Development of Coal Resources in Southern Utah

Part I Regional Analysis

FINAL

ENVIRONMENTAL STATEMENT

Cover photograph: View of the southern part of the Kaiparowits Plateau, looking north toward Fourmile Bench.

ENGLISH-METRIC CONVERSION FACTORS

To convert English unit	Multiply by	To obtain Metric unit
Inches (in)	2.54	Centimeters (cm).
Feet (ft)	3.048×10^{1}	Centimeters (cm).
	3.048×10^{-1}	Meters (m).
Miles (mi)	1.609	Kilometers (km).
Square feet (ft^2)	9.290×10^{-2}	Square meters (m^2).
Acres	4.047×10^{-1}	Hectares (ha).
	4.047×10^{-3}	Square kilometers (km^2).
Acre-feet (acre-ft)	1.233×10^{3}	Cubic meters (m^3).
	1.233×10^{-3}	Cubic hectometers (hm^3).
Cubic yards (yd^3)	7.646×10^{-1}	Cubic meters (m^3).
Pounds (lb)	4.536×10^{-1}	Kilograms (kg).
Short tons (tons)	9.072×10^{-1}	Metric tons (t).
Pounds per acre (lb/acre)	1.12	Kilograms per hectare (kg/ha).
Btu/lb	2.326	Kilojoules per kilogram (kJ/kg).
Gallons (gal)	3.785×10^{-3}	Cubic meters (m^3).
Gallons per minute (gal/min)	6.309×10^{-2}	Liters per second (L/s).
Degrees Fahrenheit (°F)	([1])	Degrees Celsius (°C).

[1]Temperature in °C =(temperature in °F - 32)/1.8.

FINAL

ENVIRONMENTAL STATEMENT

DEVELOPMENT OF COAL RESOURCES

IN

SOUTHERN UTAH

Prepared by the

DEPARTMENT OF THE INTERIOR

H. William Menard
Director, U.S. Geological Survey

1979

DEVELOPMENT OF COAL RESOURCES

IN SOUTHERN UTAH

VOLUME CONTENTS

SUMMARY

( ) Draft (x) Final Environmental Statement

Department of the Interior, U. S. Geological Survey

1. Type of action: Administrative (x) Legislative ( )

2. Brief description of action:

The proposed actions are based on three formally proposed mining and reclamation plans to produce coal from eight mines on Federal lands in southern Utah. Impacts are evaluated for the years 1980, 1985, and 1990 for population-related effects and for the life of the project for site-related effects. The statement also considers the cumulative impact of the Allen-Warner Valley (A-WV) Energy System, a 2,500 megawatt electric power generation project. The A-WV project, exclusive of the Alton mine, is being considered in a site specific EIS being prepared by BLM. The statement is in two parts; the first part (Regional Analysis) evaluates the cumulative impacts of four scenarios of development and the second part (Site-specific analyses) specifically evaluates each proposed action. Chapters IV-VII of part 1 describe the impact that would result from a projected scenario of coal and power plant development. This scenario represents a partial action and comprises coal production of 10.5 mty from the Alton strip mine, 1.0 mty from the Kaiparowits No. 5 mine and 0.5 mty from the Blue mine and development of the A-WV power plants that would consume the 10.5 mty of coal produced at the Alton mine. Chapter VIII describes a no action alternative (0-1 mty coal production) and evaluates impact of a medium (full development of the proposed actions, 29.3 mty of coal production) and a high level scenario (46 mty of coal production). The projected and medium level scenarios include the two power plants of the A-WV system and the high level considers additionally impacts of preliminarily proposed power plants (2), transportation systems (7 or more) and mines (16).

3. Summary of environmental impacts at the projected level by 1990 or for the project life:

A. Land surface on 18,584 acres would be disturbed; the Alton mine would affect 8,280 acres and the A-WV project 9,588 acres over the entire project life. After reclamation, land use probably would change permanently on 1,725 acres.

B. Population in 1990 would increase by 8,400; Kane and Garfield Counties, Utah and (or) Coconino County, Arizona would be expected to absorb 8,100, an increase from an anticipated no-action population of 10,100 to a total population of 18,200.

C. Total water use would be 43,940 acre-feet per year consisting of 42,040 acre-feet per year for the A-WV project, 240 acre-feet per year for mining and 1,660 acre-feet per year for public supply. All would be consumed except 830 acre-feet of sewage effluent which could be reused for irrigation.

D. The existing labor force mix would change. The social and cultural characteristics of workers migrating into the area may contrast sharply with those of the area's "current" residents, thus possibly leading to social conflicts.

E. The A-WV project may impact a threatened or endangered species (woundfin) and disturb rare species (Gila monster, desert tortoise, desert bighorn sheep).

F. A water project component of the proposed A-WV project would provide as much as 18,000 acre-feet per year to increase agricultural production from 10,000 acres of currently irrigated land.

G. The economy and tax revenues of a sparsely settled area would be sharply expanded.

H. Competition for labor would adversely affect existing area businesses and rising incomes would spur competition for goods, services, and housing. Those persons on fixed incomes could suffer.

I. The quality and quantity of some municipal and local services may decline; others may be enhanced.

J. Fugitive dust will be controlled by use of Best Available Control Technology and Best Management Practices: therefore air quality and visibility impact would be minimal and would be restricted to the close vicinity of roads that would be unpaved for short periods. The calculated impact on Bryce Canyon National Park is a reduction of average visibility from 87 to 85 miles.

K. Soils on 18,584 acres would be disturbed by mining, mine facilities, transportation systems, powerlines, water projects, powerplants, and community development. Onsite erosion rates could increase by an average of 10 cubic yards per acre per year.

L. Use of developed recreation sites and use areas, now utilized at or near their capacity, would increase about 10 percent over that projected to 1990 at the low (no action) level.

M. Vegetation on 18,584 acres would be destroyed by mines, powerplants, ancillary facilities and urban development over the life of the project, the loss would be 11,200 AUM's from the A-WV project and 1,729 AUM's from the mines.

N. The present visual quality of the landscape would be changed as a result of mining and the ancillary transportation and transmission facilities.

O. About 10,304 acres of wildlife habitat would be lost for the duration of the projects. The Alton mine would disturb an additional 8,280 acres over the entire mine life but only a part of the acreage would be disturbed or unreclaimed in any specific year during the mine life. About 538 acres would be permanently lost to urbanization and roads.

P. Substantial demands would be placed on transportation systems. The 104 miles of roads needed to provide direct mine access would require 205 acres of land.

Q. About 250 million tons of coal would be extracted. About 65 million tons probably would not be recoverable. Subsidence associated with mining could affect about 3,000 acres on the Kaiparowits Plateau. Fractures, depressions, and surface buckling may accompany subsidence.

R. Some fossils may be destroyed; others could be revealed.

4. Alternatives considered:

The alternatives discussed relate to the Secretary's possible decisions on mining and reclamation plans under consideration. The scenarios provide a basis for evaluation of areas of environmental concern or impact sensitivity. Four scenarios are presented. Although the Secretary is not proposing a particular level of coal production, he can consider actions that will allow Federal coal to be available under environmentally acceptable conditions.

5. Comments on the draft environmental statement were requested from various agencies, State clearing houses, and interest groups:

All written comments and responses to the comments are reproduced in chapter IX.

6. Date final statement was made available to EPA and the public:

SUMMARY ATTACHMENT I

Comments have been requested from the following:

Department of the Interior:

Bureau of Mines*
Bureau of Reclamation*
Heritage Conservation and Recreation Service*
National Park Service*
Office of Surface Mining*

Other Federal Agencies:

Advisory Council on Historic Preservation*
Department of Agriculture
  Soil Conservation Service*
  USDA Forest Service*
Department of Commerce
Department of Energy
Department of Health, Education, and Welfare*
Department of Housing and Urban Development*
Department of Labor
  Mining Safety and Health Administration*
  Occupational Safety and Health Administration
Department of Transportation
Environmental Protection Agency*
Federal Energy Regulatory Commission
Interstate Commerce Commission
Mountain Plains Federal Regional Council
National Historic Preservation Council
Office of Economic Opportunity
Office of Management and Budget
Water Resources Council

State and local agencies:

State of Utah Clearing House*
Four Corners Regional Commission
Washington County Commissioners
Iron County Commissioners
Kane County Commissioners
Garfield County Commissioners

*Responded, see comments in chapter IX.

PART 1

REGIONAL ANALYSIS

CONTENTS

ILLUSTRATIONS

[Maps designated "in pocket" are in pocket affixed to the inside back cover of this report]

TABLES

CHAPTER I

DESCRIPTION OF PROPOSED ACTIONS

A. INTRODUCTION

This environmental impact statement (EIS) analyzes the potential environmental impact of proposed mining and use of Federal coal from the southern Utah coal fields; a complementary statement under separate cover similarly analyzes proposed coal development to the north, in the central Utah coal fields. Both are joint U.S. Geological Survey (USGS)-Bureau of Land Management (BLM) statements, prepared under the leadership of the USGS. In this statement, part 1 analyzes the cumulative impact of development under several different scenarios and part 2 analyzes specific impacts that would accrue from development of eight new mines.

1. Area

The southern Utah coal region is a broad area of southern Utah which includes the Henry Mountains, Kaiparowits Plateau, Alton, and Kolob coal fields (fig. I-1). These coal fields have been idle in recent years, and past production was limited to small local markets. The EIS boundaries include the sites of the proposed coal developments, most associated activities in southern Utah and most of the area of expected major direct and indirect impact (fig. I-2, in pocket). The Harmony coal field is outside of the regional EIS boundary because no coal production has been proposed there and none is expected within the timeframe of this statement.

Detailed plans have been submitted to the USGS for approval to develop federally-owned coal under lease in the Kaiparowits Plateau and Alton coal fields. Plans and land use applications have been filed with the Bureau of Land Management (BLM) for the proposed Allen-Warner Valley Energy System (A-WV). The system includes steam-electric power generation stations near St. George, Utah and Las Vegas, Nevada and associated transportation and electrical distribution facilities; the power generation stations would consume coal transported by coal-slurry pipeline from the Alton coal field. These detailed proposals and other possible developments described in the EIS share common reclamation problems, administrative boundaries, and would involve areas that are economically interdependent.

Impacts that extend beyond the delineated boundaries of the EIS region are analyzed to the extent that they are significant and are more associated with the proposed actions than with other actions outside the region. Elements having broader geographic impact include social and economic factors, air quality, transportation systems, and recreation.

