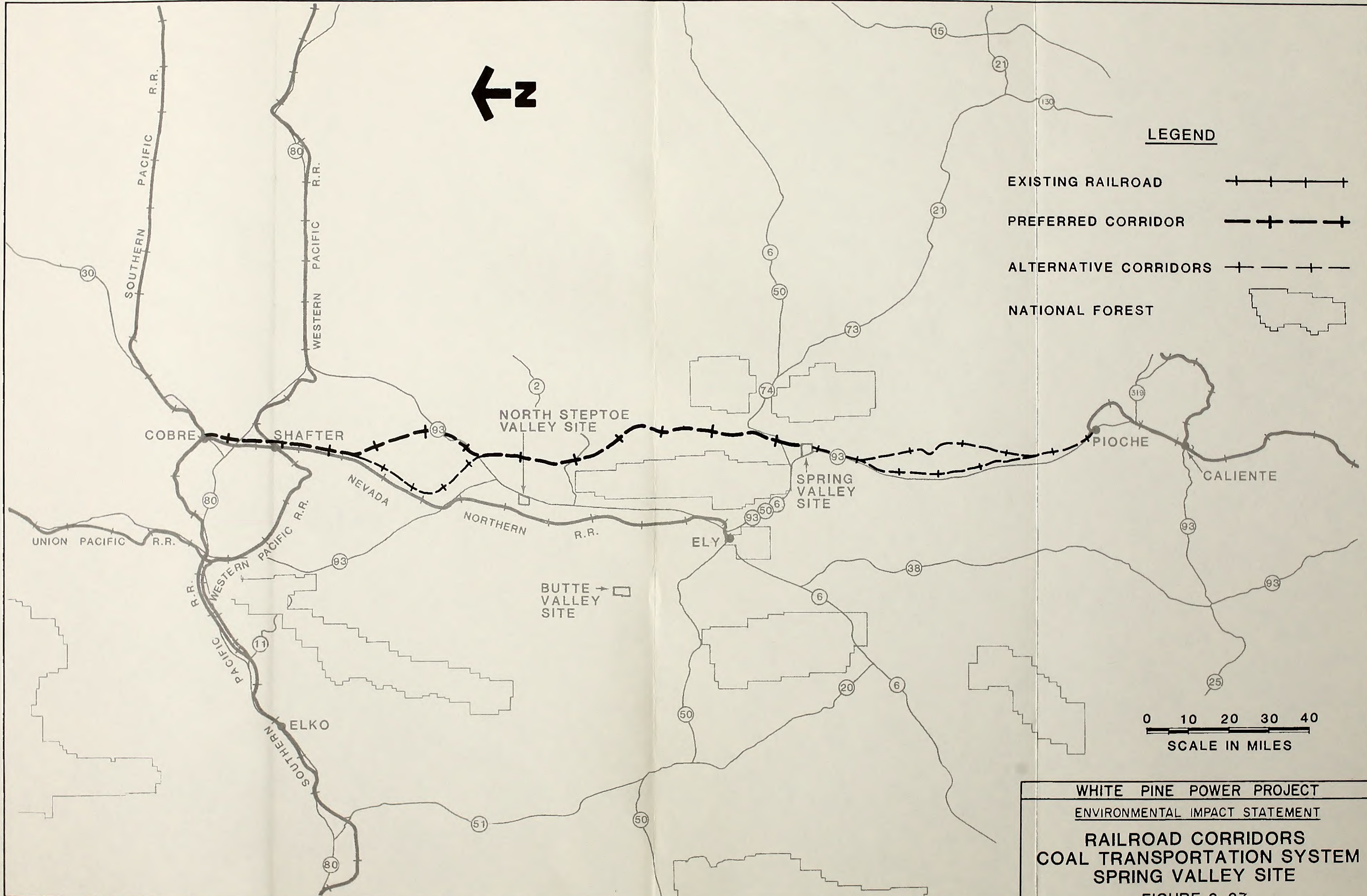


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

RAILROAD CORRIDORS
COAL TRANSPORTATION SYSTEM
BUTTE VALLEY SITE

FIGURE 2-26

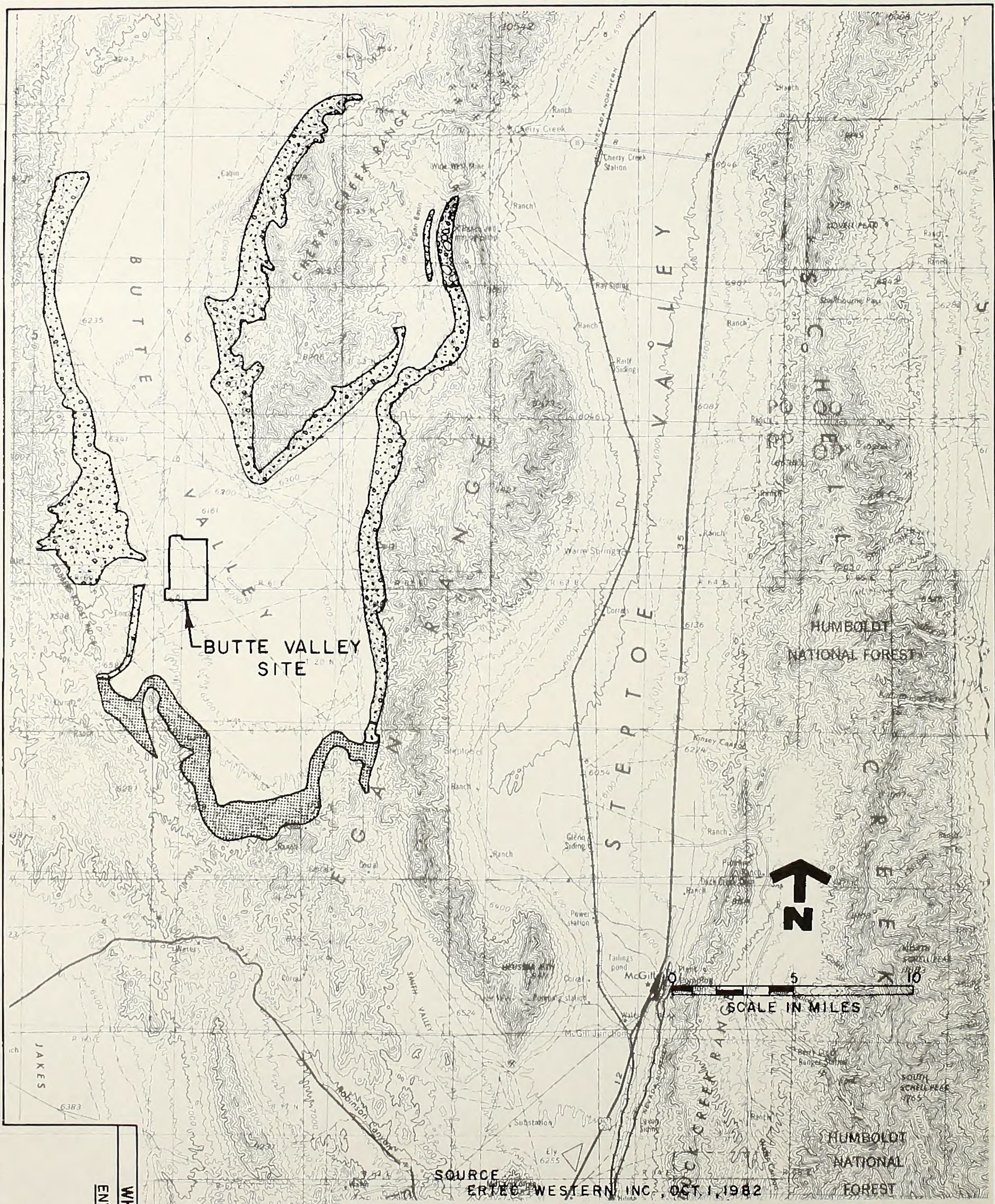


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

RAILROAD CORRIDORS
COAL TRANSPORTATION SYSTEM
SPRING VALLEY SITE

FIGURE 2-27



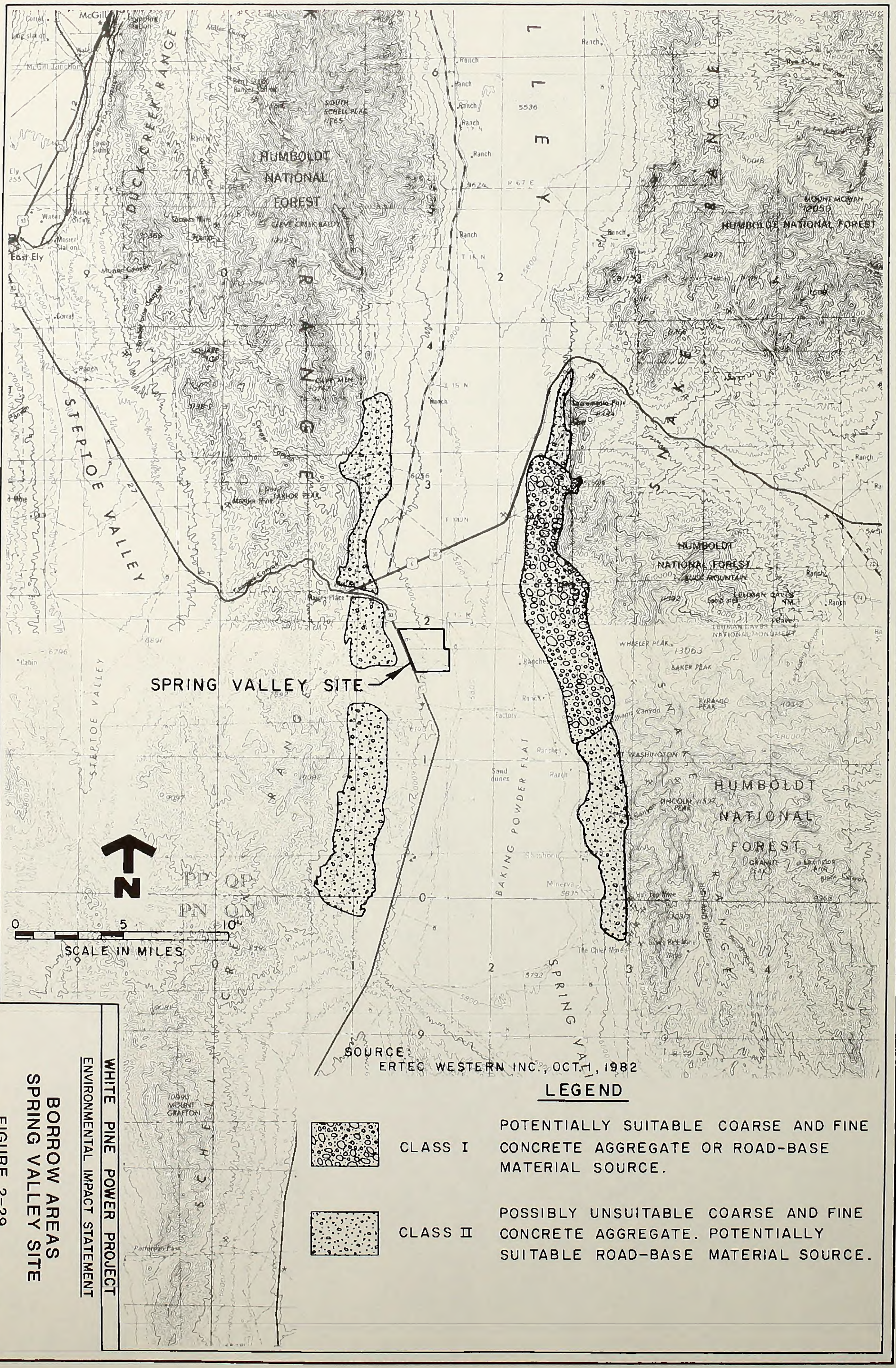
LEGEND

	CLASS I	POTENTIALLY SUITABLE COARSE AND FINE CONCRETE AGGREGATE OR ROAD-BASE MATERIAL SOURCE.
	CLASS II	POSSIBLY UNSUITABLE COARSE AND FINE CONCRETE AGGREGATE. POTENTIALLY SUITABLE ROAD-BASE MATERIAL SOURCE.
	CLASS III	PROBABLY UNSUITABLE COARSE AND FINE CONCRETE AGGREGATE OR POSSIBLY UNSUITABLE ROAD-BASE MATERIAL.

WHITE PINE POWER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

BORROW AREAS
BUTTE VALLEY SITE

FIGURE 2-28



LEGEND

	CLASS I	POTENTIALLY SUITABLE COARSE AND FINE CONCRETE AGGREGATE OR ROAD-BASE MATERIAL SOURCE.
	CLASS II	POSSIBLY UNSUITABLE COARSE AND FINE CONCRETE AGGREGATE. POTENTIALLY SUITABLE ROAD-BASE MATERIAL SOURCE.

WHITE PINE POWER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

BORROW AREAS
SPRING VALLEY SITE

FIGURE 2-29

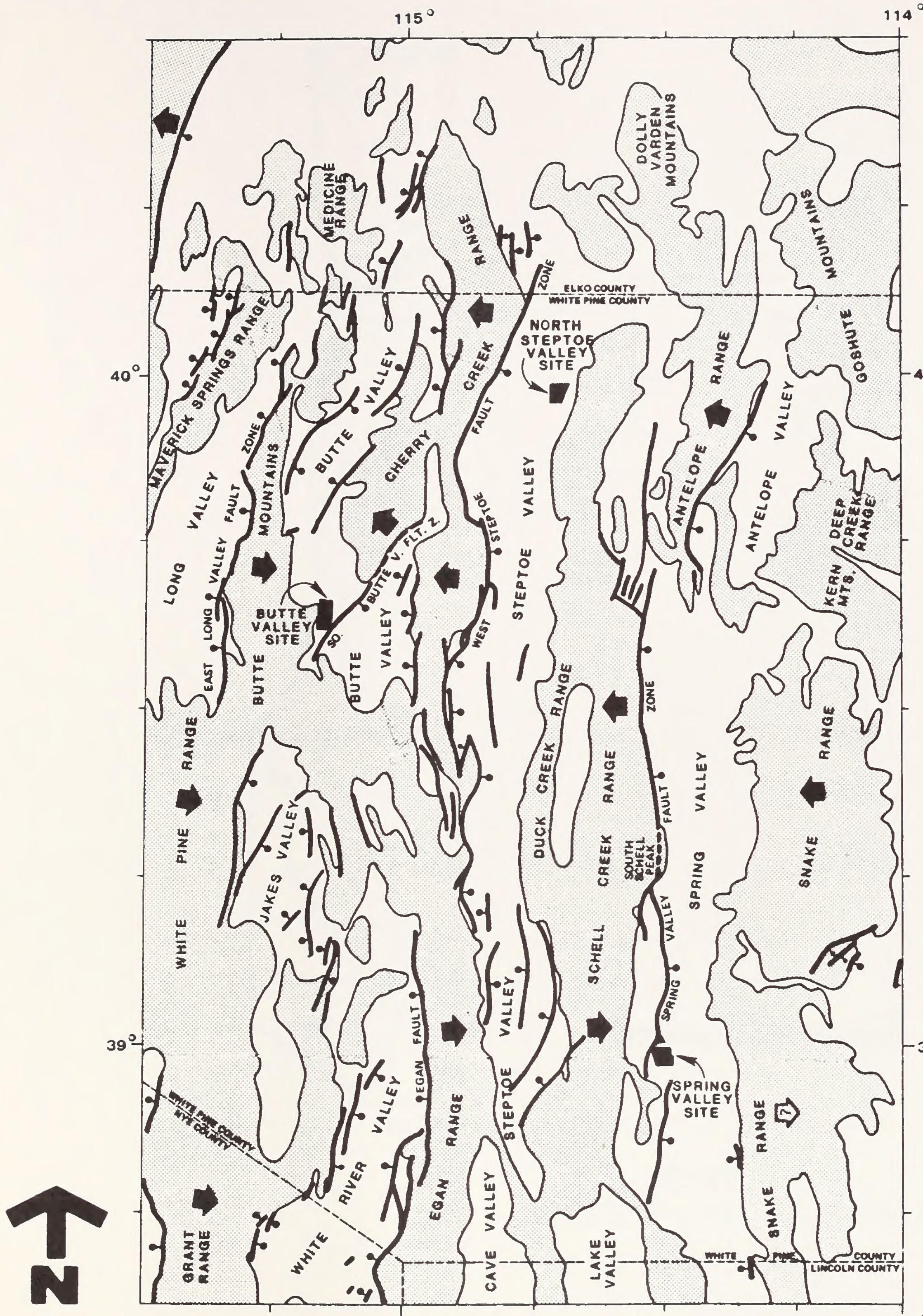
RELATIVE GEOLOGIC TIME				TIME (MILLIONS OF YEARS)
ERA	**PERIOD**		**EPOCH**	
CENOZOIC	QUATERNARY		HOLOCENE	
			PLEISTOCENE	2-3
	TERTIARY		PLIOCENE	12
			MIOCENE	26
			OLIGOCENE	37-38
			EOCENE	53-54
			PALEOCENE	65
MESOZOIC	CRETACEOUS		LATE EARLY	136
	JURASSIC		LATE MIDDLE EARLY	190-195
	TRIASSIC		LATE MIDDLE EARLY	225
PALEOZOIC	PERMIAN		LATE EARLY	280
	CARBON-IFEROUS	PENNSYLVANIAN	LATE MIDDLE EARLY	
		MISSISSIPPIAN	LATE EARLY	345
	DEVONIAN		LATE MIDDLE EARLY	395
	SILURIAN		LATE MIDDLE EARLY	430-440
	ORDOVICIAN		LATE MIDDLE EARLY	500
	CAMBRIAN		LATE MIDDLE EARLY	570
PRECAMBRIAN				3,600+

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

GEOLOGIC TIME SCALE

FIGURE 3-1



LEGEND

MAJOR LATE QUATERNARY FAULT; TICK MARK INDICATES DOWNDROPPED BLOCK.

DIRECTION OF LATE CENOZOIC TILT OF MOUNTAIN BLOCK

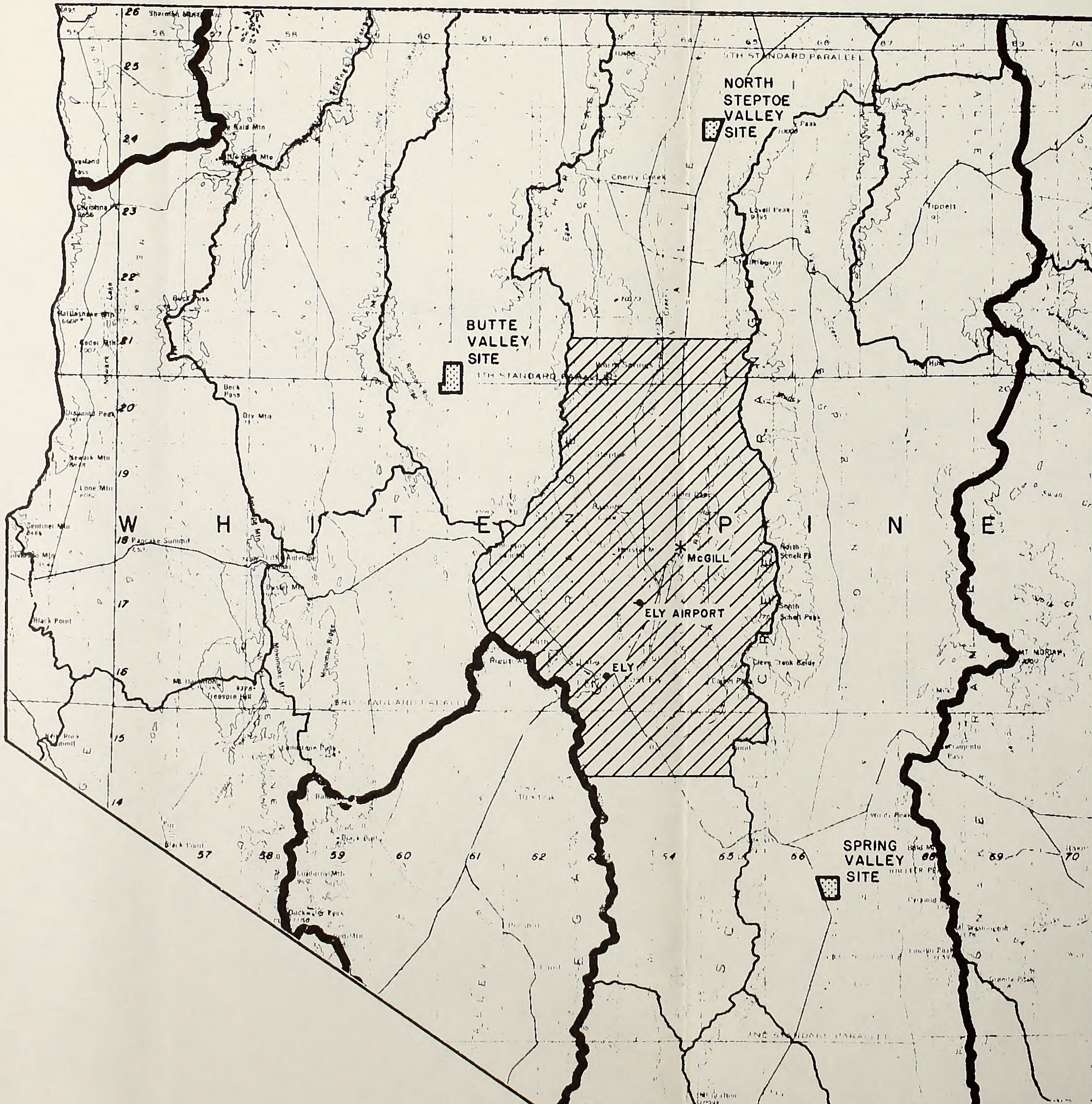
10 5 0 10 20 MILES

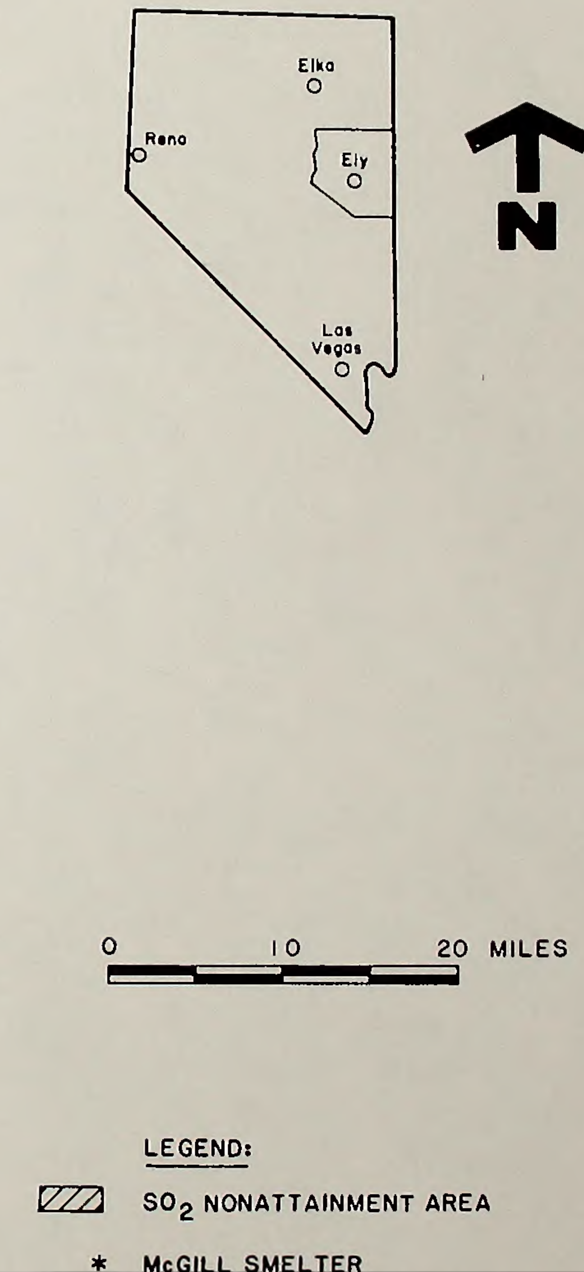
WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

