ENVIRONMENTAL IMPACT STATEMENT

final

United States
Department of the Interior

SUMMARY

FES 76-12

FINAL

ENVIRONMENTAL IMPACT STATEMENT

SUMMARY

Proposed

KAIPAROWITS PROJECT

Bureau of Land Management

Department of the Interior

(March 3, 1976)

Curt Berklund

Director

Bureau of Land Management

Prepared by Inter-Agency Team

Department of the Interior

- Bureau of Land Management - Lead Agency
- Geological Survey
- Bureau of Mines
- Bureau of Outdoor Recreation
- Bureau of Reclamation
- Fish and Wildlife Service
- National Park Service
- Bureau of Indian Affairs

Department of Agriculture - Forest Service

Federal Energy Administration

SUMMARY

( ) Draft (X) Final Environmental Statement

Department of the Interior, Bureau of Land Management - Lead Agency

1. Type of Action: (X) Administrative ( ) Legislative

2. Brief description of action: Three companies - Southern California Edison with 40.0 percent of output; San Diego Gas & Electric Company with 23.4 percent; and Arizona Public Service Company with 18.0 percent (18.6 percent uncommitted) - propose to construct and operate a 3,000 megawatt, coal-fired, electricity-generating station and related facilities on Kaiparowits Plateau in southern Utah. Twelve million tons of raw coal would be taken annually from four underground mines. A 500 kilovolt transmission system with a supporting communication network would span approximately 1,460 miles through four states for delivery of power to market areas in Arizona and southern California. A limestone quarry approximately 10 miles north of Bryce Canyon National Park would produce 362,350 tons of limestone annually.

   Private industry is cooperating with local governments in the planning for the proposed construction of a new town. The State would construct a new highway approximately 67 miles long between Glen Canyon City, and Cannonville, Utah. Federal actions would involve the transferring of federal land to state ownership for the plant site and new town, and the granting of rights-of-way across federal land for the transmission system, new highway, and water pipe line. Coal leases and a water delivery contract now exist with the Department of the Interior. Additional federal actions would include authorization for the mining of aggregate and limestone from federal lands, supervision of mining operations and enforcement of safety and environmental standards concerning air and water.

3. Summary of environmental impacts and adverse environmental effects: The generating plant, mine, and support facilities - including the new town, new highway, limestone quarry, and access roads - would occupy 7,320 acres of land. The transmission system would occupy 1,715 acres of land.

   If air pollution control equipment can be operated at design levels, the plant would emit 52 tons of sulfur dioxide, 14 tons of particulates, and 250 tons of nitrogen oxides per day considering the use of worst grade coal. These stack emission levels would equal, or better, the applicable air quality standards. Small amounts of radioactive elements and other trace elements would be released to the atmosphere. Modeling studies indicate that plume opacity would be less than the current 20 percent opacity limitations. Under certain meteorological conditions, stack emissions could cause a reduction in visibility and could produce an evident yellow coloration of the air. The project as proposed would meet the air quality limitations of the Class II designation under the Prevention of Significant Deterioration Regulations. However, the proposed project would be within a 100-mile radius of a number of National Parks, National Recreation Areas, National Monuments, and National Forests, all of which have the potential for redesignation to a Class I area in which practically any change in air quality would be considered significant. The Glen Canyon National Recreation Area (within 20 miles) and Bryce Canyon National Park (within 30 miles) are two components of the National Park system presently being studied. The calculated minimum enforceable control to meet the existing Class II air quality limitations would be daily emission of 89 tons of sulfur dioxide and 25 tons of particulates. Operation above design levels, up to the enforceable limitations, would be an additional threat to air quality of surrounding National Parks, National Recreation Areas, National Monuments and National Forests.

   The generating plant and mine would consume approximately 50,000 acre-feet of water annually from Lake Powell. Solid waste totaling 120 million cubic yards would be produced in 35 years and disposed of on 1,550 acres. Some of these wastes would contain concentrations of toxic trace elements and sulfur and would become a source of pollution to Lake Powell some years after project abandonment. Salt deposition from cooling tower drift would affect more than 1,375 acres of soil and vegetation.

   Several archaeological and historical sites, districts and trails along the proposed transmission system are presently nominated to or included in the National Register of Historic Places. Many unidentified and unassessed sites may also be eligible for inclusion in the National Register. Reduced visibility and sky discoloration due to stack emissions would have a high adverse impact on the quality of the recreation experience for Bryce Canyon National Park (431,000 visitor days in 1973), and Glen Canyon National Recreation Area (1,209,000 visitor days in 1973).

   The proposed project would create a peak employment of 3,105 construction workers and would ultimately employ 3,135 personnel during full operation. The total population increase would be approximately 14,000. Of the total, 9,400 would live in Kane County, Utah, 600 in Garfield County, Utah, and 4,000 in the city of Page, Arizona. The most heavily impacted area would be Kane County, with a present population of 2,700 (estimated). Timely development of a quality new town would be necessary to avoid the occurrence of a "boom town" and severe socioeconomic problems.

   Development of the proposed new town would entail a new socioeconomic composition. It would severely challenge the existing cultural life of nearby residents. The new population could constitute such a political base-line change that a large block of these voters could become the focus of voting power within the county. The indirect impact of the increased population would cause environmental effects on other resource values, for example, increased recreational use could destroy vegetation, disturb wildlife, and cause soil erosion, etc. Direct impacts by the generating station and coal mines on soil, water, vegetation and wildlife would be less significant since they would be largely confined to the 9,035 acres that would be directly occupied by the various project components. The proposed transmission system would have a direct adverse impact on 12 endangered species of fish and wildlife.

   The proposed project has the potential of deferring the expenditure of 80,000 barrels of oil per day. It also would allow the utility companies to maintain what they consider to be acceptable reserve margins. Availability of additional power to the market areas would facilitate continued growth.

4. The following categories of alternatives are covered: (a) design or administrative alternatives: examples are alternative cooling system, alternative voltage levels, and alternative actions by government agencies; (b) site alternatives: examples are the Nipple Bench site and sites outside Utah as alternative power plant sites, alternative new town sites, and alternative transmission routes; (c) alternative ways to meet project objectives: examples are transporting Kaiparowits coal to an alternative site, or use of nuclear power; (d) alternative uses of resources: an example is alternative uses of water; (e) delay or denial.

5. Comments have been requested from the following: Attached is a list of federal, state and non-government agencies with jurisdiction and expertise which received copies of the draft statement.

6. Date draft statement made available to Council on Environmental Quality and the public: July 30, 1975.

7. Date final statement made available to Council on Environmental Quality and the public: March 3, 1976.

COORDINATION IN REVIEW OF DRAFT STATEMENT

Organizations that received a copy of the draft statement and were requested to submit written comments.

Federal

*Department of Transportation

*Department of Agriculture

* Forest Service

* Soil Conservation Service

*Environmental Protection Agency

*Department of the Interior

* Bureau of Reclamation

Bureau of Outdoor Recreation

* Fish and Wildlife Service

* Geological Survey

* National Park Service

* Bureau of Indian Affairs

* Bureau of Mines

* Mining Enforcement and Safety Administration

Office of Coal Research

Office of Land Use and Water Planning

Office of Water Resources Research

Office of the Solicitor

Power Marketing Administration

Office of Saline Water

Federal Power Commission

*Department of Health, Education and Welfare

Energy Research and Development Administration

*Agencies and organizations which prepared written responses to the draft statement.

*Federal Energy Administration

*Department of Commerce

* National Oceanic and Atmospheric Administration

*Tennessee Valley Authority

*Federal Aviation Administration

*National Historical Advisory Council

*Army Corps of Engineers

*Department of Housing & Urban Development

Department of Labor, Occupational Safety & Health Administration

State

*State of Utah

Governor's Clearing House

Utah Department of Highways

*State of Arizona

* Governor's Clearing House

*State of Nevada

Governor's Clearing House

*State of California

Governor's Clearing House

Upper Colorado River Basin Commission

Local

Board of County Commissioners

Washington (Utah)

* Garfield (Utah)

* Kane (Utah)

Coconino (Arizona)

*Agencies and organizations which prepared written responses to the draft statement.

Yavapai (Arizona)

* Maricopa (Arizona)

* Mohave (Arizona)

* Clark (Nevada)

Lincoln (Nevada)

* Orange (California)

* San Bernardino (California)

Non-government organizations

*Sierra Club

Utah Audubon Society

Izaak Walton League - Utah Division

Rocky Mountain Center on Environment

National Stock Growers Association

Utah Wool Growers Association

*Utah Mining Association

The Wilderness Society

*Environmental Defense Fund, Rocky Mountain/Great Plains

The Institute of Ecology

Natural Resources Defense Council, Inc.

Enchanted Wilderness Association

*Escalante Wilderness Committee

*Utah Environment Center

Wasatch Mountain Club

Utah Water Users Association

*Rocky Mountain Federation of Mineralogical Societies

Women's Conservation Council of Utah

Utah Nature Study Society

*Agencies and organizations which prepared written responses to the draft statement.

Archaeological Society of Utah

Rocky Mountain Sportsman Association

*Utah Wildlife and Outdoor Recreation Federation

*Mineralogical Society of Utah

Pro-Utah, Inc.

Utah Sportsman Association

Defenders of the Outdoor Heritage

Utah Cattlemen's Association

Save Our Canyons Committee

*Advisory Commission on Arizona Environment

*Arizona Archaeological Society, Inc.

Colorado Plateau Environment Advisory Council

Arizona Cattle Growers Association

Arizona Conservation Council

*Arizona Desert Bighorn Sheep Society, Inc.

Arizona Environmental Education Council, Inc.

*Arizona Mining Association

*Arizona Wildlife Federation

Arizona Wool Growers Association

Arizonans in Defense of the Environment, Inc.

Common Cause

Environmental Awareness

Environmental Council of Arizona

Defenders of Wildlife

Good Earth

Mearns Wildlife Society

National Wildlife Federation

*Agencies and organizations which prepared written responses to the draft statement.

Nature Conservancy

Western Rockhound Association

*Friends of the Earth

Tucson Wildlife Unlimited, Inc.

SWRCC Wilderness Society

Nevada Wildlife Federation

Wild Horse Organized Assistance

Nevada Conservation Forum

Conservancy Resource Center

*Desert Protective Council

California Wildlife Federation

Society of Conservation of Bighorn Sheep

Inland Com. Conservation Clubs

*Ecology Center of Southern California

Utah Lung Association

Council on Utah Resources

Canyon Country Coalition

*League of Women Voters

Museum of Northern Arizona

Utah Farm Bureau

Tribal organizations

Yavapai-Apache Indian Community
Clarkdale, Arizona

Colorado River Indian Tribes
Parker, Arizona

Harold Tso, Navajo Tribe
Window Rock, Arizona

Kaibab - Paiute Tribe
Fredonia, Arizona

Hopi Tribal Council
Oraibi, Arizona

Hualapai Tribal Council
Peach Springs, Arizona

*Agencies and organizations which prepared written responses to the draft statement.

FOREWORD

This document is a compilation of the summaries of the nine chapters of the Final Environmental Impact Statement for the proposed Kaiparowits Project. The summaries are provided as an orientation to the various aspects of the project.

The detailed Final Environmental Impact Statement for the proposed Kaiparowits Project (6 volumes, 3,596 pages) can be obtained from the Utah State Office, Bureau of Land Management.

INTRODUCTION

Three companies propose to build a 3,000 megawatt, coal-fired electric generating plant on the Kaiparowits Plateau in southern Utah. By megawatt size comparison, there is now just under 1,500 megawatts total generating capacity in the state of Utah (Utah Department of Natural Resources, 1975). Coal would come from four underground mines. Electricity would be consumed in the companies' service areas in southern California and Arizona.

It would be necessary for the Federal Government to take several actions to allow the project to be completed. Coal leases and a water contract with the Department of the Interior already exist. The proposed site for the power plant is now federal land; transfer of this land to state or private ownership would be required. Also, the transmission system would require rights-of-way across federal land.

Traditionally, our society has based decisions for or against development of proposals such as Kaiparowits almost singly on dollar values, costs, and benefits. On January 1, 1970, however, the President signed into law the National Environmental Policy Act. Purposes of the Act are to declare a national policy which will encourage productive harmony between man and the environment, and to promote efforts which will prevent damage to the environment. Under this law all agencies of the Federal Government will develop procedures which will ensure that presently unquantified environmental values may be given appropriate attention in decision-making along with economic and technical considerations. To do that, all agencies are required to prepare a detailed statement for every major action that would significantly affect the quality of the human environment. Such statements will include environmental impacts of the proposed action, adverse effects that cannot be avoided, and alternatives.

This statement is being prepared to fulfill requirements of that law. Therefore, environmental values that would be damaged or benefited are set forth so that these values may be considered by decision-makers.

All impacts caused by the proposed project are analyzed regardless of where they may be expected to occur. Geographic limits were not imposed. For example, some impacts would occur directly at the project site. Other impacts would be caused by the greater number of people who would reside and travel in the area, and would be more widespread.

In summary, this statement sets out facts about the proposed Kaiparowits project and environmental consequences of that project in the detail necessary for decision-making. It also makes the facts available to the public.

The following is presented to aid the reader of the statement:

Chapter I locates and describes the proposed action.

Chapters II, III, and V are divided according to the resource impacted, such as air quality, wildlife, recreation values, and socioeconomic values. Each resource is further divided into Kaiparowits Plateau impact area, transmission system impact area, and limestone quarry impact area. These are geographically separate areas. The Kaiparowits Plateau impact area includes all areas impacted by the coal mines, power plant, new highway, new town, and all support facilities. The transmission system impact area includes all areas impacted by the transmission lines, communications system, substations, and support facilities such as roads. The limestone quarry impact area includes all areas impacted by the limestone quarry and support facilities. No geographic boundaries were established for these areas since the impacts must be analyzed regardless of where they may occur. The impacts that would occur in these areas are assessed collectively in Chapters VI and VII. The impacts considered collectively would be no greater than the impacts considered individually in each area.

Thus, if a reader is interested in one resource he need only read the sections on that resource. For example, a reader interested in archaeology could learn of the total impact on that resource by reading only the archaeology section in each chapter. On the other hand, if a reader is interested in a specific area, he need only read the subsections about that area under each resource. That is, a reader interested in the Kaiparowits Plateau could learn the total impact on all resources in that area by reading each subsection on "Kaiparowits Plateau."

Chapter IV sets forth mitigating measures for each of the three impact areas.

Chapters VI and VII summarize short-term uses of the environment versus long-term productivity, and irretrievable and irreversible impacts for the entire proposal.

Chapter VIII describes and analyzes alternatives and their related impacts.

Chapter IX is a summation of coordination and consultation, including public comments on the draft statement.

The reference material contains glossary, abbreviations, bibliography, and appendices.

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CHAPTER I

DESCRIPTION OF PROPOSED ACTION

SUMMARY

The Kaiparowits project would involve construction and operation of a 3,000 megawatt (MW) coal-fired electric generating station which would provide power to southern California and Arizona. In addition to the power plant, the proposal includes construction of a 500 kilovolt (kV) single circuit transmission system, and the operation of four underground coal mines, a limestone quarry and an aggregate quarry. A new town and highway are also proposed. Illustration I-1 shows the proposed location of the project in Utah. Illustration I-2 presents a composite of the proposed project.

The generating plant would be a joint venture by three utility companies: Southern California Edison Company (40.0 percent of output), San Diego Gas & Electric Company (23.4 percent of output), and Arizona Public Service Company (18.0 percent of output). Salt River Project Agricultural Improvement and Power District of Arizona was previously a participant in the Kaiparowits project, but on May 5, 1975, they terminated their agreement. Of the total output, 18.6 percent is uncommitted. Participation would ultimately be made available to other users.

The rationale for construction of a 3,000 MW generating station is based on many factors. The demand for electric power is increasing. Electric power consumption in the Kaiparowits market area is projected by the participants to grow at an annual compound rate of growth of approximately 6.8 percent. Independent forecasts indicate this rate of growth to be too high.

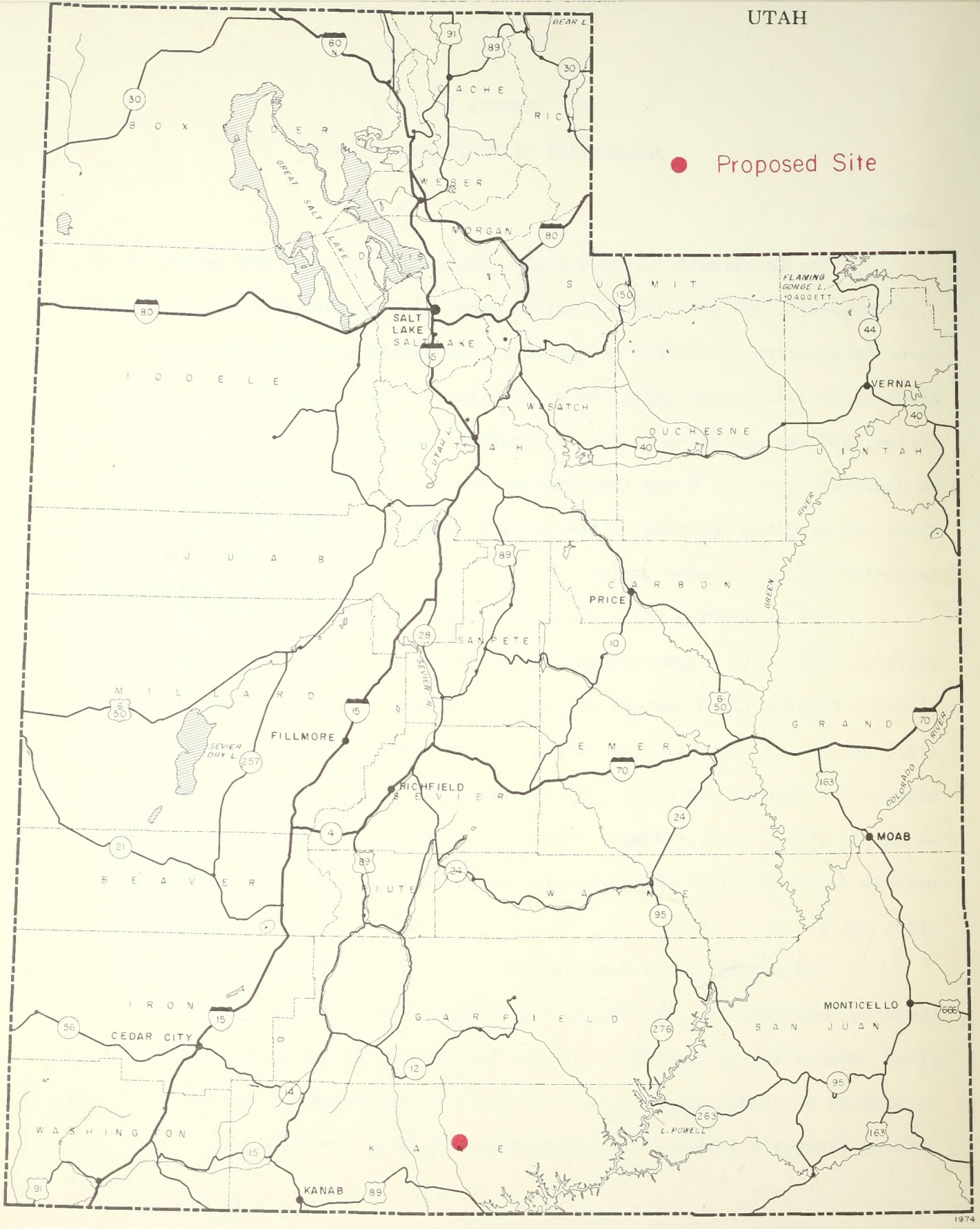


ILLUSTRATION I-1

Proposed Kaiparowits Site

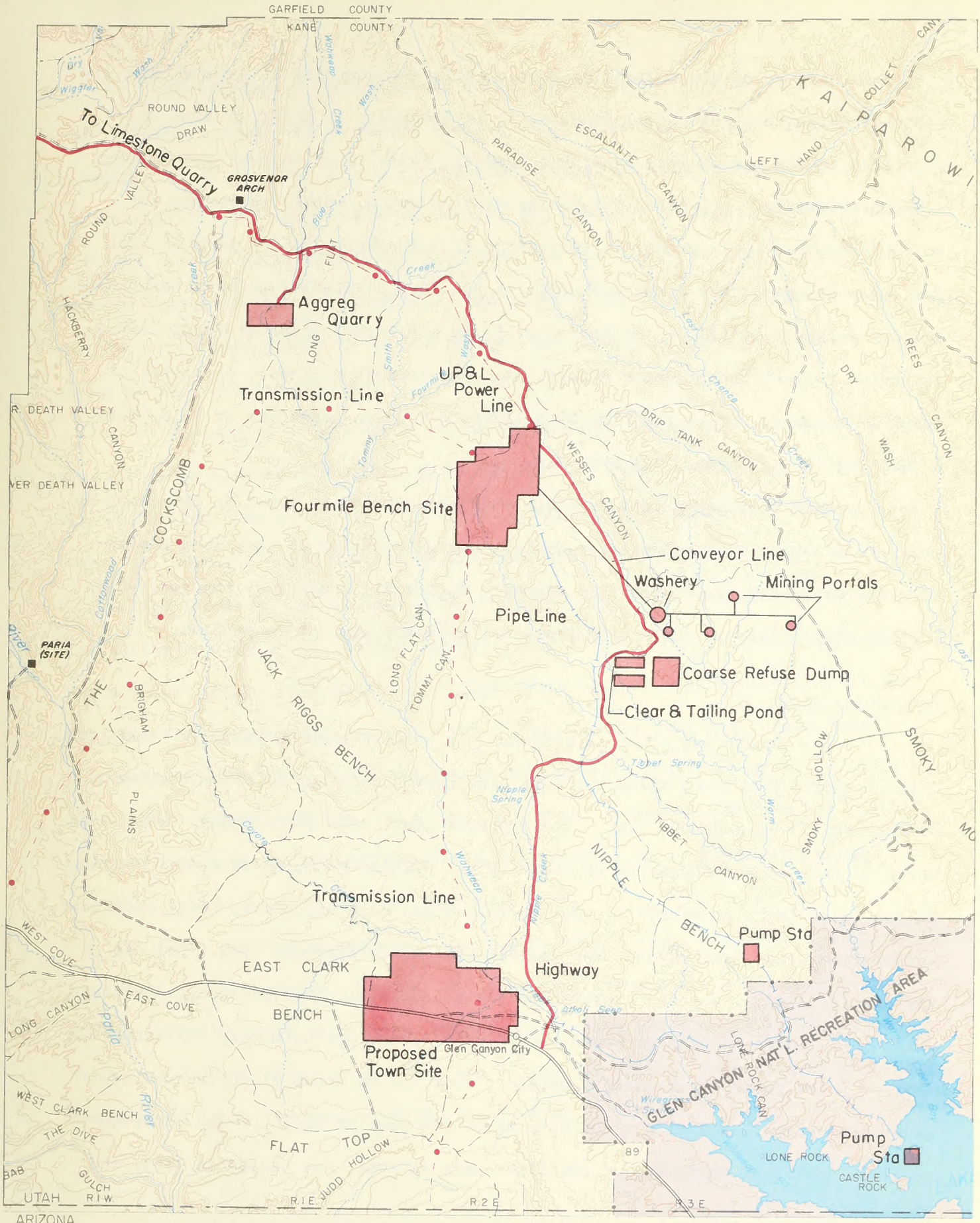


ILLUSTRATION I-2

Generating Station Composite Fourmile Bench Site

SCALE?

Because of the increasing cost of oil, the scarcity of natural gas, and the decreasing reliance on oil imports, it is necessary to shift as much as practical to the use of more available domestic fuels, such as coal and uranium. A Kaiparowits-size, oil-fired generating station would require approximately 80,000 barrels of oil per day in comparison to Kaiparowits 25,000 tons of coal per day. Assuming 1984 crude oil costs at $14.30 per barrel (Southern California Edison assumption), $11.00 per barrel or $7.00 per barrel (Federal Energy Administration Project Independence Report, high and low assumptions), operation of Kaiparowits could reduce the flow of dollars to foreign countries by $418, $321, or $204 million per year, respectively.

Base load generating capacity such as Kaiparowits would be increased in order to minimize system operation costs. Characteristics of base load generation are operation at or near full capacity during all hours that the generation unit is available, and low energy costs per kilowatt hour of generation.

Generating plant

The generating plant is proposed for construction on Fourmile Bench, located approximately 16 miles north of Glen Canyon City and 18 miles northwest of Lake Powell in southern Utah. The proposed plant site would occupy 3,520 acres of federal and 640 acres of state land. Within the 4,160 acre site would be the following: power block, coal storage area, cooling towers, water reservoir, evaporation ponds, switchyard, ash and scrubber waste disposal area, fuel oil storage facility, limestone preparation plant, administration building, shop, and warehouse. These facilities would permanently occupy approximately 932 acres.

The power block would consist of four 750 MW steam electric-turbine generating units, each with a concrete stack 600 feet in height. The present schedule envisions operation of the first unit in 1982, the second in 1983, and full operation by 1984.

Electrostatic precipitators would remove particulate matter, and wet lime scrubbers would remove sulfur dioxide (SO_2) from stack gases. The participants propose that the levels of emission control attained would be 99.5 percent particulate removal and 90 percent SO_2 removal. However, approximately 8.0 tons per day particulates and 21.0 tons per day SO_2 would pass through the removal systems into the atmosphere. Emissions of nitrogen oxides (NO_x) would be controlled to some extent by boiler design, but approximately 250 tons per day would be emitted into the air.

Coal would be delivered to the station by covered belt conveyors. The station would consume approximately 24,730 tons of washed average grade coal per day (9,000,000 tons per year). In order to maintain the continuous maximum burn rate, the conveyor would deliver 47,000 tons per day, 5 days per week. An active and inactive coal storage area would be required to accommodate this load. The active storage would contain approximately 200,000 tons of coal, sufficient for a 6-day supply. The inactive storage would contain approximately 1,500,000 tons (45 days supply) for emergency use. The inactive coal pile would cover approximately 32 acres. Both the active and inactive coal storage areas would be open. Dust suppression for the active pile would be maintained by water sprays; non-toxic chemical sprays (containing alkyl, phenol, ether and polyethylene glycol) would be used on the inactive coal pile.

Wet cooling towers would be used to reject waste heat from the plant circulating water system. Each of the four generating units would require two towers, with 10 cells per tower. Dimensions of each tower would be 400 by 70 feet, and 35 feet in height (to the top of the fan deck). Base area of each tower would be approximately 28,000 square feet.

Operation of the cooling towers would result in evaporative water losses, drift losses, and blowdown water losses. Quantities of water needed to make up the losses at maximum continuous load for four units are estimated as follows:

	gallons/minute
Evaporation	27,510
Drift losses	[a]230
Blowdown	1,735
Total estimated make-up water for four units	29,475 =

47,543 AFY

[a]Assuming 0.02 percent drift loss.

Water from Lake Powell would be pumped from a point at Warm Creek through a 30 mile long buried pipe line to a reservoir near the power plant. The reservoir would provide continued service to the plant in the event of an outage of the water make-up system. The reservoir would occupy 65 surface acres at an average depth of 35 feet, and contain approximately 2,640 acre-feet (860,000,000 gallons) of water, sufficient to supply the station for 14 days at maximum capacity during the hottest summer month. X 365 = 50,000 AFY

The make-up water system would be designed to accommodate an average flow of 30,961 gallons per minute (137 acre-feet per day) and a peak flow of 36,739 gallons per minute (162 acre-feet per day) from Lake Powell. This water demand would amount to approximately 41,400 acre-feet of the Utah allocation of Colorado River water each year (approximately 10 percent of Utah's remaining allocation of Colorado River water).

Evaporation ponds would be needed to collect and evaporate plant waste water. Two separate pond systems would be constructed to handle service water waste from plant operation and effluent discharged by the sewage treatment plant.

Six or seven ponds, ranging in size from 9 to 40 acres with an average size of 25 acres, would be needed. The total pond area (180 acres) would be divided as follows:

	(acres)
Service water waste	157
Effluent from the sewage treatment plant (one separate pond)	23
Total	180

The ponds would be divided to provide waste water management flexibility. The average water flow to the evaporation ponds would be 389 gallons per minute or 1.5 percent of the average water supplied to the station.