2. Scope

This environmental statement is an analysis of cumulative and individual impacts of coal developments proposed for Federal approval (table I-1), and associated off-lease activities. Also analyzed is

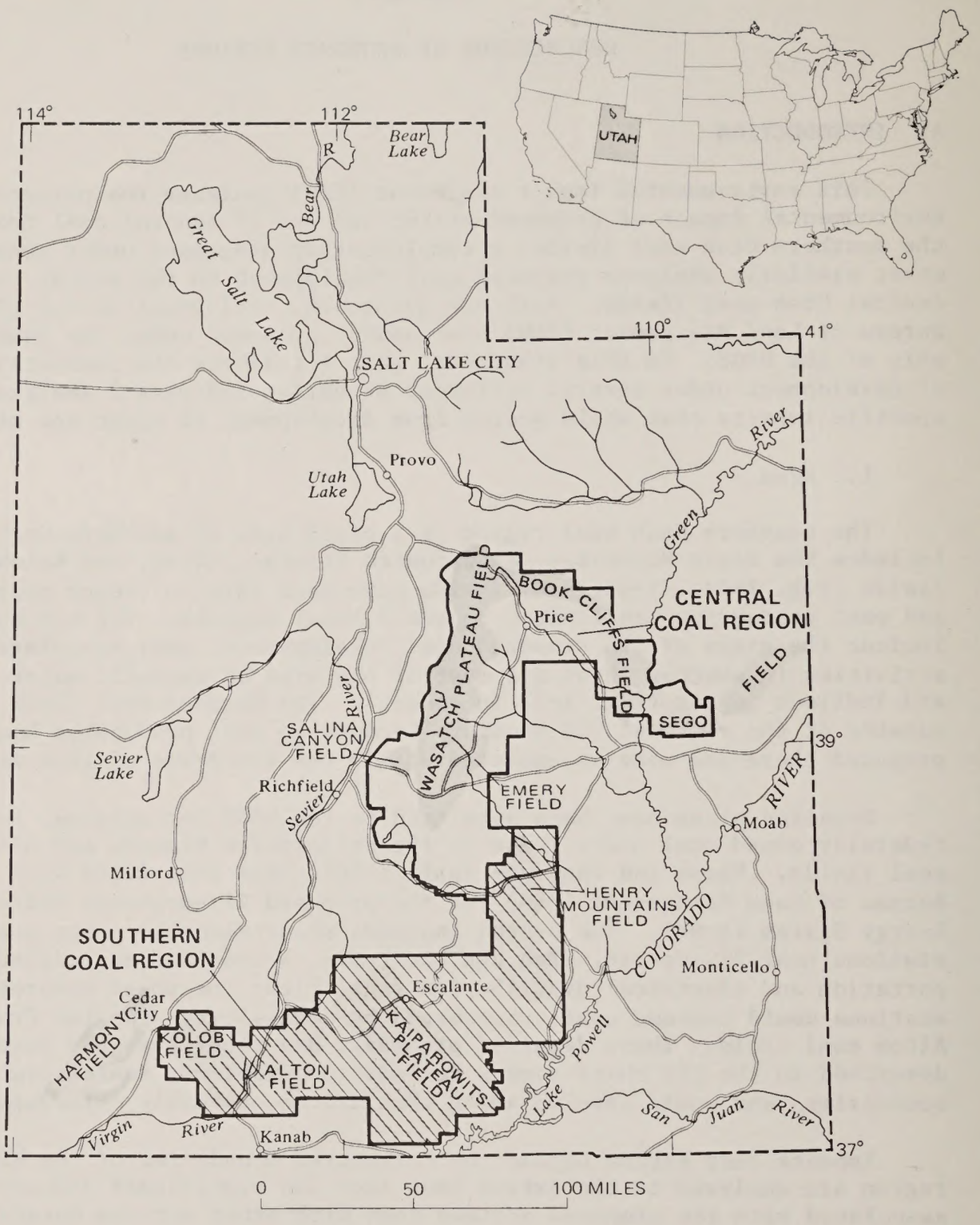

FIGURE I-1.--Index map showing southern and central Utah EIS regions and principal coal fields.

TABLE I-1.--Proposed actions--mining and reclamation plans

Company	Mine name and type	Total lease area (acres)		1990 potential coal development (millions of tons)	
		Federal	State and private	Mining plan total mid-level scenario	Projected level scenario
El Paso Coal Co.------	Red and Blue mines (underground)	27,659	12,887	6.8	[1]0.5
Mono Power Co. et al.-	Kaiparowits Nos. 1-5 mines (underground)	40,277	7,499	12.0	[2]1.0
Nevada Electric Investment Co. and Utah International, Inc.----------	Alton strip mine	26,534	2,101	10.5	10.5

[1]Blue mine (used for analysis, does not preclude different distribution of production from other proposed mines).

[2]Kaiparowits No. 5 mine (used for analysis, does not preclude different distribution of production from other proposed mines).

potential future coal production from private mines and other coal-related potential developments. The cumulative analysis is described in part 1 and the individual site specific analysis are in part 2.

The major cumulative analysis in part 1 of this statement is based on a scenario of 12 million tons per year (mty) of coal production by 1990 and construction and operation of the proposed Allen-Warner Valley Energy System (A-WV), a major 2,500 megawatt capacity power-generation project. A site specific EIS analyzing this project is being prepared by BLM. The projected production level of 12 mty is dependent on Federal approval of mining and reclamation plans on existing Federal leases. However, the Secretary of the Interior is not proposing this production level for coal in this region. Instead he is considering appropriate actions to insure that Federal coal is available under environmentally acceptable conditions and as needed to meet market demands and the energy needs of the nation. For this reason, lower and medium level scenarios and a higher level scenario that includes two more power generation projects and several railroad and coal slurry pipeline proposals are analyzed in chapter VIII.

The projected coal production of 12 mty would meet the requirements of the A-WV project (10.5 mty) to be supplied by the Alton mine and includes an additional 1.5 mty from two of the seven proposed mines on the Kaiparowits Plateau (table I-1) and (or) from potential development on State land. The 1.5 mty is the amount that could reasonably be transported from the Plateau on the current road system. Although the Kaiparowits No. 5 and the Blue mine were used for analysis, mainly because both mines have separate and specific mining and reclamation plans, an equivalent production from any combination of the proposed mines would effect an impact equivalent to that described in chapters IV-VII. This statement does not preclude a different distribution of production. The three production scenarios analyzed in chapter VIII are: (1) a low production level of less than 1 mty which could be produced with no Federal action, (2) a medium production level of 29.3 mty, based on approval of all detailed mining proposals and preliminary transportation proposals, and (3) a high production level of 46 mty based on full production from detailed and one or more preliminary mining proposals, possible production from other Federal and State lands under lease, an expanded transportation system and two additional power generation projects.

The EIS does not propose new coal leasing nor does it commit the Secretary of the Interior to a new coal-leasing program or to the issuance of new coal leases. Additionally, any future coal-related actions on Federal lands in southern Utah beyond those proposed for approval and analyzed site specifically in part 2 may require additional environmental assessment prior to granting of permits.

Development of alternative sources of energy, energy conservation, Federal development of the coal, and emphasis on coal development in other regions of the United States are more appropriately evaluated on a program rather than a regional basis. This was done in the previous Interior Department coal programmatic statement and is updated and revised in the new programmatic statement filed with EPA on December 15, 1978.

3. Timeframe of Analysis

This statement (part 1) analyzes the total cumulative site-related impacts, such as total coal production and disturbed acreage, for the entire life of the several projects that constitute each scenario. Cumulative impacts of social and economic changes that would result from the annual coal production level and selection of coal-related projects in each scenario are projected to the year 1990. The date was chosen to allow reasonably accurate predictions and to ensure uniformity between the several regional coal EIS analyses being made in other parts of the nation; however, most of the detailed proposals anticipate a much longer life to recover the total coal reserves (tables I-1, I-2). In some places the impact owing to possible retainment of access roads and powerlines beyond the project life are not analyzed because the land managing agency cannot now identify those that should be retained. Similarly the specific statements in part 2 evaluate site-related impacts for the life of the mines and social and economic impacts to 1990.

It is anticipated that none of the proposed projects will be operating by 1980 because of uncertainties in receiving approvals from various Federal and State agencies and the lead time required to acquire equipment and to construct surface facilities. These properties could be operating by 1985. The 1985 and 1990 projections are based on project approvals by 1980.

4. Agency Roles in Preparation

The analysis is a joint USGS-BLM statement prepared by an interagency task force under the leadership of the U.S. Geological Survey and with major participation by the Forest Service, Department of Agriculture. Other participating agencies are the Bureau of Mines, Fish and Wildlife Service, and National Park Service, Department of Interior; and the Interstate Commerce Commission.

5. Future National Environmental Policy Act (NEPA) Review Points

Major environmental review that may be required of both approved and preliminary projects on Federal lands include:

- Future changes in approved mining and reclamation plans.
- Future requests for right-of-way permits or coal lease applications that meet short-term standards will be reviewed.
- The Surface Mining Control and Reclamation Act of 1977 (SMCRA) requires mining permits to be reviewed and renewed at a minimum of every 5 years.
- Department of Energy (DOE) - under the Department of Energy Organization Act (P.L. 95-91) of August 4, 1977, DOE is authorized to promulgate regulations setting rates of production for Federal leases and establishing diligence requirements for operations

TABLE I-2.--Project development time frame

Proponent	Proposed project	Project development[1] 1980	1985	1990	Recoverable reserves	Project life
		millions of tons per year			million tons	years
El Paso Coal Co.	Blue mine---------	0	0.5	0.5	[2]6.0	12
	Red mine----------	0	4.7	6.3	[2]200.0	38
Mono Power Co. et al.	Kaiparowits Nos. 1-4 mines-------	0	7.3	11.0	--	--
	No. 5 mine------	0	1.0	1.0	[2]534.5	44
Utah International Co. and Nevada Electric Investment Co.	Alton strip mine--	0	8.8	[3]10.5	[4]212	[3]23
Nevada Power Co. et al.	Allen-Warner Valley power project[5]--------	--	--	--	--	40

[1] Contingent on permit approvals and coal market.
[2] 50 percent estimated recovery.
[3] 10.5 is proposed average peak production, 9.25 mty is proposed average production.
[4] Company estimates reserves of an additional 125 million tons of recoverable coal in beds deeper than 150 feet, from holdings of Federal, State and private land.
[5] Site specific EIS being prepared by BLM.

conducted on Federal leases. Guidelines and procedures are being developed for coordination of DOE's responsibilities with those of DOI.

- Preference-Right-Lease Application Status Review - preference-right-lease applicants were required to prepare an initial showing indicating evidence of commercial quantities of coal. This evidence will be evaluated in technical and environmental statements to be prepared jointly by BLM and USGS.

  Recent interpretation of the Mineral Leasing Act of 1920 has determined that areas of Federal coal under preference-right-lease application cannot be leased if there exists, on that area, a prior valid existing mining claim under the Mining Act of 1872. Preference-right-lease applications are required to submit abstracts of any mining claims found on their application area.

  On September 27, 1977, the Department of Interior was enjoined from issuing any new coal leases until a supplemental coal programmatic environmental statement correcting the deficiencies of the original statement has been issued in final form and a new coal management program has been developed. Therefore, the existing preference-right-lease applications cannot be issued until this injunction is lifted.

- Coal exploration drilling proposals on Federal coal leases are analyzed and approved where appropriate.

B. SPECIFIC PROPOSED ACTIONS (PART 2)

1. Applications

Three mining and reclamation plans (M&RP's) proposing eight mines (described in part 2), have been submitted to USGS under 30 Code of Federal Regulations (CFR) 211 of May 1976 (table I-1). Each of the proposed mines is a new operation involving development of issued Federal leases. The M&RP's were submitted for review prior to the promulgation of initial regulations (30 CFR 700) required under Section 502 of the Surface Mining Control and Reclamation Act (SMCRA) of 1977 (P.L. 95-87) and have not been officially reviewed for compliance therewith. Therefore, the mining and reclamation plans may not reflect the requirements of the initial regulations. In this statement, however, impacts are analyzed on the basis that the applicable initial regulations will be followed. The mining and reclamation plans also were submitted for review prior to the revision of 30 CFR 11 on August 22, 1978.

Proponents have been requested to revise the M&RP's in accordance with the applicable initial regulations. As soon as the plans are revised, they are to be submitted to the Office of Surface Mining Reclamation and Enforcement (OSM) which shall determine compliance with the requirements of Federal regulations at 30 CFR 211, revised August 22, 1978, and 30 CFR

700. The M&RP's plans cannot be approved until they conform to all applicable requirements.

No rights-of-way applications have been submitted for facilities associated with M&RP's. Rights-of-way applications have been filed for most major components of the Allen-Warner Valley power project which will be treated in a separate site specific EIS. The necessary and additional required right-of-ways for the proposed mines are described in part 2.

2. Required Authorizations

a. Department of Interior (DOI)

The Assistant Secretary, Energy and Minerals, must approve the mining and reclamation plans prior to commencement of mining operations on Federal lands.

b. U.S. Geological Survey (USGS)

The Area Mining Supervisor of USGS will review and evaluate the mining plans prior to any commencement of mining operations on Federal lands.

c. Bureau of Land Management (BLM)

The BLM or other surface managing agencies must concur with the mining and reclamation plans as pertains to surface management before approval is granted. BLM is also responsible for granting various rights-of-way for ancillary facilities such as access roads, powerlines, communication lines, and railroad spurs on public lands.

d. Office of Surface Mining Reclamation and Enforcement (OSM)

OSM recommends approval of mining plans or major modifications to the Assistant Secretary, Energy and Minerals, subject to the terms of any State-Federal Cooperative agreement and concurrence of BLM and USGS.

e. State of Utah

The Division of Oil, Gas, and Mining, and the Office of Surface Mining, are preparing rules and procedures to implement the applicable initial regulations of the SMCRA.