REGIONAL TECTONIC MAP

FIGURE 3-2



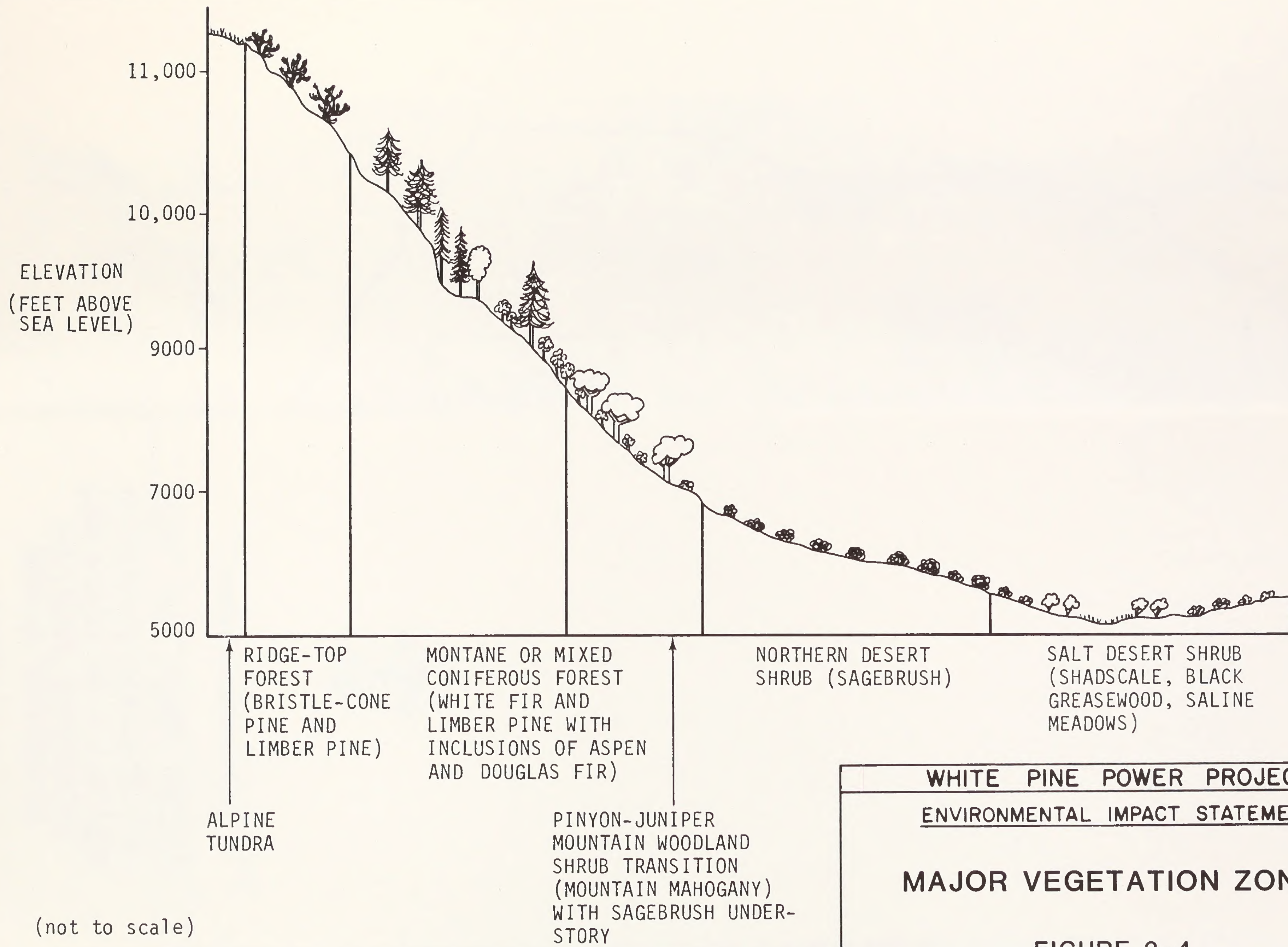


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

SULFUR DIOXIDE NONATTAINMENT AREA

FIGURE 3-3

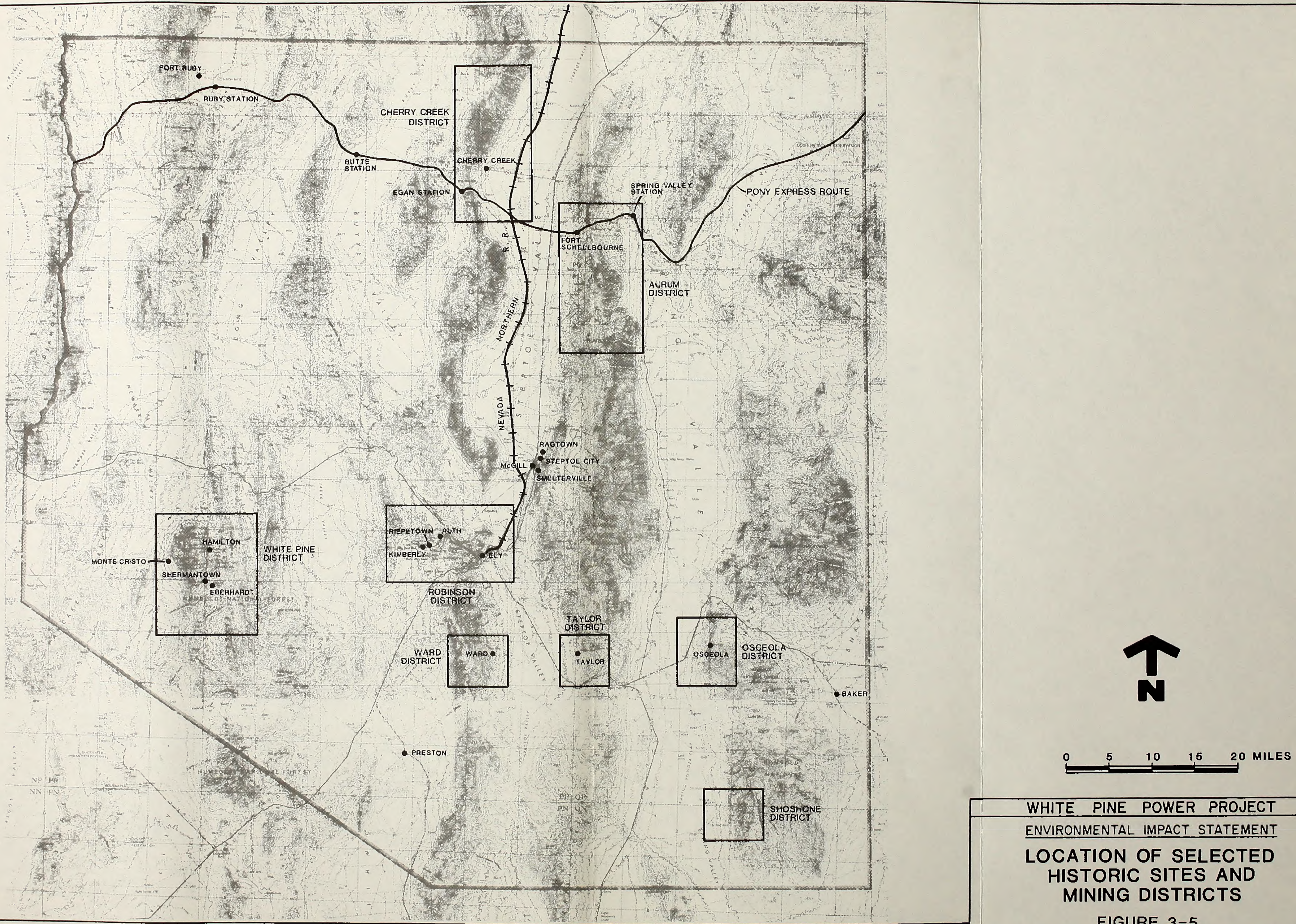


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

MAJOR VEGETATION ZONES

FIGURE 3-4

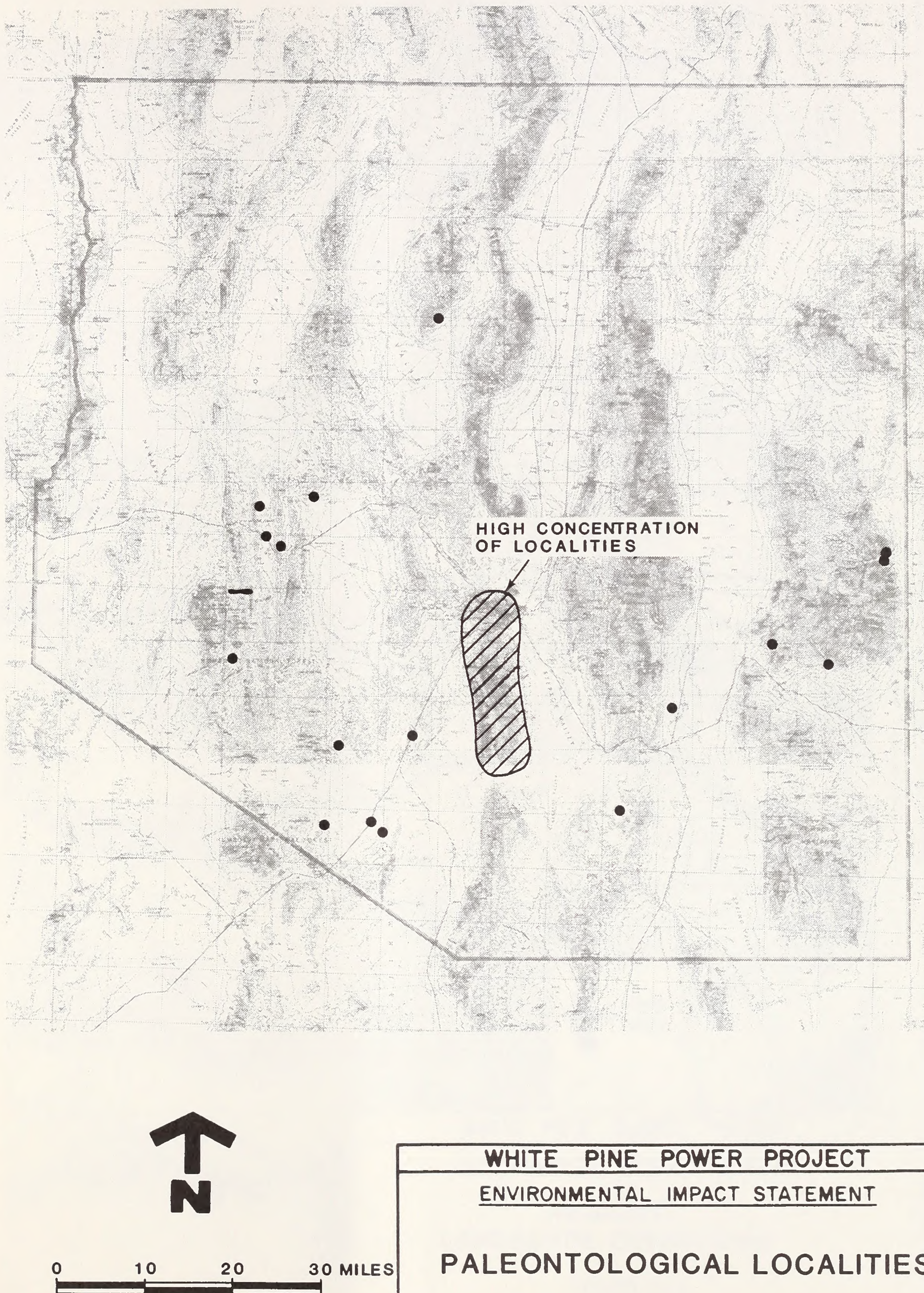


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

LOCATION OF SELECTED HISTORIC SITES AND MINING DISTRICTS

FIGURE 3-5

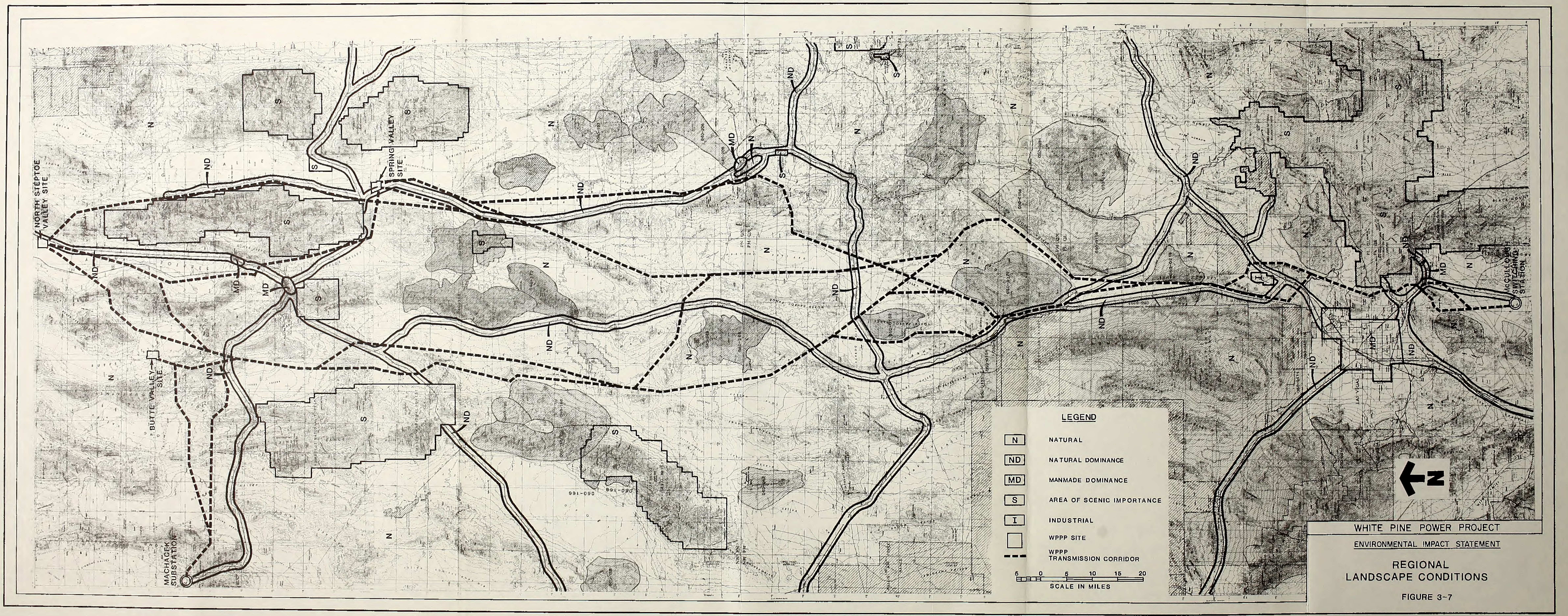


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

PALEONTOLOGICAL LOCALITIES

FIGURE 3-6

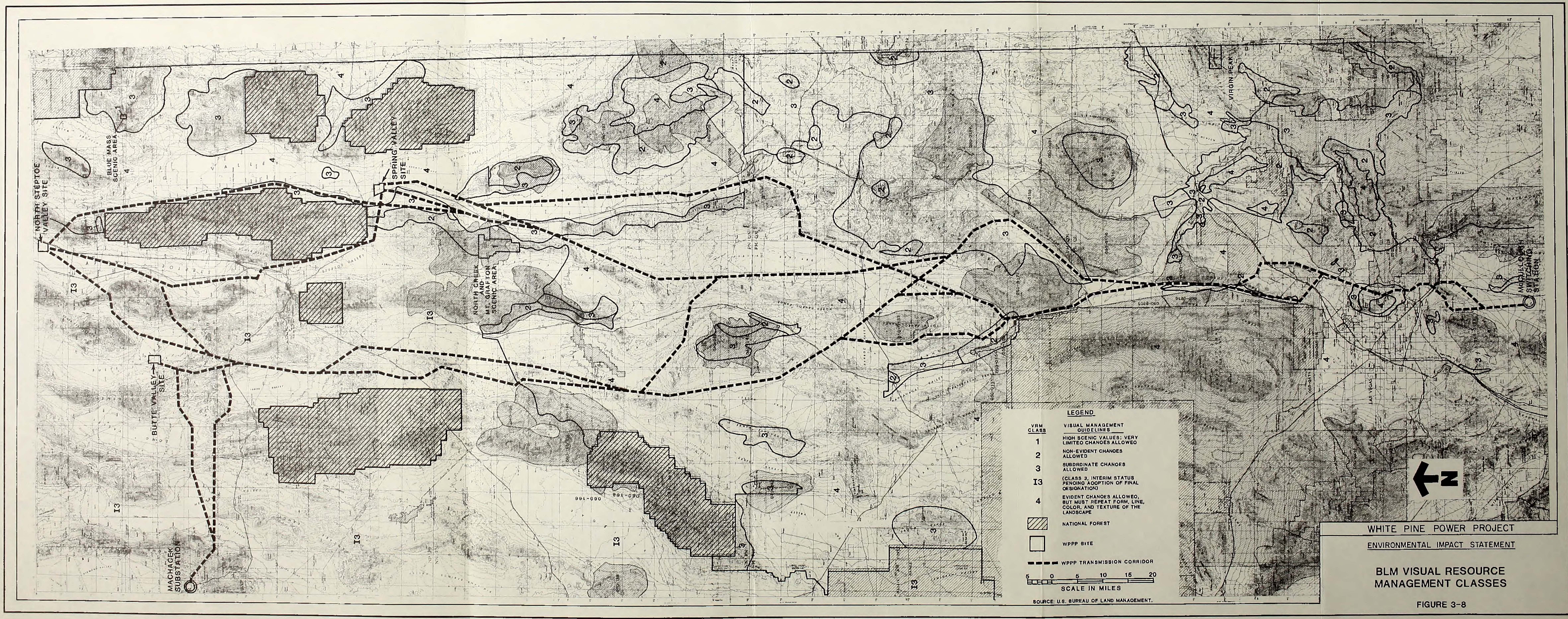


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

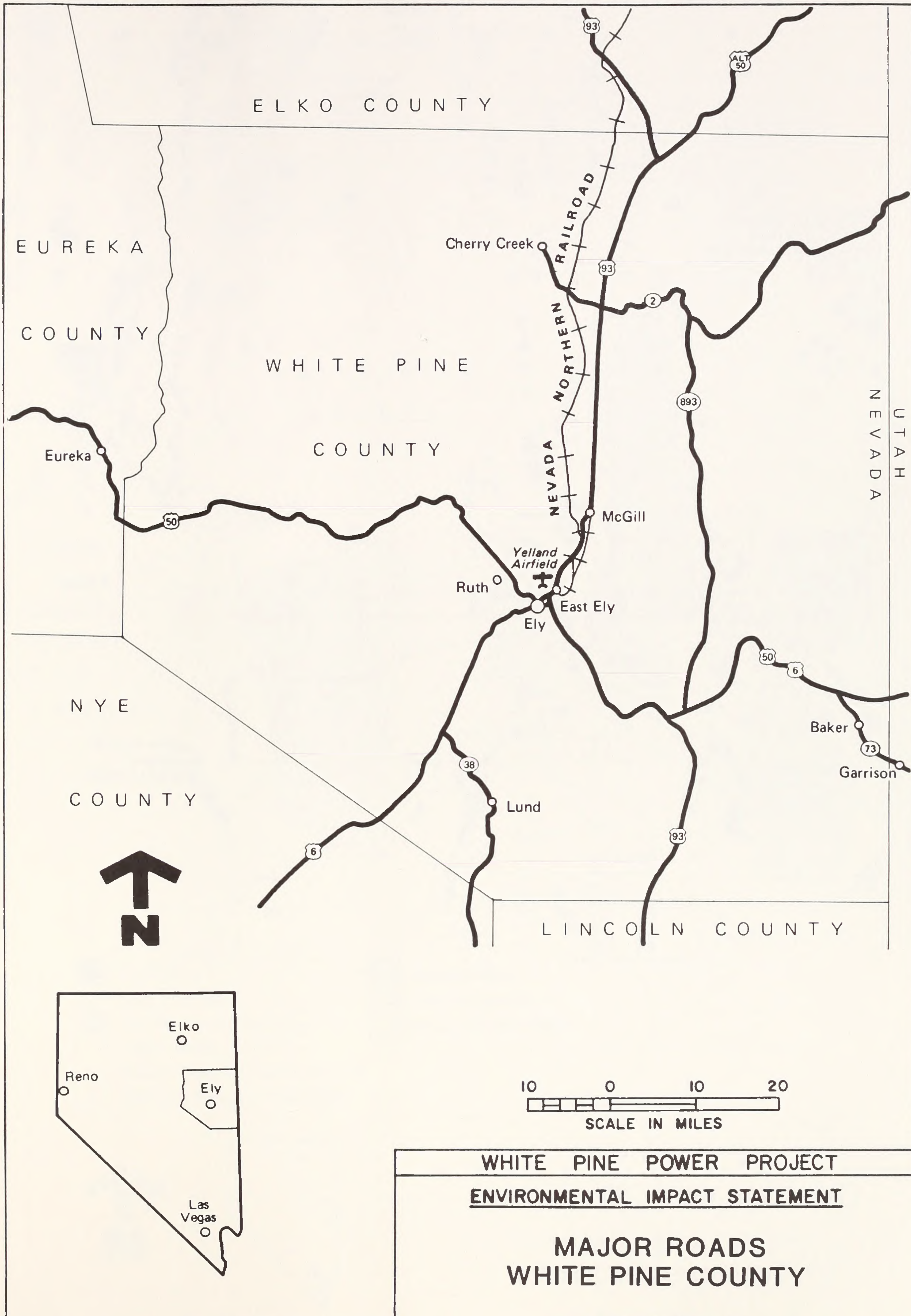
REGIONAL LANDSCAPE CONDITIONS

FIGURE 3-7



BLM VISUAL RESOURCE MANAGEMENT CLASSES

FIGURE 3-8

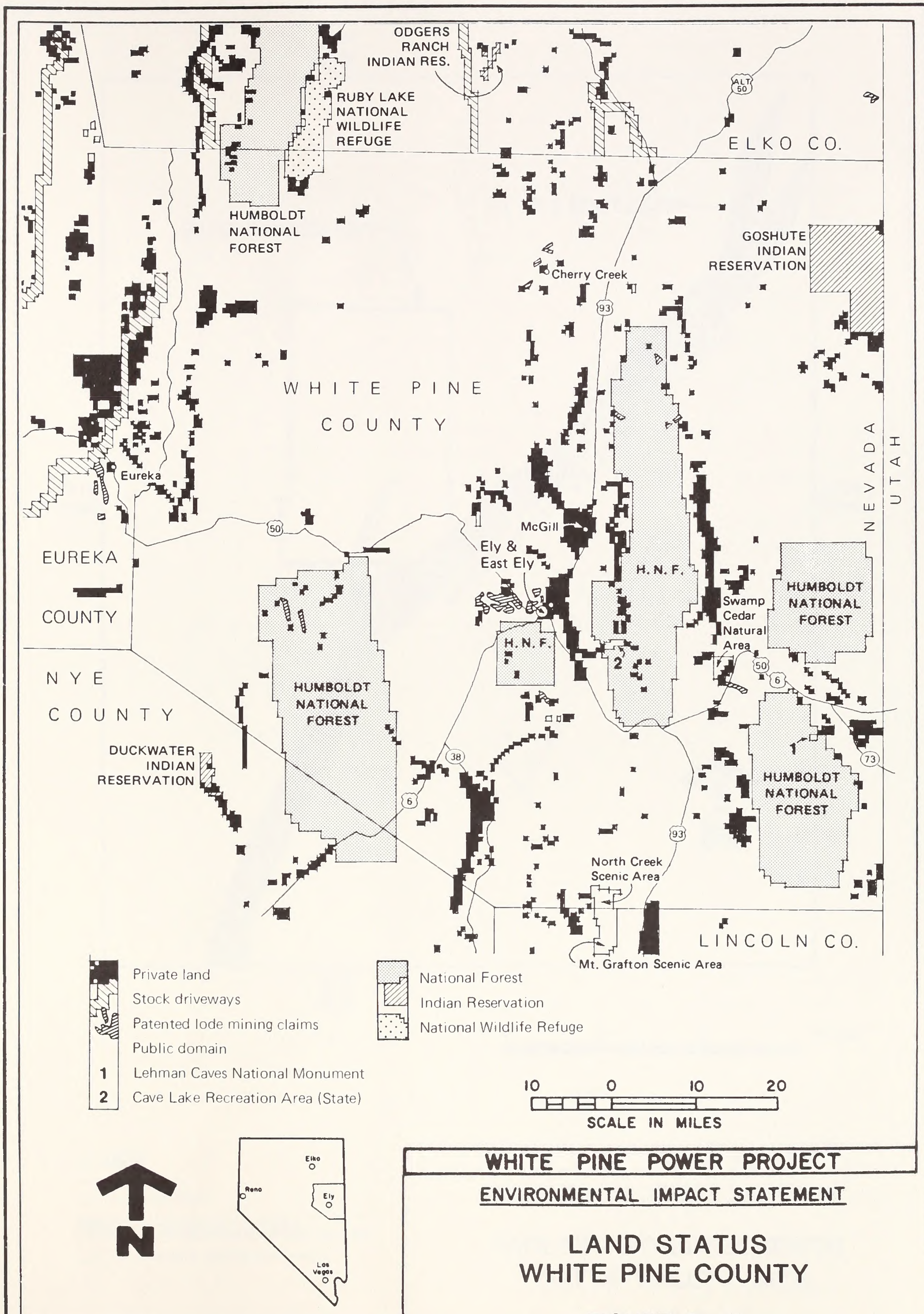


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

MAJOR ROADS WHITE PINE COUNTY

FIGURE 3-9

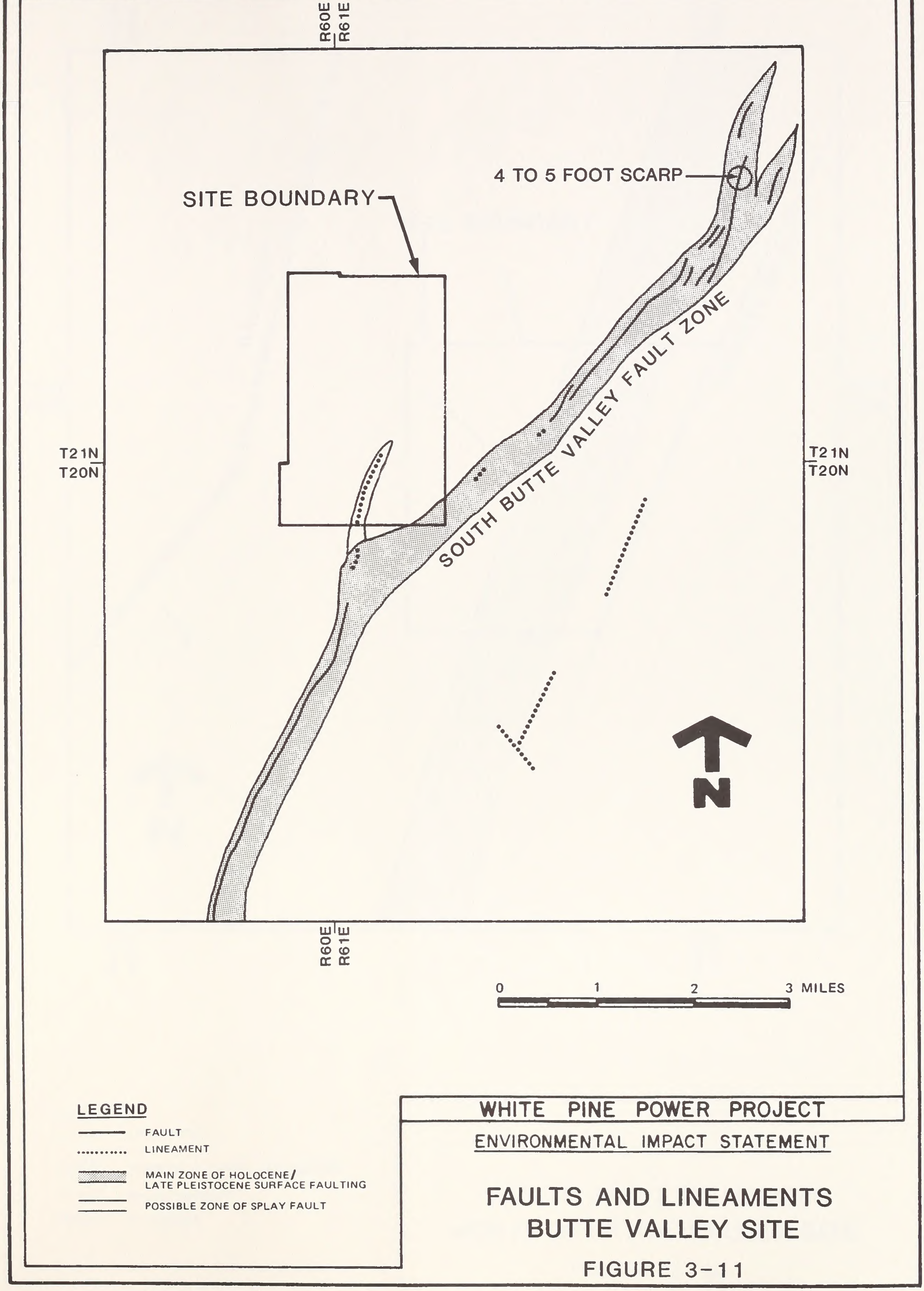