The switchyard would cover an area approximately 1,250 by 1,100 feet and include a 500 kV switch rack, a 66 kV switch rack, a single story relay-battery house, three relay banks, and other related equipment and facilities.

A waste disposal area would dispose of the ash produced by burning coal and sludge produced from the wet lime SO_2 scrubber. Anticipated quantities of ash and scrubber sludge would be 3,451 tons per day and 1,293 tons per day, respectively. Land fill would be selected for final disposal of ash and scrubber waste. The disposal site would be in a natural drainage area at the head of a canyon with a different drainage than that for the evaporation ponds and reservoir.

Total amount of waste placed in the disposal area, including contingency material, would amount to approximately 50 million cubic yards, consisting of 15 million cubic yards of ash, 31 million cubic yards of ash-scrubber sludge, 2.5 million cubic yards of excavated material, and 1.5 million cubic yards of limestone kiln waste. The resulting total disposal area would cover approximately 450 acres to an average depth of about 70 feet. Ash and sludge would be transported

to the disposal site by trucks, and placement in the disposal area would be staged in periods of from 5 to 10 years.

A system would be provided to furnish fuel oil to the boiler ignition system for the steam generating equipment. In addition, fuel oil would fire the auxiliary steam generators. During the first 2 years of plant operation, approximately 1,000,000 barrels per year would be required. After 5 years of operation the fuel oil required would drop to 200,000 barrels per year for the life of the plant.

The oil would be stored in two fixed-roof insulated tanks, tentatively sized at 110 feet in diameter and 48 feet in height, each designed to contain 75,000 barrels. The storage tanks would be completely encircled by an earthen dike capable of retaining 110 percent of tank capacity to allow freeboard for precipitation or fire fighting water. This configuration conforms to federal regulations. The tanks would be protected against corrosion by suitable coatings or cathodic protection.

Limestone would be required at the power plant site to produce lime for removing SO_2 from flue gases produced in the coal-fired boiler and for water treatment prior to boiler use. Limestone would also be required for dusting at the coal mining site. Limestone from the quarry would amount to 780 tons per day, hauled in highway-type bottom dump trucks on a 5-day per week basis. The limestone would then be crushed, and approximately 290 tons per day would be pneumatically loaded into tank-type bulk carriers and transported to the mine.

Approximately 350 tons per day of crushed limestone and 50 tons per day of coal would be converted in the kiln into 175 tons per day of lime, 157 tons per day of gaseous carbon dioxide (CO_2), and 5 tons per day of ash. Gases from the kiln would pass through a bag house for removal of fly ash prior to discharge into the atmosphere. The SO_2 produced by the burning coal would react with the

lime and thus be removed from the gas stream. Solid waste materials produced would include ash, impurities in the limestone, and unreacted limestone. These impurities would be transported to the plant waste disposal area.

Approximately 13 tons per day of lime would be used for a lime-soda water pretreatment. The lime-soda softener would function as a means of partially softening (reducing calcium and magnesium) raw lake water.

The administration building, shop, and warehouse (ASW) facilities would provide space for personnel, equipment, and materials required in administration, operation and maintenance of the generating station. These facilities would include offices, storage space for plant records, conference rooms and classrooms, equipment shops for servicing the station, storage areas for parts and materials, and locker, shower and lunch areas for operating personnel.

Total area within the ASW facilities would be approximately 86,700 square feet. Total area occupied by other facilities, including parking areas and landscaped areas, would be approximately 345,600 square feet (10 acres).

Coal mine

The Kaiparowits generating facility would be fueled with coal produced from a 47,768 acre composite of federal and state lands located in south central Utah. The property is held under lease by Resources Company (subsidiary of Arizona Public Service Company), New Albion Resources Company (subsidiary of San Diego Gas & Electric Company), and Mono Power Company (subsidiary of Southern California Edison Company).

The mining complex would include four underground mines, a coal preparation plant (washery), waste disposal areas, administration and service buildings, and utility corridors for belt conveyors, roads, power and water lines. At full operation, the surface facilities would occupy 1,636 acres (Illustration I-3).

The mines would produce 12 million tons of "raw" or mine-run coal per year to provide an annual requirement of approximately 9 million tons of washed, clean coal for the generating station. Over the 35-year life of the project, a total of 420 million tons of mine-run coal would be produced. Water consumption for mining and related surface operations would amount to about 3,100 acre-feet per year.

13,000 T/day X 365 = 4,745 MTY

Sizeable quantities of waste material would be generated in connection with the mine operation. Approximately 6,900 tons of coarse refuse and 6,100 tons of fine waste would be generated each day the mine and washery were operating. Coarse waste would be hauled to a coarse waste dump which would eventually occupy 550 acres to an approximate 29-foot depth, and contain approximately 26 million cubic yards (56 million tons). Waste material would be compacted, covered with topsoil, and eventually revegetated.

The coarse waste dump would be used in stages of about 10 acres at a time. Topsoil would be removed and saved from each stage and later used as cover over the waste to prevent spontaneous combustion and as an aid in revegetation efforts.

Fine waste would be pumped as a slurry to a tailings pond which would ultimately be of sufficient size (550 acres) and sufficient depth (50 feet) to permit most fine refuse to settle out. The pond would ultimately contain approximately 43 million cubic yards of tailings. The pond would be impounded by tailings dams engineered to meet or exceed all state and federal standards, and would be lined with mudstone to minimize water percolation. The pond would be constructed and filled in sections, each section sufficient for 3 years of tailings disposal (approximately 30 acres).

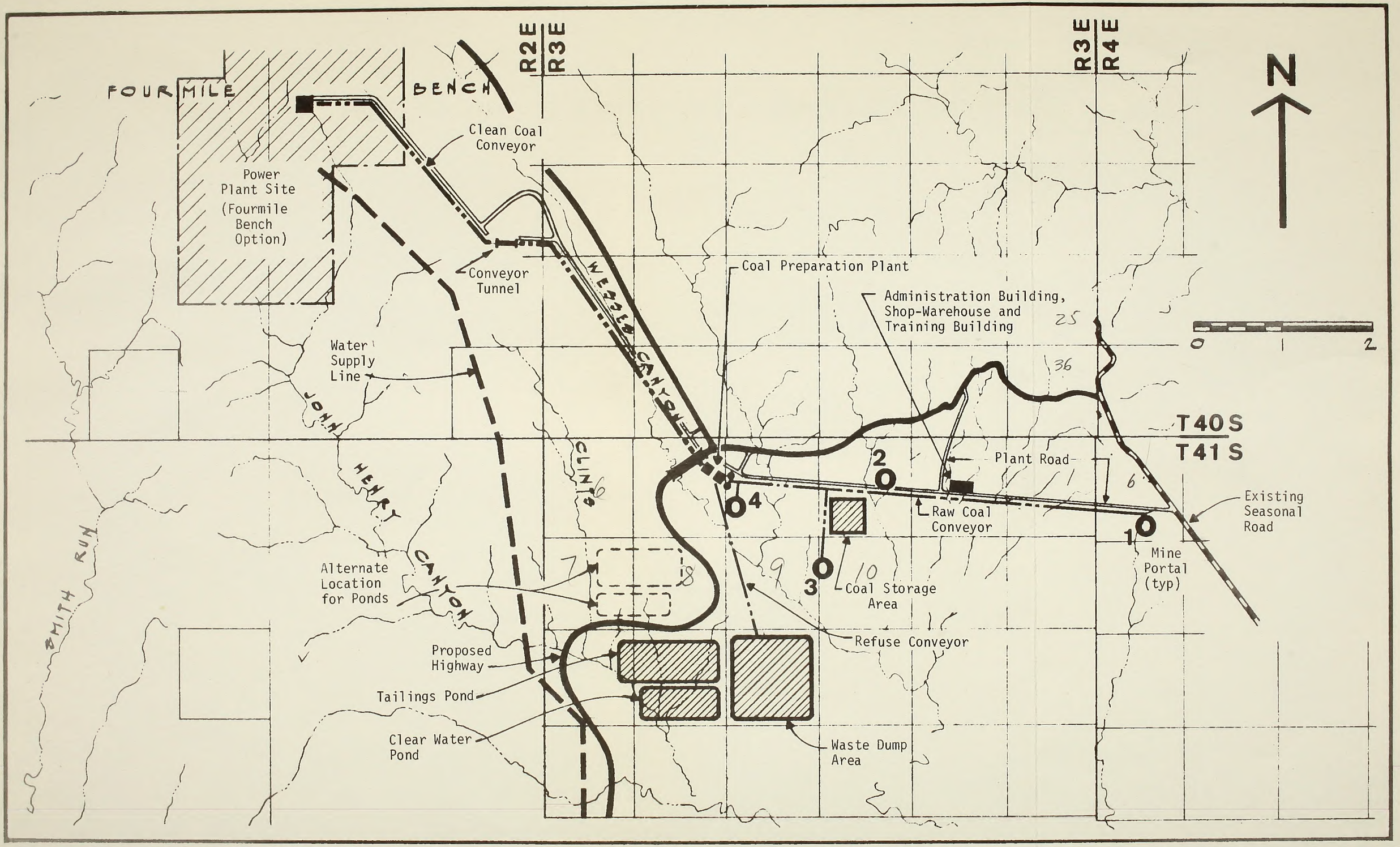


ILLUSTRATION I-3

General Arrangement of Proposed Surface Facilities

Transmission system

The transmission system would be constructed by two of the participating companies: Southern California Edison and Arizona Public Service. Southern California Edison would construct lines leading west into California (called the western system). Arizona Public Service would construct lines going south into Arizona (referred to as the southern system).

The transmission system for transmitting electrical power from the Kaiparowits generating plant to the market area would require not only new transmission lines and towers but modification of existing power substations and communication system for coordinating power use among participants.

The western participants fear that the unsettled land dispute between the Navajo and Hopi nations might delay the acquisition of an easement across the reservation for the western system. To avoid such a delay two alternatives to this route have been proposed, either of which could become the total western system.

The proposed system would require construction of approximately 1,457 miles of new transmission lines. Permanent and temporary access roads for the transmission system would require approximately 1,900 miles of roads - 870 permanent and 1,030 temporary, occupying approximately 1,480 and 1,755 acres, respectively. Figures I-1 through I-4 give a land use summary for the transmission system and proposed alternates.

Average span between towers would range from 1,500 to 1,700 feet, or three towers per mile. Average height of the towers would be 140 feet. These towers would include lattice steel self-supporting and steel or aluminum guyed structures.

No new substations would be constructed but several existing substations would be expanded or modified to accommodate new lines. Approximately nine new

FIGURE I-1

Comparison of Route Miles and Corridor Miles
for Three Proposed Systems

Proposed Routes	Miles of Corridor[a]	Miles of Line
Primary Proposal	1,035	1,457
Kaiparowits to Phoenix		
Kaiparowits to Navajo		
Kaiparowits to Eldorado		
Kaiparowits to Moenkopi to Mohave		
Mohave to Serrano		
Northern Kaiparowits Proposal	898	1,476
Kaiparowits to Phoenix		
Kaiparowits to Navajo		
Northern Kaiparowits to Mohave Preferred Alternate		
Mohave to Serrano		
Arizona Strip Proposal	880	1,440
Kaiparowits to Phoenix		
Kaiparowits to Navajo		
Arizona Strip Preferred Alternate		
Mohave to Serrano		

[a] A corridor is a linear area occupied by one or more lines. Because the Northern Kaiparowits and Arizona Strip proposals have more miles where two or more lines are together, the number of miles of corridor are reduced.

FIGURE I-2

Transmission System Land Use Summary
Participants Primary Proposal

Line Section	Dimensions			Area Occupied			
				Permanent		Temporary	
	Distance (mi)	Average R/W Width (ft)	Area T/L R/W (acre)	Lines[a] (acre)	Roads[b] (acre)	Lines[c] (acre)	Roads[b] (acre)
Kaiparowits-Eldorado	269	200	6,485	10	570	1,210	0
Kaiparowits-Moenkopi-Mohave	308	200	7,440	10	540	1,385	0
Devers-Mohave (1 & 2)	187 ea.	330	7,480	10	235	840	0
Devers-Serrano (1 & 2)	80 ea.	330	3,200	25	135	720	0
Kaiparowits-Navajo	47	200	1,140	5	0	200	240
Kaiparowits-Westwing	299	200	7,250	35	0	1,260	1,515
Total	1,457		32,995	95	1,480	5,615	1,755

	Number Towers			Communication Sites
	Self Supporting	Guyed	Total	
Kaiparowits-Eldorado	100	900	1,000	41 Sites
Kaiparowits-Moenkopi-Mohave	125	1,050	1,175	
Devers-Mohave (1 & 2)	150	1,300	1,450	Total fenced area - about 5 acres
Devers-Serrano (1 & 2)	575	0	575	Temporarily disturbed - about ½ acre
Kaiparowits-Navajo	150	0	150	Permanently disturbed - about ¼ acre
Kaiparowits-Westwing	950	0	950	
Total	2,050	3,250	5,300	

Substation	Miles of Road		Total Areas Occupied		
				Temporarily	Permanently
Devers[d] 135 acres	Temporary	1,030	Transmission Lines	5,615	95
	Permanent	870	Access Roads	1,755	1,480
	Total	1,900	Substations	-	135
			Communication Sites	-	5
			Total	7,370	1,715

[a]Assuming towers and foundations occupy 40 x 40 foot area for free standing towers and 8 foot diameter area for guyed towers.

[b]Assuming a 14 foot road width.

[c]Includes tower assembly areas, crane pads, batch plant sites, cunductor pulling sites, camp sites.

[d]Other substation construction will be confined within existing fence boundaries.

FIGURE I-3

Transmission System Land Use Summary
Northern Kaiparowits Proposal

Line Section	Dimensions			Area Occupied			
				Permanent		Temporary	
	Distance (mi)	Average R/W Width (ft)	Area T/L R/W (acre)	Lines[a] (acre)	Roads[b]	Lines[c] (acre)	Roads[b]
Kaiparowits-Eldorado	269	200	6,485	10	570	1,210	0
No. Kaiparowits-Mohave	327	130-200	4,600	15	310	900	0
Devers-Mohave (1 & 2)	187 ea.	330	7,480	10	235	840	0
Devers-Serrano (1 & 2)	80 ea.	330	3,200	25	135	720	0
Kaiparowits-Navajo	47	200	1,140	5	0	200	240
Kaiparowits-Westwing	299	200	7,250	35	0	1,260	1,515
Total	1,476		30,155	100	1,250	5,130	1,755

	Number Towers			Communication Sites
	Self Supporting	Guyed	Total	
Kaiparowits-Eldorado	100	900	1,000	38 Sites
Kaiparowits-Moenkopi-Mohave	100	1,145	1,245	
Devers-Mohave (1 & 2)	150	1,300	1,450	Total fenced area - about 5 acres
Devers-Serrano (1 & 2)	575	0	575	Temporarily disturbed - about ½ acre
Kaiparowits-Navajo	150	0	150	Permanently disturbed - about ¼ acre
Kaiparowits-Westwing	950	0	950	
Total	2,025	3,345	5,370	

Substation	Miles of Road		Total Areas Occupied		
				Temporarily	Permanently
Devers[d] 135 acres	Temporary	1,030	Transmission Lines	5,130	100
	Permanent	735	Access Roads	1,755	1,250
	Total	1,765	Substations	0	135
			Communication Sites	0	5
			Total	6,885	1,490

[a]Assuming towers and foundations occupy 40 x 40 foot area for free standing towers and 8 foot diameter area for guyed towers.

[b]Assuming a 14 foot road width.

[c]Includes tower assembly areas, crane pads, batch plant sites, cunductor pulling sites, camp sites.

[d]Other substation construction will be confined within existing fence boundaries.

FIGURE I-4

Transmission System Land Use Proposal
Arizona Strip Proposal

Line Section	Dimensions			Area Occupied			
				Permanent		Temporary	
	Distance (mi)	Average R/W Width (ft)	Area T/L R/W (acre)	Lines[a] (acre)	Roads[b] (acre)	Lines[c] (acre)	Roads[b] (acre)
Arizona Strip - Eldorado	251	200	6,085	10	570	1,210	0
Arizona Strip - Mohave	309	130-330	10,649	15	850	2,700	0
Devers-Mohave (1 & 2)	187 ea.	330	7,480	10	235	840	0
Devers-Serrano (1 & 2)	80 ea.	330	3,200	25	135	720	0
Kaiparowits-Navajo	47	200	1,140	5	0	200	240
Kaiparowits-Westwing	299	200	7,250	35	0	1,260	1,515
Total	1,440		35,804	100	1,790	6,930	1,755

	Number Towers			Communication Sites
	Self Supporting	Guyed	Total	
Kaiparowits-Eldorado	100	900	1,000	35 Sites
Kaiparowits-Moenkopi-Mohave	100	1,075	1,175	
Devers-Mohave (1 & 2)	150	1,300	1,450	Total fenced area - about 5 acres
Devers-Serrano (1 & 2)	575	0	575	Temporarily disturbed - about ½ acre
Kaiparowits-Navajo	150	0	150	Permanently disturbed - about ¼ acre
Kaiparowits-Westwing	950	0	950	
Total	2,025	3,275	5,300	

Substation	Miles of Road		Total Areas Occupied		
				Temporarily	Permanently
Devers[d] 135 acres	Temporary	1,030	Transmission Lines	6,930	100
	Permanent	1,055	Access Roads	1,755	1,790
	Total	2,085	Substations	0	135
			Communication Sites	0	5
			Total	8,685	2,030

[a]Assuming towers and foundations occupy 40 x 40 foot area for free standing towers and 8 foot diameter area for guyed towers.

[b]Assuming a 14 foot road width.

[c]Includes tower assembly areas, crane pads, batch plant sites, cunductor pulling sites, camp sites.

[d]Other substation construction will be confined within existing fence boundaries.

microwave radio relay facilities would be constructed at previously undisturbed sites to provide a reliable communication system for operation and administration of the project.

Within the state of California, transmission lines would be constructed in accordance with "Rules for Overhead Electric Line Construction," General Order No. 95, issued by the California Public Utilities Commission. Outside California, transmission lines would be constructed in accordance with "Safety Rules for the Installation and Maintenance of Electric Supply and Communication Lines," National Bureau of Standard Handbook No. 81.

Primary access roads would be constructed adjacent to or on the centerline of the right-of-way where topography permitted. Clearing would occur at tower sites, pulling sites, assembly sites, and at batch plants.

All debris and excess materials would be removed from the right-of-way and the sites returned as nearly as possible to preconstruction appearance. All substation vehicular equipment activity would be confined within the perimeter of existing substation facilities.

All transmission lines would be patrolled by air at minimum intervals of 180 days, and on the western system, once a year by ground vehicle to locate any damage which might adversely affect the integrity and reliability of the transmission line system. More frequent patrol would be made during fire and storm seasons. Access roads on the western system would be maintained as near their original state as possible. Crews would not deviate from either the alignment or grade of these roads while performing maintenance work, and vehicles would be confined to existing access roads. Access roads on the southern system would be closed at the completion of construction.

Microwave facilities would be unmanned. All sites except for two, where electricity is unavailable, would be supplied power by on-site generators.

Refueling of these facilities would be done with aid of helicopters every 3 to 5 months. Where electricity is available, generators would be placed on standby to be used in the event of electrical outages. Maintenance crews would conduct visits only as required to maintain reliable service. See Illustration I-4 for location of proposed transmission lines and microwave stations.

Limestone quarry

The proposed limestone quarry would be located approximately 16 miles northeast of Bryce Canyon National Park. The proposed quarry area would consist of two separate tracts of land, comprising state mineral lease application land and 62 federal lode mining claims on national forest land. These tracts would total approximately 1,900 acres. However, only approximately 240 acres would actually be used for the quarry and related facilities.

Limestone would be required by the Kaiparowits project for the SO_2 scrubber system and as rock dusting material in the mining operation. It would also be used for treatment of water prior to use in the plant. The participants estimate that the Kaiparowits power project would use approximately 194,450 tons per year of crude limestone from the quarry site.

Water for the quarry site would be from a well. The participants estimate that approximately 2 acre-feet per year would be required, most for dust suppression. All limestone produced at the quarry (approximately 780 tons per day) would be transported approximately 60 miles to the power generating facility by 25-ton trucks making approximately 30 round trips daily.

Aggregate

Large quantities of sand and gravel would be needed as aggregate for concrete in construction of the power plant, mine, and transmission system. Aggregate would also be necessary for roads, land fill, evaporation ponds, and

dams. The upper Wahweap Creek stream bed near Fourmile Bench is the proposed source for aggregate materials for the power plant. The aggregate from Wahweap would be hauled by truck approximately 18 miles to the power plant site and placed in a storage pile. An aggregate processing facility would process the material for use in the batch mixing plant. Aggregate processing and batch plants would be removed after completion of the power plant. Total aggregate required would be 500,000 to 1,000,000 cubic yards to be taken from an area of about 70 acres.

Further aggregate needs could total an additional 400,000 to 900,000 cubic yards for construction of the proposed town, highway system, and mine facilities. Sources for this additional aggregate are not known at this time. Possible sites include the proposed Wahweap site, the Glen Canyon City area, along major washes, and along Highways 89 and 12. Aggregate sources for transmission system construction are also unknown at this time.

For a summary of quantities of resources used for the proposed Kaiparowits project, see Figure I-5.

Actions required of government agencies

Federal

Key actions already taken by the Federal Government include issuance of water contract and coal leases. The participants have executed agreements with the State of Utah and the U.S. Bureau of Reclamation for the right to use Lake Powell as a source of water for the facility. The State of Utah and the Bureau of Reclamation have agreed to provide up to 102,000 acre-feet of water per year to the applicants. Other key actions that would be necessary before the project could be started include a favorable classification by the Secretary of the Interior and approval of the transfer of ownership of the land

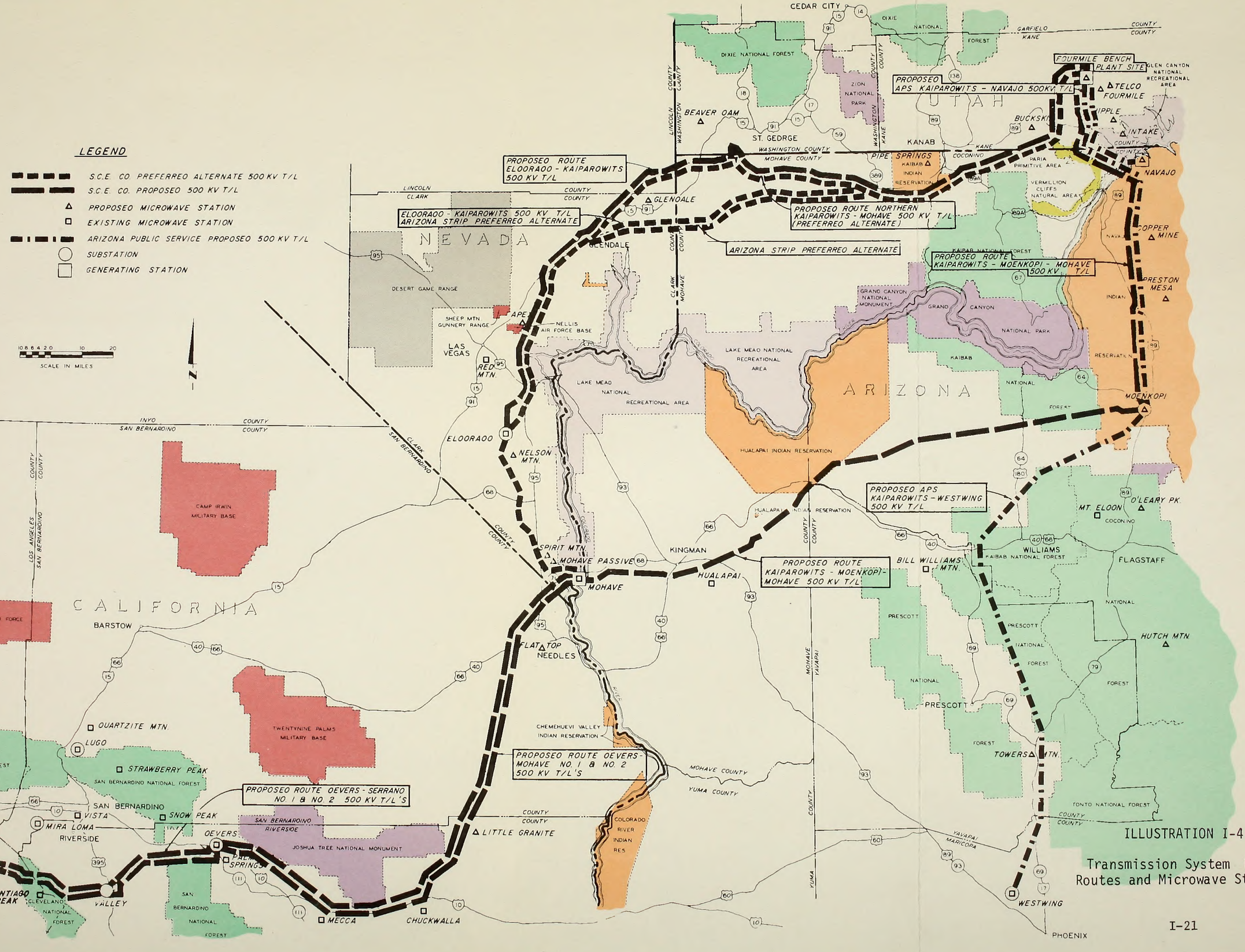


ILLUSTRATION I-4

Transmission System Proposed Routes and Microwave Stations

FIGURE I-5

Summary of Quantities

	Power Plant	Coal Mine	Transmission System	Limestone Quarry	New Highway	New Town	TOTAL
Land	4,160 acres state and federal land transferred to private ownership of companies; 932 acres permanently occupied by improvements; 225 acres permanently occupied by water line 30 mile R/W	47,768 acres state and federal land leased; 1,649 acres occupied with improvements.	95 acres occupied by towers (all types); 1,480 acres occupied by permanent roads; 140 acres occupied by substations and microwave sites.	1,900 acres state and federal land leased; 240 acres permanently occupied.	280 acres included in 67 mile R/W.	5,000 acres state and federal land transferred to private ownership; 3,900 acres permanently occupied by facilities.	58,828 acres state and federal land leased or transferred; 8,941 acres permanently occupied by roads and other improvements.
Coal	9,000,000 tons/yr washed coal would be burned in power plant. 315,000,000 tons washed coal would be burned during life of the plant.	12,000,000 tons/yr would be mined. 420,000,000 tons would be mined over the 35 year life of the plant.					420,000,000 tons mined over 35 year life of plant; 315,000,000 tons washed coal burned over 35 year life of plant.
Water	41,400 acre-ft/yr lost by cooling tower and other plant uses.	3,100 acre-ft/yr used for coal washery and mine operation.	1 acre-ft for concrete; 120 acre-ft for dust control.	2 acre-ft/yr used for dust suppression and quarry operations.		9,690 acre-ft/yr	54,313 acre-ft/yr
Solid Waste	Over 35 year life of plant: 15,000,000 yd^3 ash; 31,000,000 yd^3 scrubber sludge; 2,500,000 yd^3 excavated material; 1,500,000 yd^3 limestone kiln waste; to be disposed of in area 450 acres, 70 feet in depth.	Over life of coal mine: 26,000,000 yd^3 coarse refuse to be disposed of in area 550 acres, 29 ft deep; 43,000,000 yd^3 fine refuse to be disposed of in area 550 acres, 50 ft depth		42,657 yd^3/yr waste rock mines; 4,619 yd^3/yr top soil removed; 1,493,000 yd^3 waste rock over 35-year life; 161,904 yd^3 topsoil over 35-year life; Waste material to be returned to quarry area.			120,500,000 yd^3 of waste material over 35 year life of plant.
Aggregate	200,000 yd^3	71,000 yd^3	31,900 yd^3 for T/L; 300 yd^3 for microwave stations.		780,000 yd^3	549,000 yd^3	1,632,200 yd^3
Limestone	60,700 yd^3/yr for SO_2 scrubber.	31,700 yd^3/yr for rock dusting.		49,578 yd^3/yr mined; 1,700,000 yd^3 over 35 years.			1,700,000 yd^3 over 35 year life of plant.
People	Peak construction: 2,405 at year 4. Peak operation: 510 at year 8.	Peak construction: 700 at year 4. Peak operation: 2,560 at year 8.		Peak construction: 36 at year 1. Peak operation: 65 at year 4.		Peak population: 10,928 at year 7	Total population increase resulting from power plant and mine: 16,000

upon which the generating station and new town are proposed. The State of Utah has applied for the generating station land under its state indemnity lieu selection rights. The state, if the selection is allowed, proposes to sell the land to the participants. Other actions required by the government before the project could be initiated include: transfer of title to land, granting of rights-of-way, issuance of leases and permits, and sale of federal minerals (sand and gravel). The government would supervise mining operations to ensure that safety standards were met, and would require compliance with environmental laws and regulations pertaining to air and water quality and solid waste disposal.