C. COAL DEVELOPMENT THROUGH 1990

1. Existing Coal Development

The low production level contemplates less than 1 mty production the Southern Utah Coal EIS. A small amount of coal could be mined if existing privately-owned coal properties were reopened.

2. Production Projections

a. Federal coal

1) Proposed actions

Projected production from specific proposed M&RP's is shown on table I-1. The amounts represent full potential production by 1990. It is unlikely that any of these mines will be in production by 1980. Projected production by 1985 is dependent upon projects being approved by 1980.

2) Projected lease development

Seven preliminary coal mining proposals involving Federal leases and preference-right-lease applications (PRLA) have been submitted but require no Federal action at this time. The plans give an indication of company long-range planning and facilitate assessment of environmental impacts owing to a greatly expanded coal production potential. Twenty-two preference-right-lease applications are on file. No "short-term criteria" lease applications are under consideration in this statement.

b. Non-Federal coal

One mining proposal on State lands (5M Corp.) is pending approval by the State Board of Oil, Gas, and Mining. Other scattered tracts of State lands are involved in the detailed and preliminary mining plans.

3. Ancillary Facilities

Preliminary proposals for off-lease ancillary facilities have been submitted by the mining companies in support of the detailed mining and reclamation plans. These proposed facilities would provide access, electric power and coal transportation, etc. However, no right-of-way applications have been filed. These preliminary proposals are discussed in chapter VIII under the medium and high level scenarios.

D. COAL PRODUCTION LEVELS

The production levels projected to 1990 that form the basis for this analysis are 0-1 mty, 12 mty, 29.3 mty, and 46 mty (table I-3).

TABLE I-3.--Aggregate coal production projections

Production levels	1980 mty	1985 mty	1990 mty
Low----------	0	0-1	0-1
Projected-------	0	6.0	12.0
Medium----------	0	22.0	29.3
High----------	0	28.0	46.0

1. Low Production Level

The low production level contemplates less than 1 mty production from State and private lands. This production level is analyzed in chapter VIII.

2. Projected Production Level

The projected coal production level includes 10.5 mty from the Alton mine to meet the peak fuel requirements of the proposed Allen-Warner Valley power-generation stations, and 1.5 mty from the Kaiparowits Plateau coal field. The 1.5 mty is analyzed as production from the Kaiparowits No. 5 mine (1 mty) and the Blue mine (0.5 mty) (table I-2), but some of the production could come from other localities on or near the Kaiparowits Plateau without distorting the scenario analysis. The projected level is less than the production proposed by proponents because of limitations in the existing and detailed proposed transport systems. Coal would be transported from the Alton mine by coal-slurry pipeline (detailed proposal) and from the Kaiparowits Plateau by truck (over existing road that would require upgrading).

Facilities necessary and proposed at the projected level of development are summarized by number and type, water and acreage requirements, and as appropriate, the mileage (table I-4). Road upgradings are inferred in the site specific proposals, but no main highway upgradings are proposed. Environmentally, the most sensitive road upgrading would provide access to the Kaiparowits Plateau from Glen Canyon City. This road would cross a corner of the Glen Canyon National Recreation Area enroute to the Kaiparowits No. 5 minesite, and continue north to the Blue mine.

3. Medium Production Level

The medium production level of 29.3 mty is the sum of full production proposed in three detailed mine plans (Alton, Kaiparowits 1-5, Red and Blue mines). Several preliminary systems are suggested by the proponents to transport the large volume of coal from the Kaiparowits Plateau. This production level is analyzed in chapter VIII.

4. High Production Level

The production level of 46 mty comprises full production proposed in the detailed and preliminary mine plans, including Federal, State and private lands (chapter VIII).

E. ALLEN-WARNER VALLEY ENERGY SYSTEM

The proposed Allen-Warner Valley Energy System (fig. I-3) includes the following components and participants:

TABLE I-4.--Basic analysis data and assumptions

Facility type	Number proposed	Water requirement (acre-ft/yr)	Acreage requirements: Included in project	Acreage requirements: Disturbed
Mines:				
Underground-----	[1]2	80	3,028	[2]48
Strip----------	[3]1	160	8,280	8,280
Ancillary facilities[4,5]-	---	---	205	205
Subtotal------	3	240	11,513	8,533
Allen-Warner Valley power system:				
Water project---	1	---	2,993	[5]1,187
Powerplant------	2	[6]32,500	10,182	5,475
Slurry lines----	2	[7]8,284	2,200	1,100
Coal processing plant---------	1	1,256	1,826	1,826
Subtotal------	6	42,040	18,201	9,588
Added community-	---	1,660	---	[5]463
Total---------	---	43,940	---	18,584

[1]Kaiparowits No. 5 mine (1 mty) and Blue mine (0.5 mty).

[2]Does not include potential subsidence acreage.

[3]Alton mine (10.5 mty).

[4]Includes 104 miles of access roads and 70 miles of powerlines; 75 acres for roads on Kaiparowits plateau probably would not be reclaimed.

[5]Probably would not be reclaimed, total land use change 1,725 acres (75 + 1,187 + 463).

[6]Powerplants would require an additional 7,000 acre-feet per year which would be extracted from the coal slurry.

[7]7,000 of this would be extracted and reused in the powerplants.

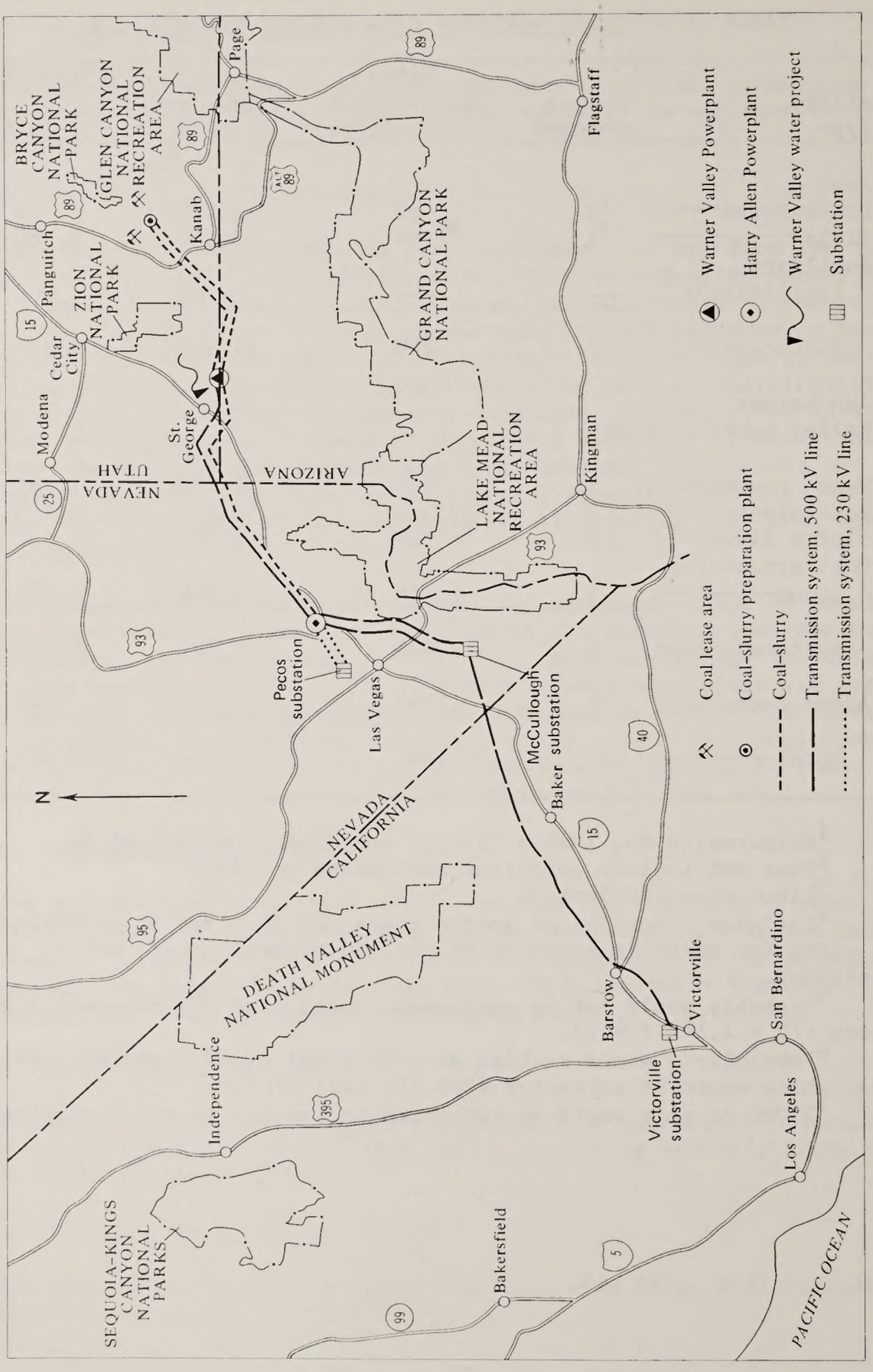

FIGURE I-3.-- Map showing proposed Allen-Warner Valley energy system.

1. Coal Mining and Processing

Utah International, Inc. has proposed development of Federal, State and private leases in the Alton coal fields of Kane County, Utah held by Utah International, Inc. (UII) and Nevada Electric Investment Co., a a subsidiary of Nevada Power Co. Coal production would involve contour strip mining on about 8,200 acres. Mined coal would be trucked as much as 35 miles to a processing facility (1,826 acres), located at Bald Knoll, Utah. This part of the system is analyzed in part 2. The remainder of the system is the subject of a site specific EIS being prepared by BLM. At the processing facility the coal would be crushed, screened, cleaned, ground, and mixed with an equal amount of water (by weight) to form slurry. The proponent estimated that 8,284 acre-feet of water per year would be needed for the coal slurry and 1,416 acre-feet for mining and coal processing. The proponent proposes a nearby well field to withdraw the entire amount from the Navajo Sandstone Formation.

2. Coal Slurry Pipelines

The Nevada Power Co. has designed and proposed two slurry pipelines. One line would extend 70 miles from Bald Knoll to the Warner Valley powerplant and would have the capacity to carry 2.5 mty of coal. The other pipeline would extend 183 miles from Bald Knoll to the Harry Allen powerplant and would have 9.1 mty capacity. At both powerplants, the coal would be dewatered and partially dried; the extracted slurry water would be used in the powerplant operation.

3. Warner Valley Water Project

The Washington County, Utah, Conservation District proposes to divert flow from the Virgin River. The water would be used for irrigation, municipal and industrial supply, and of consideration in this statement, would provide the major water supply to the proposed Warner Valley power-plant.

4. Warner Valley Powerplant

The Nevada Power Co. anticipates participation by the city of St. George, Utah, Pacific Gas and Electric Co. and the Southern California Edison Co. in this plant. Proposed as a 500-megawatt (MW) plant, the site is about 13 miles southeast of St. George, Utah. Water for cooling would be supplied from the Warner Valley Water Project reservoir proposed by the Washington County, Utah, Water Conservancy District and from extracted coal slurry water.

5. Harry Allen Powerplant

The Nevada Power Co., anticipates participation by Pacific Gas and Electric and Southern California Edison companies in this 2,000-MW plant which would be located about 25 miles northeast of Las Vegas, Nev., on a dry lake bed. Cooling water would come from the Clark County,

Nevada Advanced Waste Water Treatment Facility and by extraction from the coal slurry.

6. Electrical Transmission Lines

Four route segments are proposed in detail: (1) one line (152 miles long) from the Warner plant through Mohave County, Ariz., to the existing El Dorado substation 25 miles south of Las Vegas; (2) a line (48 miles long) from the Allen plant to the El Dorado substation; (3) two lines (16 miles each) from the Allen plant to the existing Pecos substation 8 miles north of Las Vegas. From the McCullough substation, power would be transmitted to Victorville, Calif., using 162 miles of existing lines.

Garkane Power Assoc., Inc., Panguitch, Utah, is evaluating potential powerline routes to the processing facility at Bald Knoll, Utah. The proposed 138 kV line would originate at a power source about 12 miles north of Panguitch, Utah, near US 89 and run south to the Bald Knoll-Alton area. No detailed route survey has been made; therefore, prior to construction, filing of rights-of-way applications and an environmental assessment of impact will be necessary.