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

LAND STATUS
WHITE PINE COUNTY

FIGURE 3-10

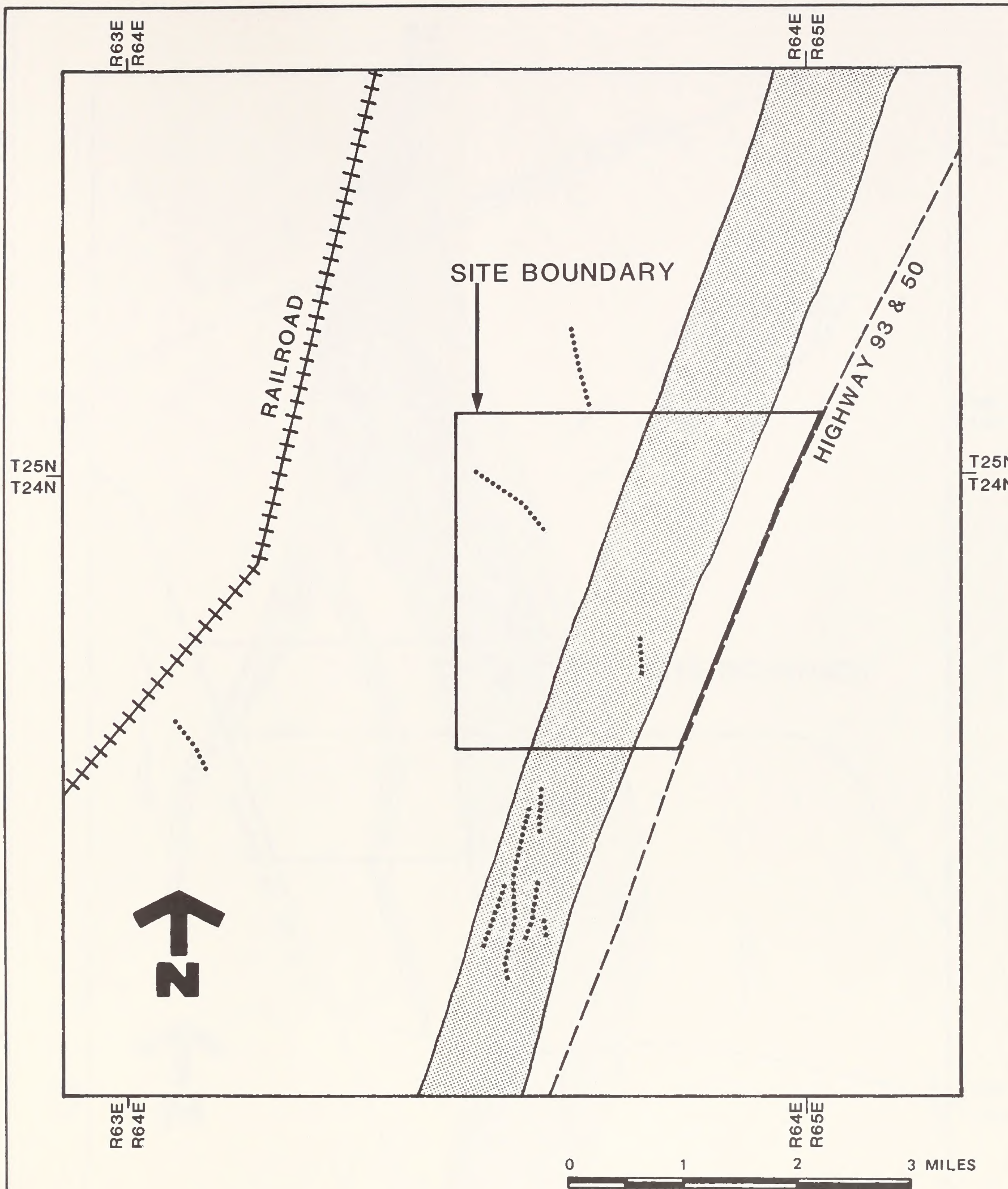


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

FAULTS AND LINEAMENTS
BUTTE VALLEY SITE

FIGURE 3-11



LEGEND

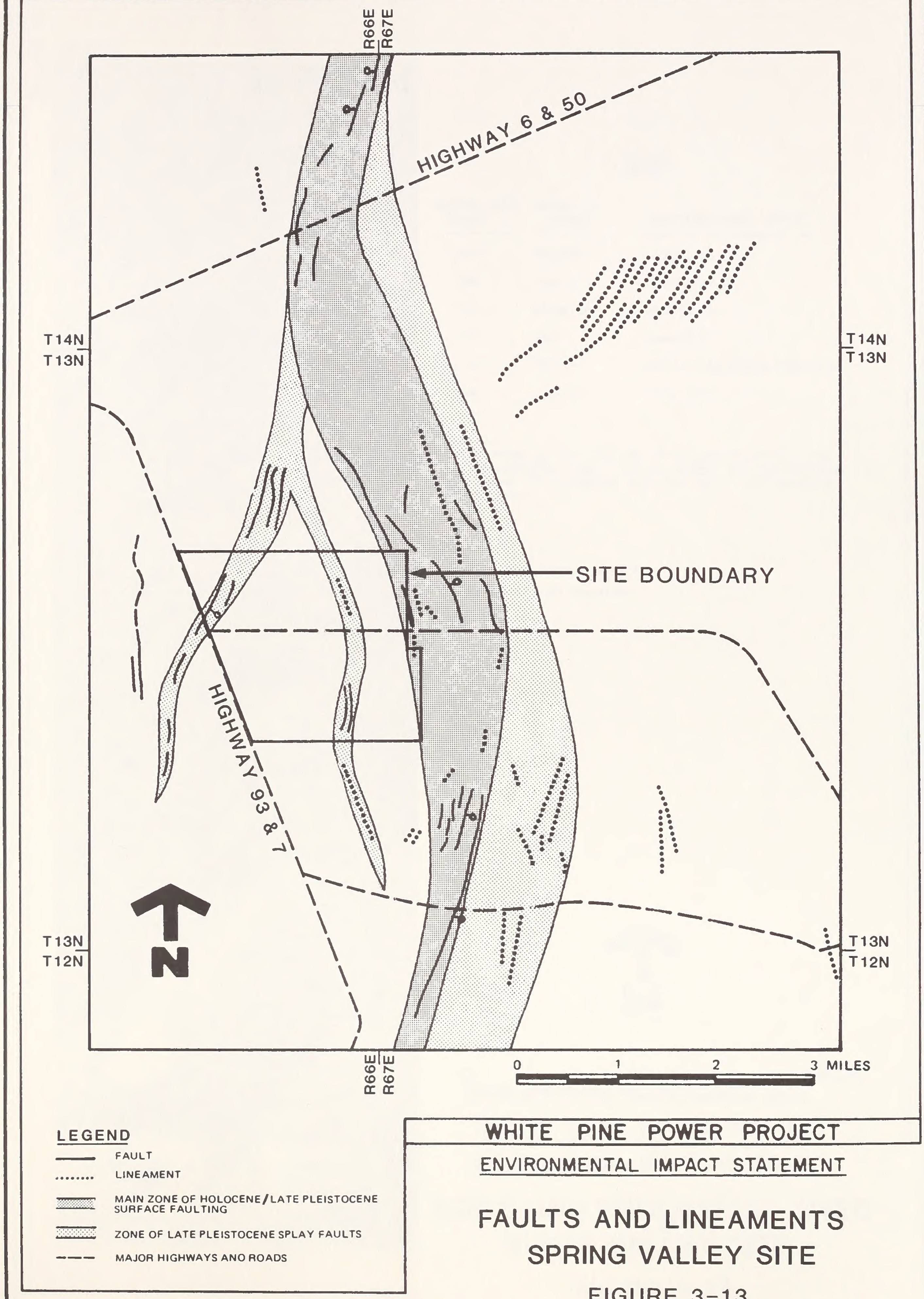
- LINEAMENT
- ZONE OF ALIGNED LINEAMENTS
- MAJOR HIGHWAY
- RAILROAD

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

FAULTS AND LINEAMENTS
NORTH STEPTOE VALLEY SITE

FIGURE 3-12

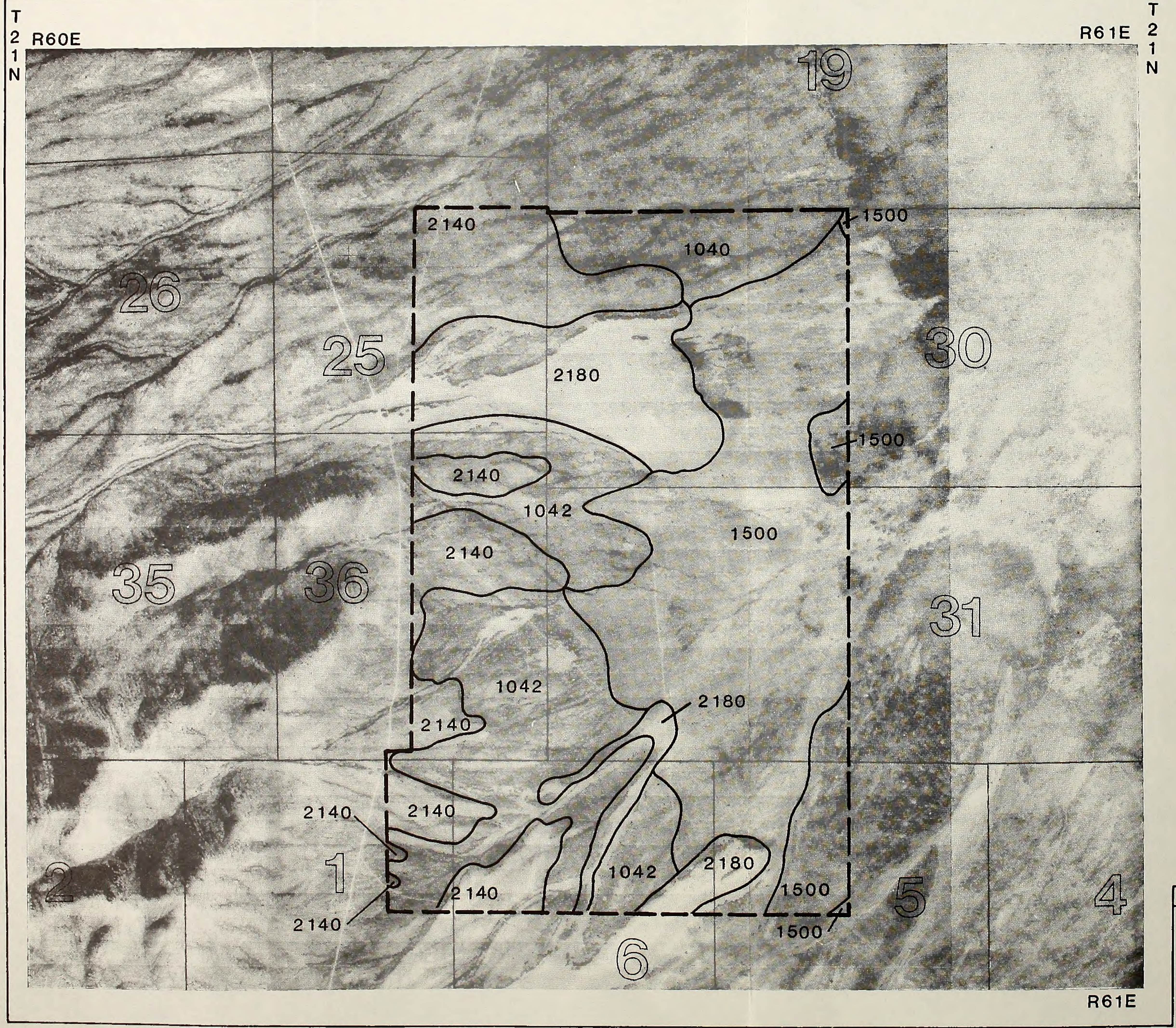


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

FAULTS AND LINEAMENTS
SPRING VALLEY SITE

FIGURE 3-13



LEGEND

MAPPING UNIT NUMBER	MAJOR SOIL SERIES	MAJOR ECOLOGICAL SITES[a]
1040	Sanpete	Loamy 8-10
1042	Oupico	Loamy 8-10
1500	Blimo-Uwell	Loamy 8-10
1500	Raph	Loamy 5-8
2140	Ursine	Shallow Calcareous Loam 8-12
2180	Lusetti	Silty 8-10

a Unless noted by (%), over 80% of the mapping unit is the listed ecological site. The percentages are the estimated occurrences of ecological sites and other lands within the mapping unit.