State and local

On August 7, 1974, Utah Governor Calvin L. Rampton established the Kaiparowits Planning and Development Advisory Council (PDAC), representing state and local agencies, to "guide and coordinate activities related to energy development in Kane and Garfield counties."

New town

The PDAC has selected a town site from four sites examined by a consultant. The preferred town site is on East Clark Bench, on Highway 89, 25 miles from the proposed mining area and 32 miles from the plant site over a proposed new highway. The consultant's plan included 5,000 acres, although only about 3,900 acres would ultimately be selected. Most of the area is federal land, which would be acquired either through State of Utah lieu selection procedure or quantity grant selection. If the plan were implemented, a developer would construct and manage the new town in accordance with planning, zoning, and building requirements established and administered by Kane County, Utah. The plan includes mobile home parks, a variety of permanent housing styles, commercial and community services, and light industry. It suggests flexibility in

design and certain measures during construction to facilitate development and to minimize disturbance.

The plan is based on an assumed eventual population of 13,548. (The Bureau of Land Management (BLM) estimates new town population resulting from the project to be 9,400.) Total water needs, supplied from deep wells, are expected to be 9,690 acre-feet per year. The sewage system would be designed to meet state health standards; treated effluent would be used to irrigate pasture crops or a golf course.

New highway

The Kaiparowits project as proposed by the participants would require construction of a new highway for access to the generating station and mines. No adequate roads now exist in the area. The Utah State Department of Highways under the direction of the Utah State Road Commission has prepared a location and feasibility study for several alternative routes.

Originally the Utah State Department of Highways was acting on behalf of Kane and Garfield counties. Since formation of the Kaiparowits PDAC, the Utah State Department of Highways is also cooperating with that council.

The PDAC has approved a "basic action proposal" which states as follows:

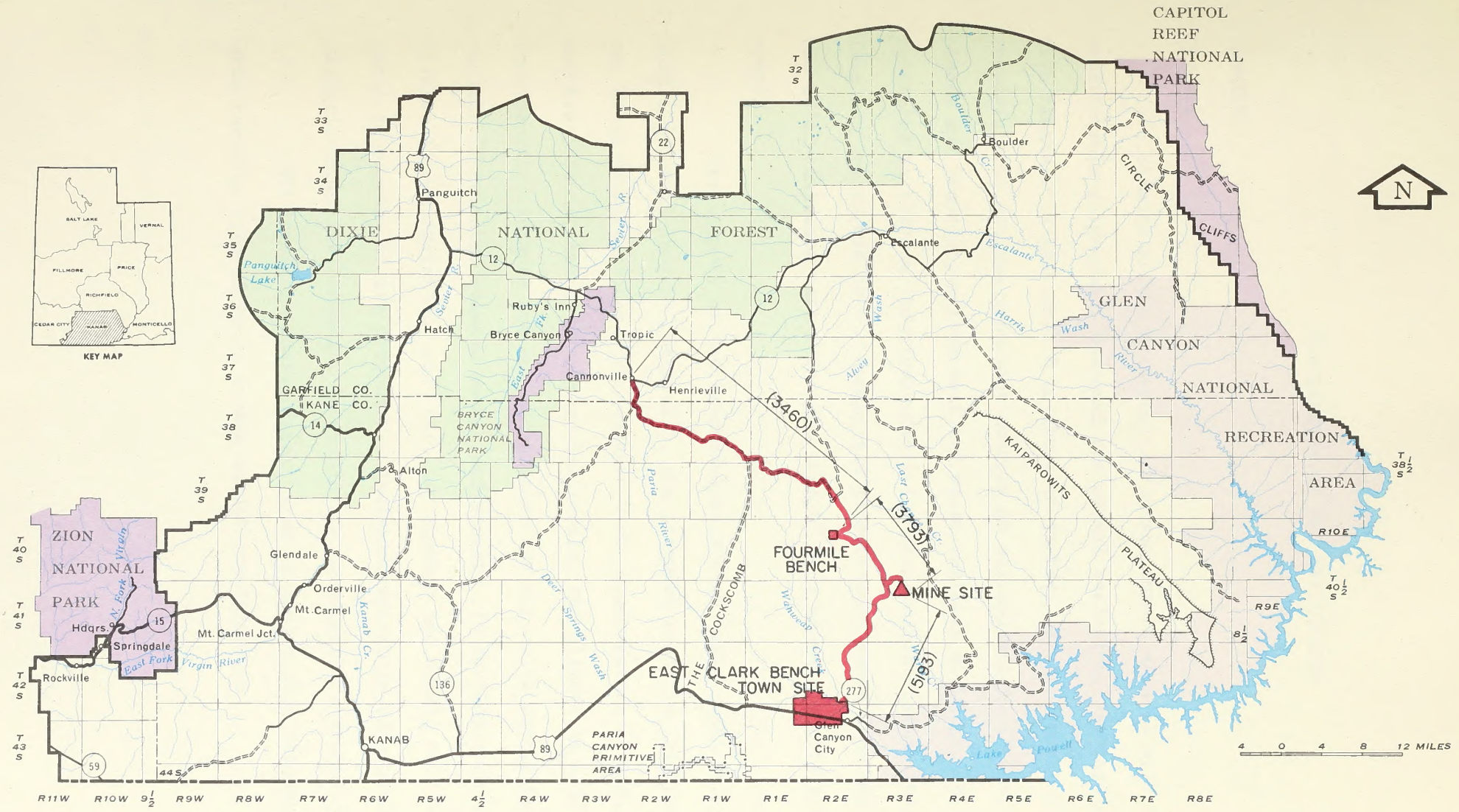
a. The highway system planned and constructed to support the proposed Kaiparowits project and new community should be a through system from Cannonville in Garfield County (on the north) to Glen Canyon City and East Clark Bench new community site on U.S. Highway 89 (on the south).

b. The route should be located as shown on Illustration I-5.

Jurisdiction or responsibility for the highway, including construction and maintenance, would be assigned to the state. It is estimated by the state that construction cost of the highway would be approximately $30.6 million. A

source of funds for highway construction would be legally available as a result of a new state law, Utah Senate Bill 256. At this time no federal funds are proposed for use for the new highway.

According to the state study, "... detailed roadway design has already been started and will take about one year, and construction 12 to 18 months. The highway would be 67 miles long, two lanes, 34 feet wide, paved and designed to carry traffic at moderate to high speeds." The estimated average daily traffic is shown on Illustration I-5.



PROPOSED HIGHWAY ROUTE

(0000) NUMBER OF VEHICLES PER DAY

KANAB DISTRICT
1974
UTAH

ILLUSTRATION I-5

Proposed Highway Route to Fourmile Bench

CHAPTER II

DESCRIPTION OF THE ENVIRONMENT

SUMMARY

Climate

Climate of the Kaiparowits Plateau impact area is arid to semiarid with considerable geographic, seasonal and annual variation. Average annual precipitation ranges from less than 6 to about 10 inches. Winter snowstorms and summer thunderstorms are the important sources of precipitation. Transpiration from plants and evaporation from soil and water surfaces are high. Winter air temperatures at various locations within the Kaiparowits Plateau impact area range from the low to mid 30's. Summer air temperatures range from the high 70's to mid 80's. Extremes vary from less than 0^{o} F in winter to more than 100^{o} F in summer.

The climate of the transmission system impact area varies over the more than 1,400-mile length. Generally, the proposed transmission routes pass through two broad climatic zones. In southern Utah, southeastern Nevada, central and western Arizona, and southeastern California, the climate is arid to semiarid Continental. Summers are hot and winters are mild with precipitation almost equally distributed between summer and winter. In southwestern California the climate is Mediterranean, with hot, dry summers and moist, mild winters. Only about 11 percent of the proposed transmission system is within the Mediterranean climatic zone, the remainder is within the Continental climatic zone.

The limestone quarry impact area is cooler than the other areas. The area receives from 12 to 16 inches annual precipitation.

Air quality

Measurements in the Kaiparowits-Lake Powell area indicate air quality is generally excellent. Background levels of particulates are variable ranging from 1 microgram per cubic meter ($\mu g/m^3$) to over 500 $\mu g/m^3$, with annual averages of approximately 30 $\mu g/m^3$. Higher concentrations are associated with windy conditions. Sulfur dioxide (SO_2) measurements made at Page, Arizona, are low and range between approximately 0.01 to 0.032 parts per million (ppm) for daily mean concentrations. Sulfation rate measurements showed a general increase in 1974 as compared to 1973 rates. Most likely this increase was influenced by the 1974 start-up of the Navajo plant near Page. The SO_2 measurements made by the Arizona Bureau of Air Quality Control showed an annual increase from 0.0004 in 1973 to 0.003 ppm in 1974 and a 24-hour maximum concentration increase from 0.004 in 1973 to 0.008 ppm in 1974. Nitrogen oxide measurements made at Page were generally low but have shown an increase from 0.005 ppm in 1973 to 0.012 ppm in 1974. Twenty-four hour maximum concentrations showed an increase from 0.024 to 0.066 ppm. Oxidant levels ranged between 0.011 ppm and 0.037 ppm compared with global average background concentrations of 0.015 to 0.030 ppm. Measurements of trace element concentration in the air reflected relatively low levels. No measurement of radioactive elements in the air is presently being made in the area. Visibility is generally excellent, averaging greater than 70 miles. However, measurements made from Page, Arizona of local visual range and long-path measurement of regional visibility have indicated a measureable decrease in visual range from 1972 to 1974. A periodic yellow discoloration associated with the Navajo plant emissions has been observed extending downwind from the plant stacks. The average atmospheric transport and mixing characteristics of the region result in good dispersion conditions throughout most of the year, particularly during the spring and summer months. The resultant large scale transport is toward the northeast.

Prevailing surface winds are from the west, strongest in the spring and early summer and lightest in the fall and winter. Net air movement from winds aloft over the site is generally from the west and southwest. Neutral atmospheric conditions (a temperature change of 5.4° F per 1,000 feet which is conducive to vertical and horizontal pollution dispersion) to slightly-stable atmospheric conditions (a temperature change with height which is conducive to restricted vertical pollution dispersion) predominate in the range of expected plume elevation. Neutral to slightly-stable conditions are most prevalent during the morning hours with predominantly neutral conditions occurring in the afternoon. During the winter, low-level surface inversions are common, frequently being strong enough to maintain themselves throughout the day. This condition would be conducive to the trapping of surface-released pollutants but on the other hand, it would also tend to inhibit an elevated release (such as emissions from tall stacks) from reaching the ground. Limited dispersion conditions, often associated with regional stagnation and the buildup of air pollution levels, can be expected to occur on the average of two to four times per winter with an average duration of 5 to 7 days. During these periods emissions could be confined to the Lake Powell Basin.

Most of the proposed transmission line system crosses sparsley-populated areas where air quality is generally good to excellent. However, there are short periods of occasional degradation caused by localized winds that stir up large quantities of sand and dust. Serious air quality conditions do occur along the heavier-populated segments of the system in California, where federal air quality standards are routinely violated.

Air quality in the limestone quarry impact area can be expected to be excellent. Air quality data has not been collected, however the quarry is located in an area that is remote from air pollution sources such as industries and population centers.

Geology and topography

The Kaiparowits Plateau lies wholly within the Canyonlands section of the Colorado Plateau physiographic province. Elevations range from 3,000 to 8,000 feet. The impact area consists of gently folded sedimentary rocks eroded to form benches bounded by steep cliffs and winding canyons. The canyons are deepest near the cliffs, which bound the benches, and decrease in depth as they rise toward the bench tops.

The important coal resources are contained within several coal zones in the Straight Cliffs Formation. Recoverable reserves in the Kaiparowits Plateau exceed 15 billion tons. The participants estimate 1.5 billion tons of coal lie within their lease holding. About 92 million tons of coal underlie the proposed plant site. Coal within the lease holding has a moderate heating value, ranging from 10,600 to 11,000 British thermal units per pound.

Other mineral resources in the plateau include oil (one field), limestone, aggregate, common clays, and bentonitic mudstones.

The transmission system impact area includes five physiographic provinces. These are: the Plateau Province, characterized by broad and flat plateaus bounded by steep-sided canyons; the Transition Zone, consisting of rugged mountains; the Basin and Range Province, consisting of rugged mountain ranges separated by wide valleys; the Salton Trough, characterized as a low-lying desert basin; and the Peninsular Range Province, consisting of a series of north-west trending mountain ranges and valleys. There are several active faults within the transmission system impact area.

The limestone quarry area is on one of a series of limestone ridges bordering Johns Valley, north of Bryce Canyon National Park.

Soils

Within the Kaiparowits Plateau impact area there are 5 soil associations, which vary from deep medium textured to shallow and rocky. Most of these soils contain small to moderate amounts of exchangeable sodium. The erosion condition varies from slight to severe with water absorption rates varying from 0.5 to 3.5 inches per hour. The potential for reseeding varies from less than 3 years out of 10 years, to 3 to 5 years out of 10 years. The erosion susceptibility, should existing vegetation be disturbed, varies from slight to moderate.

The soils found along the transmission alignment vary from sands to clays, from highly erosive to stable, bare rock to deep soils, and non-productive to productive. There are 73 soil associations along the system. These soils were rated for erosion hazard, of which 12 percent are low, 46 percent are moderate, 25 percent are moderate to severe, and 17 percent are severe. The rehabilitation potential considered that 72 percent are low, 24 percent are moderate and the remaining 4 percent are high.

The limestone quarry area contains one soil association that varies from shallow to moderately deep and is neutral to moderately acid. These soils are moderately to excessively drained with a moderate erosion susceptibility. The potential for rehabilitation success is considered to be greater than 7 years out of 10 years.

Water resources

The Kaiparowits Plateau impact area is within the Colorado River Basin. Readily available and dependable sources of water have historically been in short supply over large portions of this basin. Consequently, the use of water within the basin has been strictly allocated to various water users. Based on different interpretations of the laws and various assumptions relating to storage, regulation, and nature of use of water, Utah's share in the Upper Colorado River Basin ranges from less than 1,320,000 to 1,700,000 acre-feet per year.

Ground water occurs at varying depths throughout the plateau impact area. An estimated 800,000 acre-feet of water are available from the upper 100 feet of saturated rocks, and an estimated average annual replenishable ground water supply (by seepage for precipitation) of about 30,000 acre feet. The ground water ranges from fresh to moderately saline. Depths to the regional water table range from less than 100 feet beneath canyon bottoms to more than 1,000 feet beneath plateau tops. Shallow perched aquifers occur locally in rock strata above the regional water table. These aquifers support the flow of small seeps and springs, (annually less than 20 gallons per minute) but are not capable of supporting large sustained withdrawals by wells. The most extensive and productive aquifers are in the Navajo Sandstone. This formation is exposed at the land surface around the margins of the Kaiparowits Plateau, but occurs at depths of 1,000 to 4,000 feet beneath the higher benches in the plateau. Aquifers in the Navajo Sandstone are capable of yielding several hundred to more than a thousand gallons per minute of fresh water to wells.

Glen Canyon Dam impounds a section of the Colorado River to form Lake Powell. Lake Powell is a multipurpose storage reservoir which inundates the southeastern side of the Kaiparowits Plateau impact area. Usable storage capacity (including bank storage) is about 33 million acre feet. Concentrations of dissolved solids in Wahweap Bay of Lake Powell have ranged from 550 to 813 milligrams per liter.

All streams draining the plateau are intermittant. They are subject to periods of intense flooding, usually caused by late summer thunderstorms. These streams have little value as dependable supplies of water.

The principle water sources for largescale development in the area are Lake Powell and deep aquifers in the Navajo Sandstone. This water is suitable for most industrial, agricultural, municipal, wildlife, and recreational uses. Lake Powell is presently used as a municipal water supply for Page, Arizona, and as an industrial water supply for the Navajo power plant. It is also extensively used for wildlife and recreational purposes. Aquifers in the Navajo Sandstone have been tapped by several wells. Wells supply water for domestic use and for fish culture in the Glen Canyon City area.

The low yielding perched aquifers would not support largescale development. However, the aquifers are important since the discharge from them appears as springs and seeps that are sources of drinking water for livestock, wildlife, and campers.

Most ground water in the transmission system impact area is in basins crossed by the proposed routes. The major uses of water in the transmission system impact area, in order of importance, are agricultural, domestic, and industrial. Ground water has been the major source supplying these needs. Increasing water demand has caused greater use of perennial streams to supply water. Although numerous dry washes cross the area and may become flooded during rainstorms, the washes have no value as a dependable source of water.

The limestone quarry impact area contains several small springs that provide water for livestock and wildlife. Vegetation indicates ground water is within 50 feet of the surface. This area is within the Upper Sevier River Basin. Water from the Sevier River is used almost entirely for irrigation, and the river is fully appropriated. Because of the close relationship between ground and surface water, issuance of permits to divert additional ground water is restricted.

Vegetation

The Kaiparowits Plateau is ecologically unique because of the blending of cold-desert and warm-desert species, with wide diversity of plant life. There are areas representing a variety of successional stages preceding the final or mature (climax) conditions, as well as areas having all characteristics of the climax state. The major vegetation types present include pinyon-juniper woodland, mixed desert-shrub, salt desert brush, desert grassland, and sage-brush. At least 11 species classified as threatened or endangered under the Endangered Species Act of 1973 occur within the plateau.

Pinyon-juniper woodland on Fourmile Bench has many characteristics of a climax condition and contains a large number of old trees. One 1400-year old juniper has been identified. Vegetation on the proposed townsite of East Clark Bench is primarily mixed desert shrub. Species diversity is lower than adjacent less arid areas, and vegetative cover is low. The coal mine area is predominantly salt brush and mixed desert-shrub vegetation with sparse ground cover.

Twelve major plant communities would be crossed by the proposed transmission system. These communities are the pinyon-juniper woodland, Great Basin desert shrub, plains and desert grassland, Mohave desert shrub, riparian woodland, interior chaparral, coastal chaparral, Sonoran desert shrub (lower Colorado), Sonoran desert shrub (Arizona upland), coastal sage shrub, urban agricultural, and Joshua tree woodland. Vegetative productivity within the transmission system area is extremely variable from year to year, both between plant communities and within the same plant communities, due to greatly increased production of annuals in years of above average precipitation. Rare are endangered plants listed by the California Native Plant Society and native plants protected by Arizona Law are found within the proposed transmission corridors.

The limestone quarry area overstory is dominated by two-needle pinyon pine and Utah juniper. Small groves or scattered trees of ponderosa pine and Rocky Mountain juniper occur. Western bristle-cone pine occur in two locations within the proposed quarry area. Open areas are dominated by shrub-grass mixtures, primarily sagebrush, rabbit brush, blue grass, stipa and blue grama grasses. One species in the area has been classified as threatened under the Endangered Species Act of 1973.

Wildlife

Wildlife of the Kaiparowits Plateau impact area is characterized by diversity of species rather than dense populations. The plateau varies greatly in elevation and topography and is in a climatic zone where northern and southern habitat types intermingle. These factors have produced a diverse fauna. Arid climate and resultant sparse vegetation limit populations of many species.

Deer, pronghorn antelope, mountain lion, coyotes, foxes, and bobcats are the principal large mammals. Over 200 species of birds, including eagles, use the plateau at least seasonally. Thirty species of small mammals, and 31 species of reptiles and amphibians occur throughout the plateau. Desert bighorn inhabited the area historically, and the State of Utah plans their reintroduction on Fiftymile Mountain adjacent to the east.

Sport fishery habitat of the plateau impact area is almost completely limited to the waters of Lake Powell, which is primarily a warm water habitat although the cold, deep water near the dam supports rainbow trout. The reservior supports excellent populations of largemouth bass, walleye, crappie, bluegill, and catfish. Striped bass were recently introduced and are making excellent growth. Some larger game fish in Lake Powell have a mercury level exceeding 500 parts per billion. This mercury apparently comes largely from natural sources

throughout the watershed. Streams draining the plateau are largely intermittent and silt laden, supporting no game fish.

Paunsaugunt, Sevier, and Aquarius plateaus and Boulder Mountain north of the Kaiparowits Plateau impact area are within a zone of secondary project influence. These high, forested plateaus support populations of wildlife, including mule deer, forest grouse, band tailed pigeons, sage grouse, and wild turkeys. Small birds and mammals, predators, raptors and fur animals are also present. The Utah prairie dog, an endangered species, occurs in portions of this area. Waterfowl and shore birds nest on some shallow, marsh bordered lakes and ponds on the plateaus.

Good quality cold water fish habitat occurs in numerous small, high altitude lakes and reservoirs and in a few small streams. Some remote stream segments may contain a pure strain of the Colorado River cutthroat trout.

The Henry Mountains to the east constitute an isolated and complete ecosystem support a free roaming herd of bison.

The proposed transmission system would pass through some wildlife habitat presently isolated from human use. Wildlife species such as desert bighorn sheep, desert tortoise, Gila monster, southern bald eagle and peregrine falcon require isolation for their survival. It would cross or pass by crucial habitat for the above mentioned species plus mule deer, pronghorn antelope, elk, turkey, Gambel's quail, Abert's squirrel, waterfowl and shore birds.

Proposed transmission corridors include habitats occupied by the following endangered species: black-footed ferret, brown pelican, southern bald eagles, peregrine falcon, Vegas Valley leopard frog, Moapa dace, woundfin, Colorado River squawfish, Gila topminnow, humnback chub, bonytail chub, Colorado cutthroat trout, and possibly other, as yet unidentified species.

The limestone quarry site supports most of the same terrestrial wildlife found on the plateau impact area. In addition, the area supports sage grouse and a few elk. The endangered Utah prairie dog occurs throughout Johns Valley with some colonies within ½ mile of the proposed quarry area.

Ecological interrelationships

The Kaiparowits Plateau impact area has been disturbed by man-related activities since early pioneering days. The area was heavily grazed by cattle and sheep from the early days of settlement through the 1940's. Mineral exploration, which started in the 1950's and is still continuing, has also caused changes from the conditions that existed in pre-pioneer days.

Climate more than any other single variable is the overriding force that molds the biological character of the Kaiparowits area. Precipitation is scant and erratic, summers are hot, and the evaporation rate is high. Steep rock slopes cause much of the precipitation to run off without becoming available to plants or animals. Consequently, the area is comprised of plants and animals well adapted for survival in a harsh, arid environment. Even for the well adapted species, existence is often precarious. Populations of both plants and animals fluctuate considerably from year to year in response to climatic variations when the average moisture pattern is barely sufficient for plant growth. A slight variation in amount or seasonal occurrence of precipitation can cause drastic changes. This in turn triggers changes in the population of many species of animal life.

Soils and vegetation, with climate, affect the distribution of plants and animals. The Deep Plateau Soil Association on high benches, including the Fourmile Bench, is the most productive soil type. The Deep Plateau supports grassland, pinyon-juniper and brush, and is seasonally inhabited by deer. The

Shallow Plateau Soil Association on low benches is less productive. Its plant communities are similar to but not as vigorous as their counterparts on deeper soils. The Sandy Soil Association on East Clark Bench receives less rainfall, but is as productive as shallow soils since most rainfall is available for plant growth.

Cattle and big game animals compete for limited forage. The portion of total forage actually usable for some animals is controlled by the limited number of springs, seeps, and small streams. All large mammals of the area require water at least some of the time. Therefore, the few existing sources of water are crucial to populations of big game animals.

Major bays on Lake Powell, including those at the mouths of streams which lead into the impact area, serve as spawning waters and nursery areas for young fish. Since this type of habitat is extremely limited in the lake, the shallow water bays are extremely important to the maintenance of a viable fishery in Lake Powell.

Most productive ecosystems along the proposed transmission line are those having multi-level vegetation or free water (water available for direct consumption by animals). These areas include riparian vegetation as well as the chaparral and pinyon-juniper types. These ecosystems also have the most diverse fauna.

The limestone quarry impact area in Johns Valley has also been disturbed by man related activities. Homesteading activity that lead to plowing and cropping of previously unworked land and overgrazing of other lands was a detrimental influence. Since the end of farming and the beginning of range improvement practices, the habitat of Johns Valley is slowly improving.

Paleontology, archaeology, and history

Fossil vertebrates are relatively abundant in the Kaiparowits formation, which is exposed at the proposed plant site. Such fossils are relatively more sparse in the underlying Wahweap sandstone.

The Indian prehistory covers approximately 12,000 years. Inclusive is a chronological transisition from nomadic big game to small game hunting and wild plant gathering and processing (Desert Culture Tradition) to a sedentary, agriculture-based life style (Anasazi). A return to the nomadic hunting and gathering tradition is apparent with the transitional prehistoric-historic Indian groups.

Detailed archaeological reconnaissance of less than 10 percent of the impact area identified more than 600 archaeological sites. This included seven different types of sites, plus pictographs and petroglyphs. A diversity of prehistoric resources in the area is reflected by variation in site types, distribution, and cultural affiliations.

Historical Indian groups in the region include the Southern Paiute, Navajo, and Hopi. They were in the area from 1100-1300 A.D. until recently.

There are about 35 non-Indian historical sites in the Kaiparowits Plateau impact area, representing explorational, agricultural, and mining efforts in the 18th and 19th centuries.

The Kaiparowits Plateau impact area does not contain any listings on the National Register of Historic Places.

The transmission system impact area includes 13 geologic formations known to contain vertebrate fossils. The unconsolidated sediments and lake beds of the California desert include some of North America's most significant vertebrate fossil areas.

The transmission system would cross numerous prehistoric culture areas, principally Anasazi, Desert, San Dieguito-Lake Mohave, and Pinto-Amargosa cultures. Ages of these cultures range from approximately 12,000 B.C. to the historic contact period. While an intensive archaeological survey has been conducted on only a small part of the system, the results, plus probable sensitivity studies, suggest that sites in the path of the proposed system are likely to number in the hundreds. Many of these sites would undoubtedly qualify for inclusion on the National Register of Historic Places. The proposed Kaiparowits to Phoenix transmission line would pass through two archaeological districts that have been nominated to the National Register of Historic Places. It would also pass within 1 mile of another nominated district.

Historic Indians resident in the impact area include Navajo, Hopi, Pima, Maricopa, Papago, Hualapai, Havasupai, Havapai, Mohave, Paiute, Chemehuevi, Cahuilla, Serrano (Morongo), Vanyume, Luiseno, and Cupeno (Agua Caliente). Reservations which would be crossed by the proposed transmission corridors are Navajo, Navajo-Hopi disputed area, Hualapai, Kaibab, Morongo and Agua Caliente.

Non-Indian historic features in this area include historically significant trails, routes and roads, mining camps, a stage station, and the largest training area ever established by the U.S. Army.

Limestone at the proposed quarry site was deposited by an ancient lake and is essentially devoid of fossils. A total of 18 archaeological sites of six different types have been located within the limestone quarry impact area. Additional sites undoubtedly exist. The limestone quarry impact area does not contain any listings on the National Register of Historic Places.

Recreation

Cultural values in the Kaiparowits Plateau impact area include prehistoric remains, the old Paria townsite, portions of the Escalante and Navajo trails, movie props, and Glen Canyon Dam.

Natural values in this remote area are relatively undisturbed. Many recreational activities are directly or indirectly related to inherent natural values of the surrounding territory. The geology of the region, featuring many formations and unusual rock shapes caused by centuries of erosion, contributes greatly to visitor enjoyment and the recreation potential of the area. Steep-sided canyon walls in multicolored layers, plateaus, and escarpments provide recreational values for the sightseer or photographer.

Primitive and wilderness values are important in the plateau impact area.

Primitive or roadless areas within the plateau impact area that have significant values includes Paria Canyon, Hackberry Canyon, Escalante River Canyon, Fiftymile Mountain, and much of the undeveloped land within Glen Canyon National Recreation Area surrounding Lake Powell. The more accessible portions of the Kaiparowits Plateau impact area are interlaced with numerous low quality roads and trails. These roads and trails have made it a popular place for "back country" exploring with off-road vehicles.