F. RELATED NON-COAL DEVELOPMENT

Commencing in 1980, Plateau Resources Limited has proposed to mine and mill 750 tons of uranium ore per day with a minimum operating life of 15 years, from a site in Shootering Canyon. The mine and mill plantsite (T. 35 S., R. 11 E., secs. 33 and 34, T. 35 1/2 S., R. 11 E., secs. 3 and 4) is in Garfield County, near the south end of the Henry Mountains and about 14 miles north of Bullfrog Basin marina. A new town for work-force housing is proposed in section 16 of T. 36 S., R. 11 E., about 10 miles north of the marina and 3 1/2 miles south of the plantsite. A temporary construction work force of about 225-250 and an operating work force of 170-200 is proposed. There may be competition between coal mining and uranium mining in the northeastern portion of the region for skilled miners and housing.

G. BASIC ASSUMPTIONS, PROJECTED LEVEL SCENARIO

The analysis in chapters IV-VII considers the entire sum of site-related impacts, such as acres of disturbed land and tons of coal mined, for the entire life of the various projects included in the scenario (table I-4). Socioeconomic and population-related factors such as water use for the increased population, and increase in recreation use, were projected to 1990 and those projections then used for impact analysis. Additionally, the following basic assumptions were applied to all analyses:

1. Annual water use would be at the rate of 1 acre-foot (326,000 gallons) for five people; for each acre foot used, one-half acre-foot would be returned to the system for down stream use.[1]

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[1] Adjusted from current water use and sewage effluent records in the central Utah coal region.

2. Sewage treatment plants are or will be made adequate such that raw sewage will not be discharged.

3. Sewage effluent would not be recycled for domestic use but would be used for agricultural use.

4. Community development would be at the rate of 18 people per acre.

5. Lands converted to housing would not be returned to agriculture in the future.

6. Proposed mines would not be producing before 1980 but would be in production by 1985. Full proposed production would be reached by 1990.

7. Mining would be conducted so as to yield maximum recovery of the coal deposits consistent with miner safety, protection and use of other natural resources, sound economic practice and protection of the environment.[2]

8. Mine production would average 15 tons per manshift for underground mining[3] and 75 tons per manshift for surface mining.[4]

9. Longwall mining methods would be used where technically and economically feasible.

10. The demand for coal would increase at a rate that will continue to encourage development of Utah coal.

11. Mining and reclamation technology would not change significantly over the time frame of the analysis.

12. Labor and equipment shortages would not significantly distort the analysis.

13. Future traffic on a given segment of highway can be projected using the historic relationship between population and traffic for that segment.

14. Future traffic would be accommodated on existing and presently proposed highway system. Shortfalls in capacity would be accommodated through expansion of the specific overloaded elements.

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[2]Considering current experience in Utah, USGS reserve calculations are based on 50 percent recovery of mineable coal for underground mines; surface mining--94 percent recovery.

[3]Utah average rate in 1976 was 12.1 tons per manshift.

[4]Based on rates from similar surface mines in western U.S.

15. All employees would commute by motor vehicles; the vehicles would contain an average of 2.0 persons.

16. Average fuel efficiency of motor vehicles would improve by 75 percent between 1975 and 1990.

17. Coal-haul trucks using public roads would have a net load capacity of 25 tons.

18. Incidental service-truck traffic to mines would be 20 visits per day per mty coal production, including all sizes of service vehicles. Incidental traffic would be in the heavy truck category (six-wheels and over).

19. Access roads would have a surface mandated by Best Available Control Technology (EPA) requirements, would have a 22-foot travel way with 5-foot shoulders, would have ditches on both sides, and both cut and fill slopes would be 2 to 1 where this configuration could be achieved. Public roads were assumed to have a 24-foot traveled way as a minimum.

20. Powerline rights-of-way would be 50 feet wide for transmission lines of 69 kV or less, 120 feet for 138 kV and above, where specific information was not furnished. Clearing would be minimum necessary.

21. Numbers, particularly acreage and acre-feet of water, used in this statement generally are not rounded. This is done to facilitate tracking from one analysis section to another. The amounts are estimates and are thought to be accurate to 10 percent.

CHAPTER II

DESCRIPTION OF THE EXISTING ENVIRONMENT

A. NATURAL ENVIRONMENT

1. Climate

The climate is varied and strongly influenced by topography. The lower elevations, south and east of the Markagunt and Paunsaugunt Plateaus, are dry and are either middle latitude steppe or desert. The low amounts of annual precipitation are generally caused by the Sierra Nevada and Cascade Ranges, which rob Pacific storms of their moisture before they reach the study area. However, some of the higher terrain of the western part is able to cause enough upslope flow to have more than 32 inches per year of precipitation with areas in the lee of this terrain receiving less than 8 inches (Utah State Engineer Office, 1961, fig. II-1).

Temperature is spatially and seasonably variable in southern Utah (figs. II-2, II-3). Higher elevation valleys experience the coldest temperatures, whereas lowlands south of the high plateaus experience the highest temperatures.

Winds usually are light to moderate, with average speeds below 20 mph. Tornadoes are rare, but winds may be strong, particularly in mountain passes and canyons. Flow patterns are discussed further in the air quality section.

2. Land

a. Topography and geology

Southern Utah coal fields are in a region of high plateaus locally dissected by deep canyons. The coal fields lie within the canyonlands and high plateau section of the Colorado Plateau Province (Fenneman, 1946). Many of the plateaus are interconnected and form series of broad and erosion resistant bedrock terraces or benches that are stepped upward to the north along cliffs. Altitudes above mean sea level range from 4,000 feet near the Utah-Arizona line on the south to 11,000 feet on the Aquarius Plateau north of Escalante, Utah, and 11,615 feet in the Henry Mountains.

Southerly trending canyons are major obstacles to travel, particularly east-west; many canyons are 500 to 1,000 feet deep and in the Virgin River drainage are about 2,000 feet deep. Canyons have been formed by several major rivers, including, from east to west, the Escalante, the Paria, and the Virgin; these rivers are all part of the Colorado River drainage. Part of the area near Bryce Canyon National Park is within the Sevier River drainage, which drains north.

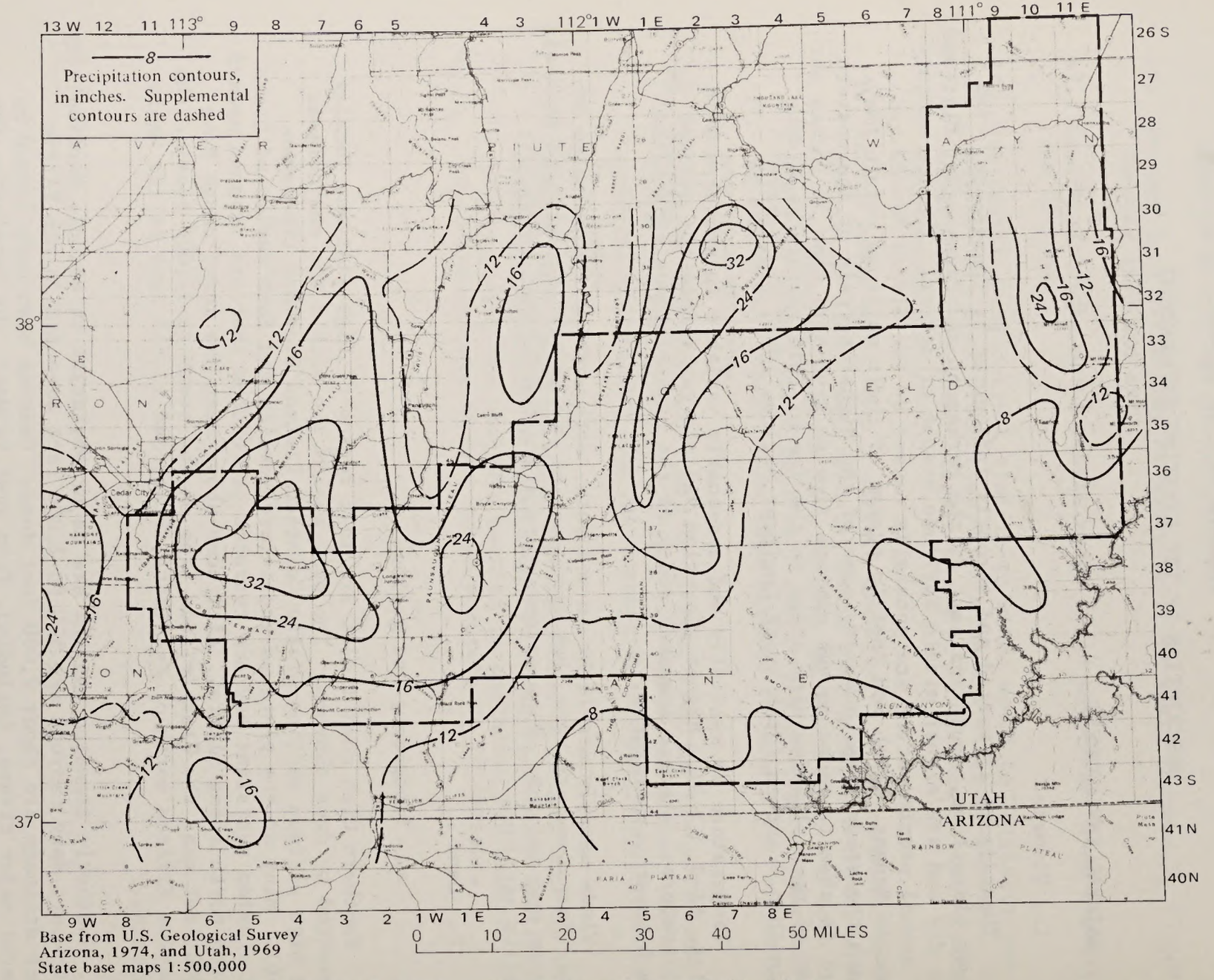
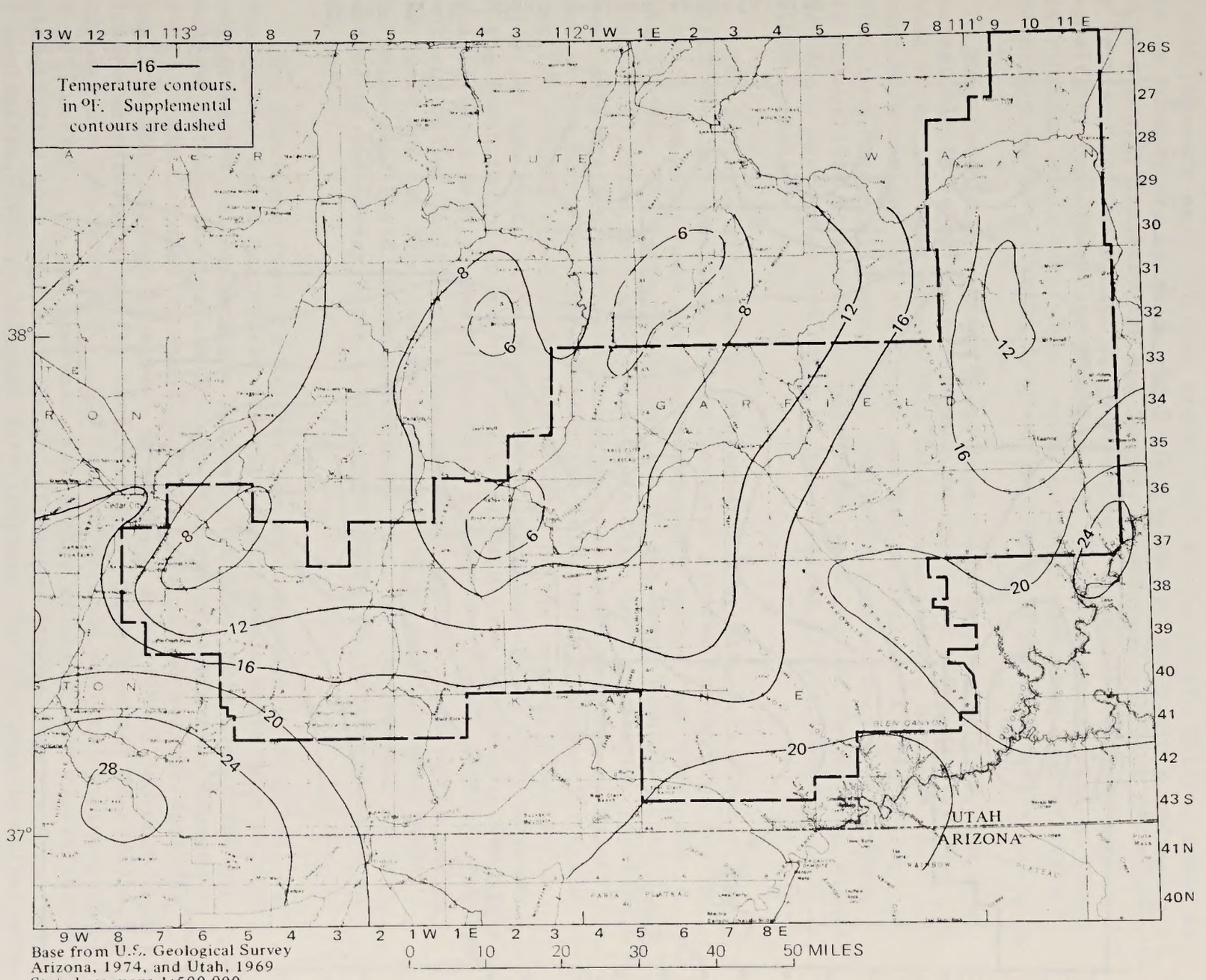
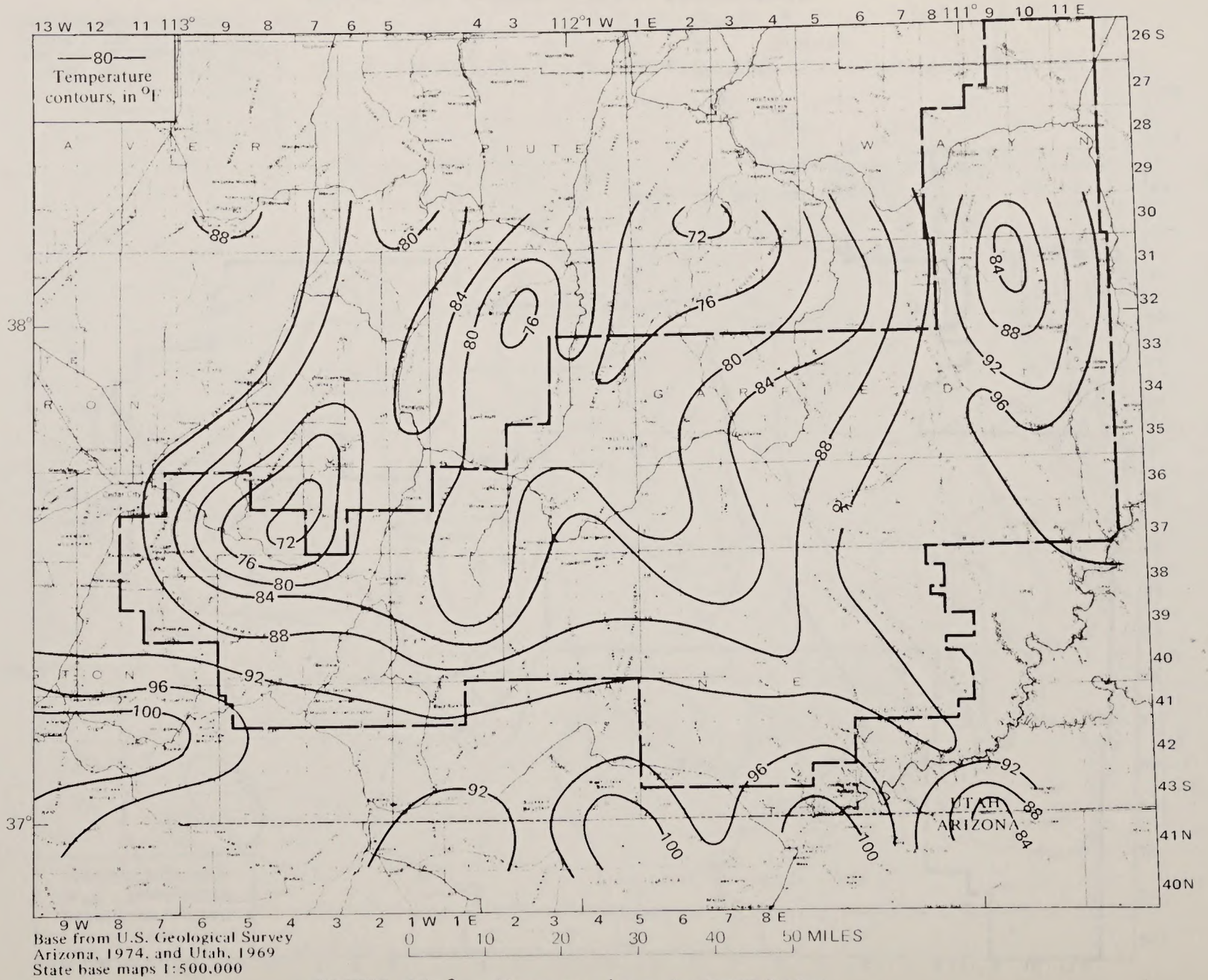