Source:

U.S. Soil Conservation Service

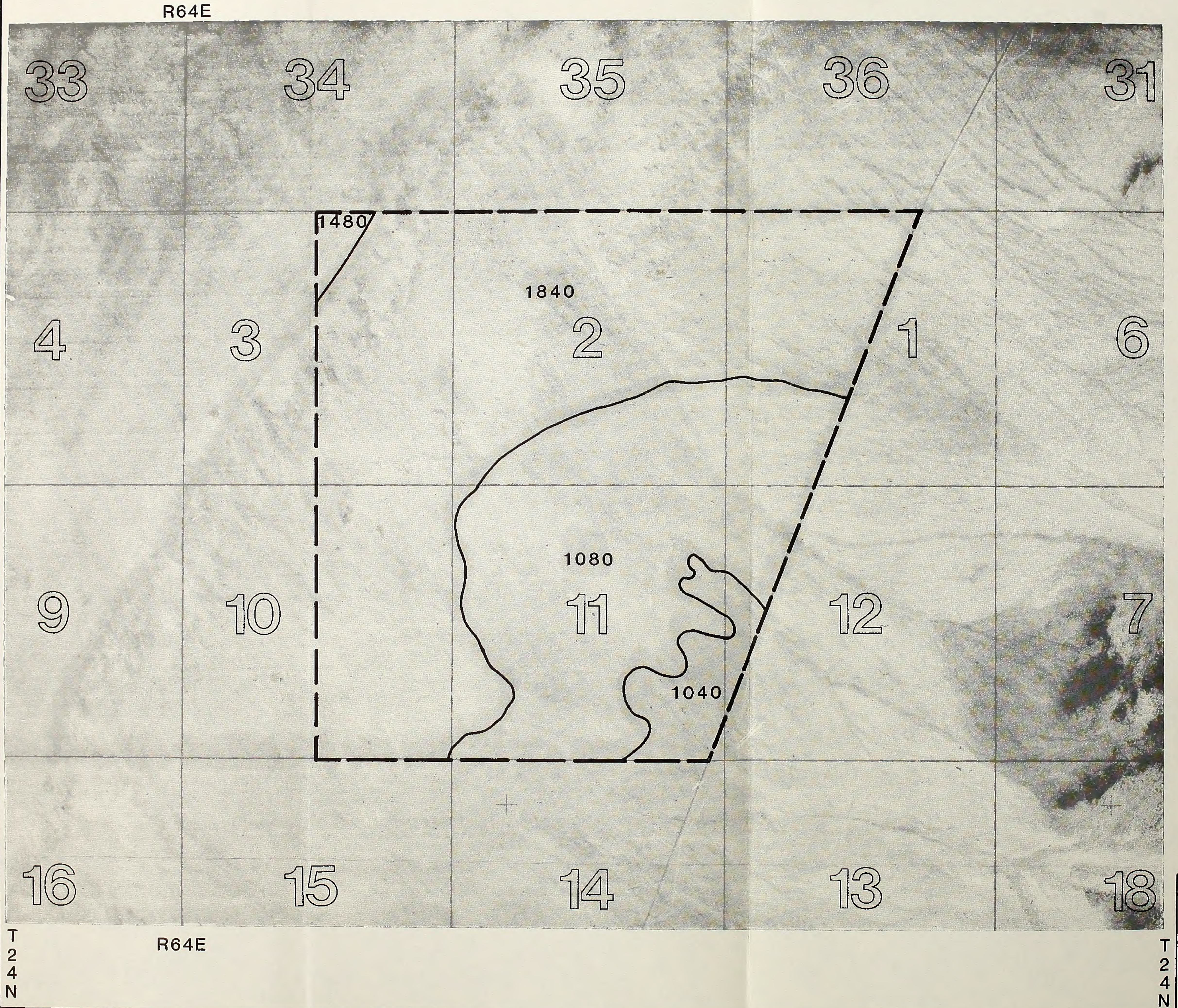
U.S. Bureau of Land Management

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

SOILS AND ECOLOGICAL SITES BUTTE VALLEY SITE

FIGURE 3-14



LEGENO

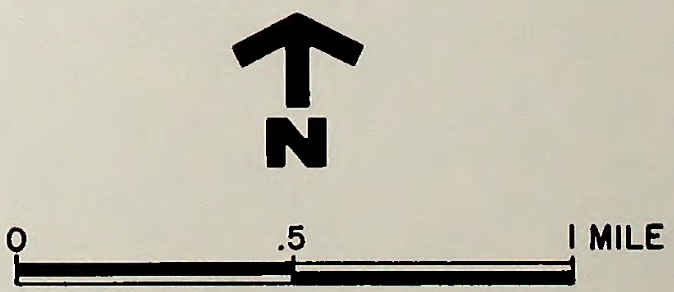
MAPPING UNIT NUM8ER	MAJOR SOIL SERIES	MAJOR ECOLOGICAL SITES[a]
1040	Sanpete	Loamy 8-10
1080	Oera	Loamy 5-8
1480	Duffer, Flooded	Saline Meadow 5-12 (20%)
1480	Equis	Saline 8ottom 5-12 (30%)
1480	8oofus	Sodic Flat 5-12 (40%)
1840	Riepe	Sodic Terrace 6-8 (45%)
1840	Stimca	Sodic Terrace 8-10 (40%)

a Unless noted by (%), over 80% of the mapping unit is the listed ecological site. The percentages are the estimated occurrences of ecological sites and other lands within the mapping unit.

Source:

U.S. Soil Conservation Service

U.S. Bureau of Land Management

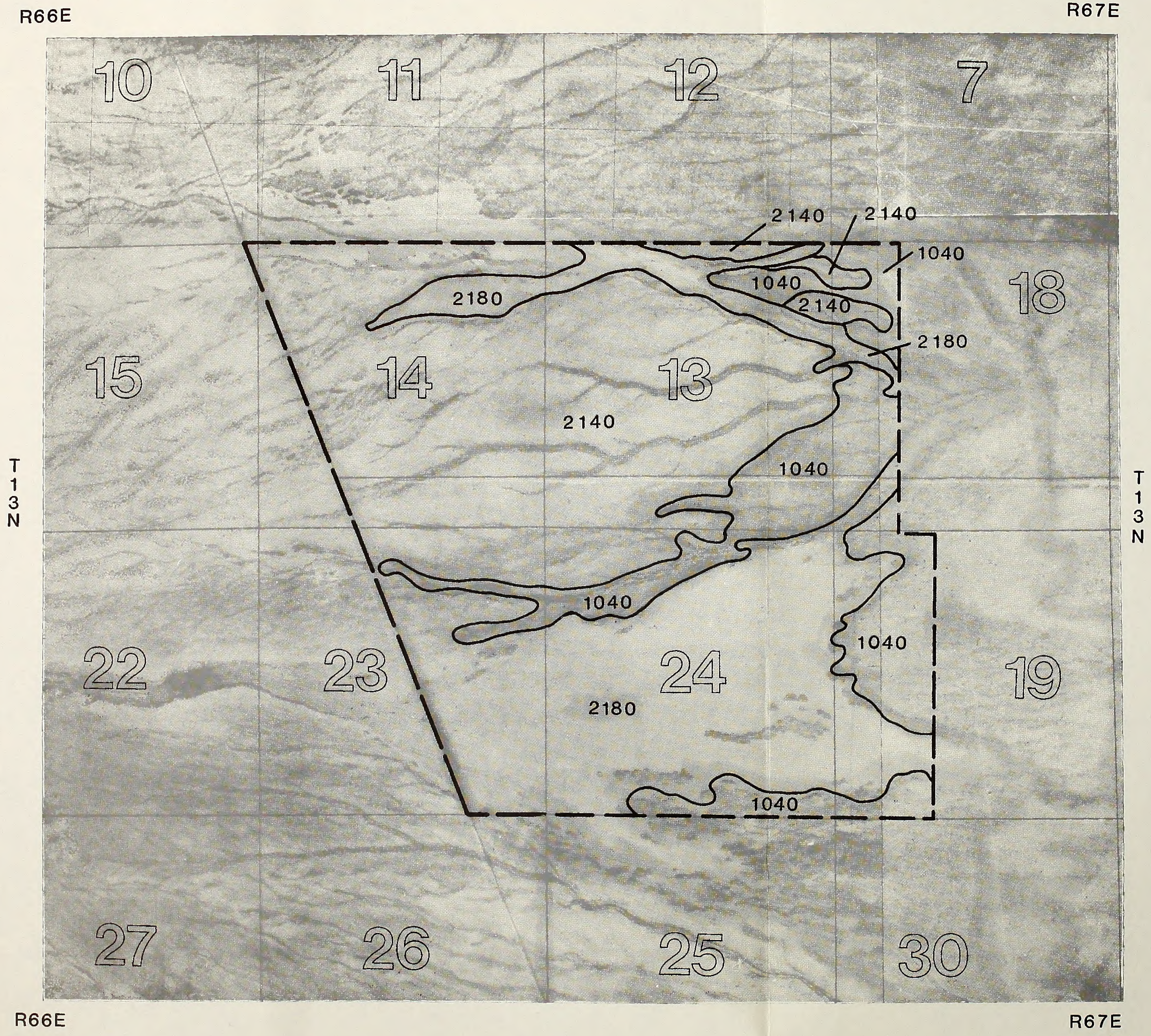


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

SOILS AND ECOLOGICAL SITES
NORTH STEPTOE VALLEY SITE

FIGURE 3-15



LEGEND

MAPPING UNIT NUMBER	MAJOR SOIL SERIES	MAJOR ECOLOGICAL SITES
1040	Sanpete	Loamy 8-10
2140	Ursine	Shallow Calcareous Loam 8-12
2180	Lusetti	Silty 8-10

Source:
U.S. Soil Conservation Service
U.S. Bureau of Land Management

N

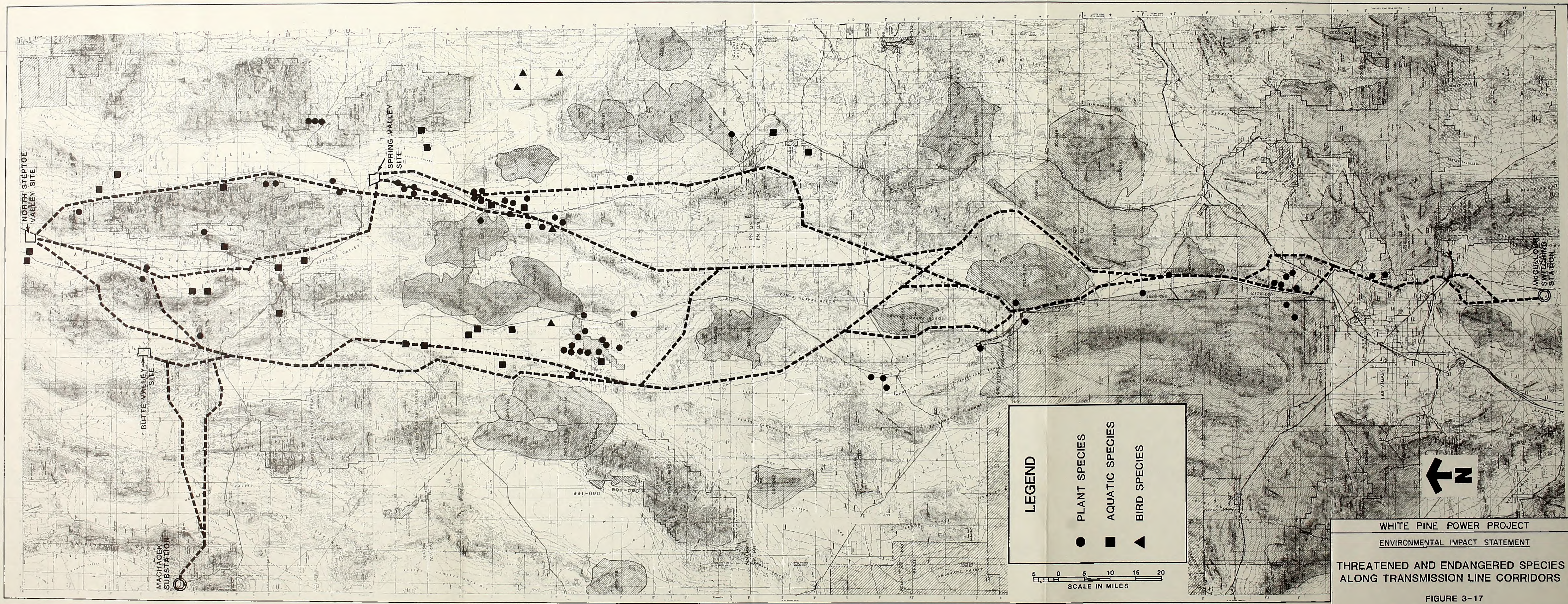
0 .5 1 MILE

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

SOILS AND ECOLOGICAL SITES SPRING VALLEY SITE

FIGURE 3-16

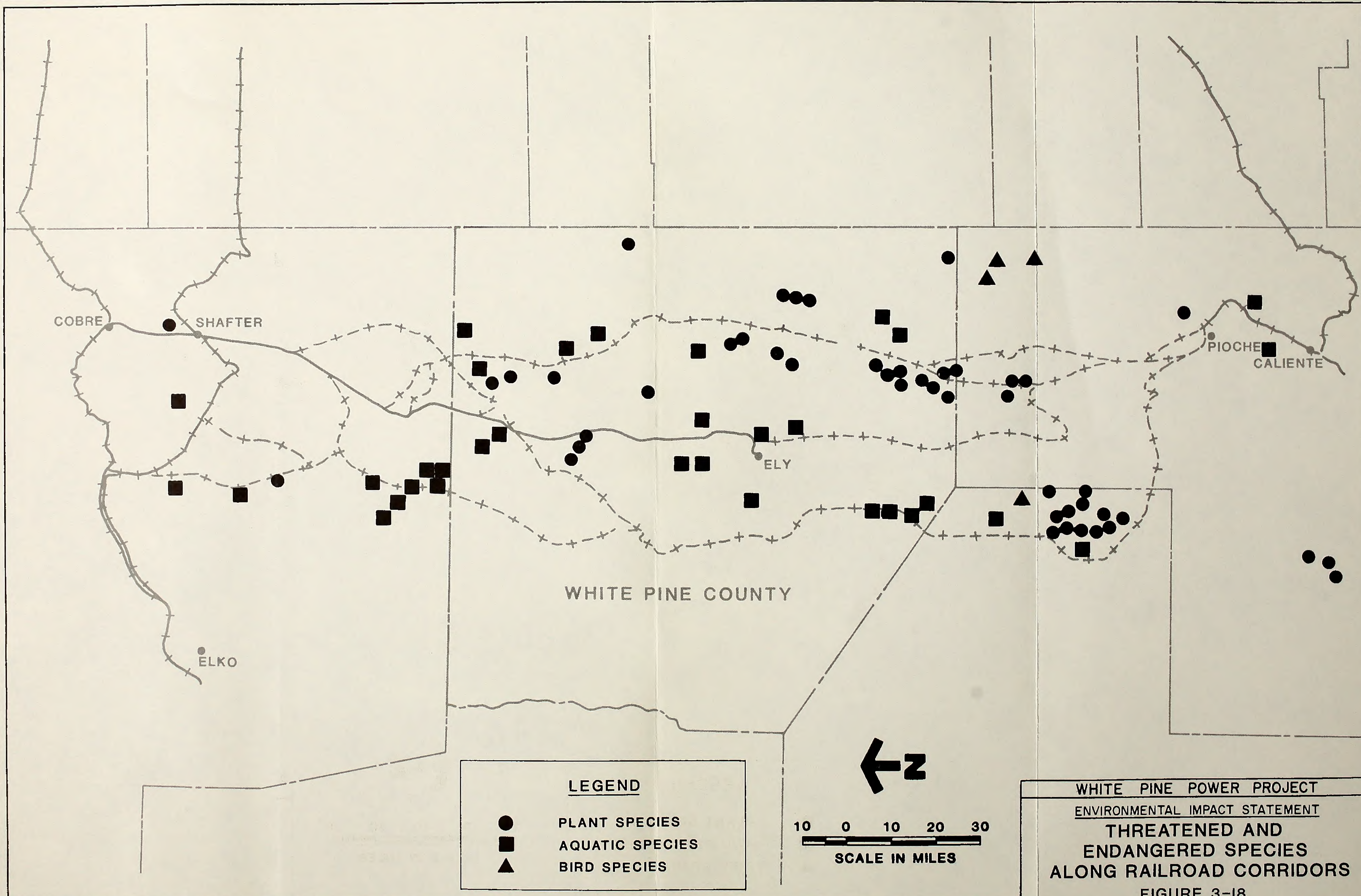


WHITE PINE POWER PROJECT

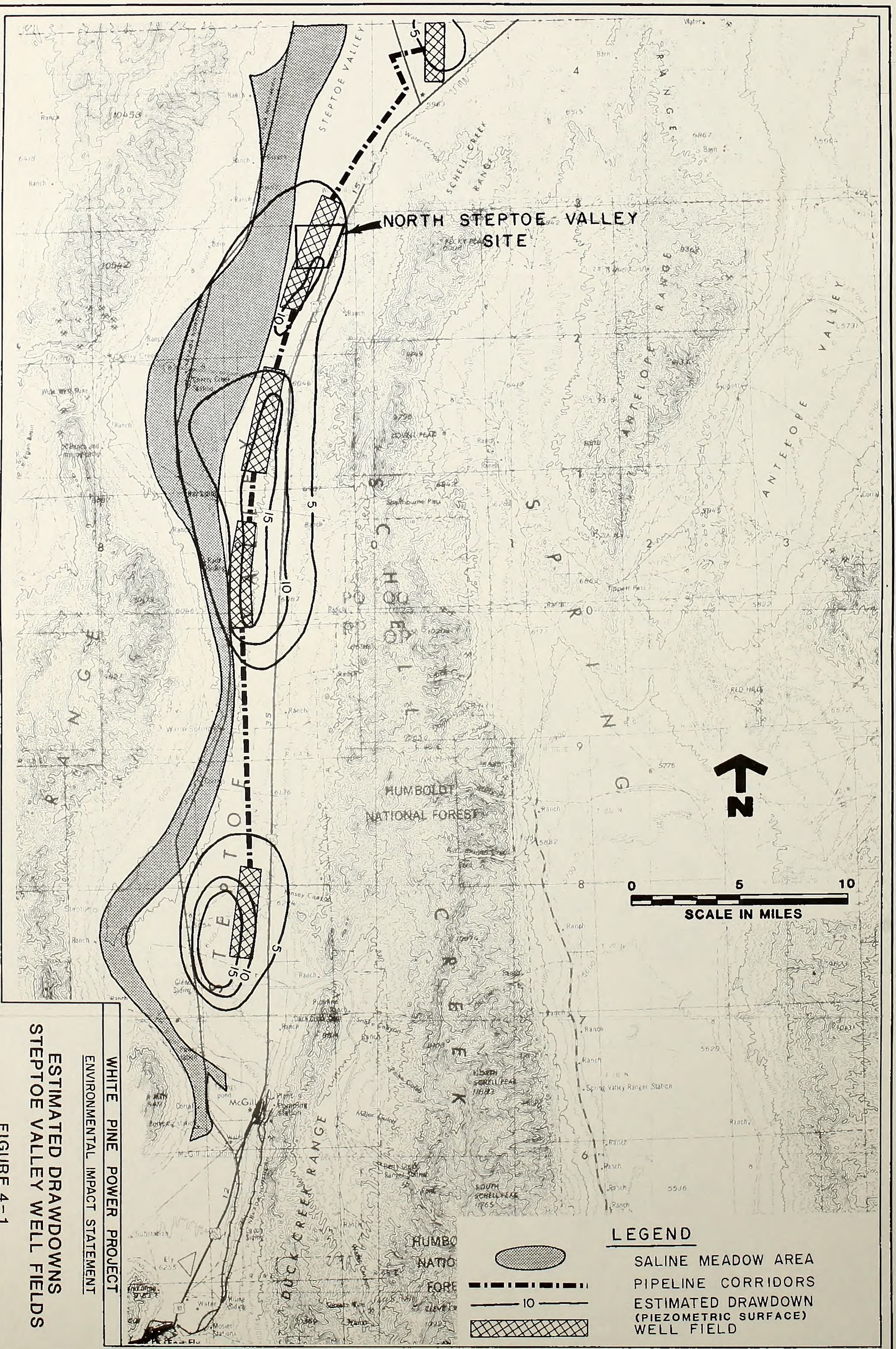
ENVIRONMENTAL IMPACT STATEMENT

THREATENED AND ENDANGERED SPECIES ALONG TRANSMISSION LINE CORRIDORS

FIGURE 3-17



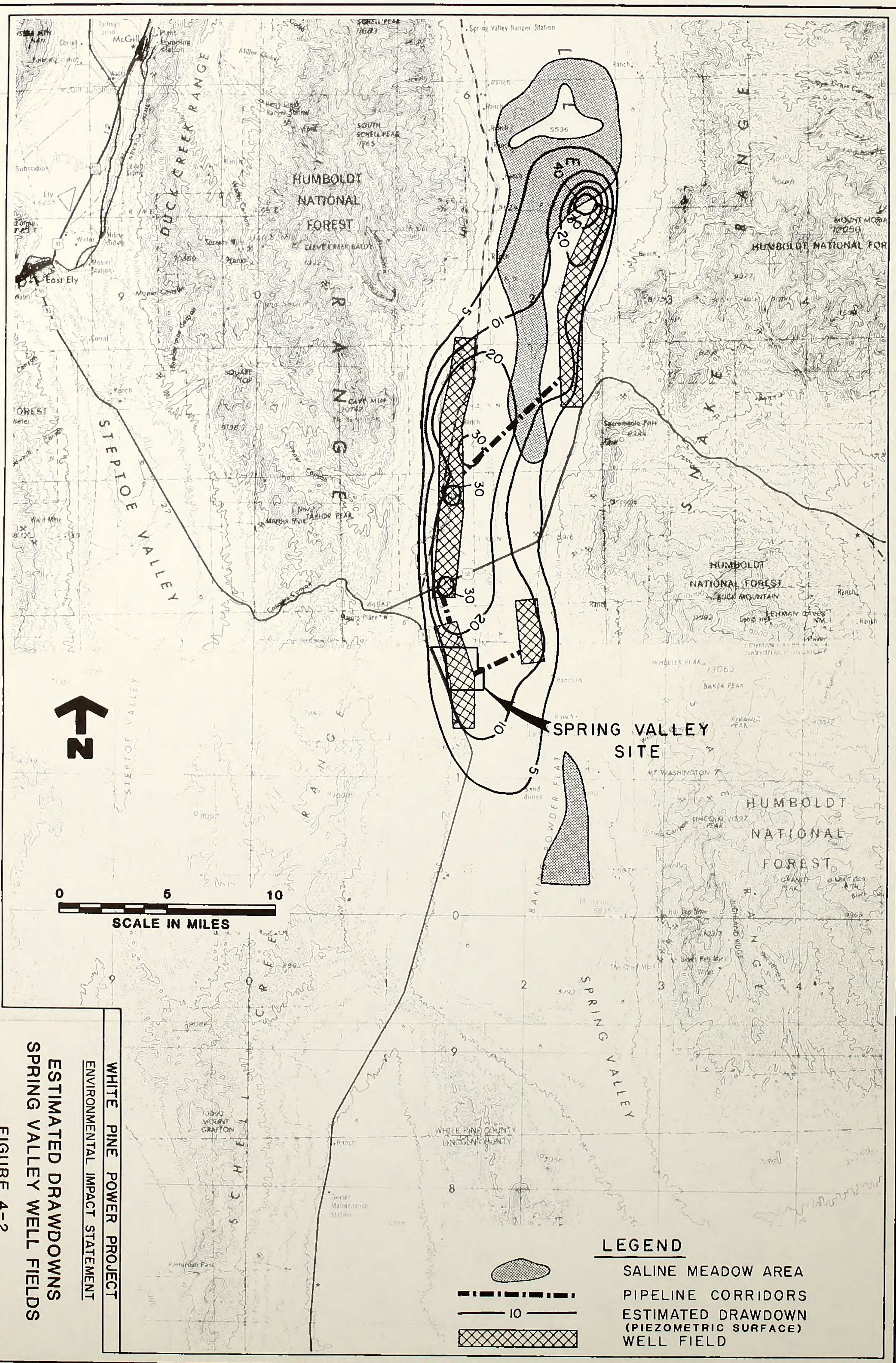
WHITE PINE POWER PROJECT
ENVIRONMENTAL IMPACT STATEMENT
THREATENED AND ENDANGERED SPECIES ALONG RAILROAD CORRIDORS
FIGURE 3-18