The plateau impact area is in the heart of the "golden circle" of parks. Within the "golden circle" are 15 national parks, monuments, and recreation areas, nine units of the national forest, and millions of acres of highly scenic lands managed by Bureau of Land Management (BLM) or the Navajo Tribal Council. The area is one of the most scenic sections of the country,

attracting millions of tourists annually. Grand Canyon, Rainbow Bridge, Zion, Bryce Canyon, Glen Canyon, and Monument Valley are well known for their scenic beauty. The high visibility enabling persons to see long distances (20 to more than 100 miles) is of paramount importance to enjoyment of this beauty.

The location of the proposed Kaiparowits power plant is 15 miles from the Glen Canyon National Recreation area that encompasses Lake Powell. Important recreational activities in this vicinity besides the normal sightseeing of tourists includes fishing, boating, back-country exploring, camping, picnicing, rock and artifact collecting, and hunting.

The transmission system impact area includes archaeological sites, historic trails, old ranches, mining areas, other historic sites, Indian reservations, modern cultural developments, national forests, and recreation and natural areas. Outstanding scenery, unusual vegetation, and desert bighorn sheep are characteristic of parts of the area. Some sites in the proposed corridors are under consideration for roadless or natural area designation.

Wildlife observation and hunting are the primary recreational activities in the vicinity of the proposed limestone quarry.

Land use

Most of the Kaiparowits Plateau impact area is public land administered by BLM, U.S. Forest Service, or the National Park Service. Most of the land is managed for multiple use.

Nineteen licensees are authorized to utilize 8,053 animal unit months on allotments in the proposed generating plant, mine, or new town areas. Oil is produced in the Upper Valley field near Escalante, and sand and gravel are mined in 12 or more pits near Glen Canyon City, Escalante, and Henrieville. The gathering of wood for burning and for fence posts is carried out mostly on and

near Fourmile Bench. The only current agricultural production in the Kaiparowits impact area is on private land along the Paria River, 13 miles west of Glen Canyon City

Two all-weather highways cross the northern and sourthern edges of the impact area. The impact area can be reached by bus and plane. Parts of the Kaiparowits Plateau impact area are inaccessible, although the area is traversed by approximately 446 miles of four-wheel drive trails and gravel-surfaced or unimproved roads.

Most of the proposed transmission system crosses undeveloped, open range land. Some areas of residential development occur in western California. Rural areas in Utah, Arizona, and Nevada are used mainly for livestock grazing and recreation. "Open space" recreation is the prime use in California. Mineral development and gathering of wood are minor. Agricultural lands would be crossed only in California. The proposed route would cross numerous existing systems including transmission and telephone lines, natural gas and water pipelines, a coal slurry pipeline, highways and roads. The lines would also pass near several airports and airstrips.

Cattle grazing, sand and gravel quarrying, some recreation use, and several miles of roads are major land uses in the limestone quarry impact area. Several hundred acres of alfalfa and grain near the proposed quarry site are irrigated by water from a spring to the south.

Land use planning

Three major land use plans have been or are being prepared for the Kaiparowits Plateau impact area. These are the Kane County Master Plan, the BLM Management Framework Plan for the Paria planning unit, and the National

Park Service Master Plan for the Glen Canyon National Recreation Area. All three plans suggest management policies and proposals and consider potential energy development in a general sense.

Most of the land within the proposed transmission system impact area is rural. County zoning and planning are not specific with regard to future transmission lines. Master or land use planning has not been conducted for much of this area. Some of the routes proposed for federal lands fall within general corridors identified in Bureau of Land Management and U.S. Forest Service planning efforts.

The proposed limestone quarry is on both National Forest land and land owned by the State of Utah. The U.S. Forest Service multiple-use management plan, completed in 1965, is being revised in 1975 in compliance with the National Environmental Policy Act.

Socioeconomic factors

Census records indicate the areas of Kane and Garfield Counties within the Kaiparowits Plateau impact area had a total population of 3,229 in 1970. The population is declining.

Unemployment in Kane and Garfield counties is the highest in Utah even though their general educational level is above the national median. The decline of agricultural employment and the seasonal nature of many jobs contribute to unemployment.

Services are adequate for the present population and basic commercial facilities are generally available. The physical facilities of public schools within a 60 mile radius of the proposed project are more than adequate for their present student population.

Kanab, located approximately 40 road miles west of the proposed plant site, is the largest community within Kane County. The population was 1,381 in 1970. The community is located on Highway 89 between Phoenix and Salt Lake City. Tourist trade has been important in the local economy since the town is readily accessible to vacationers visiting Southern Utah's many attractions. In addition, Kanab has served as a temporary base for movie companies who use the picturesque Utah scenery as background for their movies.

Most of the residents in the plateau impact area have ancestors who were involved in the early Mormon colonization of this area. Social patterns such as family and extended family unity, emphasis on formal education, relatively low major crime rates, respect for local political and religious officials, a commitment towards work and employment, and a sense of aesthetic appreciation, pervade in the culture of these residents. The historical and social characteristics which give impact area residents and communities their unique identity, make this kind of community vulnerable to disorganization when social changes occur.

Glen Canyon City is composed of mobile homes in various conditions of upkeep. There are no sidewalks, lawns, paved streets, or public recreational facilities in the community. Public services are severely limited. This is not to convey that some residents may not be contented and/or optimistic about the future prospects for their community.

Page, Arizona, located about 47 road miles southeast of the proposed plant site, is the largest community within the immediate plateau area. This community was founded in 1956, as a federal city owned by the Bureau of Reclamation, to serve as a construction base for Glen Canyon Dam. Recently it has also served as a construction base for the nearby Navajo power plant. The April

1975 population was 7259 but available documentary information shows the population is declining. The expected January 1976 population is 5750. Page was incorporated under Arizona state law in 1975.

The proposed transmission system area is sparsely populated except the area in and around Phoenix, parts of western California, and the Las Vegas area. The population has generally been increasing in Arizona, California, and Nevada Standard Metropolitan Statistical Area (SMSA) urban centers. The percentage of unemployed persons in these same urban centers is generally less than in nearby rural counties. Proposed routes would cross Indian reservations where residents such as Navajo, Hopi, Haulapai, Morongo and Agua Caliente have unique life styles and aspirations. These residents particularly, are environmentally conscious and profess through their religious values a concern for preserving their environment.

Farms, ranches and communities in the limestone quarry impact area share the cultural and sociological characteristics mentioned for all other Utah communities in the Kaiparowits Plateau impact area: a vulnerability to disorganization if large technological change activities occur in their immediate areas.

Probable future environment without project (trends)

If energy resources in the Kaiparowits impact area are not used, current natural processes and conditions within the area would continue with little alteration, because of little change in resident population. Recreational use may increase, depending on gasoline availability. The city of Page, Arizona, would decline in population to about half its 1972 size.

Approximately 220,800 acres of land in and near the Kaiparowits Plateau are currently under coal lease, prospecting permit, or competitive lease applications. If coal mines, other than those proposed by the applicants, were to be developed to produce 12 million tons of coal annually, 3,000 to 4,000 miners would be employed. This suggests a population increase of as much as 15,000 in the area, with commensurate requirements for resources.

If a 2,000 megawatt generating plant were built near Escalante, using 8 million tons of coal annually, 24,000 to 30,000 acre-feet of water would be required. About 4,000 acres of land would be occupied, and the population of Garfield County would increase by 3,000 to 5,000 people. Impacts would be somewhat different from those resulting from the Kaiparowits proposal because of the different location.

CHAPTER III

ENVIRONMENTAL IMPACTS OF PROPOSED ACTION

SUMMARY

This chapter considers the expected environmental impacts of the project as it is proposed. It presents all predictable impacts, including those which will not outlive the construction phase. It includes impacts that will be mitigated by measures inherent in the project design, such as installation of particulate removal equipment. Additional, optional mitigating measures and residual or unavoidable impacts are set forth in Chapters IV and V.

Impacts are aggregated by resource and by Kaiparowits Plateau, transmission system, and limestone quarry impact areas. The Kaiparowits Plateau impact area includes mines, power plant, new town and new highway. The transmission system impact area also includes the communications system. Each of the impact areas includes all support facilities. When added together, impacts from each of these resources and areas would not result in new or different impacts from those individually described.

Climate

No significant impacts on climate have yet been measured in the southwest as a result of emissions from large coal-fired power plants and no significant impacts on climate would be expected from the Kaiparowits power plant or the associated transmission system.

Air quality

The participants in the Kaiparowits power generating plant propose 99.5 percent control of particulate emissions, 90 percent control of sulfur dioxide (SO_2) emissions and control of nitrogen oxides (NO_x) to meet federal emissions standards. Calculated emission rates based on these efficiencies indicate that applicable emission control standards would be met or surpassed.

Oil fog plume simulation studies in November 1973, and a coordinated smoke and fluorescent particle tracer study in May 1974, did not reveal a situation leading to a significant impact of plant emissions on surrounding terrain under unstable, neutral or slightly-stable conditions. Topography of the Kaiparowits site, characterized by irregular terrain, appears to contribute to more rapid plume dispersion than would be predicted over flat terrain.

More restrictive emission dispersion conditions, potentially responsible for higher ground-level concentration, were studied using Intercomp, a three-dimensional, numerical model, the NOAA model, the EPA model (C4M3D) and the TVA model. "Stable," "limited-mixing," and "inversion-breakup" meteorological conditions were examined, using available data. With the Intercomp model, the highest ground-level concentrations of SO_2 resulted from "inversion-breakup" or fumigation conditions, with "limited-mixing" giving the second highest level. Three-hour, 24-hour, and annual ground-level concentrations were determined to be 187, 46, and 2 micrograms per cubic meter ($\mu g/m^3$) respectively, or .083, .020, and .0009 parts per million (ppm). These predicted values would be below the allowable increases defined in the Federal Prevention of Significant Air Quality Deterioration Regulations (PSDR) for a Class II area. The Kaiparowits Plateau impact area and surrounding region is presently designated as a Class II area in the PSDR. A Class II area is one in which air quality deterioration normally accompanying moderate, well-controlled growth would be considered insignificant. These predicted values would also be below ambient air quality standards established for protection of human health and welfare.

The highest ground level concentrations of SO_2 predicted by the NOAA and C4M3D models were for the stable atmosphere condition. Concentrations from the NOAA model were 252 and 58 $\mu g/m^3$ for the 3-hour and 24-hour levels. C4M3D calculated 142 and 47 $\mu g/m^3$ for the 3-hour and 24-hour case. These levels are within the allowable Class II incremental increase which is allowed under the PSDR.

There is presently experience to indicate that 99.5 percent particulate control can be obtained now and with even greater certainty with improving technology available by 1980. The design value, however, in and of itself, does not provide assurance of that fact. Calculated emission rates, ambient air concentrations, and applicable air quality standards and contracts for Kaiparowits were compared to determine the minimum enforceable control that would be required. It was determined that 82.8 percent control of SO_2 would be required to meet the PSDR, 99.1 percent control of particulates would be required to meet the PSDR, and 32.5 percent control of NO_x would be required to meet the New Source Performance Emission Standards. These emission levels would result in the release of 3.72 tons per hour of SO_2, 10.4 tons per hour of NO_x, and 1.05 tons per hour of fly ash.

The Kaiparowits proposal would fall under the purview of the Prevention of Significant Deterioration Regulations which is the single most important factor to be considered. The proposed site at Fourmile Bench lies within a 100-mile radius of a number of National Parks, National Recreation Areas, National Monuments, and National Forests, all of which have the potential for redesignation to a Class I area in which practically any change in air quality would be considered significant. The National Park Service (1976) feels that the operation of the Kaiparowits plant would result in air quality impacts that are adverse to the legislative purpose of Glen Canyon National Recreation Area and Bryce Canyon National Park. The relevant extracts from the appropriate legislation are as follows:

> Glen Canyon NRA was established "...in order...to preserve scenic...features contributing to public enjoyment of the area...." (86 Stat. 1311)
>
> Bryce Canyon NP was initially established as Utah National Park to be managed"... subject to the provisions of the Act of August 25, 1916, entitled "An Act to establish a National Park Service, and for other purposes." ..." (43 Stat. 593)

> The Act of August 25, 1916 states that parks under the administration of the National Park Service shall be managed "...by such means and measures as conforms to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." (39 Stat. 535)

The Lake Powell Recreational Area (within 20 miles of Fourmile Bench), Bryce Canyon National Park (within 30 miles), and Capitol Reef National Park (within 60 miles) are three components of the National Park system presently being studied by the National Park Service and EPA to determine whether or not to recommend reclassification from Class II to Class I areas. If these components were to be redesignated as a Class I area, it is possible that Kaiparowits power plant emissions would cause the Class I allowable incremental increases to be exceeded. Such a condition would make the proposed site and the present scope of the power plant unacceptable. Should such a redesignation be made, additional evaluation of the projected air quality levels and their impact would be necessary with careful consideration of meteorological conditions and persistence and corresponding plume transport.

Calculated ambient air concentrations of trace elements including mercury are close to or below background measurements made at Page, Arizona and other areas and not expected to have an adverse impact. Long-term accumulation of trace elements has a potential impact on the environment if accumulated in sufficient quantities, but distributive pathways through the ecosystem are not well defined. Based on the trace element analysis of Kaiparowits coal, predicted emission rates, and deposition amounts, trace elements are not expected to accumulate in sufficient quantities to have significant environmental impacts. Mercury concentration in some of the larger predatory fish in Lake Powell has approached or exceeded the current safe consumption standards so that any additional source of mercury input to the Lake Powell ecosystem needs careful examination. Based

on estimations of mercury emissions from the proposed Kaiparowits plant and the predicted atmospheric behavior of the element, it is expected that atmospheric mercury would be injected into the Lake Powell ecosystem by the Kaiparowits plant. The input of natural mercury in the environment would however, exceed the contribution from the coal-fired power plant. Mercury accumulation in Lake Powell is estimated to be between 1 and 27 percent of the total added annually by natural sources depending upon the assumptions made. Radioactive elements released from the stacks are predicted to be low in concentration, and significantly below Atomic Energy Commission guidelines for protection against radiation.

Plume opacity is a measure of plume visibility. Studies conducted at the Four Corners power plant relating particulate emission rates and plume opacity have indicated that, with the design and operating conditions predicted for the Kaiparowits generating station, maximum opacity would be 11 percent, below the 20 percent opacity limitation. Particulate emission rates greater than design quantities could lead to a more opaque and visible plume as has been the experience at Navajo.

Reduction in visibility is one of the most dramatic effects of air pollution. Particulate emissions, and conversion of sulfur and nitrogen oxides to particulate nitrates and sulfates, would have an impact on visibility. Studies by Bechtel Corporation using ground level plume concentrations indicate that with proposed emission controls operating at design specifications under neutral meteorological conditions (which is a predominant situation at Fourmile Bench), visibility could be reduced approximately 9 to 19 miles when looking along the axis of the plume. The study indicated no significant decrease in visibility under these conditions when looking across the plume. More limited dispersion conditions, such as occur during the winter, could lead to greater visibility reductions.

The Bechtel (1974) studies indicate that brown discoloration of the plume would be periodically visible, the intensity being proportional to the concentration of nitrogen dioxide in the air. Williams (1975) indicates that during low wind speed, neutral or slightly stable conditions, the Navajo plume can be tracked visually because of the apparent brown color of the plume. The Arizona Department of Health Services indicates there have been numerous observations of the yellow-brown haze in the vicinity of the Navajo power plant, but the frequency, duration, or extent have not been documented. Because proposed control measures for nitrogen oxides are similar for Kaiparowits, incidence of brown haze from nitrogen dioxide could become commonplace in the area.

Impacts from cooling tower water vapor would include the aesthetic intrusion of fog plume, localized ground level fogging and icing during cold or humid periods, and entrainment and dispersion of dissolved salts from cooling tower water.

Predicted impacts of emissions from the traffic on the proposed access roads and new highway for the Kaiparowits proposal have been examined both for the immediate vicinity of the road and on a larger regional basis and found to be minimal.

Impact on air quality as a result of mining activities such as coal processing and transfer, and employee travel to and from the mine would be minimal. Fugitive dust from exposed and unstabilized soil surfaces, the limestone calcining process, fly ash handling and vehicle travel, have the potential for impact on aesthetics and visibility.

Air quality degradation along the transmission lines would result mainly from fugitive dust generated by surface disturbance and road construction. Accidental burning of vegetation removed from the transmission corridor would cause a temporary adverse aesthetic and air quality impact. The production of ozone by energized transmission lines is not expected to be significant. Noise

disturbance would come from construction, aircraft patrol flights and corona discharge along the transmission lines.

Air quality at the proposed limestone quarry would be affected by fugitive dust from drilling, cutting, blasting and loading operations. The impact is expected to be confined to the quarry site. Noise generated by drilling, cutting, blasting and loading would affect adjacent areas as well.

Exhaust emissions from trucks would affect air quality, but would be dispersed and diluted near the source under most meteorological conditions.

Geology and topography

Impacts on topography would result from earth moving activity in the Kaiparowits Plateau impact area. About 9,460 acres would be disturbed during construction. Of this, 7,320 acres would be permanently occupied after construction.

Additionally, subsidence of mined-out lands would affect the topography over wide areas. Tentative exploration and mining proposals indicate that the four mines would affect an area approximately nine by seven miles (63 square miles). Calculations indicate a subsidence varying up to 10 to 14 feet at the center of the area and feathering out toward the edges.

Geology would in turn be impacted by rupturing of formations and removal of coal. With current technology, only about 50 percent of the coal would be recovered. Remaining coal would be left in the ground. Excavation for evaporation ponds and reservoirs, construction of access roads and new highway, mining of aggregate for construction uses, and removal of surface material to create storage areas would also impact geology.

Topography along the transmission corridors would be only slightly modified by construction of any one of the proposals. Topography in rough terrain would be permanently modified by mining sand and gravel (2 acres), permanently modified at tower sites (12-13 acres), temporarily modified at crane pads (42-47

acres) and either temporarily or permanently modified along access roads (several hundred acres).

The removal of 13 million tons of material at the limestone quarry would create a pit 30 feet deep covering 130 acres.

Soils

Soils in the Kaiparowits Plateau would be disturbed by the generating station and support facilities, new highway, coal mine and support facilities, new town and aggregate sites. About 9,460 acres would be disturbed during construction, whereas an estimated 7,320 acres would be occupied by some type of improvement after construction is completed. The probability of seeding success on the disturbed areas of the power plant, portions of the water pipe line, and the new town would be 3 to 5 years out of 10 years under natural conditions. The remainder of the disturbed areas would have a seeding success of less than 3 years out of 10 years.

The annual change in sediment deposition in Lake Powell is insignificant. It amounts to less than 0.5 percent increase (+ 1.9 acre-feet) during construction and to less than 0.25 percent decrease (0.5 acre-foot) after construction is completed. The change in sediment deposition into the Paria River is also insignificant.

The salt drift from cooling towers could adversely affect the growth of surrounding sagebrush and juniper. An estimated 140 acres would be affected after 5 years of operation and 1,375 acres would be affected after 50 years of operation. Vegetative cover on the 1,375 acres could be reduced by up to 70 percent.

Trace elements from stack emissions would be deposited into the soils within a 30-mile radius of the power plant. The trace elements include arsenic, barium, boron, flourine, lead, mercury, selenium, titanium and vanadium. After 50 years of operation fluorine concentrations would reach 22 ppm. Other trace

elements would vary from 0.008 ppm for lead to 0.55 ppm for titanium. Concentrations for these trace elements in the fly ash-scrubber residue pile would be 20 to thousands of times greater than deposited in the soils. This pile would become a source of pollution to Lake Powell some years after abandonment, when the 1 foot of topsoil has eroded off the steep side slopes and control structures no longer function.

An estimated 8,235 to 10,575 acres would be disturbed by the proposed transmission system. Removal of vegetation would cause increased exposure of soils and movement of construction equipment would cause increased compaction of soils. These effects would increase the estimate of sediment yield by 28.5 acre-feet for the first year after construction. This amounts to .038 inch of soil over the disturbed area. Sediment yield would decrease each year as ground cover is established. Other effects of exposure and compaction would be a decrease in the rate of water infiltration and an increased runoff rate.

Revegetation may not occur during the life of the project for 72 percent of the lands disturbed in the arid and semiarid zones. About 10 years may be required to reestablish plant growth on the remaining 28 percent of the disturbed lands.

A total of 240 acres would be affected by the limestone quarry operation. The probability of seeding success on the soils involved would be more than 7 years out of 10 under natural conditions.

The construction and operation of the limestone quarry would cause an insignificant increase in annual sediment deposition (less than 0.04 acre-foot) in Piute Reservoir.

Water resources

A total of 59,690 acre-feet per year of water would be used by the proposed project during its projected 35-year life. An estimated 50,000 acre-feet per year would be withdrawn from Lake Powell, reducing Utah's remaining

allotment of Colorado River water by about 10 percent and making the water unavailable for other uses. Applications would be filed to appropriate about 9,690 acre-feet per year of ground water from local aquifers near Lake Powell for the proposed new town. This could lead to litigation to determine if all or part of the water applied for is Lake Powell water in bank storage, with appropriation requiring a water service contract with the Bureau of Reclamation. Withdrawal of the 9,690 acre-feet per year would reduce natural inflow of ground water to Lake Powell by nearly the same amount, and would also conflict with existing ground water rights in the Glen Canyon City area.

Withdrawal and depletion of 50,000 acre-feet per year of water from Lake Powell would have a net salt-concentrating effect on the Colorado River compounding the existing Colorado River salinity problem. According to the U.S. Bureau of Reclamation, withdrawal and depletion of 50,000 acre-feet per year from Lake Powell would increase the salinity of the Colorado River at Imperial Dam by an estimated 2.1 milligrams per liter (mg/ℓ). It has been estimated that for each mg/ℓ increase in salinity in the lower basin, an annual damage of $230,000 could occur as expressed in terms of agricultural, municipal and industrial use. Projects completed under the Colorado River Water Quality Improvement Program would offset to some degree increased salinity in the river resulting from the proposed project. Depletions, by coal mining, of relatively poor quality ground water that flows to Lake Powell would also offset slightly the project related salinity increases in the Colorado River.

Mercury and other volatile trace elements would be deposited from smoke stack emissions onto local drainage basins immediately tributary to Lake Powell. Some of the mercury and other trace elements would eventually be carried to Lake Powell by overland runoff. This would increase the amount of mercury available for bioamplication. It could adversely effect the ecosystem in the lake and degrade sport fishing.

Removal of 420 million tons of coal during the projected 35-year amortized life of the proposed project, and subsequent land subsidence in the mined-out area, would disrupt perched aquifers and probably deplete the flow of some seeps and springs that provide water for livestock and wildlife. Fracturing of rocks by mining and subsidence would create connecting flows between fresh and saline-water aquifers, thus generally deteriorating local ground-water quality.

The proposed project would increase long-term mean annual runoff from the Kaiparowits Plateau impact area to Lake Powell and the Colorado River by about 800 acre-feet. This would be an increase of 1.33 percent of the estimated mean annual runoff from the Kaiparowits Plateau impact area, and the effect on the long-term average annual gauged runoff in the Colorado River at Lees Ferry, Arizona would be negligible.

The combined effect of the proposed project on present water uses in the area would be the possible conflicts with existing water rights associated with the proposed new town supply. The anticipated influx of population in the general area could require expansion of existing local town water supplies by about 34 acre-feet a year, and waste water treatment facilities proportionably. The principal use of ground water within the Kaiparowits Plateau impact area is for livestock and wildlife. Depletion of local springs by the mines or contamination of a spring by leakage from the evaporation ponds would eliminate or reduce productivity of the area for livestock and some species of wildlife.

The existence of the ash disposal area, mine tailings pond, and evaporation ponds long after the projected 35-year life of the proposed project would be a long term source of pollution to local springs, Lake Powell and the Colorado River.

Impacts to water resources along the transmission corridors, resulting from construction of any one of the proposals, could include alteration of springs, depletion of small ground or surface water supplies, and pollution of perennial

streams. Water used for construction would neither significantly increase regional uses nor decrease regional supplies. However, local overuse could deplete small ground or surface water supplies. Pollution of perennial streams would occur if waste materials were accidentally spilled or indiscriminately dumped. Increased sediment loads in perennial streams, attributable to construction, would probably not be measurable.

Impacts of the proposed limestone quarry on water resources would be felt most strongly in the Sevier River basin. An estimated 2,000 gallons per day (about 2 acre-feet per year) of ground water would be required to operate the quarry. The ground water would have to be pumped from an aquifer in the Sevier River basin. Because the Sevier River is fully appropriated, application to appropriate the needed 2,000 gallons per day would conflict with existing water rights.

Construction of the proposed quarry and related facilities would increase runoff from the area effected from an estimated 16 to 16.4 acre-feet per year. After the projected 35-year life of the proposed project, average annual runoff from the effected area would increase by about 2.1 acre-feet.

The workers needed to operate the quarry, and their families could increase the combined municipal water needs of Antimony and Topic by an estimated 41 percent.

The impact of the proposed quarry operation on ground water quality would be negligible if the quarry does not intersect the water table exposing the ground water directly to potential contaminants. Blasting and drilling associated with the quarry operation could change the rate of discharge of Tom Best and Reynolds springs which are used for watering wildlife, livestock and for local irrigation.

Vegetation

An estimated 9,460 acres of vegetation on the Kaiparowits Plateau impact area would be disturbed during construction. Most of the vegetation would be pinyon-juniper, mixed shrub grass-scattered juniper, and desert shrub grass communities. Of the 9,460 acres, approximately 7,320 would be permanently lost to project installations.

The Kaiparowits area has been extensively inventoried for individual species including the occurrence of endangered and threatened plant species. Astragulus malacoides (endangered) and Peteria Thompsoniae (threatened) occur in the Nipple Bench and Fourmile Bench areas. Euphorbia nephradenia and Vigviera soliceps (endangered), and Phacelia demissa var. heterotricha (threatened) occur in the East Clark Bench area. These species could be disturbed by construction activities.

The major air pollutant toxic to plants emitted from the power plant would be sulfur dioxide (SO_2) along with nitrogen oxides (NO_x). Maximum calculated ground-level concentrations of these gases, considering both proposed emission controls and minimum enforceable control levels under present air quality constraints, would be below concentrations which have been established for protection of vegetation from injury.

The projected large influx of people and their associated business and recreational activities could severely damage vegetation in many areas, (particularly on the more fragile habitats associated with the Dakota sandstones and Tropic shales). Although difficult to quantify, this could reasonably be expected to be a greater impact than removal of vegetation by construction activities.

Investigators have demonstrated that aquatic vegetation in Lake Powell is accumulating mercury that occurs naturally in the watershed. Mercury released by the proposed power plant could also enter Lake Powell and accumulate in the

plant life, where it is subject to further concentration by fish and other aquatic organisms that feed on these plants.

Long-term accumulation of salts from cooling tower drift, has been calculated to cause reduced vegetation growth and vegetative cover on an estimated 1,374 acres in close proximity to the cooling towers. The occurrence of a lower drift rate than projected by design specification which has been experienced at the Navajo power plant could result in additional evaporation pond area, requiring more land use and removal of additional vegetation. This vegetative loss could be offset, at least in part by reduced vegetative loss from the lower salt drift rate.

An estimated 8,235 to 10,575 acres of vegetation would be disturbed and about 1,350 to 1,890 acres would be occupied along the proposed transmission lines, depending on which of the three proposals is considered. Protected, rare, threatened, or endangered plant species occur along the proposed lines in Arizona, Nevada, Utah and California. These species could be disturbed by construction activities. If the project were to be approved, transmission corridors and communication sites would have to be surveyed for the presence and protection of these species.

An estimated 360 to 500 animal unit months (AUMs) of livestock forage would be lost annually during construction, depending on the proposal. After construction about 53 to 83 AUMs would be lost annually depending on the proposal chosen. This loss of AUMs would gradually be reduced as revegetation occurs on the disturbed areas.

An estimated 240 acres of vegetation, consisting primarily of pinyon pine and juniper with scattered ponderosa and bristlecone pine, would be permanently lost at the proposed limestone quarry. At least one plant species on the federal list of endangered plants occurs in this area.