FIGURE II-1.--Mean annual precipitation.



Base from U.S. Geological Survey
Arizona, 1974, and Utah, 1969
State base maps 1:500.000

FIGURE II-2.--Mean minimum temperatures.



Base from U.S. Geological Survey
Arizona, 1974, and Utah, 1969
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FIGURE II-3.--Mean maximum temperatures.

The geology of the region has been summarized by Sargent and Hansen (1976), Doelling (1972), and Hunt and others (1953). Most exposed rocks are of Mesozoic age. In some areas, such as the Circle Cliffs, rocks as old as Permian are exposed; and in some parts of the region, sedimentary rocks of early Tertiary age are found. The highest plateaus are capped by Tertiary and Quaternary volcanic rocks. Unconsolidated sedimentary deposits of Quaternary age form a veneer over much of the region. The distribution and a brief description of these rocks and some of their hydrologic characteristics is given on figure II-4 (in pocket).

Many formations contain clay, especially bentonitic clay, and are susceptible to landslipping or slumping during or after excavation. Those formations most susceptible include the Chinle, Morrison, and Wasatch Formations and the Tropic and Mancos Shales. Cliff-forming formations, especially where they overlie strata of lesser resistance, are susceptible to rockfall; these formations include the Navajo, Wingate and Dakota Sandstones and parts of the Straight Cliffs, Moenkopi, and Chinle Formations.

The geologic structure is characterized by large-scale monoclines, anticlines, and synclines. These features are cut by numerous faults, of which the major ones are the Paunsaugunt, Sevier, and Hurricane (fig. II-4). The easternmost coal field, the Henry Mountains coal field (fig. II-5), lies in a structural basin that is an asymmetric syncline, whose axis strikes north and passes near or under the town of Caineville. West of the Henry Mountains field, the Kaiparowits Plateau coal field overlies a broad structural basin bounded on the east by a series of folds; on the west, it is bounded by a large monocline, the Cockscomb. To the north the basin extends under the Escalante Mountains. The Alton coal field is west of the Kaiparowits field. It lies between the Paunsaugunt and Sevier faults in a broad, shallow syncline. The north end of the field and the syncline are terminated by an east trending fault. The Kolob coal field is the westernmost field in the region. It is bounded by the Sevier fault on the east and by the Hurricane fault on the west.

The Hurricane fault is part of the Intermountain seismic belt, a zone of pronounced earthquake activity that extends north from Arizona and terminates in northwestern Montana. In Utah, this zone forms the boundary between the Basin and Range physiographic province (Fenneman, 1946) and the Colorado Plateaus province. Tabulated seismic data for Utah from 1850 through June 1965 by Cook and Smith (1967) indicate that Richter magnitudes along the faults in the region have not exceeded 4.9, and most are less than 4.0. USGS seismic records confirm continuation of mild activity to the present. The entire area has been classified by seismologists as a region of lesser seismicity (Rocky Mountain Association of Geologists, 1972). Relevant data indicate that the area is seismically active and that earthquakes of low intensity will occur; however, the effects of such activity are predicted to be slight (BLM, 1975, p. II-88-90).

There are no comprehensive lists of fossils from the southern Utah coal region. Vertebrate fossils have been described by several scientists,

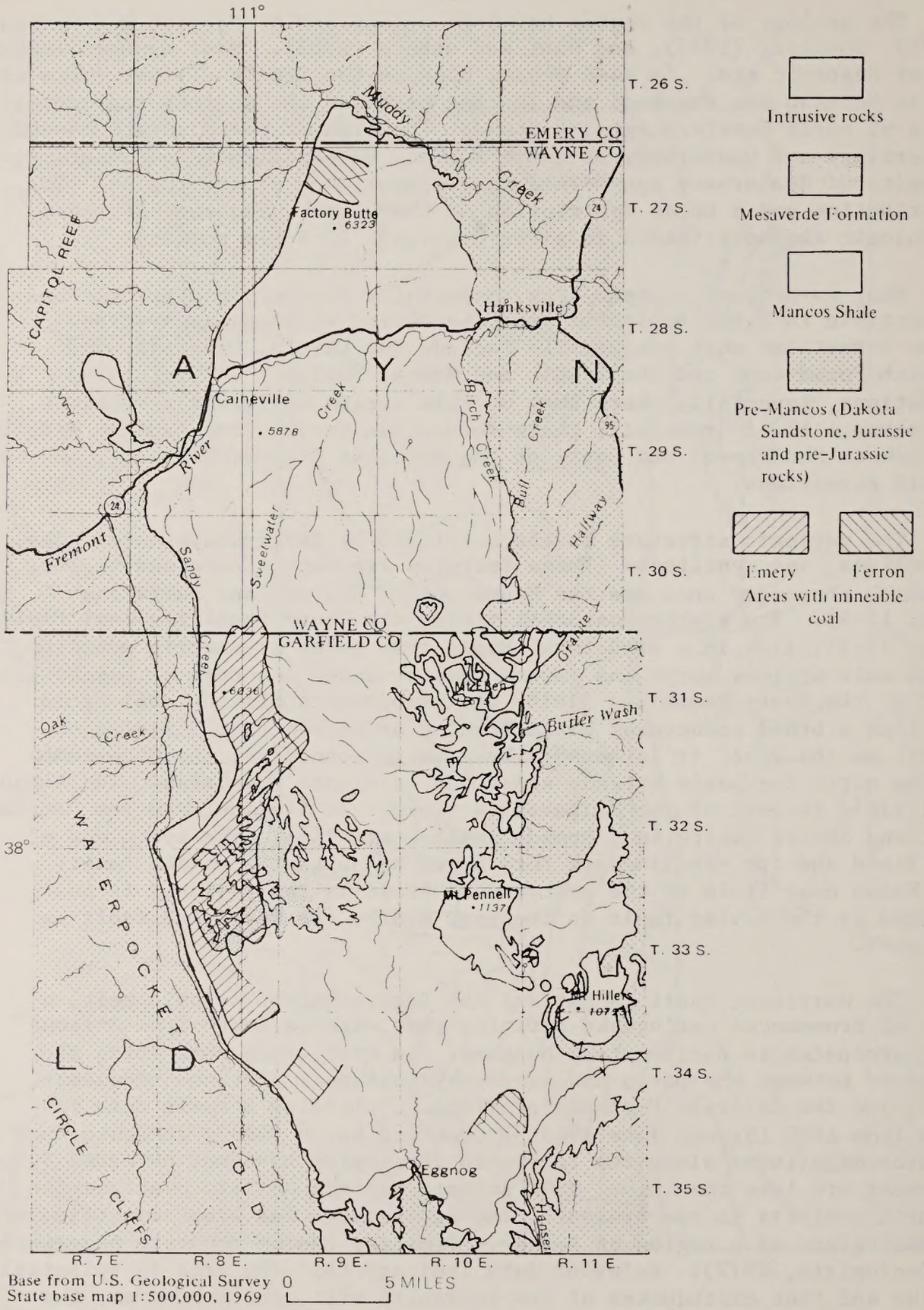


FIGURE II-5.--Generalized geologic map of the Henry Mountains.

among whom are: Dr. James H. Madsen, Utah State Paleontologist; Dr. W. I. Stokes, University of Utah; Drs. Wade Miller and James Jensen, Brigham Young University; and others. Invertebrate fossils and plant fossils have also been described from the region. Descriptions of these fossils are scattered throughout the geologic and paleontologic literature. A study of paleontologic resources was made by the Museum of Northern Arizona in 1974 for the BLM (1976, p. A609-633). Dinosaur bones, fragments of turtle shells, reptile teeth, crocodile remains, fish scales, snails and fossil wood and leaves were noted in the Kaiparowits Formation and Wahweap sandstone. Lists of fossils observed by the Museum team, and other lists taken from previously published sources, are contained in the statement.