WHITE PINE POWER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

ESTIMATED DRAWDOWNS
STEPTOE VALLEY WELL FIELDS

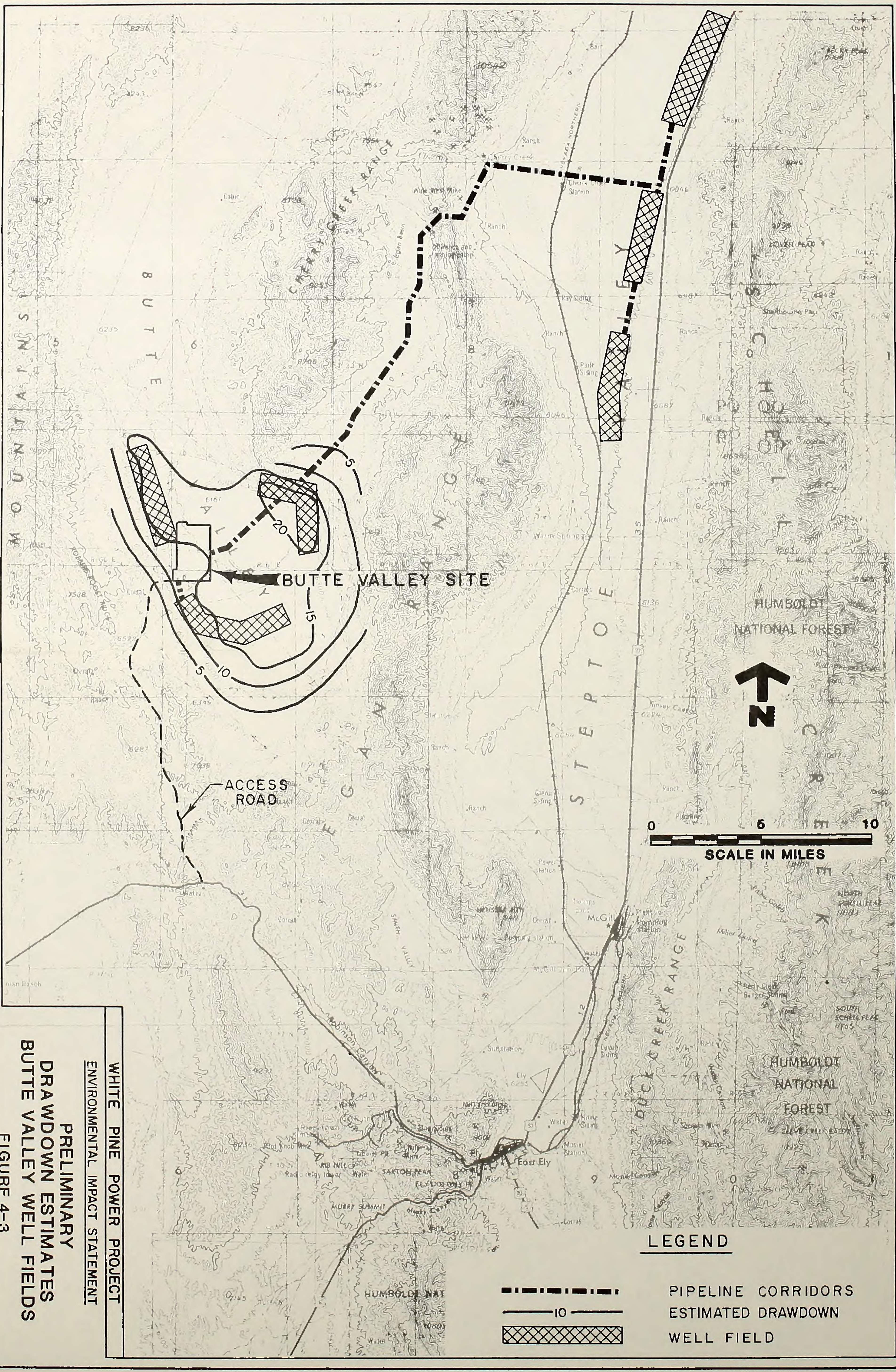
FIGURE 4-1



WHITE PINE POWER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

ESTIMATED DRAWDOWNS
SPRING VALLEY WELL FIELDS

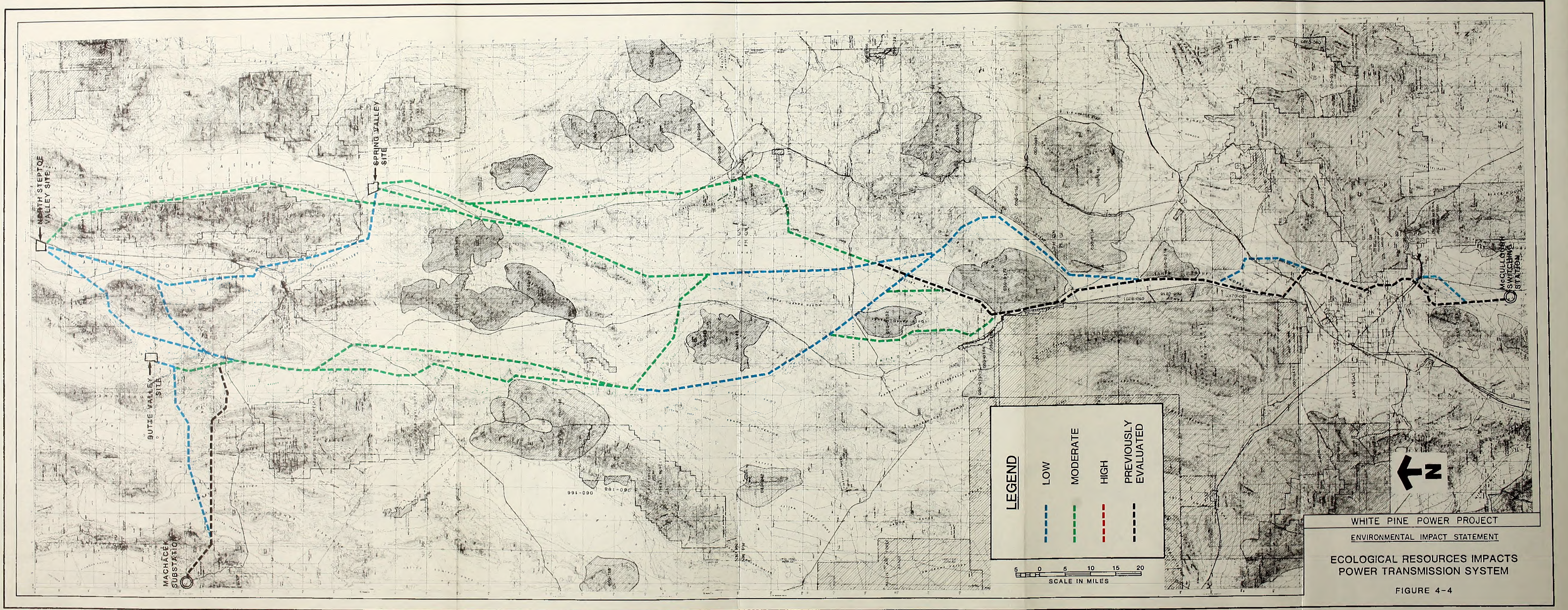
FIGURE 4-2



WHITE PINE POWER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

PRELIMINARY DRAWDOWN ESTIMATES BUTTE VALLEY WELL FIELDS

FIGURE 4-3

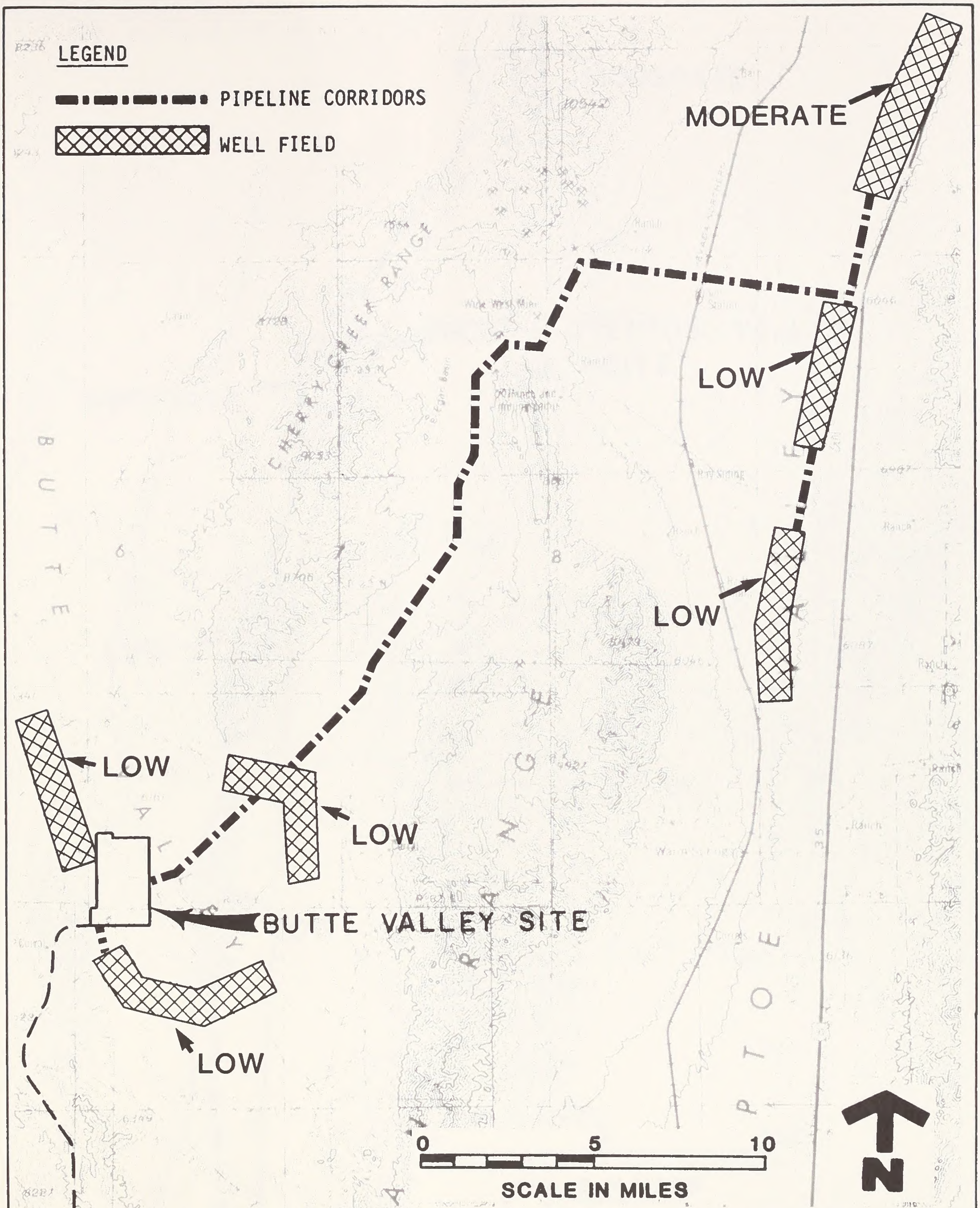


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

ECOLOGICAL RESOURCES IMPACTS
POWER TRANSMISSION SYSTEM

FIGURE 4-4

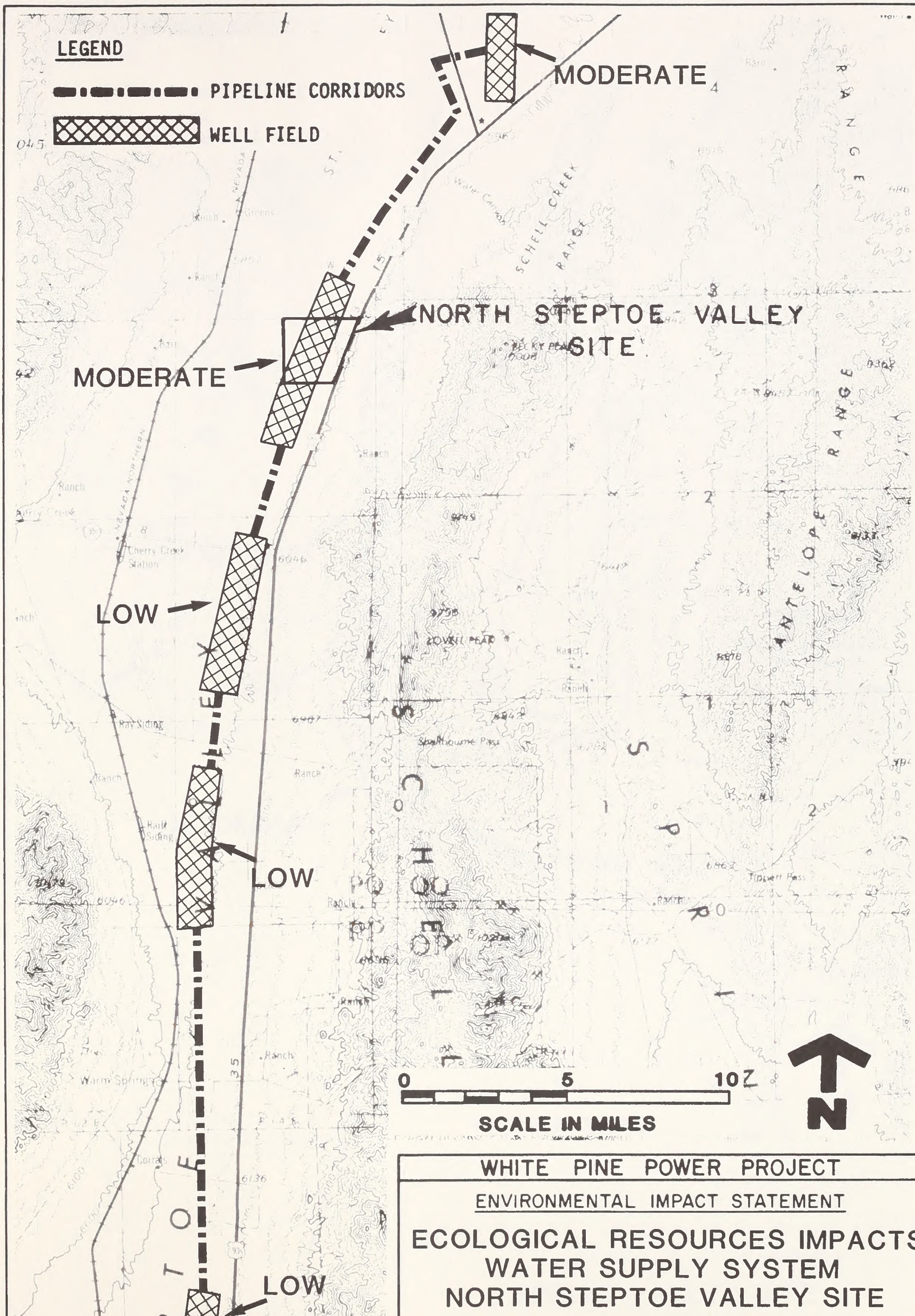


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

ECOLOGICAL RESOURCES IMPACTS WATER SUPPLY SYSTEM BUTTE VALLEY SITE

FIGURE 4-5

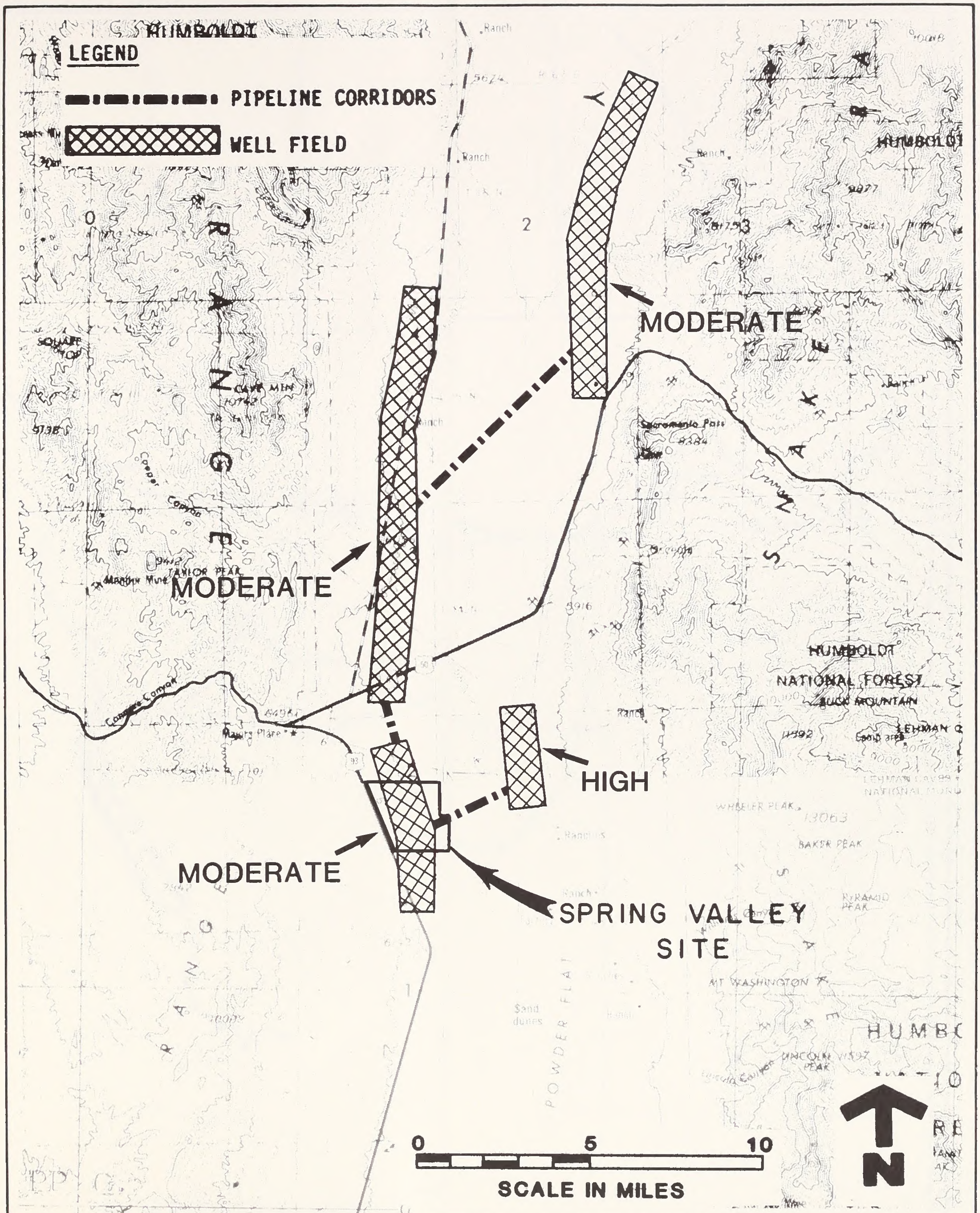


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

ECOLOGICAL RESOURCES IMPACTS
WATER SUPPLY SYSTEM
NORTH STEPTOE VALLEY SITE

FIGURE 4-6

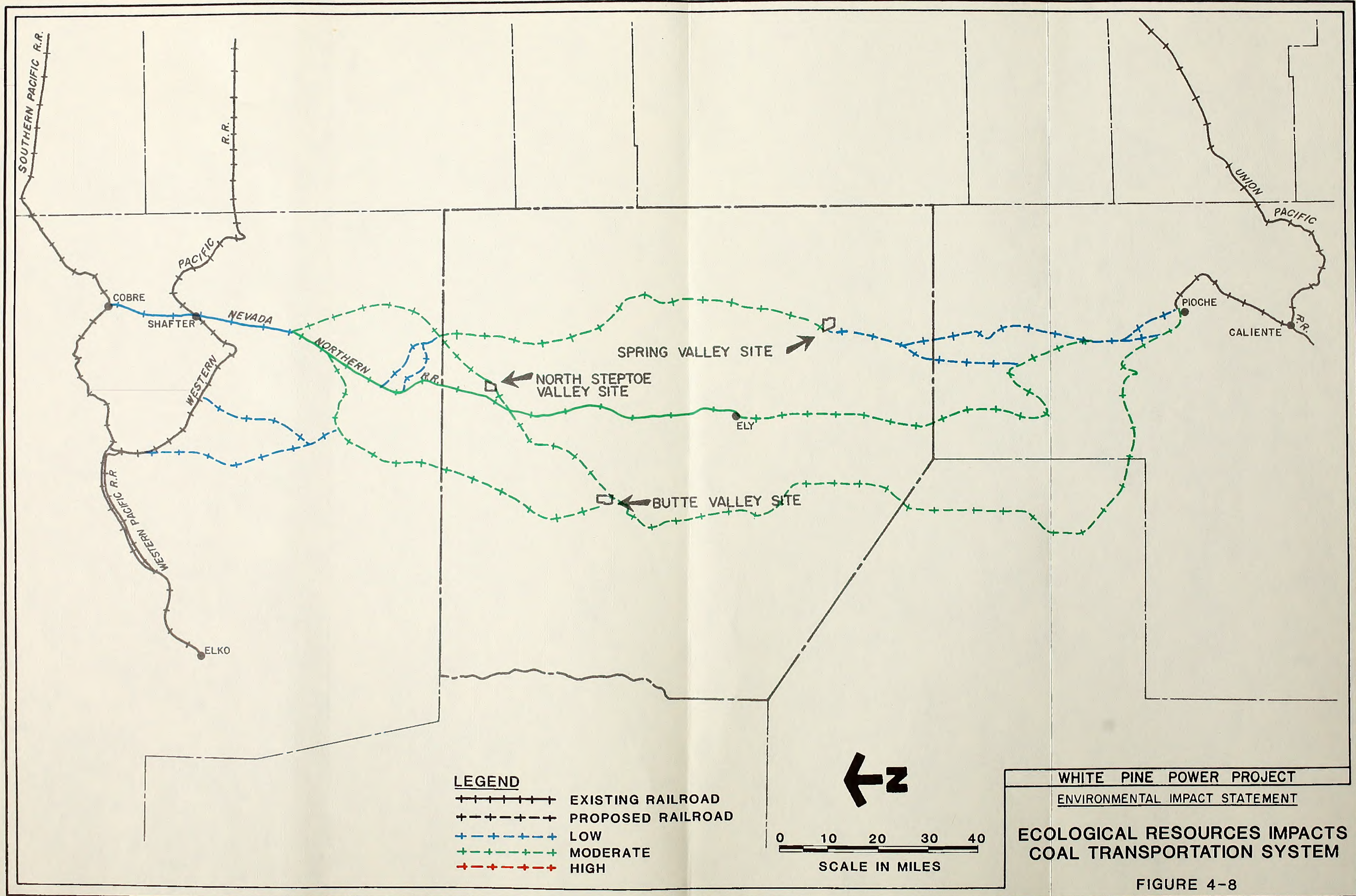


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