Wildlife

Approximately 7,320 acres of wildlife habitat, of various types and levels of productivity, would be permanently eliminated by the power plant, coal mine, water lines, highways, and new town. An additional 1,375 acres would be gradually altered over a period of 50 years by cumulative salt drift from cooling towers. About 2,600 acres of this combined permanent loss would be pinyon-juniper woodland, capable of supporting about 30 mule deer year-round and 90 seasonally. About 3,700 of the acres permanently eliminated would be desert shrub and grassland habitat in historic antelope range where a number of the animals have been released in an attempt to reestablish a herd. The project would reduce the likelihood of success in this attempt. Other species occupy other parts of the total habitat to be lost.

An additional 2,140 acres of various types of habitat disturbed during construction would be lowered in productivity. Recovery would be slow, requiring many years in some cases.

There would be danger that emissions of the Kaiparowits power plant would add an estimated 704 pounds of mercury annually to the naturally high mercury load of the Colorado River and to mercury from the nearby Navajo generating plant. This could jeopardize the sport fishery of Lake Powell through mercury contamination of game fish some of which already contain mercury concentrations exceeding 500 parts per billion. This is the maximum level now considered safe for human consumption by the Food and Drug Administration. Mercury would be accumulated and retained as sediment at the bottom of Lake Powell, and would be a hazard long beyond the life of the project. The worst impact could be complete loss of the fishery to public use. This would represent an annual loss of about 127,800 fisherman-days at present use levels, or about 217,000 fisherman-days by the end of 35 years based on current trends. A lesser, and perhaps more probable, impact would be a lowering in recreational quality of the fishery. The large game fish

most highly esteemed by the angler would accumulate the highest mercury levels. Therefore, a shift in fishing emphasis toward smaller, less esteemed forage fish could become necessary.

The long-term, cumulative impacts of other toxic elements in plant emissions cannot be accurately predicted. Several, such as selenium and arsenic, can be extracted from the soil by plants in amounts toxic to animals, and are also toxic in an aquatic biome. The acute problems of acid rain caused by sulfur dioxide in humid regions would not be expected, particularly in the short run.

When water level is low in Lake Powell there could be the problem of fish being drawn into the waterline intake.

Outdoor activity of an estimated 13,928 new inhabitants, in a now sparsely populated area, would have a more widespread impact on wildlife than would construction and operational activities of the project. An estimated increase of 13,700 man-days of hunting, 15,000 man-days of fishing, and 40,000 man-days of off-road vehicle use annually could be expected within a 100-mile radius of the new town site. Increased legal hunting, poaching, harassment and inadvertent disturbance would reduce populations of some wildlife species. The high-quality back-country fishing experience now available at the high mountain lakes north of the Kaiparowits Plateau would be lowered in quality by increased human use.

Construction of the proposed transmission system would result in significant secondary impacts on wildlife resources in addition to direct or primary impacts. Primary biological impacts would include actions that directly remove or destroy soil and vegetation. Vegetation in relation to soil productivity is the combination that produces food and cover for animals. Other primary impacts would involve physical destruction of dens and nests located in the soil or vegetation. Secondary impacts would include those resulting from increased human activity made possible because of new access. These would include increased legal and illegal hunting and disturbance and harassment of wildlife.

Major effects on deer and antelope would be the removal of existing vegetation and the increase of secondary successional vegetation. Because secondary successional vegetation is in some cases preferred by mule deer and antelope, these wildlife species would probably increase their use along the proposed transmission line route. This increase cannot be quantified from available data. A long narrow strip of vegetation of an earlier successional stage would create "edge effect" that would benefit these two species. Negative impacts would include increased access for poaching and the aesthetic losses resulting from viewing wildlife against a background of transmission line facilities.

Desert bighorn sheep generally prefer climax grass vegetation with rough, isolated terrain. Little, if any, true climax vegetation remains in the southwest. However, some areas along the proposed transmission line routes retain a preponderance of grasses mixed with forbs and half-shrubs. This vegetative type is important to bighorn survival, and its removal would eliminate valuable forage for a considerable period of time. The climate, topography and soil in most desert bighorn range make revegetation difficult, and normal plant succession is usually slow. Indirect impacts would include increased human disturbance (i.e. human access into the desert bighorn sheep home range and increased hunting and poaching) and the loss of aesthetic quality from man-made structures intruding into a relatively undisturbed habitat. Since lines would traverse such variable vegetative types it would be impossible to quantify expected decreases in bighorn sheep populations.

Removal or disturbance of existing vegetation and replacement by a lower successional stage might increase populations of some prey species utilized by large raptors and mammalian predators.

Towers and power lines provide excellent roosting and hunting perches for raptors; however birds using these facilities suffer increased vulnerability to shooting. Increased access would pose similar problems for raptors and predators as with other species.

During the construction phase, daily and seasonal movements of animals might be blocked or interrupted. The more mobile species would probably not suffer appreciably but smaller animals with small home ranges would be adversely affected. Small animals may die if blocked from important parts of their habitat.

Proposed transmission corridors would adversely impact habitats occupied by the following endangered species: black-footed ferret, brown pelican, southern bald eagle, peregrine falcon, Vegas Valley leopard frog, Moapa dace, woundfin, Colorado River squawfish, Gila topminnow, humpback chub, bonytail chub, Colorado cutthroat trout, and possibly other, as yet unidentified species.

Adverse impacts would result from outright killing of individuals during construction and maintenance activities and/or alteration, reduction, and loss of habitat. However, local impacts would be of greater consequence to the species as a whole because of already reduced numbers or range. Most of these species have become diminished in numbers or range either because critical features of their habitat are already in short supply, or because they are especially vulnerable to man's activities. Therefore, alteration of a relatively small area of critical habitat or introduction of increased human activity could be a significant increment to an already adverse environment.

The impact of a wildlife species becoming extinct would be irreversible and permanent. That particular gene pool would be permanently lost as would future opportunities for scientific study of that species and whatever knowledge this might benefit man's understanding of his environment.

The limestone quarry operation would eliminate 240 acres of diversified wildlife habitat. The proposed quarry is within an area used as winter range for deer and elk. One of the most significant impacts would be the hazard to a nearby colony of Utah prairie dogs, an endangered species. Road construction, if not properly located, could eliminate the colony.

Ecological interrelationships

The development of a large industrial complex and the influx of 14,000 people into the relatively isolated Kaiparowits Plateau would have a definite adverse impact on the fragile desert ecosystem. Natural resources such as wildlife, vegetation, soils, water and air would be adversely affected. The potential for increased mercury passage through the food chains in Lake Powell and contamination of predatory game fish constitutes the major potential aquatic impact. Similar concern exists for other toxic trace contaminants that could also be concentrated in higher life forms.

The greatest impact along the transmission line route would be the alteration of the plant community and the corresponding adverse influence on the animal community.

The limestone quarry impact area would lose 240 acres of vegetation and associated wildlife. Other concerns are potential adverse impacts to the nearby colony of endangered Utah prairie dogs and adverse impacts on two springs important to wildlife and cattle.

Paleontology, archaeology and history

Impacts on paleontological, archaeological and historical resources in the Kaiparowits Plateau impact area would be both direct, from mechanical destruction by construction and mining; and indirect, through disturbance or destruction by unauthorized collectors, vandals, and recreational users. These resources are limited and irreplaceable. Nine or ten archaeological sites in the generating station and coal mine areas would be destroyed and eighy-three similar sites, located in adjacent areas, would be subject to indirect impacts. Paleontological impacts would minimally impact eight fossil sites in the area of the generating station. Paleontological and archaeological surveys are incomplete and sites have not been identified or evaluated for their preservational value and for eligibility to the National Register of Historic Places.

Impacts on the paleontological, archaeological, and historical resources in the transmission system impact area would be both direct, from mechanical destruction by construction and mining, and indirect, through disturbance or destruction by unauthorized collectors, vandals and recreationists. These resources are limited, irreplaceable, and highly vulnerable to ground-disturbing activities. For the most part, they are as yet unidentified, and unassessed for preservation values. Several of the known sites appear to be eligible for inclusion in the National Register of Historic Places. Several archaeological and historical sites, districts, and trails along the proposed transmission system are presently nominated to or included in the National Register.

The eighteen archaeological sites in the area of the proposed limestone quarry would be subject to total destruction. The fossil sites noted in the area are of little scientific value but would also be subject to destruction.

Recreation

Reduced visibility and sky discoloration due to stack emissions would have a high adverse impact on the quality of the recreation experience for millions of tourists who annually visit the nationally significant parks and scenic areas in this region. Visitors touring the proposed new highway, Highway 89, Bryce Canyon National Park (431,000 visitor days in 1973), and Glen Canyon National Recreation Area (1,209,000 visitor days in 1973) would be most severely impacted.

The high visual contrast between the proposed plant and mine structures and the natural environment would create a major intrusion that would adversely affect the visual experiences of tourists traveling the new highway. The quality of the experience of the visitors viewing Grosvenor Arch would be adversely affected by the visual presence of the proposed new highway and the proposed Utah Power and Light power line and substation.

Off-road vehicle use generated by the new residents would have an adverse impact on the 30,000-square mile area. The impact would come in the form of destruction of vegetation, scarring of the landscape, and increase in vandalism. Increased boating use would create the need for additional boating facilities on the southern portion of Lake Powell, and would increase the vandalism in the side canyons of Lake Powell.

All adjacent areas having primitive values would be affected by the increased use and vandalism associated with the new residents. Areas near the population centers would be most heavily impacted, including Paria Canyon Primitive Area, Hackberry Canyon Roadless Area and primitive values in the Glen Canyon National Recreation Area.

The major impact of the proposed transmission system on recreation values would be the visual affect. The proposed towers, contractors access roads, and microwave repeaters could not easily be blended with the natural landscape and therefore would stand out as unnatural intrusions. The following is a summary of the recreation areas which would be directly or indirectly impacted by the construction of the proposed transmission system: Camp Young, Old Government Road, Dominquez-Escalante Trail, Old Spanish Trail, Temple Trail, Old Mormon Trails, Glen Canyon, Echo Cliffs, Cockscomb, Beaver Dam Mountains, Lava Butte-Rainbow Gardens, Coconino Rim, Aubrey and Cottonwood cliffs, Virgin River Recreation Lands, Colorado River, Push Walla Canyon, Paria Canyon Primitive Area, Indio Hills County Park, Edam Hill and Glen Ivy Recreation Vehicle Parks, Irvine and Villa Park Dam County Parks, Santa Ana Mountains, Las Vegas Dunes Recreation Area, Canyon Lake, Virgin Mountains primitive areas, Kanab Creek, Joshua Tree Natural Area, and Sacramento and Highland mountains. In addition to these areas the proposed transmission lines, roads, and other related facilities would intrude upon hundreds of miles of landscape having high scenic value.

Approximately 1,900 miles of new permanent and temporary roads would increase access and open up otherwise remote areas. The use of these roads could cause increased soil erosion, wild life disturbance, off-road vehicle damage, vegetation loss and could introduce an undetermined number of recreationalists into the transmission area.

The proposed transmission system would occupy approximately 3,000 acres of recreation lands. The construction and maintenance activities of the transmission system could tend to degrade the quality of the outdoor recreation experience for the users of the area.

The transmission system would cross and be visible from numerous highways. The impacts would depend on the number of viewers of the transmission system and their ideas and attitudes toward the intrusions created by the transmission system. Along the entire transmission system it is estimated that a daily average of 320,000 travelers could view the lines and roads.

The direct impacts of the proposed actions at the limestone quarry would be minimal; however, the truck-trailer traffic (30 round trips per day) originating at the quarry site would pass through the northeast corner of Bryce Canyon National Park creating a noise and traffic congestion problem that would adversely affect park visitors.

Land use

Construction of the proposal in the Kaiparowits Plateau would temporarily affect land use on about 9,460 acres. Of this total acreage, use of 7,320 acres would be indefinitely altered and ownership and jurisdiction would be changed on at least 9,000 acres. Most of the present uses of the proposed sites and routes would be excluded. Existing and proposed transmission lines through the proposed town site would be potential land use conflicts.

Grazing would be reduced by 740 animal unit months (AUMs) on Fourmile Bench, 40 AUMs in the proposed mining area, and up to 450 AUMs in the new town site area on East Clark Bench. Increased human activity in the impact area would disturb cattle and reduce available forage. Livestock operators would be economically impacted. They could be forced to reduce the size of their herds or even quit the livestock business.

The proposals would require mining of about 1,600,000 cubic yards of sand and gravel and 800,000 to 1,000,000 cubic yards of clay or mudstone. These operations would be major land uses during the construction phases. Marketable deposits of sand and gravel that may underlie the proposed town site could be lost to future use. Possible future deep uranium mining and oil and gas drilling could be excluded from mining, generating station, and new town areas. The proposals would encourage additional coal mining. Direct impacts on agriculture are not expected, but private owners might sell some agricultural land in Kane and Garfield counties, which could reduce hay production and in turn affect cattle ranching.

Movement of heavy loads along existing roads would be only a small increase in net traffic. Such use would damage present facilities, however, and require upgrading or repairs and could be a traffic nuisance. Use of the new highway and other roads during operation would result in increase in traffic, consisting of commuter, industrial, and recreational use. At least 1,600 commuter trips daily would be made. Congestion could result in traffic hazards. Use of existing low-grade roads in the area would increase, mostly for recreational purposes, requiring upkeep of those roads. The proposed highway would provide a north-south route about 23 miles shorter than U.S. 89, and might cause a reduction in income from tourism at Kanab and a need for traveler services in Bryce Valley. It would result in some fuel savings. Public carrier traffic would be affected by greater strain, but services might be improved as a result of increased demand.

Transmission systems and communication sites proposed in Utah, Arizona, Nevada, and southeastern California would occupy predominantly undeveloped, unpopulated desert land. In western California, Las Vegas, Nevada, and Bull Head City, Arizona, the proposed transmission lines would infringe upon residential and recreational lands. An existing airstrip in Glendale, Nevada, would have to be closed because the transmission lines would interfere with the glide path and development of a proposed airstrip in Eldorado Valley, Nevada, would be precluded. Fifty-eight acres of agricultural land would be permanently lost in Riverside County, California. Livestock grazing would be reduced by 75 AUMs along the proposed transmission system.

The proposed action in the limestone quarry impact area would eliminate about 160 acres of livestock forage and displace about 64 of the 646 cattle that presently graze the areas that would be affected. If Prospect and Tom Best springs should be reduced or contaminated by the proposed operations, cattle may not be able to water in the area or other water sources may have to be developed.

Mineral development would become the major land use in the area, and additional limestone mining and mineral exploration in Johns Valley or nearby areas might be encouraged by better access resulting from the proposed operation.

Approximately 50,000 board feet of ponderosa pine would be removed by the quarry operation. About 130 acres of pinyon pine, currently utilized for firewood, would also be destroyed.

If Tom Best Springs were contaminated or reduced by the operations, agriculture near Widtsoe Junction would possibly be terminated or other sources of water would have to be found.

The approximately 30 round trips per day (60 one-way trips) by the limestone trucks would be in addition to the current 40 trips per day by oil tankers from Upper Valley Oil Field along a portion of the route. The loaded

limestone units would be traveling eastward while loaded oil tankers are going west. A traffic "bottleneck" could result as they pass through the steep canyon segment of Highway 12 in the northeast corner of Bryce Canyon National Park. Possible safety hazards would relate to increased truck traffic through Tropic which now has Highway 12 traffic, and more especially Cannonville where the limestone trucks would leave the main highway and travel south through the town's main street. This street currently has minimal light vehicle traffic but would become the new highway.

Socioeconomic factors

The population of the Kaiparowits Plateau impact area would increase markedly if the proposed project were built. The new jobs that would be available during both the construction and operation of the project would attract many workers and their families now residing in other locations. The basic employment at the power plant and coal mines would generate additional jobs to serve the needs of the basic employees and their families. Many of these jobs would also be filled by persons that would move into the plateau impact area from other locations.

Almost all plant and mine employees would reside either in the proposed new town or in Page, Arizona. About 75 percent of the workers and their families are expected to live in the proposed new town. By the tenth year of the project (1985) it is expected there would be 2,354 basic employees residing in the new town and 785 basic employees residing in Page. The population of the new town is expected to reach 9,416 by this time while the population of Page is expected to increase by 3,925 during the same period. The expected 1985 population of Page is 6,029 without the project and 9,954 with the project.

Page may receive more than 25 percent of the population increase if development of the new town is delayed or if quality of the new town facilities

is low. The timing and quality of the proposed new town would also determine the number of families that choose to live in scattered nearby locations rather than residing in the proposed new town.

Timely development of a quality new town would be necessary to avoid the occurrence of a "boom town" during construction of the power plant and coal mines. Planning for the power plant and mines has far exceeded planning and funding for the services and housing needed to avoid development of a boom town situation. However, recent accelerated efforts to compensate for this lost lead time may be adequate so that facilities at the new town would be provided as needed. This current level of planning for the new town suggests that many problems associated with boom towns could be avoided. However, avoidance of such situations could only be maintained with constant surveillance of impending problems and the securing of adequate funding as needed to prevent the growth of such problems. Unless proper control is maintained, socioeconomic problems would occur similar to those experienced in other western locations, such as Campbell County, Wyoming, where rapid population growth caused by development of energy resources created a boom town out of Gillette. Campbell County, when compared with two nearby counties, had divorce rates that were 33 and 85 percent higher; arrests were 67 and 204 percent higher; criminal budget was 51 and 62 percent higher; school dropouts were 26 and 56 percent higher; public drunkenness was 139 and 185 percent higher; and driving while under the influence of alcohol was 350 percent higher than in both counties.

The timely provision of housing and services would be necessary for the establishment of a quality new town. The new town would compete favorably with Page only if housing were provided in a short time after plant construction began. There would be a need for 3,000 new housing units to be built within 5 years.

The distance to the mines from the proposed new town (37 miles) and from Page (56 miles) would create a need for mass transit facilities for commuter convenience and economy. However, no plans for such facilities have been made. This may encourage some workers to rent private lots for their trailers along the roadsides to avoid commuting. Should the available private lots in the area become occupied with makeshift trailer facilities, it would detract from the beauty of the surrounding countryside.

Of the wide variety of services that would be needed at the new town, some would be needed sooner than others. Construction of schools and parks would be a critical need within a few years after construction of the plant begins, whereas construction of some commercial facilities would not be as critical a need because of nearby facilities at Page. Medical facilities in the region may take care of the new demands for a few years but the project would eventually create a demand for new hospital facilities. The major impact anticipated in relation to medical facilities would be a shortage of doctors. The existing law enforcement systems in the region seem to be adequately staffed, but salaries are far below those in Salt Lake City and a high turnover rate may occur when there are new opportunities for employees to work for private industry.

In addition to creating new demands for specific service sectors, industrial development in Utah would contribute to ongoing urbanization. America is seriously short of ideas and methodologies for dealing with adverse effects of the urbanization process. The need to avoid urban degradation is particularly critical in south-central Utah, because it is a scenic area relatively untouched by problems that accompany urban development.

Development of the proposed new town would entail a new socioeconomic composition being placed in the existing sociological scene. Furthermore, it would severely challenge the cultural life of nearby residents. This town would

be unique because it may very well constitute such a political base-line change that a large block of voters in this new town could control local and regional destinies. The new town could become the locus of voting power within the county. Furthermore, because of potential differences in political orientations, it is legally possible that the new town could become the county seat of Kane County, if not of its own newly created county.

The Kaiparowits new town and supporting power plant may become socio-economic liabilities to the county and state governments. A system of financial bonding to support the development of the new town would not alleviate the mutual responsibilities of the county or state governments. If a new community becomes a part of the social system, then a change in one part of the system affects all other parts of the system. Thus, if people in the county and the community would become unemployed because of their mutual attachment to one employer whose presence originally necessitated the new community, then the county would suffer the economic burden. The same is true of problems in environmental health; law enforcement; infectious diseases; pollution control; protection and preservation of farmlands, ranch lands and scenic attractions; and other areas of concern.

There would be socioeconomic differences between the long-time residents of the plateau impact area and new residents attracted by the project. It is very conceivable that subcommunities based on ethnic and racial lines could develop in the overall area. Occupational and professional groups would subdivide as urbanization occurs and clashes would develop because of differences in cosmopolitan and local social ties.

There could be a tension between residents who attempt to maintain "closure" (i.e., maintain established and traditional sociological patterns) and people who have special interests and/or interests in socioeconomic and political factors beyond existing community parameters. To the extent that outsiders

participated in numerous special interest groups, in opposition to traditional life styles, further disruptions would occur. Finally, newly elected representatives may lead into further strains by taking actions and involving themselves in political issues which are not directly oriented towards the interests of the present native local community.

Property tax revenues generated by the plant, mines, and new town would make Kane County one of the richest counties in the state in assessed valuation. These taxes would increase from an estimated $915,400 during the first year of the project to an estimated $24,863,480 during the tenth year of the project. This money could be enough to support the provision of quality services, if a critical backlog of service problems were not created by a sudden population influx. It has proven to be considerably more expensive to correct service problems than to anticipate and prevent them.

Revenues generated in state taxes would also be substantial and would offset some needed state government expenditures. State income tax revenues would increase by an estimated $320,708 during the first year of the project and would increase by an estimated $1,439,445 during the tenth year of the project. However, timing is critical and lack of an adequate implementation schedule would cause residents to undergo hardships until services become available.

Most social and economic impacts resulting from construction of the proposed transmission system in the four-state region would appear to be of short-term duration. The work force for the transmission system would be transient in nature. Little or no on-site hiring would be expected except where the proposed transmission lines would cross Indian reservations. Some Indians could obtain temporary jobs if agreements are reached between participants and the tribes for transmission line right-of-way.

Local governments would collect increased property taxes for improvements erected by the participants, although they would have to provide only minimal services to benefit the transmission system.

Power line construction across some Indian lands may have detrimental impacts on their traditional religious beliefs and customs.

The population of the limestone quarry impact area would increase if the proposed quarry site in Garfield County were developed. It is expected that limestone quarry workers would live in Garfield County if housing is available. The 131 basic employees that would be needed at the quarry by the tenth year of the project would result in a total expected population increase of 587 persons. This would create a demand for about 100 new housing units assuming one-fourth of the labor force were obtained locally. Construction of some permanent housing and planned, landscaped trailer villages in one or more of the small towns in this area could meet the housing needs and promote the economy. However, should makeshift trailer villages be established in Garfield County to meet increased housing needs, the attractiveness of this scenic area could be permanently impaired. Present trailer village restrictions to ensure quality are minimal and even these restrictions are often poorly enforced.

In general, socioeconomic impacts in the limestone quarry impact area would be similar to those in the plateau impact area, particularly problems of population increase, educational facilities, law enforcement, and sociopolitical structures.

If the new highway is built, there would be an increase in retail trade activities in the Cannonville and Bryce Valley area that would necessitate business and new residential construction. Such an impact would possibly be beneficial and not in and of itself too disruptive of area life styles. However, when

combined with the contemplated population growth in the immediate region, the effect of the new highway on transportation patterns would create severe social change impacts on the communities of Cannonville, Tropic, Henrieville, and further north, on such communities as Widtsoe Junction.

Existing water facilities are not presently adequate from an environmental health viewpoint. Additional population would increase water needs creating additional tax burdens and social and cultural impacts. There is no known master plan which indicates a concern for this problem. Since water in the Sevier drainage basin is fully appropriated, increased water use by an expanding population could divert water from existing uses. The impacts of this action are presently unknown.

Impact on the market area

There is no question that increased availability of electricity would influence the pattern and intensity of population growth. Population is expected to grow in the service area, and any increase in available electricity would facilitate that growth. Continued growth could negatively affect existing open space, pollution abatement, and transportation problems.

Most of the population which would be dependent on the power from Kaiparowits would reside in Phoenix, San Diego, and suburban southern California. Although the Kaiparowits project would help meet power needs, it is only a supplement to the total supply that could be expected to have an impact on the market area.

Adequate energy supplies would facilitate urban growth and sprawl in the market impact area. Quality of community life would probably decrease even while per-capita income increased. The increasing concern over air pollution, open space preservation, and mass transit may mitigate the expected degradation to some extent.

CHAPTER IV

MITIGATING MEASURES

SUMMARY

If the proposed project is approved, federal, state, and local government agencies having jurisdiction in the Kaiparowits Plateau impact area would issue rights-of-way and other grants to allow implementation of those portions of the proposed project on lands under their respective administration. These governmental entities are obligated under statutes, regulations, and specific contractual requirements to specify stipulations intended to reduce environmental impacts. These are administrative measures that would specify certain physical actions for compliance. Federal agencies would have little authority on private land, such as the generating station and town site.

The water service contract states that air pollution control designs and specifications would require the Secretary of the Interior's written approval in advance of construction, installation, or major modifications. The contract requires that air pollution control equipment must be designed for 99.5 percent removal of particulates and would be operated to remove not less than 97 percent of particulate matter from stack emissions in each month and not less than 96 percent in any 24-hour period. However, Environmental Protection Agency standards which are more restrictive, would have to be met. For average grade coal at maximum load, they would permit the release of not more than 35.5 tons of particulates, 427.2 tons of sulfur dioxide, and 249.6 tons of nitrogen oxides per day. Operation of the air pollution control equipment would be verified by monitoring equipment, and records thereof subject to inspection by the Secretary or his agent.

The Lake Powell water service contract requires submittal of plans for waste water, waste materials, and sewage disposal facilities to the Secretary for approval in advance of construction, installation or major modifications. Steps must be taken to reduce the risk of harming fish and wildlife, and water quality and quantity must be monitored.

Requirements relating to preserving the quality of interstate water are outlined in the Federal Water Pollution Control Act, as amended. The Fish and Wildlife Coordination Act, as amended, requires consultation with the U.S. Fish and Wildlife Service before water is removed from a body of water under federal permit.

Stipulations intended to reduce impacts would accompany authorizations for rights-of-way and the mining of coal and aggregate. Coal mining would have to include measures to reduce subsidence. Federal land management agencies must also require that archaeological, historical, and paleontological values be protected. Vehicle use, camping, and collection of wood products, mineral materials, and petrified wood are also regulated on public lands, which would reduce some impacts resulting from activities of an increased population.

Utah has statutes and regulations relating to air quality, water, rights-of-way over state lands, wildlife, and occupational and coal mine safety.

State and local government agencies have authority to take actions to mitigate social impacts. Examples are passage and enforcement of land use planning and control laws. Most of these actions are optional. The participants have proposed a contingency housing plan, and the State of Utah has passed legislation and created an advisory council that could implement measures to reduce the social and economic impacts of poorly planned and hastily provided housing services.

The participants propose certain measures which exceed legal requirements to mitigate environmental impacts. These are described in detail in Chapter I. These proposed measures include installation of precipitators and scrubbers designed to remove 99.5 percent of particulates and 90 percent of sulfur dioxide from stack emissions, disposal of all waste water and solid waste on site, and implementing a contingency housing development should the new town not be developed when needed. It is assumed the participants would act in good faith in carrying out the mitigation actions to which they have committed themselves in writing.

If they do not, or should the measures fail, impacts would occur as described in Chapter III. If the measures are successful, impacts would occur as described in Chapter V. Many of the proposed measures are general, and cannot be fully analyzed as to their specific mitigating effects.

If carried out as proposed, the overall immediate effects of the participants' proposed mitigating measures in the Kaiparowits Plateau impact area would be to reduce emissions of particulate matter to 10.3 tons per day and sulfur dioxide to 276 tons per day, using average grade coal. The participants would rehabilitate a total of 2,140 acres and reclaim 1,245 acres after project abandonment. Runoff and sediment loss would be reduced slightly by mitigating measures. The reduction in runoff would be 8.2 acre-feet and 0.41 acre-foot in sediment loss annually.

Rights-of-way, Indian and private land would be subject to separate negotiations with the individual land owners. Rights-of-way across federal and state lands would include stipulations determined by the appropriate agency.

Transmission system construction activities producing high noise levels on national resource lands would be located at least 1/2 mile from residential areas. This would insulate residents from high volume noise activities. Preventative measures for dust control during construction and operation would be required to prevent deterioration of existing air quality.

Effects of the proposed action on the environment in the transmission system impact area would be lessened if all proposed mitigating measures for soils resources were implemented. These measures would reduce sediment yield, reduce the time frame for reestablishment of ground cover and reduce wind and water erosion. Ground cover in areas of medium to high rehabilitation potential would reestablish in 1 to 3 years under normal climatic conditions.

If all measures proposed for mitigating vegetative impacts in the transmission system impact area were implemented, considerable recovery, through rehabilitation, would occur. This assumes returning all temporarily disturbed

areas to a near natural state of production. Some areas could become more productive than they are under current (predisturbance) conditions. Rehabilitation of the generating plant site may be less effective because of greater disturbance.