The region contains large amounts of bituminous and subbituminous coal in rocks of Cretaceous age (fig. II-6 in pocket). Past coal production did not exceed a total of one million tons and most was extracted from the Kolob Field, where annual production was not greater than 55,000 tons. None of the proposed or preliminarily proposed mines would produce coal from the Kolob Field.

The Henry Mountains Coal Field, in Emery, Wayne, and Garfield Counties, has been described by Doelling and Graham (1972). Coal in this field is found in the Ferron and Emery Sandstone Members of the Mancos Shale and in the Dakota Sandstone (fig. II-5). The coal in the Dakota is not of minable thickness. Coal in the Ferron is between 4 and 7 feet thick in three widely separated areas. Coal in the Emery generally ranges from 2 to 6 feet thick, and has a maximum known thickness of 13 feet (Peterson and Ryder, 1975). Coal quality ranges from subbituminous C to high-volatile B bituminous (table II-1). Reserves are poorly known, but Doelling (1972) has estimated reserves to a depth of 1,000 feet (table II-2).

The Kaiparowits Plateau Coal Field, described by Doelling and Graham (1972), is located on the Kaiparowits Plateau in Garfield and Kane Counties. The minable coal beds are found in the John Henry Member of the Straight Cliffs Formation (fig. II-7). The best quality coal in the region is found in the Kaiparowits Plateau field (table II-1). The higher quality coals from Christensen and Alvey zones account for most of the reserves; however, those from the Reese zone are also significant. Most of the known reserves are from the Smoky Mountain and Escalante area; those from the northern part of the field are not well known.

About 220,800 acres of land in and adjacent to the Kaiparowits Plateau is currently under coal lease, prospecting permit, or competitive lease applications. There are 12 holders of leases and prospecting permits in the Kaiparowits area. In addition, more than 40,000 acres is under State lease. Major lessees and permittees are Resources Company, El Paso Natural Gas, Consolidation Coal Company, Peabody Coal Company, Sun Oil Company, Del Coal Incorporated, Woods Petroleum, J. H. Knight, and Hiko Bell Mining and Oil. Total reserves of coal are estimated to be 15 billion short tons (Doelling and Graham, 1972).

TABLE II-1.--Southern Utah coal quality data

[From Doelling and Graham, 1972]

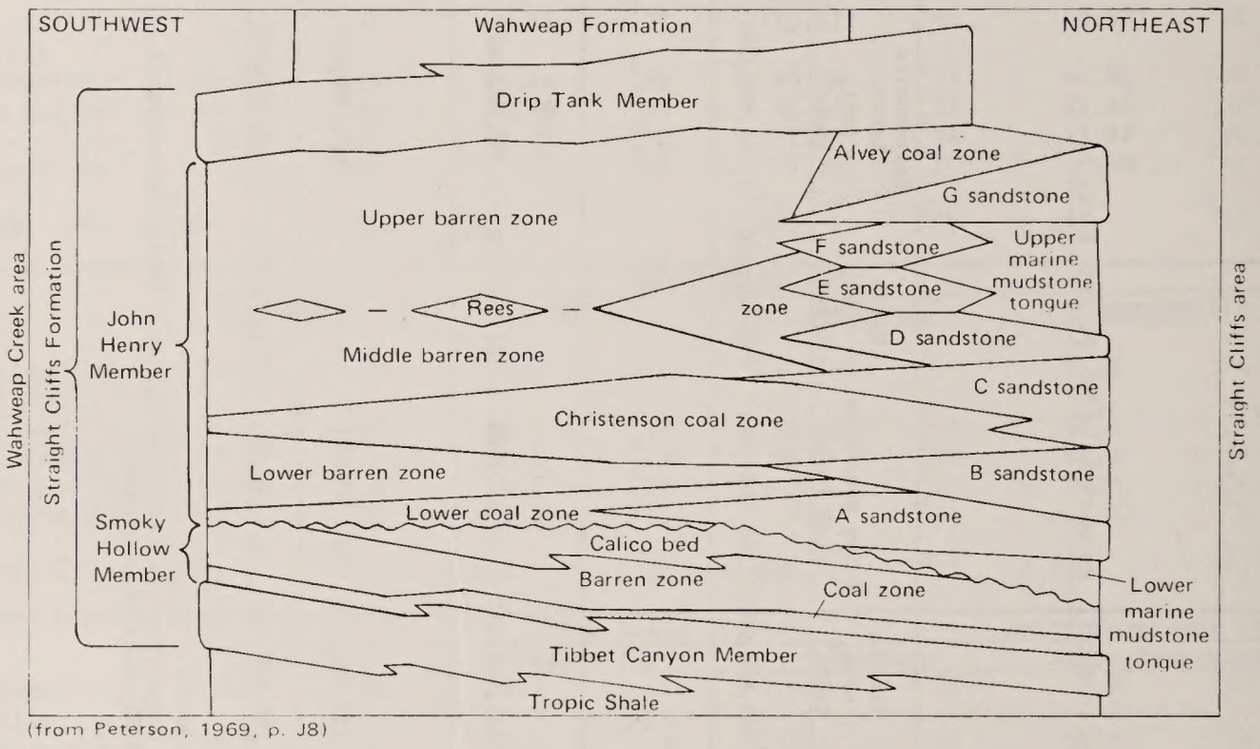
	Average percent	Number of analyses	Average percent	Number of analyses	Average percent	Number of analyses	Average percent	Number of analyses
	Kaiparowits Plateau field							
	All areas		Smoky Mountain		Escalante		Tropic	
Moisture-----	11.33	[1]137	9.63	[1]77	10.51	[1]40	19.50	[1]20
Volatile matter-----	43.63	[2]164	42.44	[2]91	45.39	[2]53	44.42	[2]20
Fixed carbon-	47.25	[2]164	48.70	[2]91	46.81	[2]53	41.81	[2]20
Ash----------	8.96	[2]165	8.59	[2]91	7.80	[2]54	13.77	[2]20
Sulfur-------	.87	[2]129	.75	[2]91	1.26	[2]24	.98	[2]14
Btu/lb-------	11,999	[2]161	12,401	[2]91	11,563	[2]53	11,207	[2]17
	Alton field							
	All areas		Alton		Skutumpah		Cannonville	
Moisture-----	17.4	[1]29	17.0	[1]13	19.3	[1]11	15.8	[1]4
Volatile matter-----	41.2	[2]27	40.1	[2]12	43.6	[2]11	37.9	[2]4
Fixed carbon-	47.5	[2]27	50.3	[2]12	46.7	[2]11	41.6	[2]4
Ash----------	11.1	[2]28	9.4	[2]13	9.8	[2]11	20.5	[2]4
Sulfur-------	1.15	[2]28	1.3	[2]13	1.07	[2]11	1.87	[2]4
Btu/lb-------	10,371	[2]27	12,069	[2]12	10,166	[2]11	8,530	[2]4
	Kolob field						Henry Mountains field	
	Cedar City		Orderville		Harmony		Henry Mountains	
Moisture-----	8.2	86	12.1	9	6.7	11	9.8	13
Volatile matter-----	39.8	86	40.1	9	10.4	11	36.5	13
Fixed carbon-	42.3	86	36.0	9	56.0	11	43.9	13
Ash----------	10.8	87	11.5	9	26.6	11	9.4	13
Sulfur-------	5.76	67	2.21	9	3.31	11	.87	13
Btu/lb-------	10,492	64	10,344	9	9,123	11	11,253	13

[1]As received.
[2]Dry.

TABLE II-2.--Coal reserves (in short tons)

Reserve classification[1]	Classification criteria[1]	Alton coal field[2]	Henry Mountains coal field[2]	Kolab coal field[2]	Kaiparowits Plateau coal field[2]	Total southern Utah coal region (sum of columns)	Kaiparowits Plateau coal field[3]
Measured reserves (Class I)	Based on adequate exploration and development data, properly correlated.	[4]643,800,000	[4]202,400,000	[4]708,710,000	[4]3,784,800,000	[4]5,539,710,000	
Indicated reserves (Class II)	Based on geologic measurement supplemented by limited drill-hole data and limited to 1 1/2 miles from a control point.						20,600,000,000
Inferred reserves (Class III)	Based on geologic inferrence and projection of the habit of the coal beyond 1 1/2 miles from control points.	865,600,000	28,600,000	1,305,590,000	3,893,200,000	6,092,990,000	
Potential reserves (Class IV)	Based on geographic and geologic position, with little supporting data, and includes coal concealed by 3,000 feet or less of cover.	637,500,000	311,500,000	---	7,320,000,000	8,271,000,000	
Total----------		2,148,900,000	542,500,000	2,014,300,000	15,198,000,000	19,903,700,000	

[1]After Doelling, 1972a.
[2]Adapted from Doelling, 1972a, table 4, p. 550-551.
[3]Unpublished preliminary data, Conservation Division, U.S. Geological Survey. Total "demonstrated coal resource," in beds 4 feet or more thick, beneath less than 3,000 feet of overburden.
[4]Includes a small amount of Class II reserves.



(from Peterson, 1969, p. J8)

FIGURE II-7.--Relations of members and informal units in the Straight Cliffs Formation.

The Alton Coal Field, described by Doelling and Graham (1972), lies west of the Kaiparowits Plateau field in Kane and southern Garfield Counties. The minable coal is in the Dakota Sandstone and much is strippable. The quality (table II-1) ranges from subbituminous C to bituminous high-volatile C. Reserves in the Alton field are given on table II-2.

The Kolob Terrace Coal Field, described by Doelling and Graham (1972), lies west of the Alton field in Washington, Kane, and Iron Counties. Coal is contained in several zones in the Tropic Shale-Dakota Sandstone interval and in the Straight Cliffs Formation (Sargent and Hansen, 1976). The coal from this field (table II-1) ranges from high-volatile bituminous C to subbituminous A (table II-2).

A few test wells for oil and gas have been drilled, and a small oil field, the Upper Valley field, was developed in 1964. This field, about 10 miles southwest of Escalante, had produced about 15 million barrels of oil through December, 1975. Doelling (1975) has estimated as much as 30 million barrels of ultimate recovery. Tar sands are found in the Circle Cliffs and are known to contain several hundred million barrels of bitumen (Doelling, 1975). Noxious or combustible gases are present locally, in unknown concentrations, in some coal beds and overburden rocks of the region.

Other mineral resources in the region have been summarized by Sargent and Hansen (1976) and Hunt and others (1953). Known uranium deposits are small and of low grade. Those that could be of future economic value are found in the Circle Cliffs and Waterpocket Fold (Capitol Reef) areas. Copper is found in the Circle Cliffs area (Davidson, 1967), in the Capitol Reef area, and locally in the Paria River basin. Other metallic mineral deposits have been found in small uneconomic amounts.