ECOLOGICAL RESOURCES IMPACTS
WATER SUPPLY SYSTEM
SPRING VALLEY SITE

FIGURE 4-7



WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

ECOLOGICAL RESOURCES IMPACTS
COAL TRANSPORTATION SYSTEM

FIGURE 4-8

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

CULTURAL RESOURCES IMPACTS
POWER TRANSMISSION SYSTEM

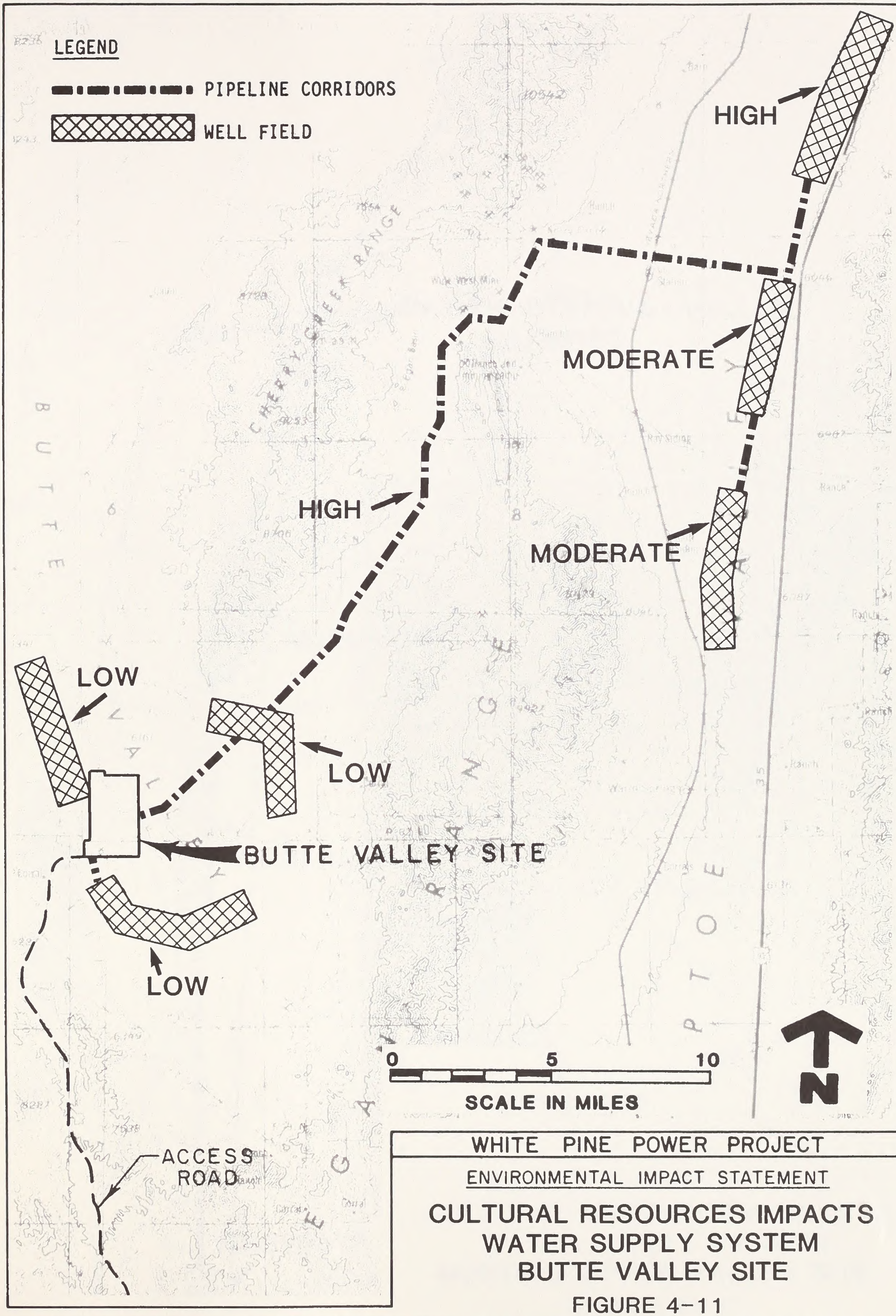
FIGURE 4-9

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

PALEONTOLOGICAL RESOURCES IMPACTS
POWER TRANSMISSION SYSTEM

FIGURE 4-10

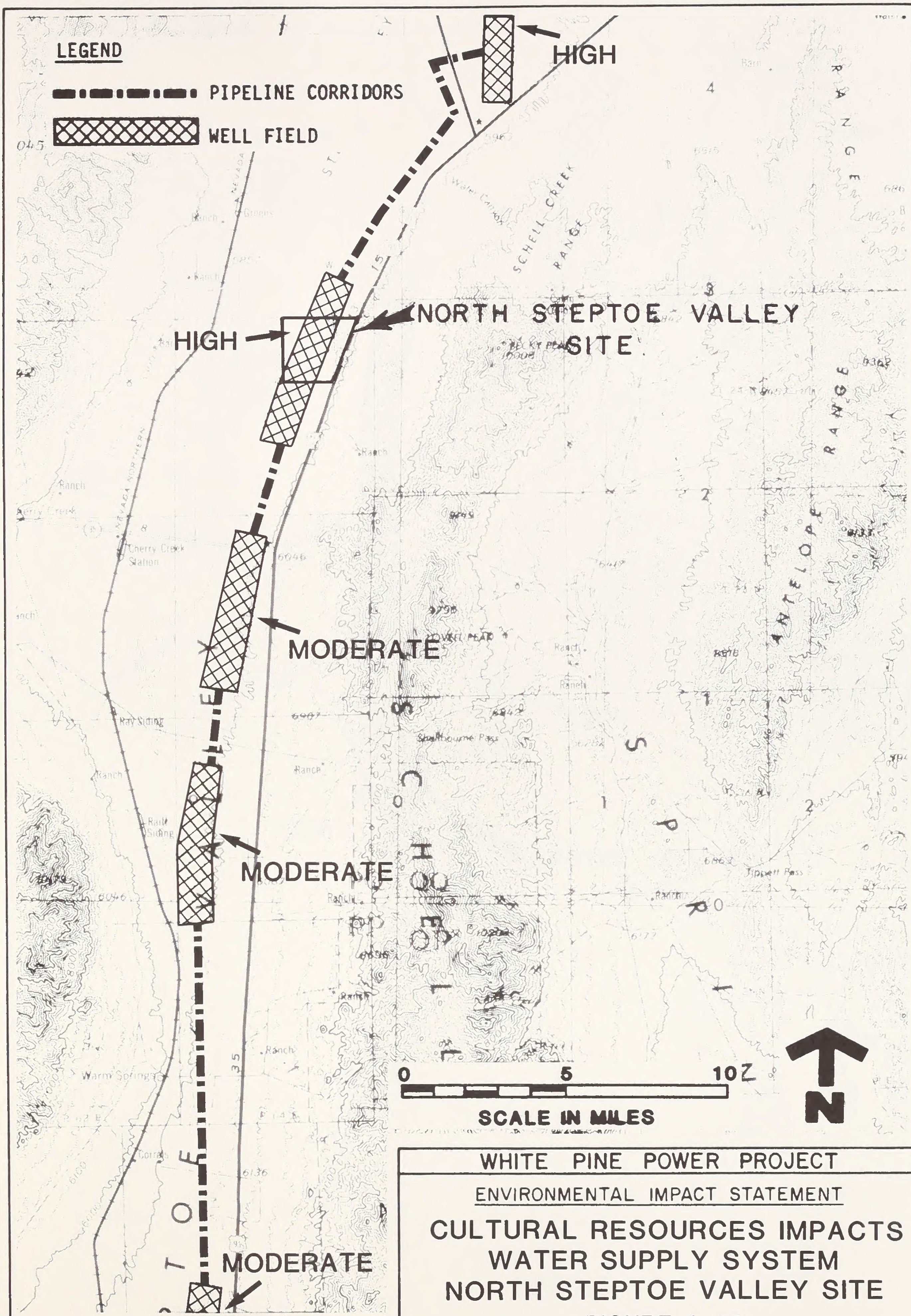


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

CULTURAL RESOURCES IMPACTS
WATER SUPPLY SYSTEM
BUTTE VALLEY SITE

FIGURE 4-11

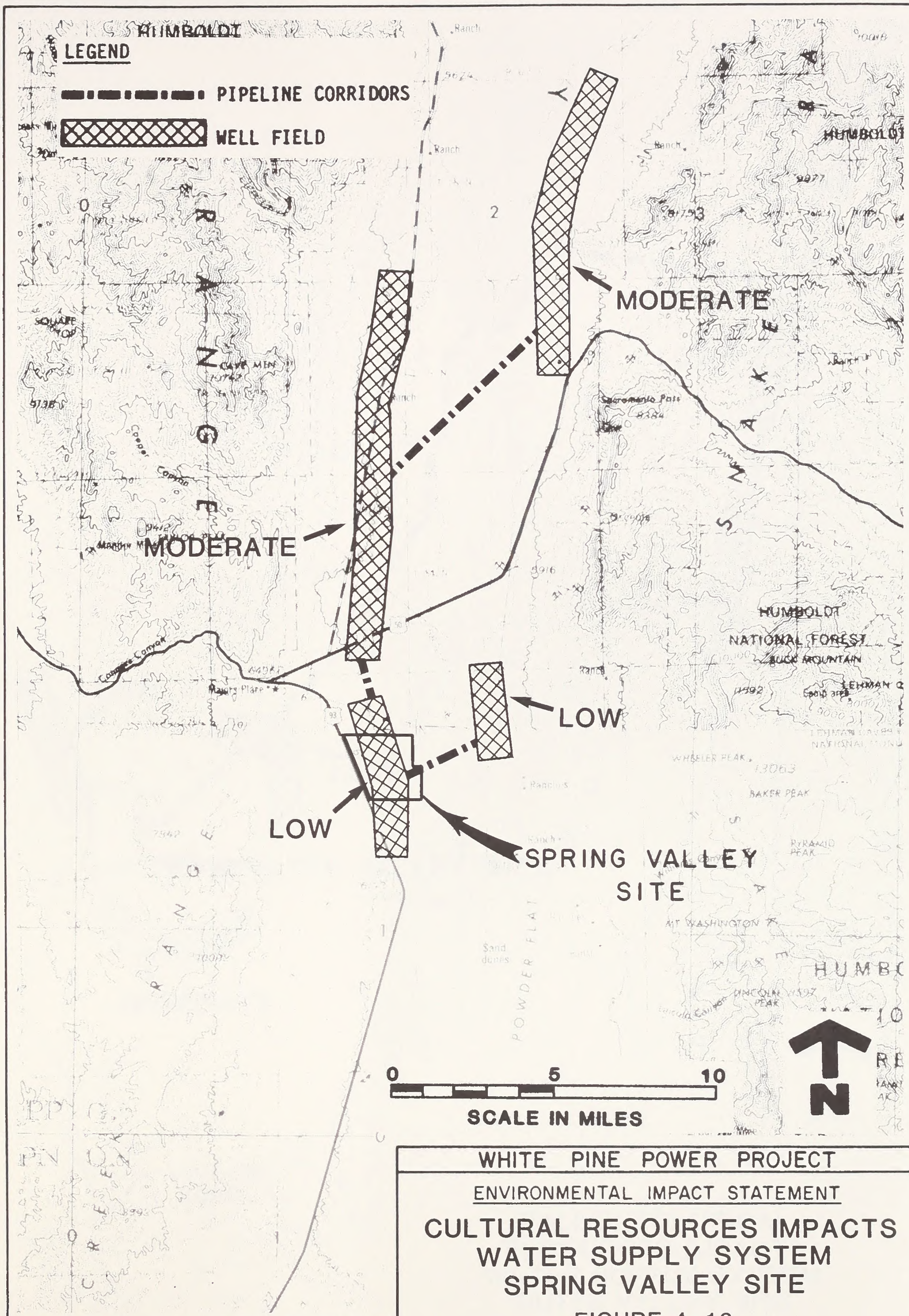


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

CULTURAL RESOURCES IMPACTS
WATER SUPPLY SYSTEM
NORTH STEPTOE VALLEY SITE

FIGURE 4-12

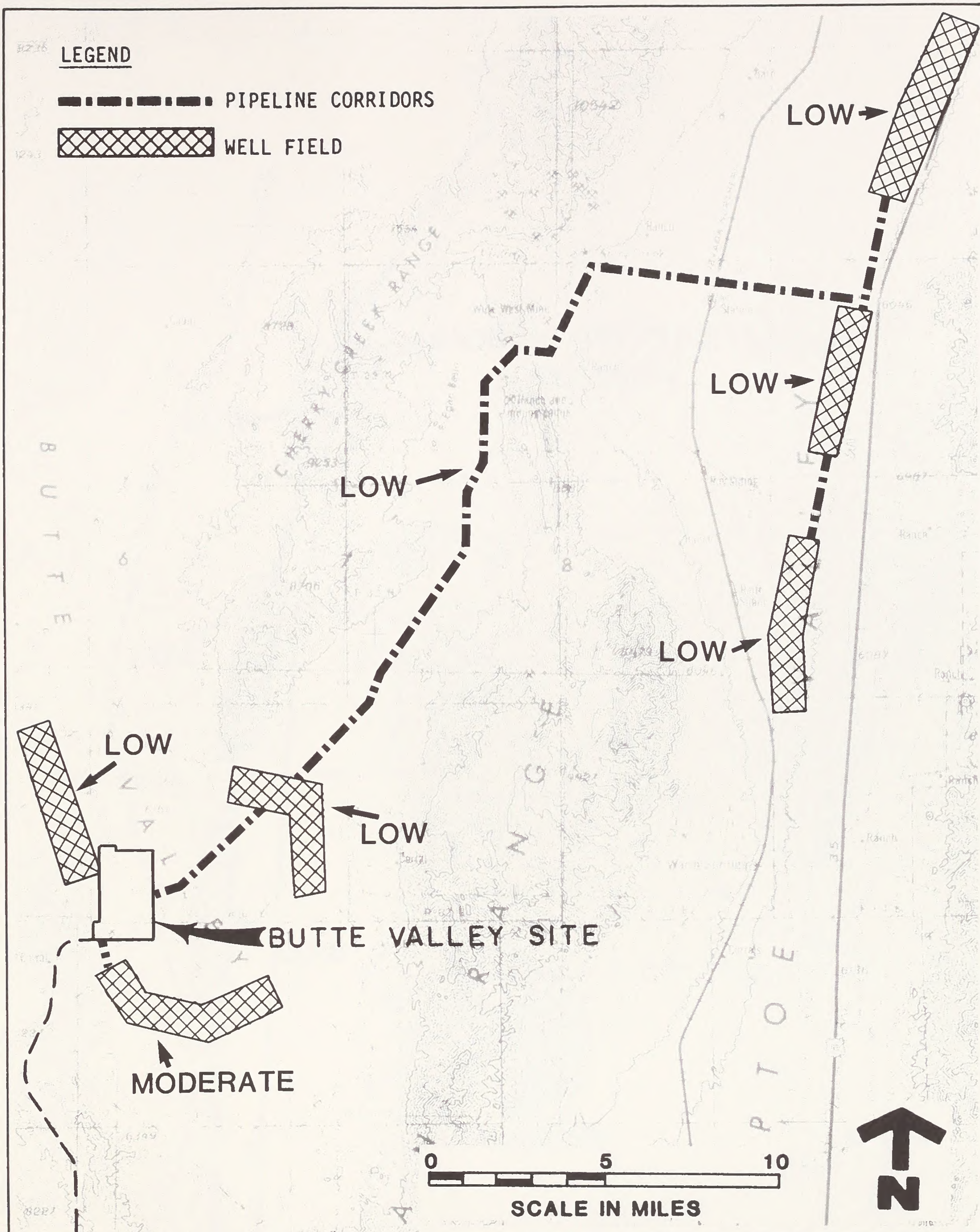


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

CULTURAL RESOURCES IMPACTS WATER SUPPLY SYSTEM SPRING VALLEY SITE

FIGURE 4-13

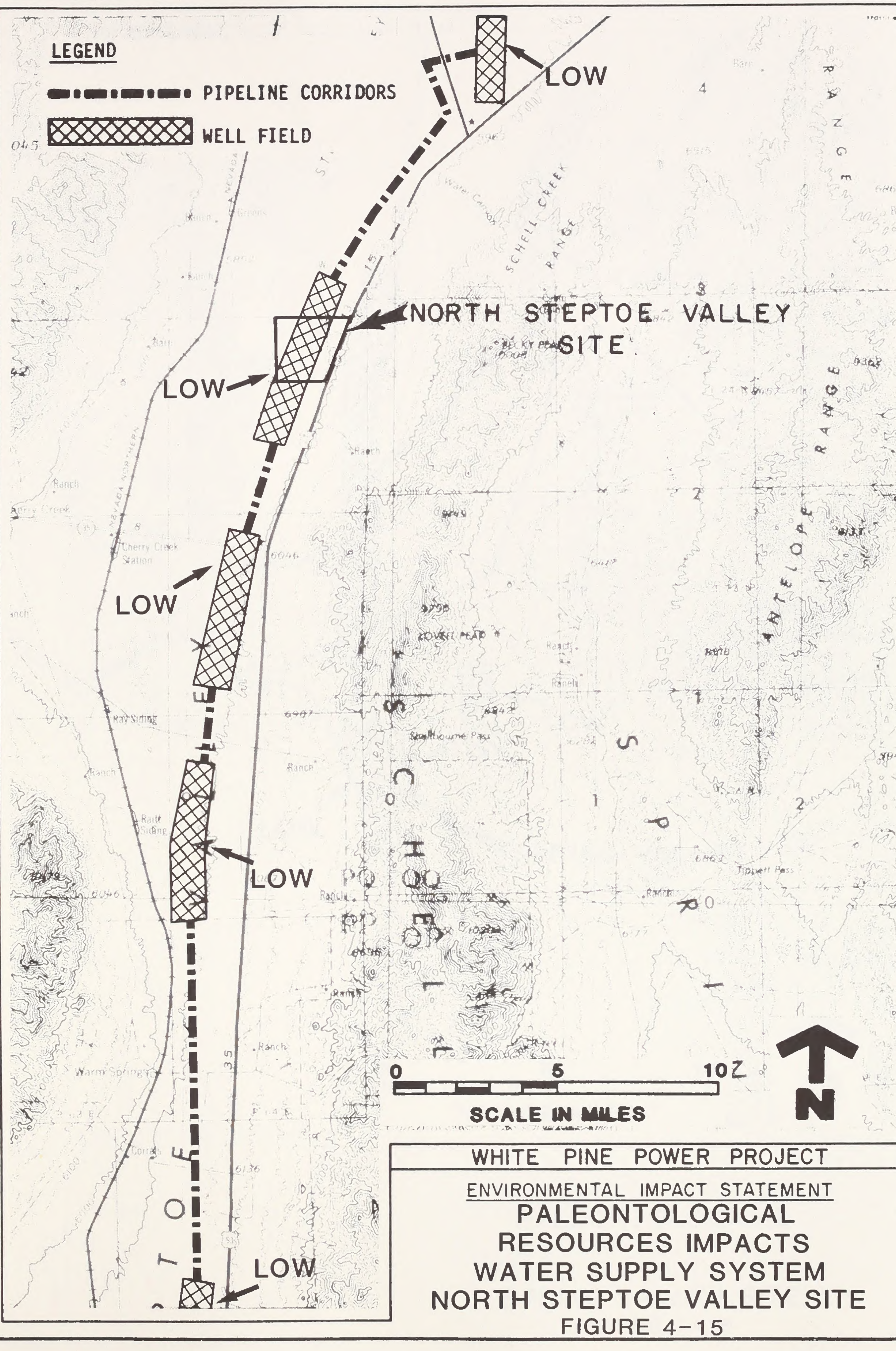


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