Mitigating measures would minimize impacts on many wildlife species and their habitats near the proposed transmission system. The endangered or threatened wildlife species and their habitats would be protected or disturbance minimized by adjusting the season, area, or method of construction.

Proposed measures for protecting paleontological, archaeological, historical, and cultural values would reduce losses by identification of these values, providing for their avoidance to the greatest possible extent, and salvage operations where unavoidable. All measures reflect requirements of existing statutes, regulations, and a presidential executive order. Specifications in these mandates require such measures for all land, regardless of ownership.

Proposed mitigation measures would reduce visual impacts, protect recreational values, and ensure public access to national resource lands. These measures would also ensure public safety and added conveniences for recreationists.

In the proposed transmission system impact area, proposed mitigating measures would prevent destruction of livestock facilities and minimize disruption of operations. Maintenance measures would improve or prevent degradation of existing road systems.

The participants would be required to keep the granted rights-of-way and improvements located thereon in a safe and repaired condition so that authorized uses of the public lands would not be impaired.

Sewage effluents and toxic material would not be discarded on public lands, but would be disposed of in designated public disposal sites.

In the limestone quarry impact area, the U.S. Forest Service would be the primary authorizing agency. Permits from the Forest Service would include

stipulations to protect air, water, vegetation, wildlife, and cultural values. Prior to issuing a permit, a rehabilitation plan would have to be submitted by the participants for approval.

The National Park Service could require the limestone haulage trucks to move only at night, to reduce traffic hazards.

Mining and rights-of-way on state lands would require permits from the State of Utah. Water rights would have to be obtained from the state, and all Utah regulations pertaining to vehicles, safety, health, sanitation, solid waste disposal, and air and water pollution would have to be observed.

The participants have proposed several mitigating measures. Several of these would reduce aesthetic impacts. They are somewhat more specific than measures proposed by federal agencies at this time, but nevertheless are still quite general. The participants' reclamation plan would rehabilitate 130 acres after abandonment of the project.

CHAPTER V

ANY ADVERSE EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

SUMMARY

Climate

No significant impacts on climate have yet been measured in the Southwest as a result of emissions from large coal-fired power plants and no significant impacts on climate would be expected from the Kaiparowits power plant or associated transmission system.

Air quality

The addition of air pollutants including sulphur dioxide (SO_2), nitrogen oxides (NO_x), particulates, trace elements, cooling tower salts, coal mine emissions, coal dusts, auto and truck emissions, and fugitive dusts is an unavoidable impact of varying degree to the presently minimally polluted atmosphere of the region.

Hourly emissions that would come from the generating plant after abatement are estimated at 0.58 tons of particulates, 2.17 tons of SO_2, and 10.42 tons of NO_x using worst grade coal at 100 percent load, assuming 99.5 percent control of particulates and 90 percent control of SO_2.

Minimum control efficiencies to meet applicable air quality standards are calculated to be 99.1 percent control for particulates and 82.8 percent for sulfur dioxide. The resulting hourly emission of particulates would be 1.05 tons, and 3.72 tons for SO_2 using worst grade coal at 100 percent load. The differences in the two sets of numbers are the differences between what is proposed by the participants as compared to the maximum emission rates calculated as allowable under present regulation.

Although within federal and state limitations, emissions would result in some unavoidable deterioration of air quality. The proposed site at Fourmile Bench lies within a 100-mile radius of a number of National Parks, National Recreation Areas, National Monuments, and National Forests, all of which have the potential for redesignation to a Class I area in which practically any change in air quality would be considered significant. The National Park Service (1976) feels that the operation of the Kaiparowits plant would result in air quality impacts that are adverse to the legislative purpose of Glen Canyon National Recreation Area and Bryce Canyon National Park. The relevant extracts from the appropriate legislation are as follows:

> Glen Canyon NRA was established "...in order...to preserve scenic...features contributing to public enjoyment of the area..." (86 Stat. 1311)
>
> Bryce Canyon NP was initially established as Utah National Park to be managed "...subject to the provisions of the Act of August 25, 1916, entitled "An Act to establish a National Park Service, and for other purposes." ..." (43 Stat. 593)
>
> The Act of August 25, 1916 states that parks under the administration of the National Park Service shall be managed "...by such means and measures as conforms to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." (39 Stat. 535)

The Lake Powell Recreational Area (within 20 miles of Fourmile Bench) and Bryce Canyon National Park (within 30 miles), and Capitol Reef National Park (within 60 miles) are three components of the National Park system presently being studied by the National Park Service and EPA to determine whether or not to recommend reclassificaton from Class II to Class I areas. If these components were to be redesignated as a Class I area, it is possible that Kaiparowits power plant emissions would cause the Class I allowable incremental increases to be exceeded. Such a condition would make the proposed site and the present scope of the power

plant unacceptable. Should such a redesignation be made, additional evaluation of the projected air quality levels and their impact would be necessary with careful consideration of meteorological conditions and persistence and corresponding plume transport. The objective of the NPS-EPA study presently being conducted includes the assembly of the rather limited meteorological data which is available for input into a diffusion model to better define the potential impacts on the three parks. The addition of fine particulates and the conversion of sulfur and nitrogen oxides to aerosols would result in reduced visibility, the amount of reduction dependent upon meteorological conditions.

Periodic yellow-brown atmospheric discoloration from NO_x emissions would be produced. The intensity and extent of the discoloration would be proportional to the concentration of NO_2 in the atmosphere and existing meteorological conditions.

Small amounts of trace elements would be released and accumulated in the ecosystem over the life of the plant. Mercury accumulation in Lake Powell is estimated to be between a minimum of 1 and a maximum of 27 percent of the total added annually by natural sources, depending on the mercury concentration in coal and watershed movement.

Fugitive dusts would be generated periodically from construction activities and exposed soil surfaces. Impacts on aesthetics and visibility would be unavoidable, and inversely proportional to control success.

The impact of steam plume, fogging and icing from the cooling tower water vapor would be unavoidable but localized. Salt dispersion of 1,812 tons per year would adversely impact soils and vegetation in the vicinity of the cooling towers.

Additional air pollution from the expected 14,000 population increase would also be unavoidable and could be potentially significant. An estimated 980

tons of particulates and 700 tons of SO_2 per year could be added to the atmosphere by activities of the new residents.

Most of the adverse impacts discussed in Chapter III for the transmission system could not be mitigated. They are air pollution from accidental fires, ozone production from conductors, noise from conductors, construction noise on the right-of-way, electrostatic effects of the lines and pollutants exhausted from construction equipment and workers' vehicles.

Most of the construction-caused fugitive dust could be controlled by the proposed mitigating measures. Only a small amount would enter the atmosphere. Also the mitigating measures would prevent odd-hour work schedules and avoid locating marshalling areas, camps, and assembly areas near inhabitated areas.

Within the limestone quarry impact area it would be impossible to control dust at all times by water sprinkling or other dust suppression operations. Fugitive dust would enter the air during drilling, blasting and excavating. During dry weather, truck haulage along unpaved roads and in the quarry would result in some fugitive dust between sprinkling truck runs. Dust would accumulate on vegetation along the roadsides between precipitation periods and would be aesthetically displeasing; however, it should not have any significant adverse effects on man, animal, or plants.

Pollutant emissions from internal combustion engines could be only partially controlled by pollution control devices.

Geology and topography

Project modification of topographic features and drainage patterns in the Kaiparowits Plateau impact area would be unavoidable. Major excavations, waste disposal areas, and parts of some structures would remain permanently on about 1,800 acres.

A minimum of about 420 million tons of coal would be removed. An estimated equal amount of coal would be left behind and lost to ultimate recovery. Depletion of this 840 million tons of nonrenewable coal resource would be unavoidable. This represents approximately 10.5 percent of the total known coal reserve on the Kaiparowits Plateau.

The four coal mines would affect an area about 9 by 7 miles (63 square miles). Subsidence of 5 to 10 feet would likely occur over most of the area above mined-out coal beds. Percolation of surface water through these mined areas could contaminate aquifers. Such percolation and contamination would be an unavoidable adverse impact.

Construction of the generating station on Fourmile Bench would defer development of approximately 92 million tons of coal below the station site in order to protect surface installations from subsidence during the life of the plant.

An unknown volume of sand and gravel underlying East Clark Bench would be lost during the life of the town should it be constructed at this location.

For any one of the transmission system proposals most of the adverse impacts to topography could not be mitigated. Two acres would be mined for sand and gravel materials. Access road construction in rough terrain would modify a few hundred acres. Construction of tower sites would permanently modify 12 to 13 acres, while construction of crane pads would temporarily modify 42 to 47 acres, depending upon the proposal chosen.

Even though mined-out areas in the limestone quarry impact area would be filled with waste material, graded and revegetated, the original topography of the ridges would be permanently altered by excavation. A pit 30 feet deep and covering 130 acres would be created.

Soils

An estimated 7,320 acres of soil within the Kaiparowits Plateau impact area would be covered by man-made structures during the life of the project. An additional 1,375 acres would be subjected to an increase in salinity caused by salt drift from cooling towers. Vegetative cover on this acreage would be reduced by up to 70 percent after 50 years of power plant operation.

Trace elements such as arsenic, barium, boron, fluorine, lead, mercury, selenium, titanium, and vanadium contained in the power plant stack emissions would be deposited into the soils within a 30 mile radius of the plant. Fluorine concentrations in the soil would reach 22 ppm after 50 years of power plant operation. Other trace elements would vary from 0.008 ppm for lead to 0.55 ppm for titanium. The concentration of these trace elements in the fly ash-scrubber residue pile would be 20 to thousands of times greater than deposited in the soils. This pile would become a long-term source of pollution to Lake Powell.

In the transmission system impact area, soils disturbance and associated wind and water erosion would increase sediment yield by approximately 28.5 acre-feet annually. Sediment yield would decrease as ground cover is reestablished. However, the soils on about 72 percent of the impact area have low potential for revegetation and recovery would be slow. Of this, about 3,700 acres would be located in an arid or semiarid climatic zone, where lack of moisture severely limits plant growth. Consequently, under normal climatic conditions, ground cover may not be reestablished in some of these areas during the life of the project. The remaining 28 percent would require up to 10 years to reestablish ground cover.

In the limestone quarry impact area, 110 acres would be covered by man-made structures. Productivity would also be reduced on the 130 acre quarry itself. Of the acres in the quarry, 15 to 20 acres of steep side slopes would be subject to severe erosion.

Water resources

Withdrawal and depletion of 50,000 acre-feet per year of water from Lake Powell for the proposed project would make this water unavailable for other uses. Utah's remaining share of Colorado River water would be reduced by about 10 percent. Withdrawal of 50,000 acre-feet annually would result in an estimated net increase in salinity of the Colorado River at Imperial Dam of 2.0 mg/ℓ. This would cause an estimated annual cost damage to lower Colorado River Basin users of about $460,000 - see p. III-10 ($230,000) in terms of agriculture, municipal and industrial uses.

Application to divert the required 9,690 acre-feet per year of ground water needed for the proposed new town would conflict with existing water rights in the area and with water rights provided by the Colorado River Compact.

Coal mining activities would disrupt perched aquifers that discharge an estimated 160 acre-feet per year of water to seeps and springs in Warm and Last Chance Creeks which are used by wildlife and livestock. The flow of some of the seeps and springs would be depleted by this action. Subsequent subsidence would result in rock fracturing that would create hydraulic connections between fresh- and saline-water aquifers and, thus, generally degrade the quality of ground water in the coal-lease area. This would eliminate or reduce productivity of the area for livestock and some species of wildlife.

Seepage losses from the evaporation ponds (which would contain brines) would be reduced to about 22 acre-feet per year by use of mudstone linings in those ponds. This would have negligible effect on ground-water quality regionally, but could seriously degrade the quality of water in underlying perched aquifers of limited extent and storage capacity which support the flow of seeps and springs used by livestock and wildlife. These seepage losses could also emerge as saline seeps along walls of nearby canyons and eventually enter Warm Creek.

By the end of the proposed project, the fly ash-scrubber sludge residue pile would contain an estimated 50 million cubic yards of ash and scrubber sludge

with concentrations of toxic trace element. The tailings ponds would contain an estimated 43 million cubic yards of tailings with concentrations of pyritic sulfur and toxic trace elements. The evaporation ponds would contain an estimated 160,000 tons of salt. These large stock piles of project-produced wastes would all be in the Warm Creek drainage basin. They would be a long-term source of pollution to the quality of water in Lake Powell and the Colorado River as there would be no incentive to maintain the retaining structures after abandonment.

Smoke stack emissions from the power plant would release some trace elements to the hydrologic system. Some of the mercury that would be deposited in the local drainage basins immediately tributary to Lake Powell would be carried by runoff into the lake and would increase the amount of mercury available for bioamplification concentration in the lake. It could adversely effect the ecosystem in the lake and degrade sport fishing.

For the transmission system, water use for construction processes and dust control would require about 121 acre feet. Most of the adverse impacts on the water resource could be mitigated with the exception of accidental spills of waste materials. Prompt clean up of these wastes would negate further impact on the resource.

The proposed limestone quarry is in the fully appropriated Sevier River Basin. Application to divert the 2,000 gallons per day of ground water needed to operate the quarry would conflict with existing water rights. Use of this water for operation of the quarry would be at the expense of some existing use. Blasting at the quarry site during the projected 35 years of operation could eventually reduce the flow of Tom Best and Reynolds Springs. This reduction would reduce the available water supply for wildlife, livestock and irrigation proportionately.

Vegetation

Physical improvements in the Kaiparowits Plateau impact area, would cause a permanent loss of about 7,320 acres of native vegetation. Salt drift

from cooling towers would eliminate an estimated 70 percent of the vegetation from about 1,375 additional acres over a period of 50 years. After abandonment another 124 acres would be lost on the side slopes of the fly ash-scrubber residue disposal site due to erosion.

Unavoidable adverse impacts to vegetation in the transmission system impact area would occur along any of the three proposals. There would be approximately 1,573 acres and 75 animal unit months (AUM) lost on a permanent basis in the primary proposal, 1,350 acres and 53 AUM's lost in the Northern Kaiparowits proposal and 1,890 acres and 87 AUM's lost in the Arizona Strip proposal. In addition there would be an unavoidable loss of some protected, rare, endangered or threatened plant species during construction.

In the limestone quarry impact area, the loss of about 110 acres of vegetation due to various facilities and roads would be unavoidable. Vegetation would be lost on an additional 20-30 acres a number of years after abandonment due to erosion on side slopes where quarry rehabilitation could not be maintained.

Wildlife

In the Kaiparowits Plateau impact area, approximately 7,320 acres would be permanently lost to physical development and 1,375 acres reduced in productivity by salt drift. The greatest impact to wildlife would result from the increased activities of the 14,000 new inhabitants. An estimated increase of 13,700 man-days of hunting, 15,000 man-days of fishing, 40,000 man-days of off-road vehicle use, and other outdoor activities would be expected within a 100 mile radius of the residences of the new population.

The existing antelope population probably would be eliminated from East Clark Bench and surrounding area along with any future chances for reestablishment. The probability of desert bighorn becoming reestablished on Fiftymile Mountain would be diminished by increased human activity. The wild bison herd on

the Henry Mountains, already subject to extensive poaching, would suffer increased losses.

An uncertain quantity of mercury could be introduced into Lake Powell where mercury levels in some game fish are already at maximum level considered safe for human consumption. A significant increase of mercury in game fish would seriously reduce value of the sport fishery to man. Accumulations within the fallout area of other toxic elements such as selenium and arsenic would cause a potential long-term hazard to terrestrial and aquatic wildlife.

The transmission system impact area under any of the three proposals would cause permanent disturbance to habitat on 1,350 to 1,890 acres. Productivity for most wildlife would be lowered by habitat alteration. Upland game birds and small mammals may benefit from invasion of subclimax vegetation on disturbed areas, whereas migratory birds would suffer from reduction of riparian vegetation.

On the primary proposal, the greatest adverse impact on wildlife would result from increased poaching and disturbance induced by approximately 1,900 miles of roads (870 permanent) into areas previously remote from human activity. The other two proposals would require 1,765 and 2,085 miles of roads, with 735 and 1,055 miles, respectively, being permanent.

Construction and maintenance of the transmission system would cause unavoidable adverse impacts on wildlife and wildlife habitat, even with diligent implementation of proposed mitigating measures. Alteration of soil and vegetation would affect the ability of the ecosystem to support existing wildlife species. Some recovery of the habitat would be expected with time, but habitat in fragile arid areas may never fully recover.

Increased access provided by construction of 1,900 miles of new roads into areas previously remote from human activity would have adverse secondary impacts on wildlife resources that would be unavoidable and significant. There would be increased legal hunting; and poaching, harassment of wildlife, killing of raptors, and collecting of unique species such as the desert tortoise.

Desert bighorn sheep would be unavoidably impacted by removal of existing forage along the proposed transmission system. The climate, topography and soil in most desert bighorn range makes revegetation difficult. Additional human disturbance in the form of increased contact, hunting and poaching would place additional stress on this species that requires relative isolation from human interference.

During the construction phase, daily and seasonal movements of animals might be blocked or interrupted. The more mobile species would probably not suffer appreciably but smaller animals with small home ranges would be adversely affected. Small animals may die if blocked from important parts of their habitat.

Proposed transmission corridors would adversely impact habitats occupied by the following endangered species: black-footed ferret, brown pelican, southern bald eagle, peregrine falcon, Vegas Valley leopard frog, moapa dace, woundfin, Colorado River squawfish, Gila topminnow, humpback chub, bonytail chub, Colorado cutthroat trout, and possibly other, as yet unidentified species.

Adverse impacts would result from outright killing of individuals during construction and maintenance activities and/or alteration, reduction, and loss of habitat. However, local impacts would be of greater consequence to the species as a whole because of already reduced numbers or range. Most of these species have become diminished in numbers or range either because critical features of their habitat are already in short supply, or because they are especially vulnerable to man's activities. Therefore, alteration of a relatively small area of critical habitat or introduction of increased human activity could be a significant increment to an already adverse environment.

The impact of a wildlife species becoming extinct would be irreversible and permanent. That particular gene pool would be permanently lost as would future opportunities for scientific study of that species and whatever knowledge this might benefit man's understanding of his environment.

In the limestone quarry impact area, diversified wildlife include a few wintering deer and elk which would be eliminated from about 240 acres. Hazards to a nearby colony of Utah prairie dogs, an endangered species, would be increased by road construction, traffic and human activity. Some wildlife would be reduced over a larger area if nearby springs are eliminated by the quarrying operation.

Ecological interrelationships

Clearing vegetation in the Kaiparowits Plateau impact area from 7,320 acres of land and covering it with an impervious surface would eliminate forage for livestock and wildlife. Most vegetation would be eliminated from an additional 1,375 acres over a 50 year period by salt accumulation from cooling tower drift. A major portion of the salt drift loss would be in a pinyon-juniper stand averaging 500 to 700 years old. Populations of deer and other wildlife associated with this vegetative type would be lost and livestock grazing eliminated.

Coal mine operation would cause springs and seeps to dry up, a loss of water source for livestock and wildlife. Saline and fresh water aquifiers would also become mixed.

Human activity resulting from new town establishment would also create erosion problems, plus increased sediment deposition in Lake Powell through recreational activities. Also, human recreational activities could interfere with nesting and reproduction of birds of prey.

Surface disturbances and vegetation removal in the transmission system impact area would set plant communities back to earlier stages of plant succession, increase erosion, reduce soil moisture, and physically damage animals and their dens, shelters, cavities and nests. Desert vegetative types would be very slow to recover. Recovery may take 20 to 50 years and on some harsh, extreme sites revegetation would perhaps not occur. Changes in vegetation would be followed by

corresponding changes in wildlife because of their dependency on vegetative types.

In the limestone quarry impact area, vegetation would be lost from 110 acres. Another 15 to 20 acres probably could not be revegetated due to erosion on the quarry side slopes after abandonment has taken place. This situation would result in a loss of forage for wildlife. The removal of vegetation would increase competition for forage and place an added burden on undisturbed plant communities at least until some of the vegetation is reestablished.

Increased human activity would be the major unavoidable impact on ecological interrelationships in the area. Hunting pressure and harassment of wildlife would be increased and habitats of some animals would be altered in avoiding the presence of man.

Paleontology, archaeology and history

Paleontological, archaeological and historical resources in the Kaiparowits Plateau impact area would be disturbed or destroyed. Direct impacts would be controlled to the maximum possible extent by mitigating measures, such as survey, salvage and relocation operations, but these would not eliminate damage to the non-renewable unique scientific resource base. Elimination of nine or ten archaeological sites in the areas of the power generating station and coal mine would be unavoidable. Limitations in existing technology for location, evaluation, recovery, and analysis would prevent total data preservation and remove those sites affected from future research use when technology is expected to be better.

Paleontological, archaeological, historical and cultural resources in the transmission system impact area would be disturbed or destroyed. Direct impacts would be controlled to the maximum possible extent by mitigating measures, but these would not eliminate damage to the non-renewable, unique, scientific resource base. Limitations in existing technology for location, evaluation,

recovery, and analysis would prevent total data preservation and remove those sites affected from future research use when technology is expected to be better.

For the most part, archaeological resources in the transmission system impact area are as yet unidentified, and unassessed for preservation values. Many of the known sites appear to be eligible for inclusion in the National Register of Historic Places. Several archaeological and historical sites, districts, and trails along the proposed transmission system are presently nominated to or included in the National Register.

Removal of archaeological or historical artifacts from their natural setting in the limestone quarry impact area would be unavoidable in areas to be developed or quarried. Significant data would not be destroyed if proper survey and salvage were conducted prior to disturbance. However, even with mitigation, sites or parts of sites would be unavoidably damaged or destroyed.

In all areas indirect impacts would stem from improved access and increased human activity. Both accidental and intentional activities would erode the resource base. Disturbance or destruction by unauthorized collectors, vandals, and recreational users would occur. These losses would be uncontrollable.

Recreation

Natural values on a 7,320 acre area would be destroyed, including a portion of the mature pinyon-juniper forest on Fourmile Bench. The natural environment at Grosvenor Arch will be disturbed by the new highway. All adjacent areas having primitive values would be impacted by destructive effects associated with increased human and vehicle use.

Potentially the most severe impact would be the effect that haze and sky discoloration emitted from the stacks would have on the quality experience of the millions of people who annually visit the nationally important parks and scenic areas in the region, including Bryce Canyon National Park and Glen Canyon National Recreation Area.

The structures and landscape modifications associated with the proposed plant and mining complex would have a high visual impact on the travelers along the proposed new highway. The proposed marshalling yard, construction camp and new town site in the East Clark Bench area would also institute a high visual impact.

The increase in the number of people participating in outdoor recreation would result in the need for additional marina facilities at Lake Powell, destruction of cultural and natural values in a 30,000 square mile area are due to increased off-road vehicle use, and reduced deer hunting success due to overhunting.

There would be noise and congestion problems along the proposed new highway due to increased truck and commuter traffic.

The major impact of the proposed transmission system would be the unavoidable adverse visual effects. Regardless of the number of mitigating measures applied, the system would still create a major intrusion into otherwise natural landscapes.

Thirty recreation areas would be directly or indirectly impacted by the intrusion of the proposed transmission system. The system would also intrude upon hundreds of miles of landscape with high scenic values.

Approximately 1,900 miles of new permanent and temporary roads would increase access and open up otherwise remote areas. The use of these roads could cause increased soil erosion, wildlife disturbance, off-road vehicle damage, vegetation loss and could introduce an undetermined number of recreationalists into the transmission area.

The proposed transmission system would occupy approximately 3,000 acres of base recreation lands. The construction and maintenance activities of the transmission system could tend to degrade the quality of the outdoor recreation experience for the users of the area.

The transmission system would cross and be visual from numerous highways. The impact would be dependent on the number of viewers of the transmission system and their ideas and attitudes toward the intrusions created by the transmission system. Along the entire transmission system it is estimated that a daily average of 320,000 travelers could view the lines and roads.

Proposed actions at the limestone quarry impact area would remove 240 acres from recreational use. Dust from blasting and crushing operations would have moderate visual impact. The 30 round trip truck hauls per day originating at the quarry would create traffic congestion and safety problems along the Johns Valley road and through the northeast corner of Bryce Canyon National Park, particularly during the summer tourist months.

Land use

In the Kaiparowits Plateau impact area, livestock forage that could support 780 animal unit months (AUM's) in the generating stations and mining areas and 450 AUM's at the new town site would be lost. This loss would have an adverse economic impact on the affected operators. They could be forced to reduce the size of their herds or even quit the livestock business.

Mining of non-coal mineral resources would be restricted in all occupied or developed areas. Oil and gas drilling would be restricted on at least 6,468 acres in the generating station, coal mine, and new town areas.

Increased traffic and the transport of heavy loads would unavoidably damage roads. Maintenance and patrolling would require capital expenditures exceeding current expenses, and may not be entirely offset by the participants pre-payment of taxes.

Several adverse impacts could not be mitigated for the proposed transmission system. In western California, Las Vegas, Nevada, and northwestern

Arizona the proposed transmission lines would infringe upon recreational and residential lands. These lands may suffer a loss in value due to the presence of the transmission lines. Two existing air strips would have to be closed because the transmission lines would interfere with their glide path. The development of a proposed major airport in Eldorado Valley, Nevada, would be precluded. Livestock grazing in the impact area would be reduced by 75 animal unit months annually. Fifty-eight acres of agricultural land would be permanently lost in Riverside County, California. In the limestone quarry impact area, livestock grazing would be excluded from 240 acres during the life of the project. About 130 of these acres would be reclaimed, leaving 110 acres that would not be reclaimed and would be unavailable for grazing for many years.

Socioeconomic factors

Two adverse impacts in the Kaiparowits Plateau impact area would be loss of a "sense of community" and changes in present community organization. These have resulted from similar projects in the past.

By 1985 an estimated 2,354 basic employees would reside in the proposed new town and about 785 in Page, Arizona. Timely implementation of the companies' community plans would prevent a boom town situation. Delays in implementing the plan, or a low quality town as a result, would tend to shift much of the population and its impacts to Page, Arizona. Assuming new town development goes according to plan, trailer facilities would house much of the population. Trailer housing is often thought of as "temporary," but its nature makes many people in the trailer villages feel that they are not really part of the community.

Regardless of the success in planning, some discomfort and inconvenience would be expected. Planning for the industrial development to attract employees is far ahead of planning for the service and housing needs that would be created by

the development. Water and sewer inadequacy are often critical concerns; additional population would create new water needs, and existing water facilities are inadequate from an environmental health standpoint. Also, many social impacts could not be mitigated because hospitals, mental health facilities, and other facilities do not yet exist in the area.

Though new job opportunities would be created, potential economic benefits to present local residents would not be realized. Due to lack of local skilled personnel, a high percentage of the employees would be trained migrants. This and other factors could create tension between present residents who attempt to maintain existing sociological patterns and the trained migrants whose socio-economic and political interests would differ from those of the present community.

Political base-line changes could be expected that could result in a large block of voters in the new town controlling local and regional destinies. This change in community organization would be a direct result of population influx.

The limestone quarry impact area would be subject to the same kinds of impacts as described for the plateau region, with perhaps some modifications due to the distance between the quarry and the planned power plant and the town. With no plan for routing heavy truck traffic from the limestone quarry around the small towns in Garfield County, no mass transportation plans, and heavy traffic expected, a disrupting influence on communities may be expected.

In transmission line impact areas, basic impacts would be temporary use of lodging and service facilities by construction workers, erection of power lines across land which some Indians may wish to keep pristine, and to supporters of a nongrowth ethic, a belief that their life style is being threatened.

Market area

Impacts in the market area in southern California and Arizona are discussed in detail in Chapter III. Increased concern about air pollution, mass

transit, open space preservation and planning may mitigate adverse impacts to a degree. The quality of community life in the market area will probably deteriorate due to the positive relationship between continued urban growth and availability of electricity. None of this impact can be directly attributed to Kaiparowits, but only to the overall increase in available electricity.

CHAPTER VI

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

SUMMARY

No significant impacts on climate have yet been measured in the Southwest as a result of emissions from large coal-fired power plants and no significant impacts on climate would be expected from the Kaiparowits power plant or associated transmission system. The National Oceanic and Atmospheric Administration (NOAA) is currently conducting studies in the Four Corners area in order to gain information to determine the effects of large scale coal related energy development on regional climate. NOAA has indicated that it is reasonable to assume that there is yet insufficient data to assess the long-term meteorological consequences of coal development.