Clay, gypsum, sand and gravel, and dimension stone are present throughout the region in large amounts. Limestone suitable for rock-dusting in coal mines and stack-scrubbing of SO_2 in coal-fired powerplants is present in the Wasatch Formation on the west side of Johns Valley and in the Canaan Peak area northeast of Henrieville, Utah. Other nonmetallic resources, such as silica sand, diatomite, and volcanic ash are present; gem materials, mainly jasper, agate, petrified wood, and dinosaur bone are found at scattered localities.

b. Soils

Soils vary considerably in response to changes in geology, topography, climatic conditions, and vegetation. They have formed primarily from sandstone and shale which yield sandy to clayey textures. The clayey soils are especially prone to erosion by water, whereas wind erosion is most active on the sandy soils. Soils over most of the area receive sparse amounts of precipitation, which results in limited soil development and low productivity potentials. About 25 percent of the area consists of rockland and badlands that have essentially no soils. The soils in places where annual precipitation is less than 15 inches are typically

high in soluble salt content, have a high pH, are low in organic matter, and typically have an accumulation of carbonate in the subsoil which commonly forms a hardpan. Vegetation is generally sparse, leaving much of the soil exposed to the erosive forces of wind and water. As elevation and precipitation increase, the soils tend to have better development and increase in productive potential until the cold, and commonly rocky, sites at high elevations are reached.

The soils are classified into 10 groups comprising 27 different soil associations, as identified by Wilson and others in Soils of Utah (1975). Distribution and extent of the various soils are shown on figure II-8. Descriptions of landforms, climate, use of soil groups (table II-3) and soil characteristics and taxonomic classifications (table II-4) are for relatively broad units of land, and each soil area shows local variations. The major limiting factors (table II-4) apply to some of the soils in the association but may not apply to all.

3. Water

a. Water supply

The Colorado River system including Lake Powell is the main water source in the region but the quantity of water that can be used in Utah is limited by the Upper Colorado River Basin Compact of 1948. Under that compact, Utah's allotment of water from the Upper Colorado River Basin is about 1,400,000 acre-feet per year. In 1975, the estimated annual use was 850,000 acre-feet and approved filings amounted to about 550,000 acre-feet per year; thus, only a small part, if any, of Utah's Colorado River water is yet "unappropriated" (Utah Division of Water Resources, 1976). About 25,000 acre-feet of surface water per year in the lower Fremont River Valley and 8,000-10,000 in the Escalante Basin are diverted for irrigation and some wetlands management.

Water use in Utah is based on the doctrine of prior appropriation. Under this doctrine, the State allocates unappropriated water to an individual or corporation upon his compliance with the provisions of the State law. First in time, first in right--and beneficial use is the measure and the limit of the right. This right to use has taken on the attributes of private property, and an acquired right may be sold and transferred to another party, or even under certain conditions may be moved from one place to another. Utah water laws do not recognize instream use of water for preservation of aquatic habitat as a beneficial use. Thus, a stream can be dewatered by diversion except where a downstream water right requires flows to be bypassed.

The State Engineer, who is the Director of the Division of Water Rights, is responsible for administrating all water rights within the State and for determining whether proposed applications can be approved by State statutes and law.

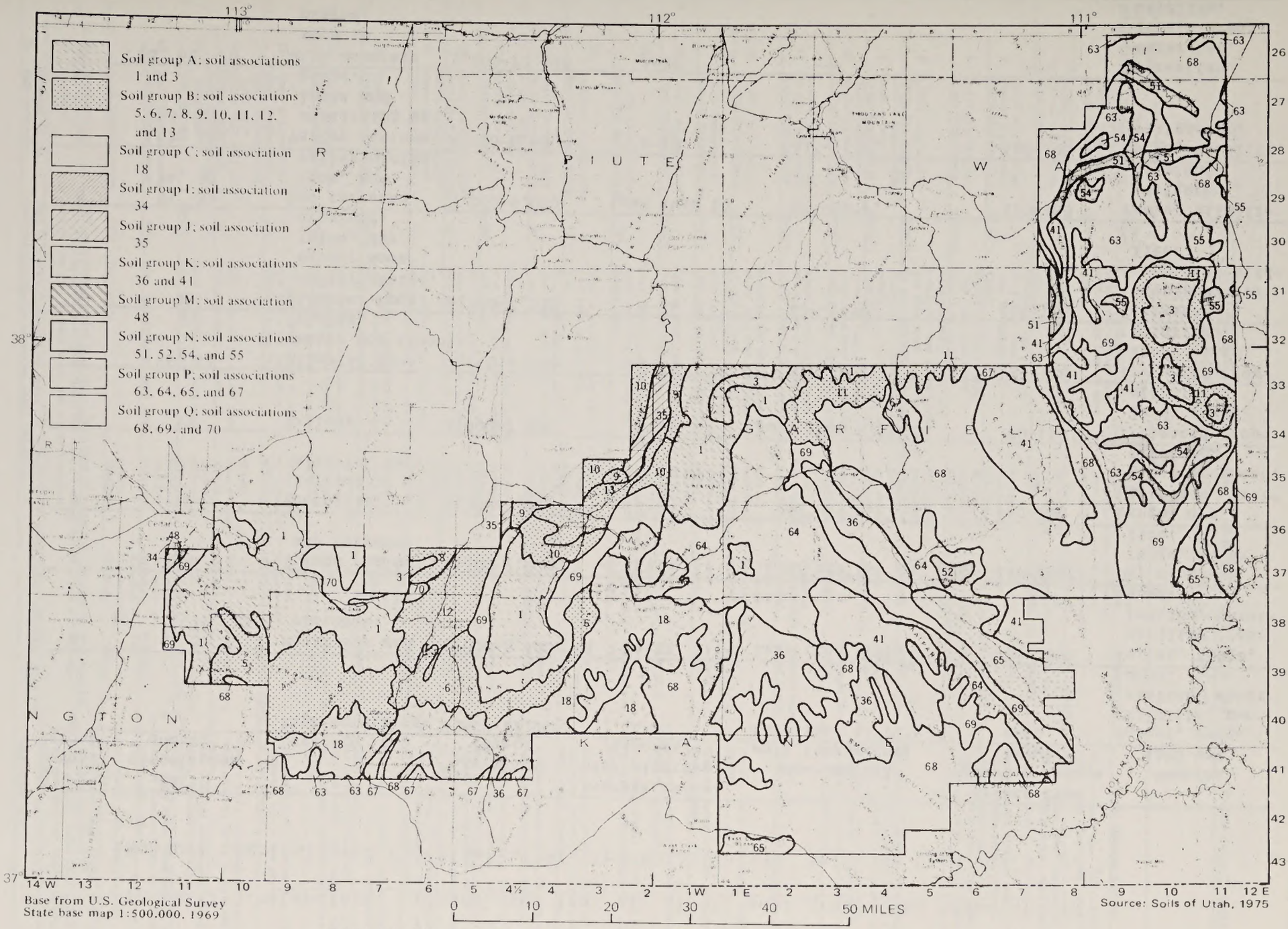


FIGURE II-8.--Map of soil groups and associations.

TABLE II-3.--Landform, climate, and land use of the soil groups and associations

[Source: Agricultural Experimental Station Bulletin 492, Soils of Utah, 1975, p. 3]

Soil group	Soil association number	Landform	Elevation (feet)	Average annual precipitation (inches)	Mean annual soil temperature	Freeze free growing season (days)	General land use
A	1, 3	High mountains.	8,000-12,000	18-40	Less than 47°F.[1]	0-60	Forest, range, wildlife, recreation, watershed.
B	5, 6, 8, 9, 10, 11, 12, 13	Mountains and plateaus.	6,000-8,400	14-22	Less than 47°F.	60-100	Forest, range, wildlife, recreation, watershed.
E	18	Upland plains and terraces.	5,500-7,000	12-14	47°-59°F.	110-180	Dry cropland, range, wildlife.
I	34	Foothills, terraces, alluvial fans.	4,300-6,000	12-14	47°-59°F.	110-180	Range, dry cropland, irrigated cropland, wildlife.
J	35	Valleys.	6,000-7,000	8-14	Less than 47°F.	80-110	Irrigated cropland, range, wildlife.
K	36, 41	Alluvial fans, mesas and flood plains.	3,600-7,000	8-14	47°-59°F.	110-180	Irrigated cropland, range, wildlife.
M	48	Alluvial fans, valley plains, desert mountains, dry cropland.	4,300-7,500	8-14	47°-59°F.	110-180	Irrigated cropland, dry cropland, wildlife.
N	51, 52, 54, 55	Low terraces, fans, and valley plains.	4,000-6,000	Less than 10	47°-59°F.	110-180	Range, wildlife irrigated cropland.
P	63, 64, 65, 67	Valley bottoms, undulating uplands and mesas.	4,200-6,600	6-18	41°-55°F.	100-190	Range, wildlife, recreation.
Q	68, 69, 70	High mountain tops to playas.	3,000-13,000	6-40	---	---	Recreation, watershed, scenic areas, wildlife.

[1]Mean summer soil temperature is less than 59°F.

TABLE II-4.--Characteristics and classifications of soil associations in the southern Utah coal region