PALEONTOLOGICAL RESOURCES IMPACTS WATER SUPPLY SYSTEM BUTTE VALLEY SITE

FIGURE 4-14

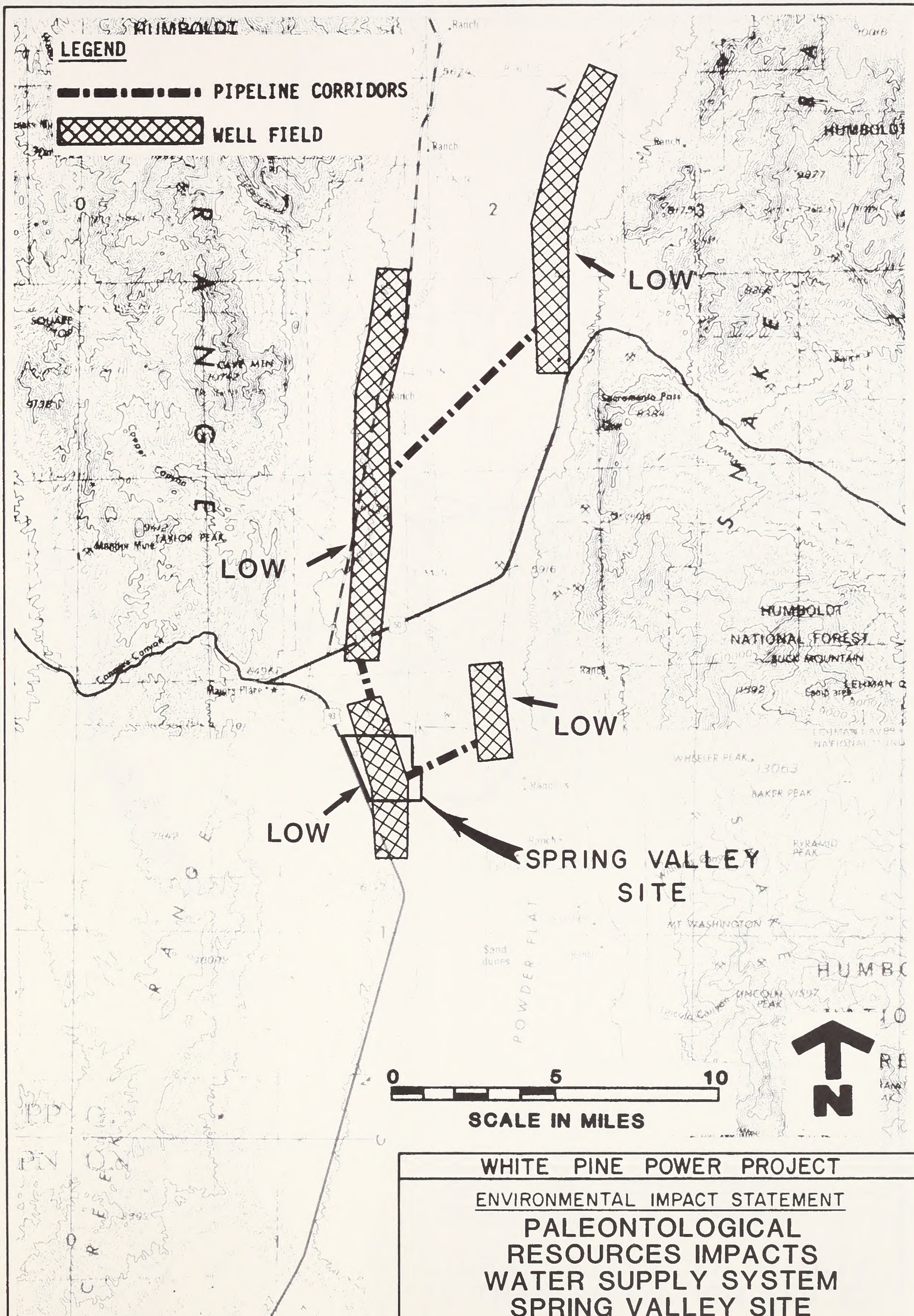


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

PALEONTOLOGICAL RESOURCES IMPACTS WATER SUPPLY SYSTEM NORTH STEPTOE VALLEY SITE

FIGURE 4-15

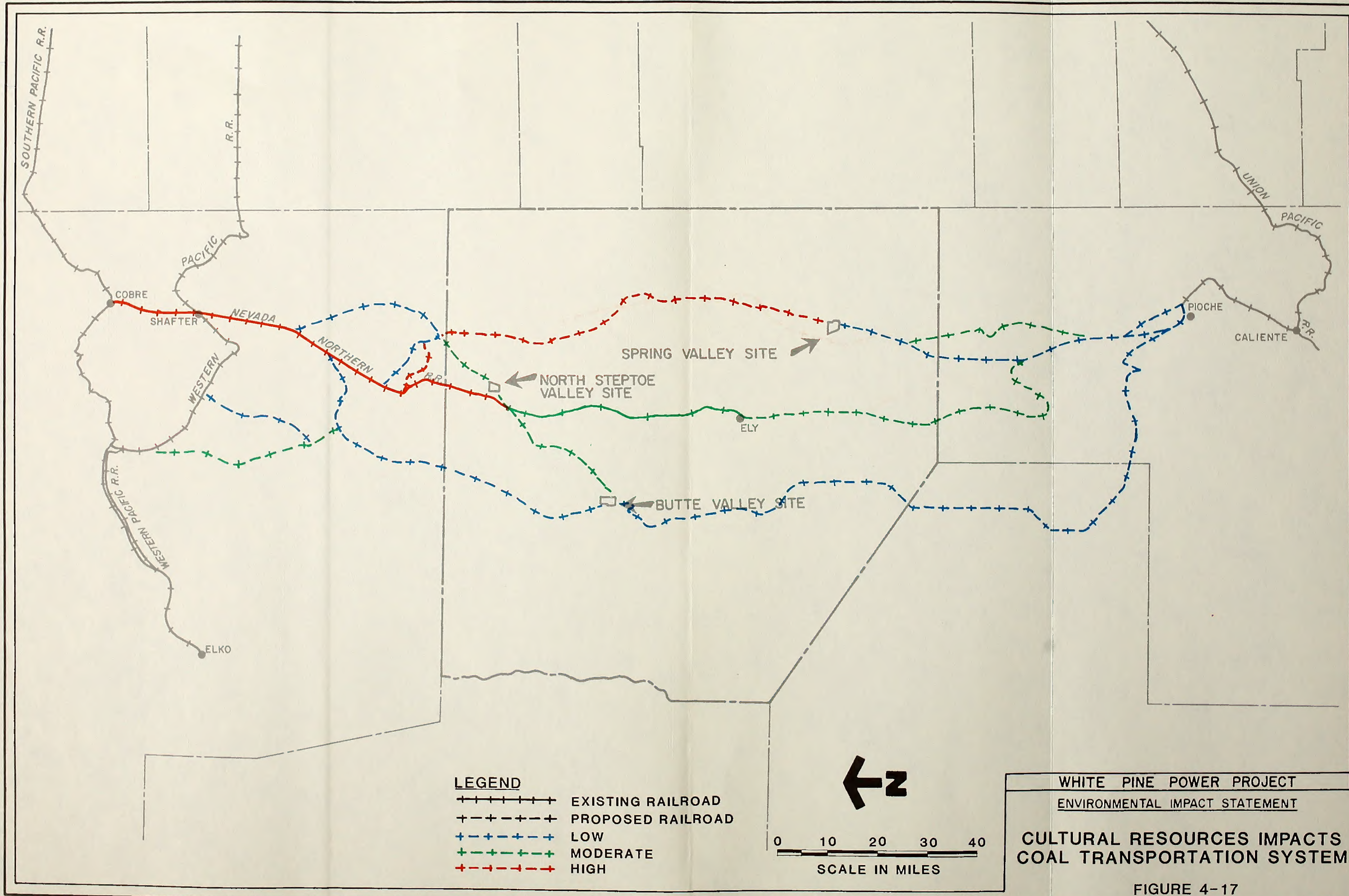


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

PALEONTOLOGICAL RESOURCES IMPACTS WATER SUPPLY SYSTEM SPRING VALLEY SITE

FIGURE 4-16

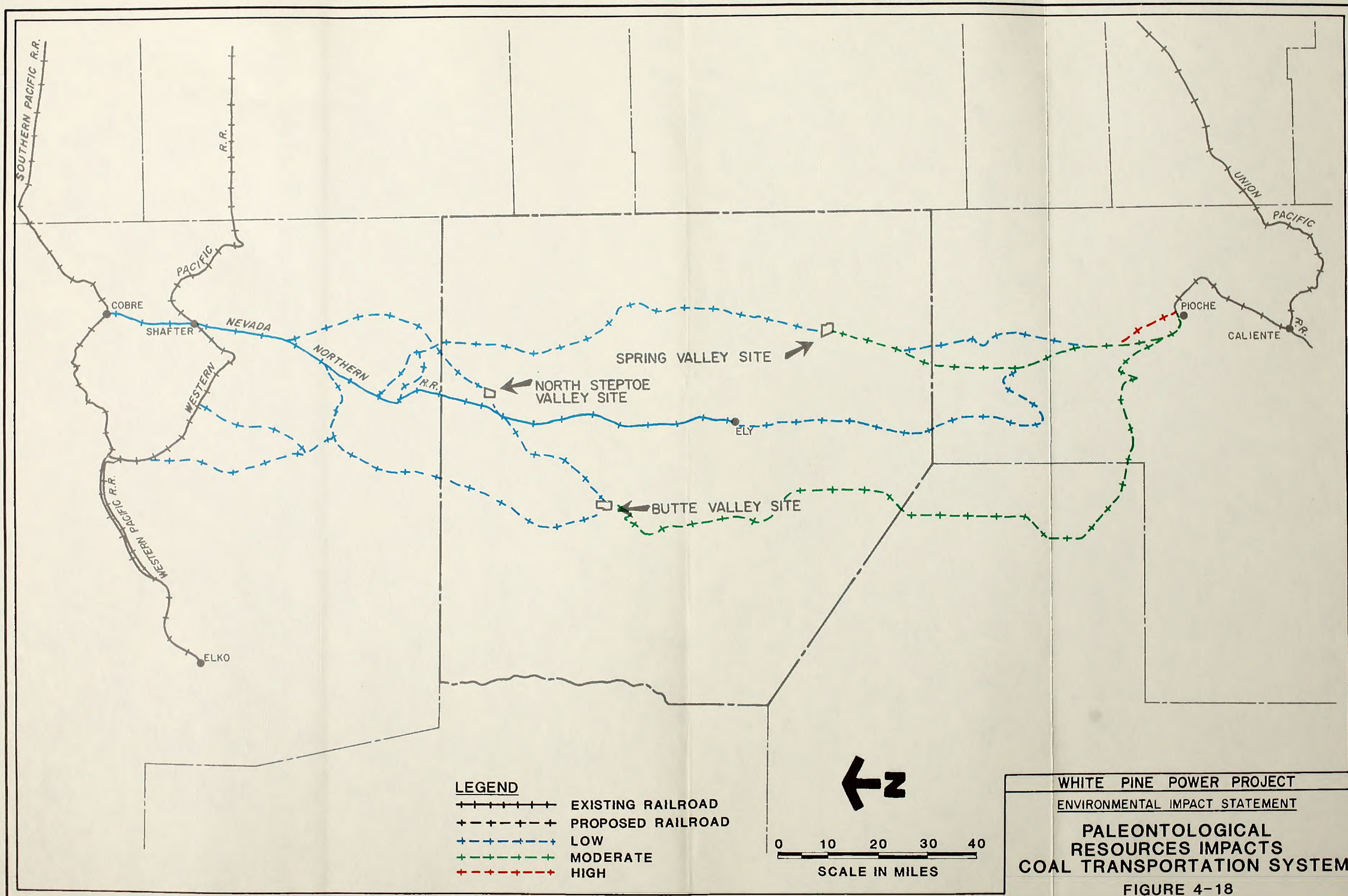


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

CULTURAL RESOURCES IMPACTS
COAL TRANSPORTATION SYSTEM

FIGURE 4-17

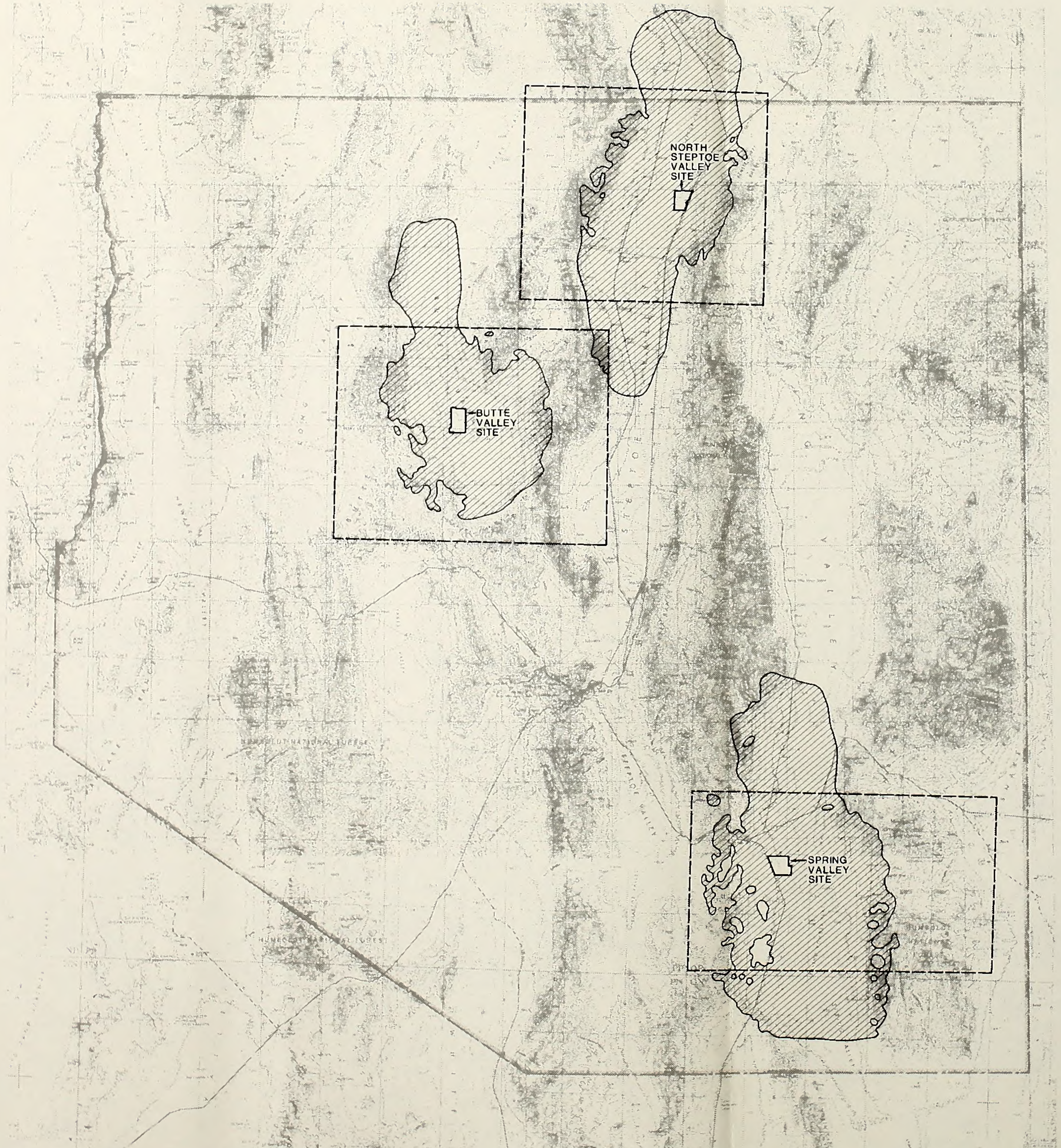


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

PALEONTOLOGICAL RESOURCES IMPACTS COAL TRANSPORTATION SYSTEM

FIGURE 4-18



LEGEND:

WPPP SITE

VIEWSHED (AREA FROM WHICH STACK WOULD BE SEEN)

LIMITS OF AREA SHOWN ON PERSPECTIVE VIEWS

NOTE: VIEWSHEDS WERE COMPUTED BY DAMES & MOORE'S GEOGRAPHIC INFORMATION MANAGEMENT SYSTEM (GIMS™) BASED ON DIGITAL TERRAIN DATA OBTAINED FROM THE USGS NATIONAL CARTOGRAPHIC INFORMATION CENTER.