The exceptionally high quality of the atmosphere, as it now exists in the Kaiparowits area, would be committed to a degree of quality degradation should plant development begin. The air would become a receptacle for coal combustion products such as sulfur oxides, nitrogen oxides, particulates, (including fly ash, sulfates, and nitrates) trace elements, radioactive elements, carbon dioxide, and water vapor. Solid, liquid, and gaseous contaminants emitted to the air are ultimately removed within a period of time by a number of processes. The residence time in the atmosphere of sulfur dioxide, nitrogen dioxide and particulates generally varies from a few hours to a few days, so the duration of air quality degradation as a result of the Kaiparowits project would generally coincide with the duration of the project. The addition of particulates and chemical transformation of gases to particulates would affect visibility in the area during the life of the project. The effect on air quality of the area by the anticipated population increase could be of longer term impact than the life of the plant.

The proposed Kaiparowits site is within 36 miles of the existing 2,250 MW Navajo power plant. Although interaction between the two plants is not expected to be high in frequency, federal and the more stringent Arizona state air quality standards could be in jeopardy when cumulative effects occured. Five additional coal-fired power plants (860 to 2,085 MW) are within a 200 mile radius of Kaiparowits. Considering the separation distance, relationship of plant sites to prevailing winds, large atmospheric dilution potentials, interposing terrain features and types of emission controls proposed, the probability of emission interaction between the plants and the Kaiparowits plant appears small. However, there is presently insufficient background information to fully evaluate the long term and cumulative effects of the present energy development scenerio on air resources, visibility, and elemental buildup through long range transport to areas of higher accumulation.

During the 35 year life of the project 420 million tons of coal would be mined and another 420 million tons of coal no longer recoverable and therefore lost for the long-term. The short-term benefit would be the potential replacement of 33,460,000 barrels of crude oil that would not be needed for a 3,000 MW power plant.

As a result of the project 7,320 acres would no longer be available for grazing by livestock and wildlife in the Kaiparowits Plateau area, nor 1,700 to 2,030 acres along the transmission line, nor 110 acres within the limestone quarry.

Another 1,375 acres would lose 70 percent of its vegetative cover due to salt drift from cooling towers. Some years after abandonment, productivity of an additional 124 acres would be lost due to erosion of side slopes around the fly ash- scrubber residue disposal site, as well as 20 to 30 acres within the limestone quarry.

The project would use about 60,000 acre feet, of water annually. This use combined with water demands for other energy development in the Colorado

River basin could significantly affect long term productivity in the region. Colorado River salinity would increase 2.0 milligrams per liter (mg/ℓ).

Project activities would impair wildlife habitat values on some 8,175 acres. Recreation land would be diminished on 12,850 acres around the new town and power plant and on 46,130 acres within the coal mining area.

In the short run the project will provide new jobs in the Kaiparowits area, and add to property tax base and some tax revenues. It will also transform the life style of the residents in the area.

The Kaiparowits power project would consume or lose an estimated 15.78 quadrillion (10^{15}) Btu's during its project life while generating a 2.5 quadrillion Btu's of electricity for use in the market area. This indicates an efficiency of 16 percent. The energy expenditure does not include the energy required to maintain the transmission lines, the energy to transport workers, the energy to transport limestone, nor the efficiency of electrical use in the market area.

CHAPTER VII

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

SUMMARY

Implementation of the project would result in irreversible trends in land and resource uses and environmental impacts, and irretrievable losses of resources. Some irreversible and irretrievable commitments would have effects throughout the 35-year proposed life of the project, with some expectation of return to preproject conditions after abandonment of the project. Others would have effects for longer periods, and some commitments would be permanent.

Air quality and visibility would be reduced during the life of the project. A total of 840 million tons of coal would be irretrievably lost. Half of this would be mined for use in the generating station, and the remaining half would be left in place for safety and technological reasons, and would be unrecoverable. The project would also require the irretrievable commitment of 1,600,000 cubic yards of aggregate, 6.8 million tons of limestone, 6.3 million gallons of diesel fuel, 42 million gallons of fuel oil, 58.3 million gallons of gasoline, 55,000 tons of steel, 11,000 tons of concrete, and unspecified quantities of other construction materials.

Disruption of aquifers and subsidence caused by mining would be permanent. About 60,000 acre-feet of water would be committed annually for use on the project and new town, and would not be available for other uses for the period of the project existence. Losses of archaeological, historical, and paleontological values would be permanent. Aesthetic intrusions of facilities on 8,941 acres would last at least as long as the project, and perhaps longer.

Recreation use could be excluded from 9,160 acres of government land transferred to private ownership. The expected additional population of 14,000 would result in average increases of 13,700 man-days of hunting, 15,000 man-days of fishing, and 40,000 man-days of off-road vehicle use each year. This would irreversibly alter the present wild and semiwild character of much of the area to more intensified uses, prohibit future establishment of wilderness and primitive areas, and impact nearby national parks and existing wilderness and primitive areas.

Forage loss on more than 12,000 acres, including 4,431 acres to be occupied by man-made structures, would reduce grazing by wildlife and up to 91,805 animal unit months for the life of the project. Reduction of grazing would last even longer. However, the total loss cannot be predicted.

The project itself would result in an average of three to six fatalities a year, and greater numbers of disabling injuries. Expanding social systems could require commitment of additional land, and result in new life styles in the area. The project could also encourage additional development in the market areas, which would be irreversible.

CHAPTER VIII

ALTERNATIVES TO THE PROPOSED ACTION

SUMMARY

Technical Alternatives

Generating plant designs

Changes in location of various components might occur during final design engineering. These changes would not increase the area required for each component, and would create the same impacts to the environment as described in Chapter III.

Alternate stack marking would include 24-hour strobe lights, which would increase visual impact during night hours.

Four alternative particulate removal systems and seven alternative sulfur dioxide (SO_2) removal systems were evaluated for the participants by Bechtel Power Corporation. All of these alternatives would result in virtually the same impacts to the environment as the primary proposal.

The participants considered the following for waste disposal: the southwest corner of the proposed plant site as an alternate location for bench-top landfill, an alternative bench-top disposal method, canyon landfill, and disposal in the mine. The alternate bench-top site would require an additional 4,000 cubic yards of excavation and increase the surface disturbance by 2.3 percent (10 acres). The alternative method of bench-top landfill would involve spreading wastes behind a berm; this would result in increased erosion and visual impact. Considerable construction and excavation would be required for a canyon landfill. Necessary diversion of the natural drainage would disturb more acres of vegetation and possibly eliminate wildlife in the canyon. Approximately 2 miles by 1/2 mile of the canyon floor would be buried. Waste could also be injected into mined-out areas as a slurry; this would require 675 acre-feet annually of additional water,

and could ultimately contaminate adjacent ground water. Sufficient space in the mine would not be available for at least 10 years; however, this method may reduce subsidence.

The participants considered alternate sites, alternative designs, and alternate pipe line routes for the water supply system. One alternate site would be at Romana Mesa. This site would require an additional 10 miles of pipe line, and disturbance of 27 more acres as compared with the proposed location. It would also have an adverse visual impact. Another alternate site at Warm Creek is within 1 mile of the proposed site, and would involve the same kinds of impacts as the proposed action. Alternative designs of water intakes include a trench intake, which would cause disturbance from underwater blasting and excavation, and a jack-up offshore platform, which would involve technical problems, create a navigation hazard to boaters, and have an adverse visual impact to the lake aesthetics. An alternate pipe line route would cross Smoky Mountain; it would be longer than the proposed route and would result in more disturbance. A route up Nipple Creek, along the proposed highway, would involve less total disturbance.

Alternate locations for the reservoir and various pond lining materials were also considered. These alternatives would have the same impacts to the environment as the primary reservoir proposals.

Alternate cooling systems include cooling ponds, spray ponds, wet-dry cooling towers, and dry cooling towers. Cooling ponds would eliminate the environmental effects of drift and save 20 megawatts (MW) of power, but they would require lining, use an additional 16,000 acres of land, and increase water consumption by 16,500 acre-feet annually. Spray ponds would require less land than cooling ponds, but they would require 95 acres more than cooling towers. Spray ponds may also cause fogging and icing downwind, and would use as much energy as the proposed method. Wet-dry cooling towers require 20 to 30 percent more energy to operate.

They would have less drift loss and would use less water; however, they are relatively unproven. Dry cooling towers would not use water and, therefore, would not cause the environmental disturbance associated with the proposed wet cooling towers. Experience with these systems is limited, and research on technical feasibility is now being carried on. Possible effects on weather conditions due to release of heated air are unknown.

Six alternative limestone processing and handling methods were examined. These systems include processing at the plant, at plant and mine, at the quarry, the use of lime or limestone, and purchase from an outside supplier. Processing at the quarry site would result in an additional surface disturbance of 22 acres. Processing at the quarry would also require coal and an additional transmission line. Purchasing from an outside supplier would involve no surface disturbance in the impact area of the proposed Kaiparowits project, but would require long-distance haulage. If raw limestone were used instead of lime, a kiln and the coal used to heat the limestone would not be needed.

Coal mine design

The alternative surface mining methods of conventional area strip, multiple-bench and open-pit were examined. The amount of overburden above the coal zones, 400 to 500 feet, precludes the conventional area strip method under current technology. Multiple-bench open-pit was determined to be the only alternative.

In order to furnish the required 420 million tons of raw coal over the 35-year life of the project, an area of about 12 square miles would have to be excavated down to the coal beds. Resultant obliteration of existing vegetation, relocation and exposure of overburden, and destruction of ground water aquifers and surface water courses would cause heavy impacts on the environment. However, coal recovery would be 90 percent or more, compared to about 50 percent by underground methods, thereby conserving a nonrenewable natural resource.

The in situ mining or in situ gasification of coal were considered. This method causes greater environmental impacts than either surface or underground mining. And, at present it is not technically feasible.

Alternate transportation methods of railroad, off-highway trucks and slurry pipe line were analyzed; all indicated more adverse impacts than the proposed belt conveyor system.

Two alternative 138 kilovolt (kV) power line routes to supply power to the coal mine operations were examined. One alternative would follow much the same route as the proposed line described in Chapter I, but it would follow the general alignment of the new highway in the bottom of Wesses Canyon. The impacts for this alternative would be the same as the proposed route except along the new highway, where it would create a visual impact for highway users.

The second alternative would require construction of a new substation near Glen Canyon City. It would follow the general alignment of the new highway to the coal mine. This alternative would require 1 mile less of power line and 15 more acres of disturbance. It would also pass through a portion of the proposed new town, creating a visual impact.

Transmission system

Routes

A variety of alternate routes were considered for each of the four proposed segments of the transmission system. Fifteen alternates were considered for the proposed Kaiparowits to Eldorado route, six for the proposed Kaiparowits to Phoenix route, eight for the proposed Kaiparowits to Moenkopi to Mohave route, and seven for the proposed Mohave to Serrano route. Figures VIII-1 through VIII-4 compare the impacts resulting from each alternate route to the impacts resulting from the corresponding proposed route. For a summary of any alternate route, the reader should refer to the proper figure.

FIGURE VIII-1

Impact Evaluation of Alternate Routes for Proposed Kaiparowits to Eldorado Route[a]

		Importance to decision making[b]	Fivemile Valley	Cottonwood-Paria	East Clark Bench	Flat Top	Mokiah Wash	Black Rock Gulch	Navajo-McCullough	Highway 91	Telephone	Blake's Lambing Ground	California Wash	Lava Butte	Railroad Pass	Black Hills	Kaiparowits to Mohave Nos. 1 & 2
Mileage (more or less than proposed route)		5	+1	+1	+1	+9	-7	-2	-2	+2	+7	-4	-7	0	0	-1	+22
Climate		0	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
Air Quality		1	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS
Geology and Topography	General	1	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS
	Seismology	0	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
	Economic geology	0	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
Soils	Erosion hazard	5	MM	MM	MH	MS	MM	MM	SS	SM	MH	MM	SS	NN	NN	NN	MH
	Rehabilitation potential[c]	5	SS	SS	MS	SM	MM	MM	MM	MS	MM	MM	SS	SS	SS	SS	MS
Water Resources	Quality	5	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS
	Demand	7	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS
Vegetation	Grazing (potential loss of forage)	4	SS	SS	SS	SS	SM	SM	NN	SM	SM	SS	NN	NN	NN	NN	MH
	Acres disturbed (permanent)	6	MM	MS	MM	MM	MH	MH	MS	SM	SM	MM	MM	SS	SS	SS	MH
	Acres disturbed (temporary)	6	MM	MS	MM	MM	MH	MH	MS	SM	SM	MM	MM	SS	SS	SS	MH
Wildlife	Terrestrial	9	MM	SS	MH	MS	MH	MH	HS	HS	HS	HS	HH	SS	HS	HS	MH
	Aquatic	2	NN	NN	NN	NN	SS	SS	NN	NN	NN	SS	MM	NN	SS	SS	SS
Ecological Interrelationships	Terrestrial	9	MM	SS	MH	MS	MH	MH	HS	HS	HS	HS	HH	SS	HS	HS	MH
	Aquatic	2	NN	NN	NN	NN	SS	SS	NN	NN	NN	SS	MM	NN	SS	SS	SS
Paleontology		2	SS	SS	SS	SS	SS	SS	NN	SS	SS	NN	SS	SS	SS	SS	SS
Archaeology		8	MM	MM	MM	MM	MH	MH	NN	SS	SM	NN	SM	MM	SS	SS	SM
History		6	SS	SS	SS	SS	MH	MH	NN	SS	SM	NN	SS	SS	SS	SS	SS
Recreation	General	6	MM	MM	SS	MM	MH	MH	SS	SS	SS	MM	SS	MM	SS	SS	MM
	Scenic values	10	MH	MH	HM	MS	MH	MH	MM	MM	MS	HH	MH	SM	SM	SS	SH
	Natural values	9	MM	MM	MM	MM	MH	MH	MM	MM	SS	MM	MM	SM	SM	SS	SH
Land Uses	Miles of new corridor (more or less than prop.)	9	-5	-6	0	+9	+78	+86	-12	+9	+39	0	+28	+3	+12	+7	+137
	Wood Products	1	SS	NN	SS	SS	SM	SM	NN	NN	NN	NN	NN	NN	NN	NN	NN
	Agriculture	1	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
Socio-Economic	Housing and services	1	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MH	MH	MH
	Culture and attitudes	1	SS	SS	SS	SS[c]	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS

[a]Impacts rates as N-none; S-slight; M-medium; H-high - All alternates are compared to that part of the proposed route replaced by the alternate. The first letter indicates the impact each resource would undergo along the replaced segment of the proposed route. The Second letter indicates the impact each resource would undergo along the alternate where it deviates from the proposed route.

[b]Rated from 1 to 10 - This rating indicates the significance of each resource to decision making. Generally, ratings are based either on the degree to which a resource or activity would be impacted, or on the degree of potential controversy surrounding the resource or activity; the higher the rating, the higher the potential for impacts or controversy.

[c]This rating is not a comparison of impacts, but instead it is a comparison of rehabilitation potentials.

FIGURE VIII-2

Impact Evaluation of Alternate Routes for Proposed Kaiparowits to Phoenix Route[a]

		Importance to decision making[b]	John Henry	Cedar Ridge	Agua Fria	Pinnacle Peak	Antelope-Hualapai	Antelope-Wickenburg
Mileage (more or less than proposed route)		5	+3	+2	-3	+2	+36	+36
Climate		0		NN	NN	NN	NN	NN
Air Quality		1		SS	SS	SS	SS	SS
Geology and Topography	General	1		SS	SS	SS	SS	SS
	Seismology	1		NN	NN	NN	NN	NN
	Economic geology	2		NN	NN	NN	NN	NN
Soils	Erosion hazard	5		MM	MM	MM	MM	MM
	Rehabilitation potential[c]	5		MM	MM	MH	MM	MS
Water Resources	Quality	1		SS	SS	SS	SS	SS
	Demand	1		SS	SS	SS	SS	SS
Vegetation	Grazing (potential loss of forage)	4		SM	MM	MM	MM	MM
	Acres disturbed (permanent)	5		SS	SS	SH	SM	SS
	Acres disturbed (temporary)	6		SM	SS	SH	SM	SM
Wildlife	Terrestrial	8	Same As Proposed Route	SS	HM	MH	MH	MH
	Aquatic	4		SS	HM	SM	SS	SS
Ecological Interrelationships	Terrestrial	8		SS	HM	MH	MH	MH
	Aquatic	4		NN	HM	SM	SS	SS
Paleontology		3		SS	SS	SS	SS	SS
Archaeology		8		SM	MM	MM	SM	SM
History		5		SS	SM	SM	SM	SM
Recreation	General	8		MM	MH	MH	MH	MM
	Scenic values	10		MH	MH	MH	MH	MM
	Natural values	8		MH	MH	MH	MH	MH
Land Uses	Miles of new corridor (more or less than prop.)	10		+56	+45	+24	+145	+264
	Wood Products	3		SS	SS	MH	SS	SS
	Agriculture	1		NN	NN	NN	NN	NN
Socio-Economic	Housing and services	1		MM	MM	MM	MM	MM
	Culture and attitudes	5		MH	MM	MH	MH	MH

[a]Impacts rated as N-none; S-slight; M-medium; H-high - All alternates are compared to that part of the proposed route replaced by the alternate. The first letter indicates the impact each resource would undergo along the replaced segment of the proposed route. The second letter indicates the impact each resource would undergo along the alternate where it deviates from the proposed route.

[b]Rated from 1 to 10 - This rating indicates the significance of each resource to decision making. Generally, ratings are based either on the degree to which a resource or activity would be impacted, or on the degree of potential controversy surrounding the resource or activity; the higher the rating, the higher the potential for impacts or controversy.

[c]This rating is not a comparison of impacts, but instead is a comparison of rehabilitation potentials.

FIGURE VIII-3

Impact Evaluation of Alternate Routes for Proposed Kaiparowits to Moenkopi to Mohave Route[a]

		Importance to decision making[b]	John Henry Alternate	Cedar Ridge Alternate	Detrital Valley Alternate	Eldorado Valley Alternate	Coal Slurry Alternate	Antelope-Reservation Aubrey Alternate	Antelope-Lake Mead-Detrital Alternate	Antelope-Lake Mead-Hualapai Alternate
Mileage (more or less than proposed route)		5	+3	+ 2	+20	+56	-5	-28	-58	-49
Climate		1	Same as John Henry Alternate of the Kaiparowits-Phoenix Route	N-N	N-N	N-N	N-N	N-N	N-N	N-N
Air Quality		1		S-S	S-S	S-S	S-S	S-S	S-S	S-S
Geology and Topography	General	1		N-N	N-N	N-N	N-N	N-N	N-N	N-N
	Seismology	1		N-N	N-N	N-N	N-N	N-N	N-N	N-N
	Economic geology	3		NN	NM	NM	N-N	N-N	N-N	N-M
Soils	Erosion hazard	5		M-M	M-M	M-M	M-M	M-M	M-M	M-M
	Rehabilitation potential[c]	5		M-M	M-M	M-S	M-M	M-H	M-S	M-S
Water Resources	Quality	5		S-S	S-N	S-S	S-S	S-S	S-S	S-S
	Demand	1		SS	SS	SS	SS	SS	SS	SS
Vegetation	Grazing (potential loss of forage)	4		S-M	S-M	M-S	S-M	S-M	M-M	M-M
	Acres disturbed (permanent)	6		S-M	S-M	M-S	M-S	S-M	S-M	S-M
	Acres disturbed (temporary)	6		S-M	S-M	M-S	M-S	S-M	S-M	S-M
Wildlife	Terrestrial	9		S-M	S-M	S-H	S-S	M-H	M-H	S-H
	Aquatic	2		S-S	N-N	N-N	N-N	N-N	N-N	N-N
Ecological Interrelationships	Terrestrial	9		S-M	S-M	S-H	S-S	M-H	M-H	S-H
	Aquatic	2		N-N	N-N	N-N	N-N	N-N	N-N	N-N
Paleontology		3		S-M	S-S	S-S	S-S	S-S	M-H	M-H
Archaeology		8		M-M	M-M	S-M	M-M	M-H	M-H	M-H
History		5		M-H	M-M	M-M	S-S	M-H	M-H	M-H
Recreation	General	3		S-S	S-S	M-H	M-M	M-H	M-H	M-H
	Scenic values	6		M-H	M-H	M-H	M-M	S-H	M-H	M-H
	Natural values	6		M-H	M-H	M-H	M-M	S-H	M-H	M-H
Land Uses	Miles of new corridor (more or less than prop.)	10		+24	-7	-22	+54	+70	+131	154
	Wood Products	1		S-S	S-S	S-S	S-S	S-S	S-S	S-N
	Agriculture	1		N-N	N-N	N-N	N-N	N-N	N-N	N-N
Socio-Economic	Housing and services	1		M-M	M-M	M-M	M-M	M-N	M-N	M-N
	Culture and attitudes	5		M-H	M-M	M-M	S-S	M-H	M-H	M-H

[a]Impacts rated as N-none; S-slight; M-medium; H-high - All alternates are compared to that part of the proposed route replaced by the alternate. The first letter indicates the impact each resource would undergo along the replaced segment of the proposed route. The second letter indicates the impact each resource would undergo along the alternate where it deviates from the proposed route.

[b]Rated from 1 to 10 - This rating indicates the significance of each resource to decision making. Generally, ratings are based either on the degree to which a resource or activity would be impacted, or on the degree of potential controversy surrounding the resource or activity; the higher the rating, the higher the potential for impacts or controversy.

[c]This rating is not a comparison of impacts, but instead is a comparison of rehabilitation potentials.

FIGURE VIII-4

Impact Evaluation of Alternate Routes for Proposed Mohave to Serrano Route[a]

		Importance to decision making[b]	Sheephole Pass	Bristol Mountains	Ward Valley East	Martinez Canyon	Devers Serrano	BLM Ward Valley	North Indio Hills
Mileage (more or less than proposed route)		5	-29	-15	+1	+12	+5	+11	+2
Climate		1	NN	NN	NN	NN	NN	NN	NN
Air Quality		3	SS	SS	SS	SS	SS	SS	SS
Geology and Topography	General	1	SS	SS	SS	SS	SS	SS	SS
	Seismology	2	MM	MM	SS	MM	MM	MM	MM
	Economic geology	1	NN	NN	NN	NN	NN	NN	NN
Soils	Erosion hazard	2	SS	SS	SS	MM	SS	SS	SS
	Rehabilitation potential[c]	1	SS	MM	SS	MM	SS	SS	SS
Water Resources	Quality	2	SS	SS	SS	SS	SS	SS	SS
	Demand	0	SS	SS	SS	SS	SS	SS	SS
Vegetation	Grazing (potential loss of forage)	1	SS	SS	NN	NN	NN	NN	NN
	Acres disturbed (permanent)	3	SS	SS	SS	SS	SS	SS	SS
	Acres disturbed (temporary)	3	SS	SS	SS	SS	SS	SS	SS
Wildlife	Terrestrial	8	MM	MM	MM	MM	MM	MM	MM
	Aquatic	1	NN	NN	NN	SN	SS	SS	SS
Ecological Interrelationships	Terrestrial	8	MM	MM	MM	MM	MM	MM	MM
	Aquatic	1	NN	NN	SN	SS	SS	SS	SS
Paleontology		2	NN	SS	SS	SS	SS	SS	SS
Archaeology		6	SS	SS	SS	SH	SS	SS	SS
History		3	SS	SS	SS	SH	SS	SS	SS
Recreation	General	8	MM	MM	MM	MH	MM	MM	MM
	Scenic values	10	MM	MH	MH	MH	SM	HM	SM
	Natural values	8	MM	MH	MH	MH	MS	MM	SS
Land Uses	Miles of new corridor (more or less than prop.)	8	+125	+38	+99	+77	-56	+12	+34
	Wood Products	0	NS	NS	NN	NN	NN	NN	NN
	Agriculture	2	SS	SS	SS	SS	SS	SS	SS
Socio-Economic	Housing and services	2	+MM	+MS	+M+M	+MS	+M+M	+M+M	+M+M
	Culture and attitudes	4	MH	MH	MM	MS	MH	MM	SM

[a]Impacts rated as N-none; S-slight; M-medium; H-high - All alternates are compared to that part of the proposed route replaced by the alternate. The first letter indicates the impact each resource would undergo along the replaced segment of the proposed route. The second letter indicates the impact each resource would undergo along the alternate where it deviates from the proposed route.

[b]Rated from 1 to 10 - This rating indicates the significance of each resource to decision making. Generally, ratings are based either on the degree to which a resource or activity would be impacted, or on the degree of potential controversy surrounding the resource or activity; the higher the rating, the higher the potential for impacts or controversy.

[c]This rating is not a comparison of impacts, but instead is a comparison of rehabilitation potentials.

Direct current and alternative voltage levels

The proposed system of two 500 kV alternating current (ac) lines was compared with four 345 kV ac lines, one 600 kV ac line, one 765 kV ac line, two 600 kv direct current (dc) lines, and two 765 kV ac lines. Construction of four 345 kV lines would double environmental impacts (land area occupied, and vegetation and wildlife disturbance). One 600 kV dc line could carry the necessary energy; however, it cannot be integrated into an ac system without ac converters. One 765 kV ac line would require taller and wider towers than a 500 kV ac line, thereby creating increased visual impacts. Both the two 600 kV dc and the two 765 kV ac lines would carry all the Kaiparowits power plant proposed generation plus an additional 2,000 MW. The larger capacity towers would create additional visual impacts.

Use of existing transmission systems

Kaiparowits to Eldorado route

The existing single circuit line would be upgraded to double circuit towers. Double circuit towers are taller than single circuit towers; therefore visual impacts would be increased.

Kaiparowits to Phoenix

This alternative would involve either upgrading two 500 kV lines to one 765 kV line with one 500 kV line left in place, or upgrading one existing 500 kV line to double circuit 500 kV towers. Soil disturbance would be increased during tower reconstruction. The greater mass of 765 kV towers would be more intrusive on the landscape. Systems reliability would be reduced, and construction costs would double.

Glen Canyon Dam to Pinnacle Peak substation

Soil disturbance would not be any greater than new construction.

Construction costs would increase four times over new construction due to disassembly of existing lines.

Kaiparowits to Mohave

An existing 500 kV line would be upgraded to a double circuit 500 kV line. Severe soil disturbance could be caused during disassembly of existing lines. There would be a decrease in system reliability.

Undergrounding

Placing the transmission lines underground would increase costs 10 times. Also, undergrounding of 500 kV ac and higher voltages is not technically feasible due to overheating problems. Undergrounding would eliminate visual impact, but would involve surface disturbance because of the need for a trench.

Line spacing

A line spacing closer than 2,000 feet would reduce the number of disturbed acres, but system reliability could be reduced.

Limestone quarry

Alternate surface mining methods

Several methods for extracting limestone from the quarry area were considered. However, regardless of the alternative used, impacts would be the same as those discussed in Chapter III on the Limestone Quarry.

Alternate access roads and limestone transportation routes

An alternative access route from the county road to the quarry would disturb the Utah prairie dog and would not be considered a viable alternative. Three alternate highway haulage routes were considered. The East-Widtsoe Junction route would eliminate the need to haul material through Bryce Canyon National Park, but would be difficult to travel during winter months. The Paunsaugunt

Plateau route would also bypass Bryce Canyon National Park, but would result in scars that could be visible from the park. A third alternative would result in hauling through Bryce Canyon National Park.

Alternate methods of transportation of limestone

Limestone transportation by railroad or conveyor belt would require construction of a 60-mile route and would disturb an additional 400 acres. Slurrying and pumping limestone would require about 175 acre-feet of water annually. Water in the slurry may affect the limestone, causing a reduction in its binding characteristics and lowering its effectiveness in the SO_2 scrubbers. Crushing and grinding limestone at the quarry site would reduce needed highway transportation. This method would require a large water system, an electrical transmission line and about 150 tons of coal per day hauled from Fourmile Bench.

Implementation alternatives

Regardless of the construction alternative considered, impacts to the natural environment would not be any different than those identified and discussed in Chapter III. Coordinating the employment of construction workers among all participants and components of the project would reduce social impacts.

Capacity greater than 3,000 MW

No specific plan has been presented by the participants for increasing the size of the proposed operation above 3,000 MW. However, studies by the participants indicate that up to 25,000 MW capacity could be built at the site without exceeding the 3-hour sulfur dioxide standard.