N

0 15 30 MILES

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

VIEWSHED FOR WPPP GENERATING STATION

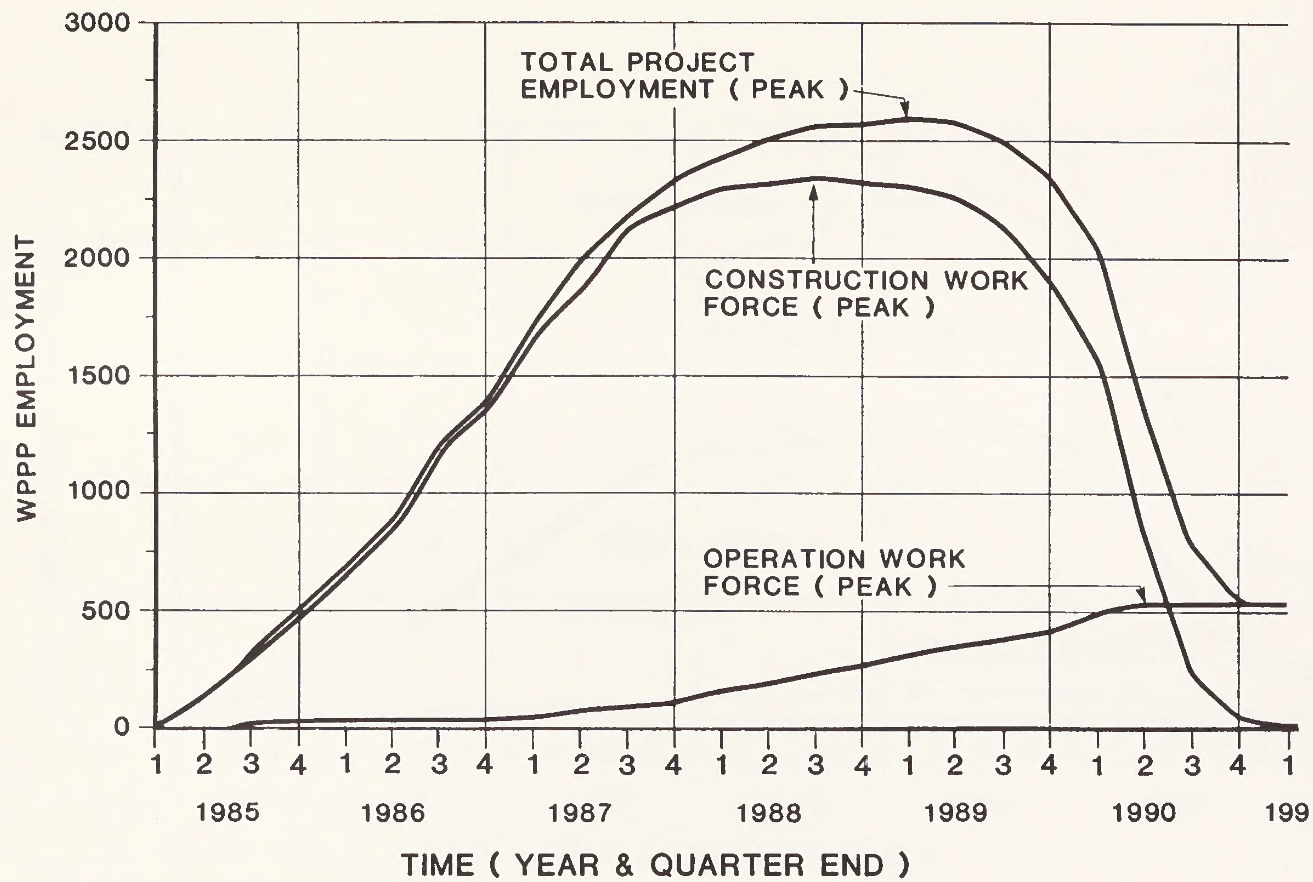
FIGURE 4-19

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

VISUAL SENSITIVITY RATINGS
POWER TRANSMISSION SYSTEM

FIGURE 4-20

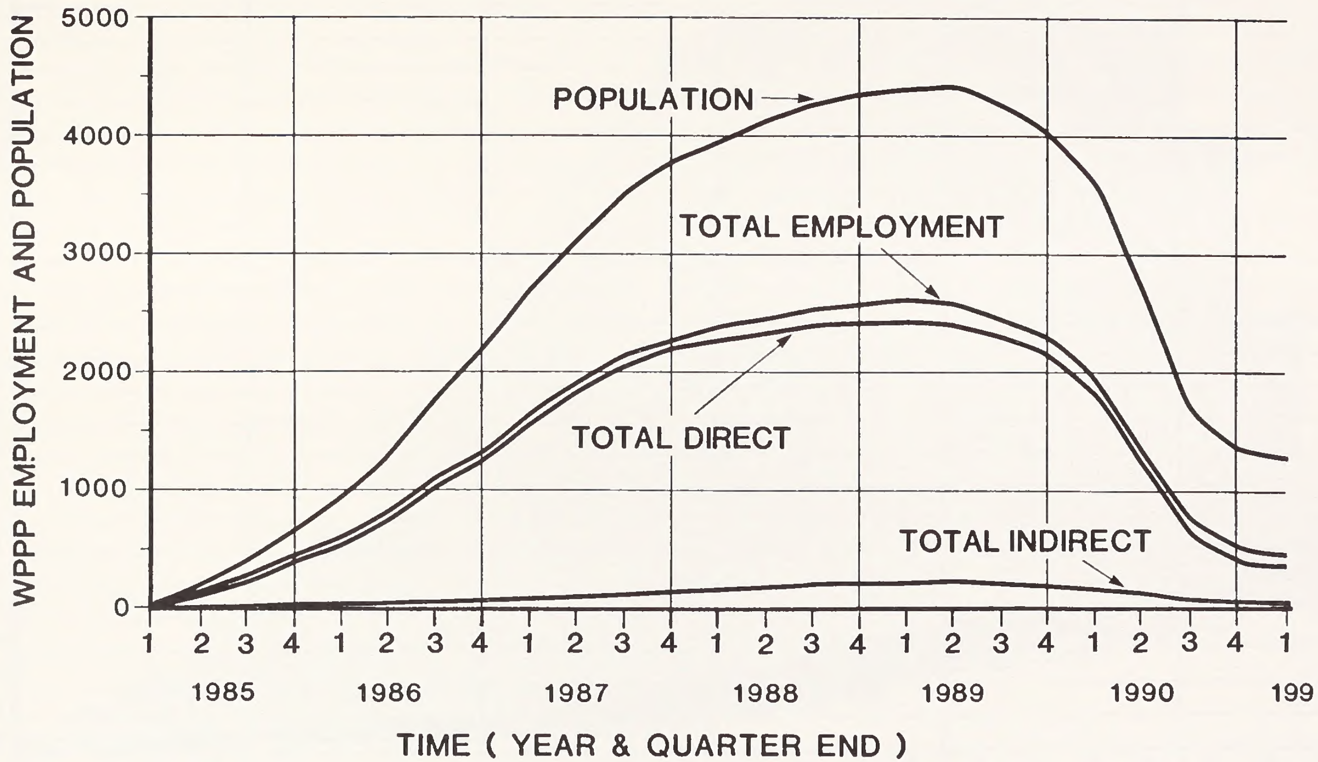


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

DIRECT WORK FORCE REQUIREMENTS

FIGURE 4-21

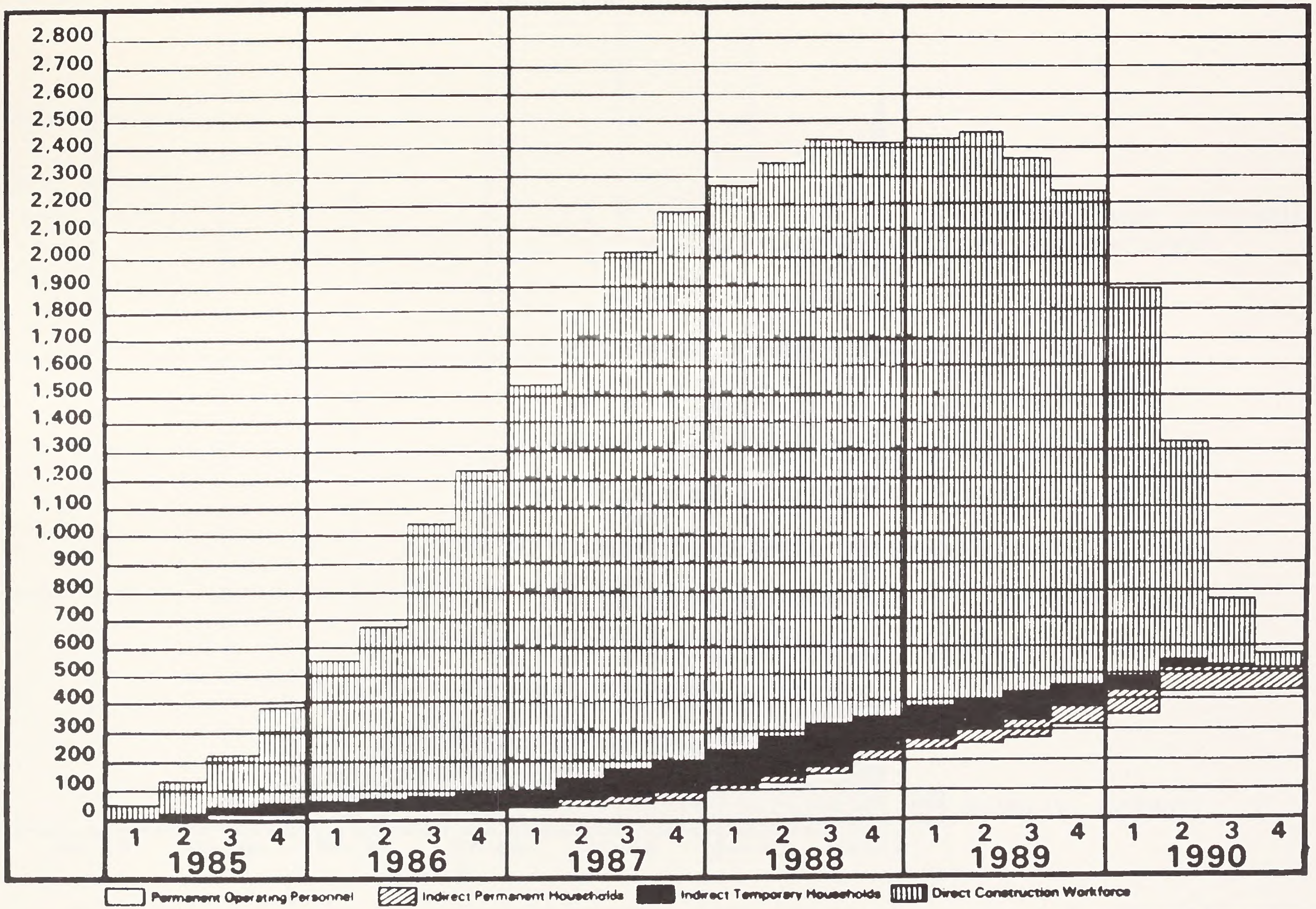


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

DIRECT AND INDIRECT EMPLOYMENT AND POPULATION

FIGURE 4-22

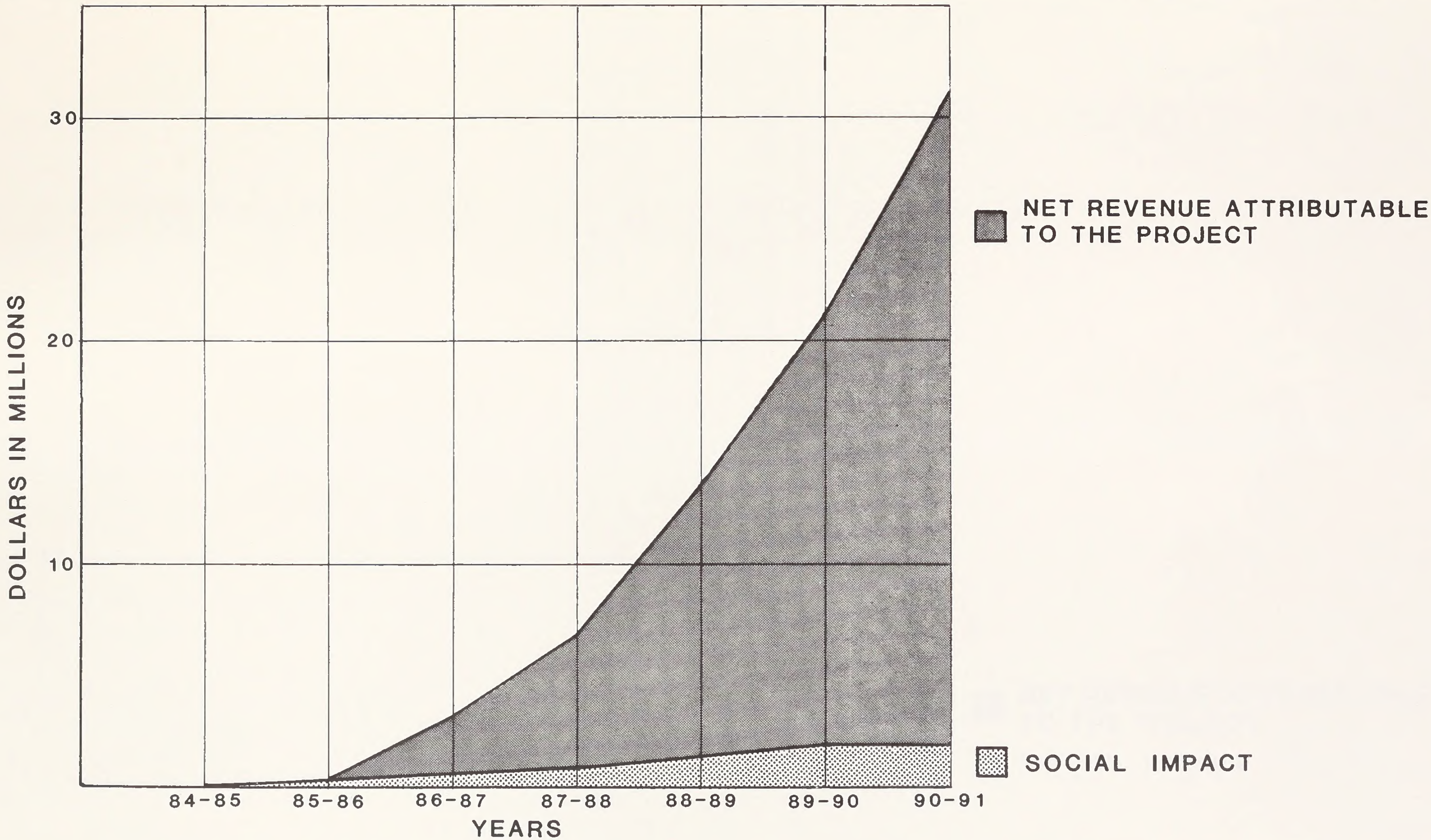


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

HOUSING DEMAND

FIGURE 4-23

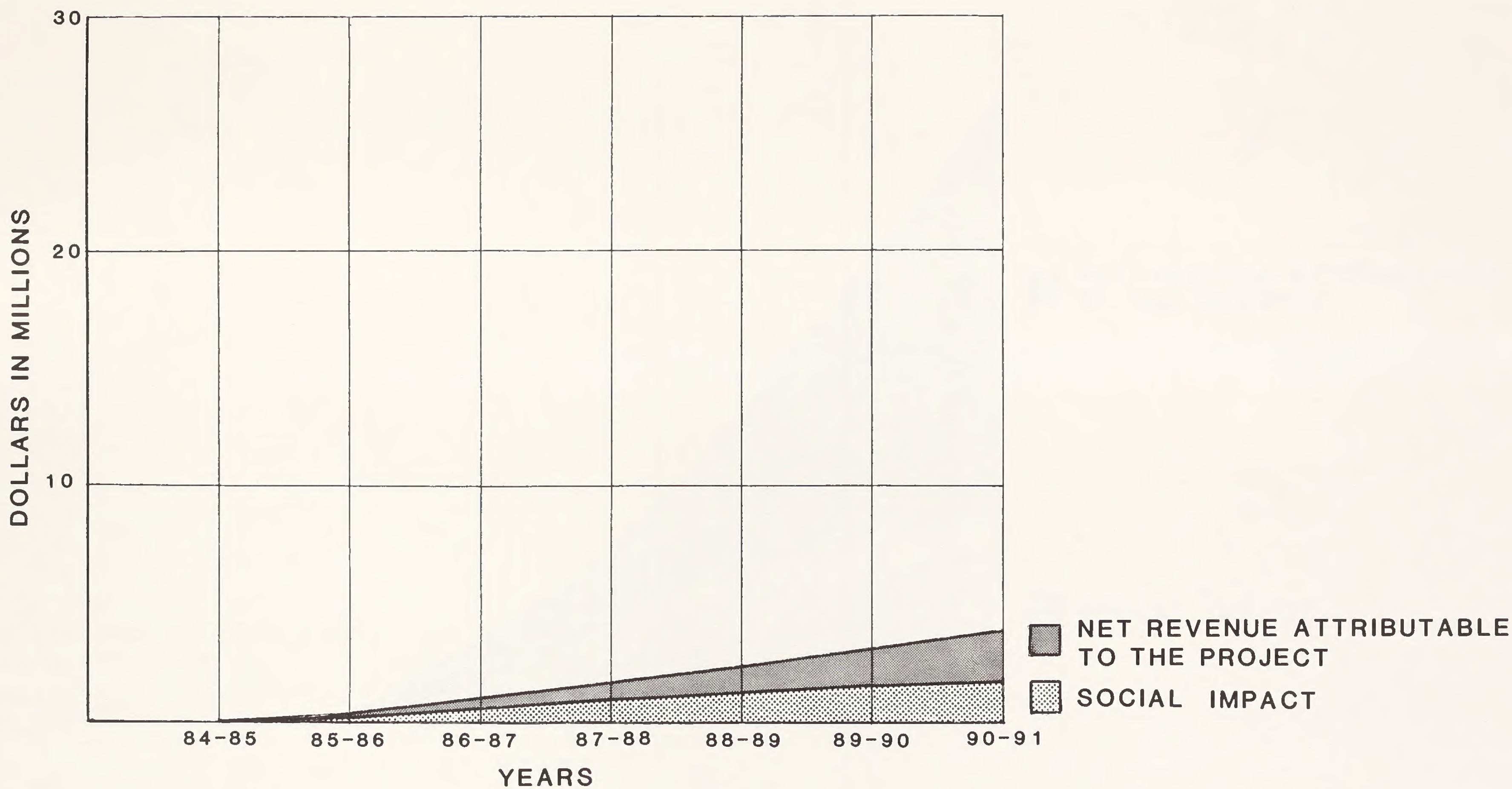


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

NET FINANCIAL LIABILITY
WHITE PINE COUNTY

FIGURE 4-24

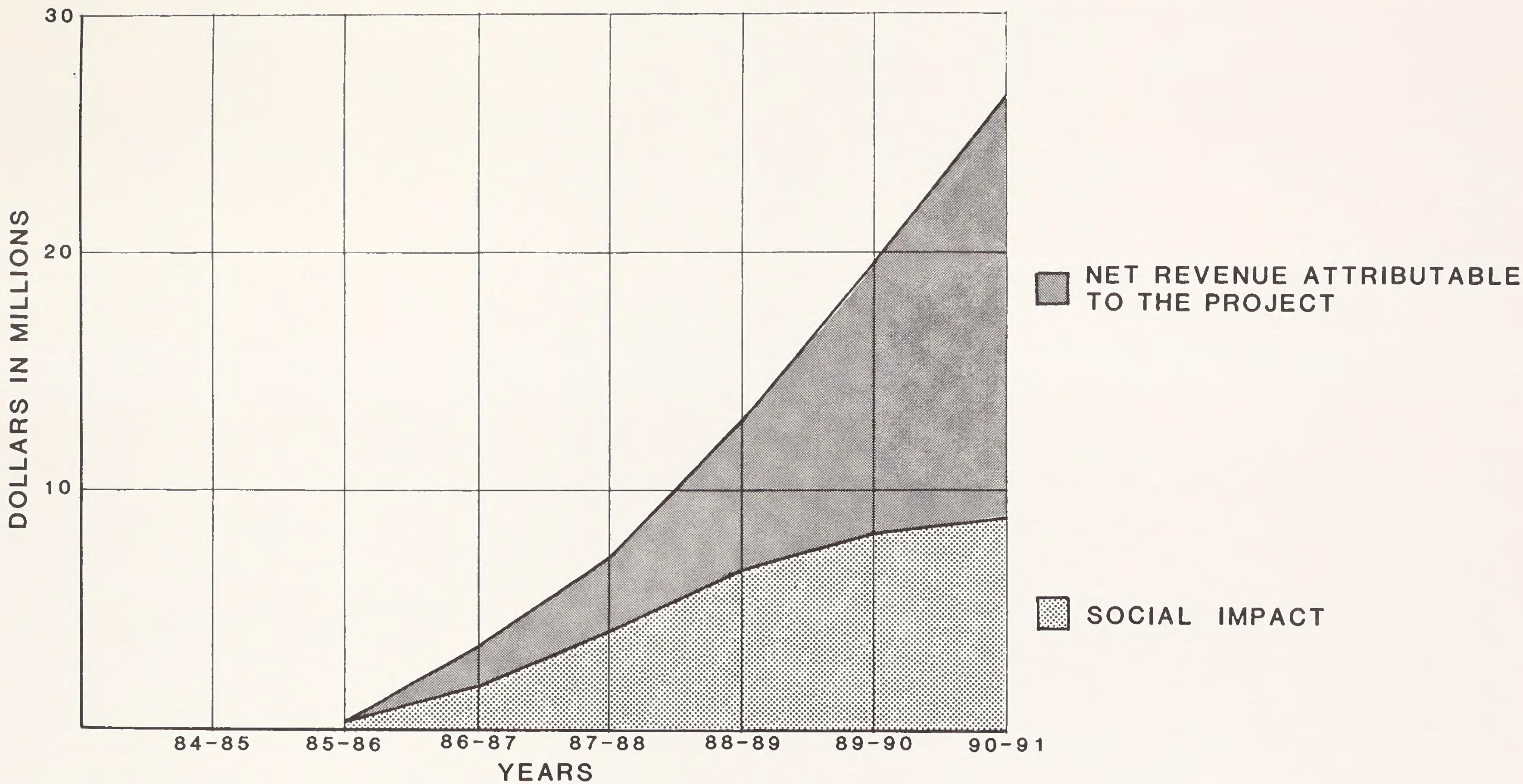


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

NET FINANCIAL LIABILITY
CITY OF ELY

FIGURE 4-25



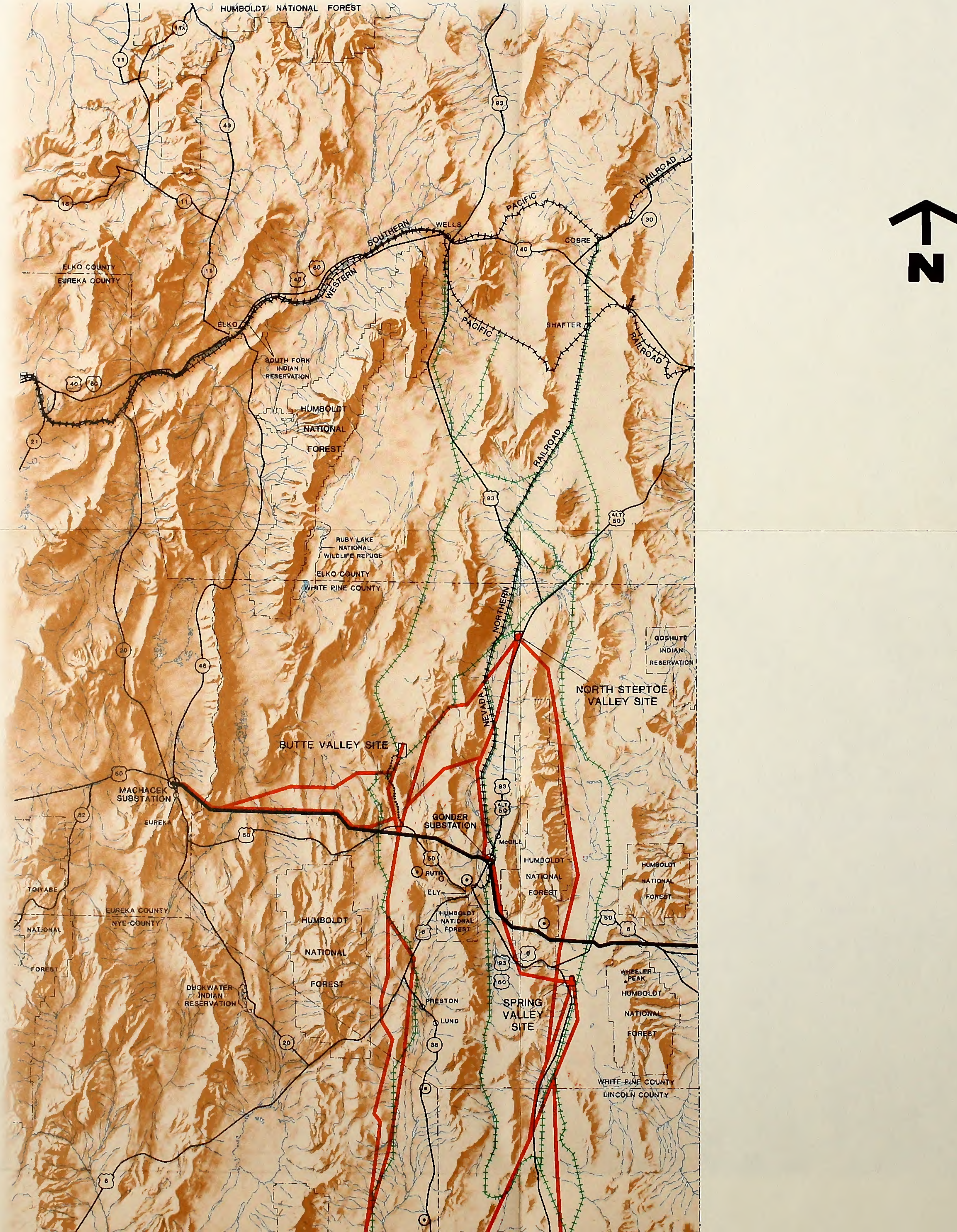
WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

NET FINANCIAL LIABILITY WHITE PINE COUNTY SCHOOL DISTRICT

FIGURE 4-26

WHITE PINE POWER PROJECT
STUDY AREA


HUMBOLDT NATIONAL FOREST
ELKO COUNTY
EUREKA COUNTY
ELKO
SOUTHERN
WESTERN
PACIFIC
WELLS
COBRE
SHAFTER
RAILROAD
SOUTH FORK INDIAN RESERVATION
HUMBOLDT NATIONAL FOREST
NORTHERN
NEVADA
RUBY LAKE NATIONAL WILDLIFE REFUGE
ELKO COUNTY
WHITE PINE COUNTY
GOSHUTE INDIAN RESERVATION
NORTH STEPTOE VALLEY SITE
BUTTE VALLEY SITE
MACHACEK SUBSTATION
EUREKA
GONDER SUBSTATION
McGILL
RUTH
ELY
TOIYABE
NATIONAL
FOREST
EUREKA COUNTY
NYE COUNTY
HUMBOLDT NATIONAL FOREST
DUCKWATER INDIAN RESERVATION
PRESTON
LUND
SPRING VALLEY SITE
WHEELER PEAK
WHITE PINE COUNTY
LINCOLN COUNTY
N

LEGEND:

- WPPP TRANSMISSION CORRIDORS
- EXISTING AND PLANNED TRANSMISSION CORRIDORS
- WPPP RAILROAD CORRIDORS
- EXISTING RAILROAD
- WPPP MICROWAVE SITE
- WPPP ACCESS ROAD

0 5 10 15 20 25 MILES
0 10 20 30 40 KILOMETERS

WHITE PINE POWER PROJECT STUDY AREA