Site Capacity Predictions*

Capacity (MW)	Maximum SO_2 Emission (g/s)	Estimated 3-hour Maximum Ground-Level SO_2 Concentrations ($\mu g/m^3$)
3,000	565	187
6,000	1,130	326
12,000	2,260	617
24,000	4,520	1,194
27,000	5,005	1,333

*Based on compliance with the most limiting 3-hour SO_2 EPA air quality standard.

Increased generating capacity would require several additional mines and more sophisticated mine planning and scheduling. In the absence of detailed mining plans it is estimated that ten to twelve mines would be required to meet the higher generating capacity at the Kaiparowits site.

Water-quality-impact differences between a 3,000 MW plant and a 6,000 MW plant would be increased diversion of water from Lake Powell, larger salt depositions from cooling tower drift, and increased trace elements in runoff. Withdrawal of 102,000 acre-feet of water per year from Lake Powell would increase the salinity of the Colorado River at Lee's Ferry less than 1 mg/ℓ.

The 102,000 acre-feet of water that would be diverted for possible use at Kaiparowits has been included in future development plans by the State of Utah and the Upper Colorado Region Comprehensive Framework Study. In 1973, consumptive water use of diversions by Utah from the Colorado River system was approximately 680,000 acre-feet out of a total allocation of approximately 1,350,000 acre-feet.

Greater quantities of limestone would be required in rock dusting the coal mines and to mitigate SO_2 emissions from a 6,000 MW power generating facility. Limestone quarrying operations would increase production to approximately 3,000 tons per day. Requirements for manpower, equipment, and the amount of highway transportation would also increase. As production level increased, there would be a corresponding increase in surface disturbance and excavation.

Alternative of constructing plant at Nipple Bench

Physically, the generating plant which would be constructed at the alternate Nipple Bench site would be similar to the Fourmile Bench proposal. Generating capacities would be the same. Space occupied by various components of the generating plant would be similar; but, due to the site configuration, the acreage permanently occupied by the generating plant at the Nipple Bench site would be somewhat greater - 1,077 acres compared to 932 acres for the Fourmile Bench site. The area permanently occupied by the water line and ancillary features would be less - 120 acres for the Nipple Bench site versus 225 acres for the Fourmile Bench site.

Construction of the power plant on Nipple Bench would have no significant effect on the proposed coal mine other than possible relocation of facilities to direct movement of coal to the south toward Nipple Bench, instead of to the northwest. Construction and operation schedules and plans would be essentially identical. If the Nipple Bench generating site were to be used, coal transportation could be by conveyor belt, railroad, or slurry pipeline. The participants have proposed railroad transportation as a possible alternative.

Two Utah Power and Light 138 kV power line alternatives have been selected to supply power to the mine. They would permit running a stub line to the Nipple Bench site for power during construction. One power line would begin at the existing (UP&L) substation north of U.S. Highway 89 near the Paria River, run easterly to the Nipple Bench site, thence northward to the coal mine, about 26 miles. About the same length as the route proposed in Chapter I, this alternative would disturb 28 acres. The second alternative would be a 138 kV line beginning at a new UP&L substation to be constructed near Glen Canyon City and running northward past the power plant construction site to the coal mine. The length would be about 18 miles, and the line would disturb 20 fewer acres than alternative one, but it would go through part of the proposed new town.

Description of environment - Nipple Bench site

The Nipple Bench site is located 14 miles south-southwest of Fourmile Bench at an elevation of 5,200 feet. It is approximately 21 miles northwest of the Navajo generating station and approximately 1,000 feet above the station. There is no sharp relief within the immediate vicinity of the Nipple Bench site. However, elevated terrain rises approximately 1,000 feet above the site within 6 to 12 miles northeast and east, with additional high terrain within 30 miles to the west, north, and east.

Small differences in relative humidity, precipitation, and evapotranspiration exist between Nipple Bench and Fourmile Bench. Fourmile Bench does have much lower cold weather temperatures than Nipple Bench both for extreme minimums and monthly means. The temperature differential between the two sites decreases during the warm season. Differences in surface winds between the two sites are minor. Prevailing upper winds are southwesterly at Nipple Bench and westerly at Fourmile Bench. Atmospheric stability in the lowest 3,000 feet above the surface is very similar between the two sites, although dispersion-enhancing turbulence appeared to be consistently lighter at Nipple Bench. Stagnation conditions, which include prolonged limited mixing conditions and low wind speeds, are expected to occur with a slightly greater frequency at Nipple Bench than at Fourmile Bench.

Meteorological conditions and predicted emission rates which would influence air quality impacts do not differ significantly from Fourmile Bench. Predicted ground level concentration for both sites would be similar as are calculated plume opacity and effects on visibility. Cooling tower fogging potential and drift rate would be similar at both sites. The proposed Nipple Bench site is 1,000 feet lower in elevation than the Fourmile Bench site with slightly greater potential for plume entrapment by elevated inversion layers. The Nipple Bench site is approximately 15 miles closer to the operating Navajo generating station and the potential for plume interaction with the Navajo plant would be greater

but still low in probability considering the necessary simultaneous and sustained occurrence of meteorological conditions necessary for interaction.

There are no known coal beds underlying Nipple Bench even though the geology is primarily the Straight Cliffs formation. Soils belong to the Badland-Rockland soil association. Nipple Bench is drained by intermittent streams which are subject to intense flooding after thunderstorms. The only perennial water sources are two small springs with a maximum discharge of less than 10 gallons per minute.

Two major vegetation types occur on Nipple Bench, blackbrush and a mixed shrub-grass association. There are no unique plants; however, one known population of a threatened plant, Peteria thompsonae, occurs north of the proposed plant site. Wildlife on Nipple Bench consists primarily of small, non-game species.

Nipple Bench exhibits fewer fossils than does Fourmile Bench. Thirty-five archaeological sites have been recorded within or near the proposed plant site. There are no known sites of historical value.

Recreational use is very limited. Livestock grazing is the only commercial land use.

Environmental impacts

Impacts on the environment of power plant construction and operation at Nipple Bench as compared with the site at Fourmile Bench are presented in Figure VIII-5 .

Four alternatives were examined which would permit the use of the Nipple Bench site as one of the terminals to proposed transmission line alternatives. There would be no environmental impacts beyond those already described.

Other alternative generating sites - Kaiparowits Plateau

The participating companies considered 17 locations in the Kaiparowits Plateau area as alternative generating station sites. Four sites close to Lake

FIGURE VIII-5

Site Comparison Study - Fourmile and Nipple Bench
Environmental Considerations

Factors	Fourmile Bench Site		Nipple Bench Site	
Average annual rainfall	8 to 9 inches		7 to 8 inches	
Frost-free days	150		160	
Potential evapotranspiration	27 to 30 inches		30 to 33 inches	
Prevailing winds	Southwest and west		Southwest and west	
Elevation of plant site	6,200 feet above mean sea level		5,200 feet above mean sea level	
Stack height	600 feet		800 feet	
Stack emissions and rates	Similar for both sites			
Predicted ground level concentrations (fumigation conditions)	$\mu g/m^3$	ppm	$\mu g/m^3$	ppm
Particulates				
Annual	1		1	
24-hour	10		9	
Sulfur dioxide				
Annual	2	0.009	2	0.001
24-hour	45	0.020	41	0.018
3-hour	181	0.080	166	0.069
Nitrogen dioxide				
Annual	15	0.0080	15	0.0080
Stagnation episodes	2 to 3 episodes per year		Slightly higher	
Average stagnation episode	5 to 7 days		5 to 7 days	
Predicted plume opacity	11 percent		13 percent	
Emission effects on visibility	Similar for both sites			
Potential for plume entrapment by elevated inversion layer and ground level effects from limiting mixing	Slightly greater potential at Nipple Bench than at Fourmile Bench			
Potential for plume interaction with elevated terrain	Greater potential at Nipple Bench than at Fourmile Bench			
Cooling tower plume rise	Similar for both sites			
Cooling tower fogging potential	Similar for both sites			
Drift rate from cooling towers	Similar for both sites			
Distance from Grand Canyon	76 miles		70 miles	
Distance from Navajo Power Plant	36 miles		21 miles	
Potential for plume interaction with Navajo Power Plant	Slightly greater at Nipple Bench, but low probability for both sites			
Total acres disturbed during construction	9,460		9,410	
Total acres occupied by structures and improvements after construction completed	7,320		7,460	
Change in annual sediment deposition into Lake Powell, compared to present conditions: During construction	+ 1.9 acre-feet		+ 1.7 acre-feet	
After construction	- 0.5 acre-foot		- 0.5 acre-foot	
Potential number of acres that could be adversely affected by salt deposition from cooling tower drift	1,375		865	
Potential percent reduction in vegetative cover	70 percent		50 percent	
50-year change in cumulative sediment deposition in Lake Powell, proposed compared to present conditions	- 26.0 acre-feet		- 12.9 acre-feet	
50-year change in annual sediment yield on area of salt accumulation, proposed compared to present conditions	+ 0.29 acre-foot		+ 0.08 acre-foot	

(continued)

FIGURE VIII-5 (Concluded)

Factors	Fourmile Bench Site	Nipple Bench Site
Types and potential numbers of wildlife that could be lost due to presence of the power plant after 50 years have lapsed	20 head of deer year long or 70 head of deer during the winter, and numerous small mammals, raptors, reptiles, birds and predators	Numerous small mammals, reptiles, and a few birds
Loss of unique biological features	Pinyon and juniper trees at least 500 to 700 years old, one being over 1400 years old	Negligible
Impact on paleontological values	Encompasses the Kaiparowits formation that contains numerous fossils on 13 sites	Encompasses the Wahweap and Straight Cliffs sandstones that contain three sites with fossil fragments of turtle shells, dinosaur bones, and crocodile teeth
Impact on archaeological values	50 archaeological sites recorded, 30 within proposed plant site, and 20 within half-mile buffer zone, reflecting limited and specialized activities. 7 would be disturbed.	35 archaeological sites, 15 within proposed plant site and 20 within half-mile buffer zone, exhibiting complex associations of features and artifacts. 5 would be disturbed.
Effect on surface water quality	The effect would be the same regardless of the site chosen.	
Effect on ground water quality	The effect would be the same for both sites, as the ground water would be influenced by the mining operation on John Henry Bench and the new community on East Clark Bench.	
Loss of livestock grazing	740 AUM's per year	948 AUM's per year
Visibility of power plant, indicating aesthetic impact on region	Power plant complex in full view from Bryce Canyon National Park, 32 miles away. Top of stack visible from Page, Arizona, 32.5 miles away. None of power plant complex visible from Glen Canyon City, Utah, or Warm Creek Basin and Wahweap Marina on Lake Powell.	Top of stack visible from Bryce Canyon National Park, 40 miles away, Page, Arizona, 18.5 miles away, and Highway U-89, 10 miles away. Top of stack may also be visible from some portions of Lake Powell. None of power plant complex visible from Glen Canyon City, Utah, or Warm Creek Basin and Wahweap Marina on Lake Powell.
Coal underlying power plant site that would be lost during life of project	92 million tons	Negligible
Potential loss of wood products due to location of power plant	1,170 acres of trees suitable for firewood and posts	None
Potential impact on agricultural lands	There are no lands of agricultural value on Fourmile Bench or Nipple Bench.	
Access highway needed	67 miles	71 miles
Access roads for pipeline and power plant needed	60 miles	45 miles
Water pipeline needed	32 miles	19 miles
Change in elevation from coal mine to power plant site	+ 1,200 feet	+ 200 feet
Conveyor way needed	13 miles	14 miles
Rock tunnels needed	0.6 miles	1.2 miles
Transmission lines to be built	1,457 miles	1,443 miles

Powell were favored for consideration by the companies in 1964. Subsequent discussions with the National Park Service, passage of the Clean Air Act (1970), and meteorological studies of these sites prompted the companies to consider sites on nearby benches. A site on Nipple Bench was favored by the companies but was not acceptable to the Secretary of Interior (June 1973). Environmental concerns included the site's proximity to Glen Canyon National Recreation Area, Lake Powell, and Navajo power plant. Four other sites on more remote benches were analyzed by the participants (November 1973) to determine their suitability for a power plant. These sites were John Henry Bench, Dry Bench, Horse Flat, and Fourmile Bench (proposed site). Since the three alternative sites have many similarities to the proposed site and are also within the plateau, most of the impacts reported for the plateau impact area in Chapter III would also occur if the plant were located at any of these alternative sites. Any site-specific impacts such as loss of vegetation and archaeological remains would occur at the alternative plant site rather than at the proposed site. None of the three alternative plant sites have an advantage that would markedly reduce environmental disturbances if they were selected as the site for the proposed generating facility.

Alternate generating station sites outside Utah

Sites for coal-fired power plants in California, Arizona and Nevada were considered as alternatives to the Kaiparowits power plant. New coal-fired plants cannot be built in California unless there is a reduction in either air quality standards or present sources of pollution.

To increase capacity of coal-fired power plants in Arizona and Nevada would require additional water which is not presently available in the amount needed to meet increased generating capacity needs.

Alternate limestone quarry sites

Five alternate sites were considered. The best alternative to Johns Valley would be the Canaan Peak site. This alternative would eliminate the need to haul limestone through Bryce Canyon National Park. Also a less-diverse population of wildlife, containing fewer game animals and no known endangered species, would be affected if the Canaan Peak site were used rather than Johns Valley.

Alternate actions by government agencies

New town

Six new community sites were investigated. All sites had some limitations, but the East Clark Bench site appeared to be the most favorable. It is the only site, except the East Clark Bench alternate, that is now served by a paved all-weather highway. It has sufficient space for expansion and the best potential for attracting additional business and industry. The lower elevation, warmer climate and closer proximity to Lake Powell make it more attractive for a town site.

New highway

The Kaiparowits Planning and Development Advisory Council recommended a road from Cannonville to Glen Canyon City (East Clark Bench). The same route would be used whether the plant is located at Fourmile Bench or Nipple Bench. Alternatives would have the same impact to the environment as the primary proposal with exception of the alternate route up Last Chance Creek. The Last Chance Creek alternative would result in disturbance of tropic shales, which are highly erosive.

Alternate means of meeting project objectives

Purchase power from outside Kaiparowits market area

Purchase of power outside the Kaiparowits market area could only occur if surpluses were available or if utilities were willing to provide additional

capacity. Most utilities in the Kaiparowits market area will need additional generating capacity soon, even at radically slowed electrical-use growth rates. Utilities would find themselves competing for any available power outside the market area. Thus, buying and selling surplus power can be used as a short-term expedient, but cannot be considered a long-term alternative.

Oil and gas

Present California air pollution control regulations rule out the construction of any new fossil-fueled (oil, gas, coal) electric generating plants for the near future.

U.S. proven oil reserves amount to about a 9-year supply; the life of proven natural gas reserves in the 50 states at current use rates is 10 to 11 years. National shortages and dependence on foreign imports preclude oil and gas as realistic alternatives.

Oil shale and tar sands

Despite large reserves, commercial production of synthetic crude oil from shales or sands has not yet begun in the United States. Major problems have arisen in disposal of large amounts of solid wastes, economical extraction, and the use of large amounts of water in water-short areas. Oils produced must be burned in conventional fossil-fueled power plants in order to convert their energy into electricity. Particulates and sulfur emissions may be substantially lower than for a coal-fired plant.

Hydroelectric power

Hydroelectric power could be a viable alternative to the Kaiparowits proposal if suitable dam and reservoir sites could be found. High capital costs and large-scale changes in the environment are effects; hydroelectric plants use a renewable resource. Pumped storage units can take over some peak load generating capability. Southern California utilities propose to construct 6,673 MW of

hydroelectric capacity between 1972 and 1991, of which 3,600 MW would be pumped storage capacity. Several additional sites would have to be developed in order to produce 3,000 MW of base-load capacity. Environmental impacts would be large and not all beneficial.

Organic waste

Power generation from municipal wastes could produce part of the power needed in the Kaiparowits market area. Technology is available - recycling of metals and glass is possible; part of the solid waste disposal problem is solved. However, the potential power to be generated from municipal solid waste is small, and municipal solid wastes from Los Angeles County would be able to provide only about 5-1/2 percent of the heat value needed for a 3,000 MW plant. Environmental impacts would be about the same as for coal-fueled plants. This would rule out the construction of a coal-fired, municipal waste-assisted plant in the Los Angeles area. The low heat value of municipal waste would rule out shipping it long distances to plants outside the market area.

Coal gasification

The gasification of coal would provide synthetic natural gas which would be burned elsewhere. The production of synthetic natural gas having the same heat value as the coal needed to fire a 3,000 MW power plant would require about 1-1/2 times as much coal and 40 percent of the water. It would produce about 85 percent of the ash, 22 percent of the particulates, 32 percent of the SO_2, and about 8 percent of the nitrogen oxides that the Kaiparowits plant would produce with air emission controls in operation. If the gas were to be converted into electricity, a 3,000 MW gas-fired plant would be constructed which would use about the same amount of water as a coal-fired plant and which would discharge about the same amount of NO_x as a coal-fired plant. Present regulations preclude construction of such a plant in southern California. However, part of the gas could be diverted

to direct heating, and a coal-gasification plant could produce salable quantities of sulfur, phenols, naphtha, tar oils, tar, and anhydrous ammonia. Although this alternative is technologically feasible, there is doubt that it would be commercially attractive.

Nuclear power

The alternative of using nuclear power to generate electricity is economically feasible, but questions of proper siting, design, operation, transportation and reprocessing of fuels, and storage of waste products remain unanswered to the satisfaction of many persons. Although the applicants have investments in proposed nuclear developments, they consider them to be supplementary to the proposed Kaiparowits plant rather than altneratives to it. The State of California has concluded that nuclear plants will be needed to produce half of the electrical power needed to meet the demand during the next 20 years.

Geothermal

Geothermal energy may be considered an alternative for part of the power to be generated by the Kaiparowits plant, and the proponents have substantial investments in exploration and development of geothermal sites. However, recoverable amounts of energy from geothermal sites may prove to be rather small. Use of geothermal energy for generating 3,000 MW is not a technically feasible alternative at this time.

Solar energy

Recent nationwide interest in solar energy may hasten the development of solar energy sources which may eventually supplement, and even replace in some cases, conventional generation of electricity; however, delays in implementing presently feasible methods, whether large-scale or on a single-residence basis, preclude consideration of solar energy as a feasible alternative generating 3,000 MW at present or in the near future.

Investments in energy conservation services

Conservation programs require public, governmental and company cooperation; long-term planning on a national and regional basis is needed to bring about long-term changes in consumption patterns. If this cooperation was in effect now, construction could be deferred 10 years. If it took 5 years to develop this cooperation, the power plant could be deferred 5 years. Construction of the Kaiparowits coal-fired generating plant could not be replaced by adoption of energy conservation measures.

Advanced generation and transmission systems

Due to technical problems, none of the advanced generation and transmission systems would be available soon enough to either be incorporated in or offset construction of the Kaiparowits power plant.

Delay or denial of proposed actions

Moratorium on proposal until regional energy planning completed

If regional energy planning involving state, federal, and local governments was initiated, the Kaiparowits power plant probably would be delayed 2 to 3 years.

Effects of delay

The Kaiparowits area would continue, without much change, the same industries and activities as it has in the past. Reserve generating capacities would be substantially reduced, in some cases to less than half of the 18 to 20 percent margin that utilities like to maintain. This would reduce system reliability. More time would be available for a regional energy study or for improvements in scrubber technology. Oil-fired generating plants scheduled to be replaced by the Kaiparowits project would continue to operate.

Denial of proposed actions

The participants would be forced to look to other areas and sources of energy and possibly a reduction in consumption of electricity in the market area. The Kaiparowits area would continue with the same industries and activities.

If construction of the Kaiparowits power plant was denied, 102,000 acre-feet of water would still be allocated to the proponents until the allocation was transferred to other hands. It could then be used for other power or chemical projects or for agricultural purposes.

The coal in the Kaiparowits area could be used for coal gasification and related petrochemicals.

CHAPTER IX

PUBLIC COMMENT

INTRODUCTION

This summary has been prepared from written comments and hearings testimony received on the proposed Kaiparowits project and the Draft Kaiparowits EIS. The hearings transcripts are available for review at the Bureau of Land Management, Utah State Office, Salt Lake City, and BLM Washington Office. All written comments from government agencies, recognized organizations and experts are covered in Chapter IX of the final statement. Comment letters are available for review at the BLM Utah State Office.

POSITION OF INTERESTED PARTIES ON THE PROJECT

Federal Agencies - Department of the Interior

Bureau of Reclamation

No position indicated

Fish and Wildlife Service

No position indicated

U.S. Geological Survey

No position indicated

National Park Service

NPS recommends "that the project be modified, relocated, or reduced in scope so that the present air quality of our national parks will remain unimpaired. It should be made clear that the project could not proceed as presently envisioned if parks in the affected area are designated Class 1 under the new EPS guidelines for prevention of significant air quality deterioration."

Bureau of Indian Affairs

No position indicated

Bureau of Mines

No position indicated

Mining Enforcement and Safety Administration

No position indicated

Bonneville Power Administration

No position indicated

Federal Agencies - Other than Department of the Interior

Environmental Protection Agency

EPA Region 8 has not taken a formal position, but indicated serious environmental reservations concerning the project.

Federal Energy Administration

Supports the participants' position that the additional generating capacity will be needed. They also support the use of Kaiparowits coal for electrical power generation, regardless of demand forecasts, to replace oil consumed in oil-fired generating plants. They do not, however, take a firm position on the project.

Energy Research and Development Administration

ERDA stated that cumulative air quality impacts of the 21,000 MW capacity coal-fired plants proposed within a 200-mile radius of Kaiparowits must be assessed in the final statement. They are deeply concerned about the total impact--immediate, cumulative, and future--of the proposed project, which has the "potential of deferring use of 80,000 barrels of oil per day" to "allow the utilities to maintain what they consider to be acceptable reserve margins."

Forest Service

No position indicated

State of Utah - State and Local Officials

State

Governor Calvin Rampton is for the project. All division and office heads, who have taken a position on the proposal, are for the project. The Kaiparowits Planning and Development Advisory Council which Governor Rampton created in August of 1974 favors the proposal.

Local - Kaiparowits area

Local officials who have taken a position for the project include: James F. Yardley, Commissioner, Garfield County; Laurie Holley, Town President, Cannonville; Merrill Mac Donald, Chairman Kane County Commission; Dixie Leavitt, State Senator; Garth Jones, State Legislator; Claud Glazier, Mayor, Kanab; Lloyd Frandsen, State Legislator; Cal Black, Commissioner, San Juan County; Karen Alvey, Kane County School Board; Sterling Griffiths, Commissioner, Kane County; and Billy Terrel, Commissioner, Kane County.

Local - Other

Former Salt Lake City Mayor Conrad Harrison is for the project. Genevieve Atwood, State Legislator, presented comments at the hearings but her position is unknown.

States of Arizona, Nevada, California - State and Local Officials

Arizona

Certain divisions and offices of the State Government, with the exception of the Game and Fish Department, did not take a position. The Game and Fish Department stated that they could not support the proposed project.

Nevada

Did not state a position.

California

Did not take a position on the project, but raised several questions. Their concern is that electrical demand studies used by the companies cite forecasts which may overestimate actual demands. They criticized the draft statement for lack of an independent demand study. They will reserve comment on their position until after publication of the Final Statement.

State and local officials who commented on the project include: Jerry Lewis, Assemblyman; Perry Horton, Councilman, Banning; Robert Kohagen, Councilman, Banning; W.R. Holcomb, Mayor, San Bernardino. Messrs. Lewis, Horton, and Kohagen expressed strong opposition against transmission line routing through the Morongo Valley, San Gorgonio Pass and Banning areas, respectively. Mr. Holcomb favors the project.

Utah Congressional Delegation

Senator Frank Moss, Senator Jake Garn, Congressman Allen Howe and Congressman Gunn McKay are strong advocates of Kaiparowits.

Other Congresspersons

Timothy Wirth, 2nd District, Colorado, stated that, "The pure air of the region around the proposed plant, and the possibility of legislation preventing the deterioration of that air, are important enough that any decision on Kaiparowits should be postponed until Congress makes this determination of national policy."

Shirley Pettis, 37th District, California, expressed concern for the potential impacts of the transmission lines upon the environment in her district.

Norman Mineta, 13th District, California, opposes the project.

Environmental and Conservation Groups

Large and small environmental groups strongly oppose the Kaiparowits proposal. Among those groups voicing opposition are the Sierra Club, Environmental Defense Fund, Friends of the Earth, Canyon Country Coalition, the National Audubon Society, National Parks and Conservation Association, Escalante Wilderness Committee, Utah Environment Center, Utah Clear, Utah Wildlife and Outdoor Recreation Federation, Arizona Wildlife Federation, League of Women Voters (Utah and Arizona) and the Ecology Center of Southern California.

Organized Labor

Several local Utah labor unions have voiced strong approval for the project.

Students

A class of University of Colorado students studying geography expressed opposition to the project. The great majority of a class of students attending Panguitch Elementary School, Panguitch, Utah, and a class at St. Joseph High School, Ogden, Utah expressed views against the project.

General Public

Utah Residents

The majority that commented favor the project. Responses from southern Utah indicate near 100 percent approval. The heavily populated Wasatch Front is generally for the project. Recent correspondence indicates some reservations.

Arizona Residents

Arizona residents generally expressed views against the project. Over 100 individuals expressed objections to a transmission line across the Arizona Strip.

Nevada Residents

They expressed opposition to additional transmission lines in their already heavily impacted transmission corridors.

California Residents

They expressed strong views against the project. They felt additional power in their heavily populated areas would attract more people, therefore, cause more pollution. They also expressed strong views against proposed transmission line routing through the Morongo Valley, San Gorgonio Pass, and Banning-Beaumont area.

New Mexico Residents

Residents from the Albuquerque, New Mexico area (Four Corners region) indicated almost 100 percent opposition to the project. They expressed concern for the pollution which they claimed the Four Corners plant was creating.

Totals Pro and Con

Letters that expressed opinions on the project were for, against, and neutral. These letters were counted and placed in the official Kaiparowits file. The tabulated count was as follows:

For	Against	Neutral
837	4,933	23

GOVERNMENT ORGANIZATIONS THAT PREPARED WRITTEN COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

Federal

Department of Transportation, Department of Agriculture (Forest Service and Soil Conservation Service), Environmental Protection Agency, Department of the Interior (Bureau of Reclamation, Fish and Wildlife Service, Geological Survey, National Park Service, Bureau of Indian Affairs, Bureau of Mines, Mining Enforcement and Safety Administration, Bonneville Power Administration), Department of Health, Education and Welfare, Energy Research and Development Administration, Federal Energy Administration, Department of Commerce (National Oceanic and Atmospheric Administration), Tennessee Valley Authority, Federal Aviation Administration, National Historical Advisory Council, Army Corps of Engineers and Department of Housing and Urban Development.

State

State of Utah, Department of Developmental Services, Division of State History; State of Arizona, Governor's Clearing House; State of Nevada, Governor's Clearing House; State of California, The Resources Agency.

Local

Board of County Commissioners, Garfield and Kane counties (Utah); Maricopa and Mohave counties (Arizona); Clark County (Nevada); Orange and San Bernardino counties (California).

PUBLIC COMMENTS

General

Some individuals said the draft statement recommended a particular course of action or was biased in favor of the participants. Some expressed

concern that the statement would allow project development without full knowledge of impacts. They were concerned because the document indicated that certain data were not available or that the extent or magnitude of certain impacts were unknown. Other individuals questioned why certain items were not included in mitigating measures, particularly socioeconomics, site abandonment, reclamation, wildlife, etc. Recent letters indicate a concern that the Secretary may have already given his assurances to Governor Rampton, Congressman Howe and others that he will approve the project.

Specific

These include the following comments: (1) the need for a regional study of all proposed and operational power projects in the Southwest and their potential cumulative impacts upon the environment, (2) the need for additional power in the Arizona and southern California market areas, (3) the need for an extensive study of impacts in the market area, (4) the need for more definitive data and possible impacts of plant emissions (trace elements, mercury, etc.) on water, wildlife, vegetation, air quality, and health of the residents of the Kaiparowits Plateau airshed, (5) the impact on air quality of Utah's National Parks, National Recreation Areas, etc., and (6) the direct and indirect impacts on resources, resulting from increased numbers of people in the Kaiparowits Plateau area.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