Soil group	Soil association	Taxonomic classification	Soil depth	Soil textures	Soil reaction	Drainage class	Permeability	Major limiting factors
A	1	Argic Cryoborolls-Pachic Cryoborolls-Cryic Paleborolls	20-36"	Silt loam to clay loam over cobbly loam to clay loam.	Slightly alkaline to strongly acid.	Moderately well to excessively drained.	Slow to rapid.	Steep slopes, some areas with unstable soils, high elevations, some rocky areas.
	3	Lithic Cryoborolls-Mollic Cryoboralls-Rock Outcrop	10-36"	Loam to cobbly loam over cobbly loam to cobbly clay loam.	Mildly acid to strongly acid.	Well to excessively drained.	Slow to moderate.	Steep slopes, high elevations, shallow soils, cobbly soils, some rocky areas.
B	5	Typic Argiborolls-Lithic Argiborolls-Typic Haploborolls	10-36"	Gravelly loam to silty clay loam over cobbly loam to cobbly clay loam.	Neutral to moderately alkaline.	Well drained.	Slow to moderate.	Steep slopes, shallow soils, some areas with unstable soils, somewhat limited precipitation (14-20").
	6	Typic Argiborolls-Typic Ustorthents	10-36"+	Gravelly loam to silty clay loam over silty clay loam to clay.	Neutral to moderately alkaline.	Well to moderately well drained.	Slow to very slow.	Clayey soils, some steep slopes, somewhat limited precipitation (14-20").
	8	Lithic Argiborolls-Typic Argiborolls	10-36"+	Loam, gravelly loam, and cobbly to very gravelly loam and fine sandy loam over cobbly to very gravelly loam-clay loam.	Neutral to moderately alkaline.	Well drained.	Slow to moderately slow.	Steepness of slopes, some shallow soils.
	9	Lithic Argiborolls-Rock Outcrop-Typic Argiborolls	10-36"	Gravelly to cobbly loam over cobbly to gravelly loam and clay loam.	Neutral to moderately alkaline.	Well drained.	Moderate to slow.	Steep slopes, shallow soils, cobbly soils, somewhat limited precipitation (14-20").
	10	Typic Haploborolls-Typic Argiborolls-Typic Calciborolls	20-36"	Gravelly loam, silt loam, or sandy loam over gravelly to cobbly sandy loam and clay loam.	Neutral to moderately alkaline.	Well drained.	Moderate to rapid.	Somewhat limited precipitation (14-20"). Calcium carbonate layers in the subsoil.
	11	Lithic Haploborolls-Lithic Argiborolls-Typic Haploborolls	10-36"+	Gravelly and cobbly loam to sandy loam over gravelly to cobbly loam to clay loam.	Neutral to moderately alkaline.	Well to somewhat excessively drained.	Slow to moderately rapid.	Steep slopes, shallow soils.
	12	Lithic Haploborolls-Lithic Calciborolls	10-20"	Gravelly and cobbly loam to sandy loam over very gravelly to cobbly loam.	Neutral to moderately alkaline.	Well to somewhat excessively drained.	Moderate.	Shallow depth to bedrock, steep slopes.
	13	Typic Ustochrepts-Cumulic Haploborolls	10-36"+	Gravelly loam, clay loam, and silt loam over gravelly loam, clay loam or silty clay loam.	Neutral to moderately slow.	Well drained.	Moderate to moderately slow.	Wind and water erosion potential, some steep slopes.
E	18	Aridic Argiustolls-Typic Argiustolls	20-36"+	Loam to very fine sandy loam over silty clay loam.	Neutral to moderately alkaline.	Well drained.	Moderate.	Low precipitation (12-14"), wind erosion potential.
I	34	Aridic Calcixerolls-Xerollic Calciorthids	36"+	Loam, cobbly loam and gravelly loam over very gravelly to cobbly loam.	Moderately to strongly alkaline.	Well to somewhat excessively drained.	Moderate to rapid.	Low precipitation (12-14"), calcium carbonate hardpan within 20" of the surface.
J	35	Ustollic Torrifluvent Borollic Calciorthids	36"+	Loam to gravelly loam over clay loam to gravelly loam.	Mildly to strongly alkaline.	Well drained.	Moderate to moderately rapid.	Limited precipitation (8-14"), calcium carbonate layers in the subsoil, some clayey subsoils.
K	36	Ustic Torrifluvents Ustic Torriorthents	36"+	Fine sandy loam to silty clay loam over sandy loam to silty clay.	Mildly to moderately alkaline.	Well to moderately well drained.	Slow to moderately rapid.	Limited precipitation (8-14"), erosion potential by wind and water.
	41	Lithic Ustollic Calciorthids-Lithic Ustic Torriorthents	10-36"	Cobbly fine sandy loam to loam over clay loam to very cobbly sandy loam.	Mildly to strongly alkaline.	Well drained.	Moderate to rapid.	Limited precipitation (8-14"), some steep slopes, shallow soils, rock outcrops, cobbly surface soils.
M	48	Xeric Torrifluvents-Xerollic Calciorthids	36"+	Silt loam, loam, and fine sandy loam over silty loam to sandy loam and gravelly loam.	Mildly to strongly alkaline.	Well drained.	Moderately slow to moderately rapid.	Limited precipitation (8-14"), calcium carbonate layers are present at 12-24" in some of the soils.
	51	Aquic Xerofluvents-Aquic Ustifluvents-Typic Torrifluvents	36"+	Fine sandy loam to clay over sandy loam to clay.	Mildly to strongly alkaline.	Well to somewhat poorly drained.	Slow to moderately rapid.	Bank cutting, low precipitation (less than 10"). Water table at 20-40" on some of the soils. Clayey soils.
N	52	Typic Torrifluvents-Typic Torriorthents	36"+	Silty clay loam, loamy fine sand or sandy clay loam over silty clay loam to sand.	Mildly to strongly alkaline.	Moderately well to somewhat exc. drained	Slow to rapid.	High salt contents, low precipitation (less than 10"), high temperatures, clayey soils.
	54	Lithic Calciorthids-Typic Calciorthids	10-36"+	Fine sand to very fine sandy loam over gravelly sands to clay loam.	Moderately to very strongly alkaline.	Well drained.	Moderate to rapid.	Low precipitation (less than 10") strongly alkaline soils, some shallow soils over bedrock, calcium carbonate layers.
	55	Typic Calciorthids-Typic Torriorthents	36"+	Gravelly sandy loam to sandy clay loam over clay loam to gravelly sandy loam.	Moderately to strongly alkaline.	Well to somewhat excessively drained.	Slow to rapid.	Low precipitation (less than 10"), calcium carbonate layers are present in some of the subsoils.
P	63	Typic Torriorthents (shallow)-Lithic Calciorthids-Lithic Natrargids	10-36"	Silt loam to silty clay loam over clay loam to loam.	Mildly to very strongly alkaline.	Well drained.	Moderate to slow.	Clayey soils, alkalinity, limited precipitation (6-18"), some shallow soils.
	64	Ustic Torriorthents (shallow)-Rock Outcrop	10-20"	Loam to silty clay loam over loam to silty clay.	Mildly to moderately alkaline.	Well drained.	Moderate to very slow.	Rock outcrops are common, clayey soils, limited precipitation (6-18").
	65	Typic Torripsamments-Typic Torriorthents	36"+	Fine sand to loamy fine sand.	Mildly to strongly alkaline.	Somewhat excessively drained.	Rapid.	Fine sandy soils, wind erosion potential, limited precipitation calcium carbonate layers some soil.
	67	Ustic Torripsamments	36"+	Fine sand.	Mildly alkaline.	Somewhat excessively drained.	Rapid.	Fine sandy soils, wind erosion potential.
Q	68	Rockland	This is a miscellaneous land type. More than 50 percent of the area is rock outcrop.					Rocky land, steep slopes, limited precipitation (6-18").
	69	Badland-Rockland	This is a miscellaneous land type. The area is mainly barren shale and sandstone. Much of the area is very steep and highly dissected.					Steep slopes, rocky land, clayey soils, soil erosion, low precipitation, high salt contents.
	70	Rockland of the high mountains	This is a miscellaneous land type. It is composed of steep, rocky colluvial areas and rock outcrops in the mountains above timberline.					Very rocky land.

Estimates of the use of water in the study area area as follows:

Irrigation----------	93-96 percent
Municipal and industrial------	4-6 percent
Managed wetlands----------	0-5 percent

The quantity of water applied annually to croplands averages 3.6 acre-feet per acre.

Ground water is used to some extent for irrigation, for domestic and stock purposes, and public supply. Although the total amount of ground water used is small, it is the principal source of water for the small communities (total domestic use in the region is about 100 acre-feet per year). Water from both wells and springs is utilized, but springs provide the greater quantity of water. Springs and seeps throughout the area supply water for livestock and wildlife; many have not been mapped, and the number and flow of these springs probably varies with the season and climatic conditions. Some may go dry at times. The total volume of water used is not known, but is presumably small. Nonetheless, these springs and seeps are an important source of water for livestock and wildlife.

1) Surface water

The average annual discharge of the Colorado River at Lees Ferry, Ariz. was 12.96 million acre-feet for 49 years before completion of Glen Canyon Dam in 1963. The usable storage capacity of Lake Powell behind the dam is about 25 million acre-feet, excluding bank storage around the lake. Most of the region is drained by tributaries to the Colorado River and Lake Powell, but about 10 percent along the northwest edge is drained by the headwaters of the Sevier River (fig. I-2), which flows into the Great Basin. Most of the area receives less than 16 inches of precipitation per year, and little runs off. Streamflow is perennial in small tributaries in the mountains and in a few large streams that head in the higher mountains. Most streams, however, are ephemeral and flow only in direct response to precipitation or snowmelt. Summer precipitation does not usually produce much runoff. Intense rainfall may cause heavy flooding at times, but the areas affected are usually small; hence, total runoff is small. The precipitation of 6-hour duration that will be equalled or exceeded once every 100 years on the average ranges from 2 inches near Lake Powell to 3 inches in the mountains. Snowmelt is a major contributor to streamflow. Snow is generally stored through most of the winter at higher altitudes and gradually melts during the spring and early summer. Ground water also contributes to streamflow; it provides the continuity of flow (base flow) in the perennial streams, as well as some seasonal flow to intermittent streams.

Available streamflow data, including maximum, minimum, and average flows, and data-collection sites, are identified on figure II-4. The flow of some of the major rivers and the principal tributaries is affected by diversion of water, mainly for irrigation, and by storage reservoirs.

Only miscellaneous discharge measurements are available for the intermittent streams that drain the Kaiparowits Plateau. However, based on channel geometry characteristics, the total mean annual runoff from the plateau is estimated to be 6,000 acre-feet (BLM, 1976).

2) Ground water

The most extensive aquifers are the very thick sandstone beds, such as the Navajo sandstone. Other consolidated sedimentary or volcanic rocks may yield ground water to wells, depending on their content of permeable beds such as sandstone, or the amount, size and degree of interconnection of fractures. Unconsolidated deposits of alluvium in the channels of the larger rivers are the most permeable aquifers (fig. II-4). Water-table conditions commonly prevail in shallow alluvium along the larger streams and in relatively flat lying sedimentary rocks. Deep wells tapping saturated sandstone will probably show an artesian effect but artesian conditions are known only in part of the region. A few wells tap ground water under sufficient pressure to flow at the surface.

Ground water is recharged principally in the higher plateaus, which receive the most precipitation and produce most of the runoff. Ground water moves from areas of recharge to discharge areas, which include numerous widely scattered springs, gaining reaches of streams, and patches of phreatophytes (generally streamside type, see Vegetation section). Ground-water withdrawal apparently has not had widespread nor significant effects on ground-water levels. Changes in ground-water levels (which reflect changes in ground-water storage) are caused chiefly by changes in precipitation and to a lesser extent by evapotranspiration.

Yields to individual wells and springs are generally small in most places. Wells that tap consolidated sedimentary rocks generally yield less than 50 gal/min, although a few yield more than 1,000 gal/min. Yields of 50 to 500 gal/min are generally available from wells tapping alluvium in the larger stream valleys. Springs are numerous and discharge from less than 1 to several hundred gpm.

In the Escalante River basin and adjacent smaller drainage basins in the eastern part of the region, yields to wells and springs are small to moderate (less than about 50 gal/min) from sandstone, limestone, and volcanic rock, and probably large (more than 100 gal/min) from massive sandstone. Many of the present developed water supplies are springs (Goode, 1969; BLM, 1976; Price, 1977b; and Feltis 1966). Most wells in the basin yield 5 to 50 gal/min, but wells that tap massive sandstone beds along Lake Powell may yield 500 to more than 1,000 gal/min, especially where the permeability is enhanced by fractures. Springs yield less than 1 to about 20 gal/min, generally, but more than 100 gal/min in some places.

Wells in the Paria River basin yield little or no water on tapping thick shale and thin-bedded sandstone and limestone but yields are moderate to large from thick or massive saturated sandstone. Well yields in the eastern Paria River basin vary widely, and may be as much as 500 gal/min

in places (Price, 1977b, and Price and Waddell, 1973). The area has few wells and most of the developed water supplies are from springs. Information on the occurrence of ground water west of the Paria River is available from Marine (1963), Goode (1966), and Feltis (1966).

In the area drained by Kanab Creek and the Virgin and Paria Rivers volcanic rocks, thin-bedded and fine-grained sandstone, and shale yield small amounts (less than 10 gal/min) of water to wells and springs; alluvium, interbedded limestone and sandstone, and thick sandstone yield moderate amounts (about 50 gal/min); and thick, massive sandstone yield large amounts (more than 100 gal/min). Springs discharge ground water from limestone of the Wasatch Formation and from sandstone beds above siltstone or claystone in the Kaiparowits, Wahweap, and Straight Cliffs Formations into upper Kanab Creek and the East Fork of the Virgin River and its tributaries. The Navajo Sandstone and the Straight Cliffs, Wahweap, and Kaiparowits Formations are the principal water-bearing units in the Kanab Creek and upper Virgin River basins. The Navajo may be capable of yielding more than 1,000 gal/min to wells. General information on well potential, depth to water, and change in ground-water levels, 1960-1965, in the lower Colorado basin, is given in Brown (1976).

b. Water quality

In general, the chemical quality of surface water is relatively good for most purposes in the headwater areas but deteriorates downstream. The dissolved-solids content of surface water ranges from 100 to 500 mg/L (milligrams per liter) in headwater areas to 500 to 5,000 mg/L in the lower reaches of most streams. The dominant chemical constituents in the headwaters are calcium and bicarbonate; in the middle reaches calcium, magnesium, sodium, and bicarbonate with local variations; and in the lower reaches sodium, calcium, and sulfate (table II-5). In the lower reaches, concentrations of the toxic trace elements (table II-5), cadmium (Cd), lead (Pb), manganese (Mn), and selenium (Se) frequently exceed the maximum allowable limits recommended by the EPA (1973). Streams are usually saturated with suspended sediment during snowmelt and storm runoff (USGS data, Salt Lake City, Utah and Tucson, Ariz.).

The concentration of dissolved solids in streams is usually inversely proportional to flow. Thus, the chemical quality of water is usually best during high flow and worst during low flow.

The dissolved-solids content of the Colorado River at Lees Ferry averages 500 mg/L and Lake Powell averages 500 to 815 mg/L (BLM, 1976, p. II-154). Concentrations of dissolved solids in the Colorado River at Lees Ferry ranged from 476 to 757 mg/L during the last 10 years (USGS water-data reports, 1967-76).

The quality of most of the water from wells and springs is good (dissolved-solids concentrations are less than 1,000 mg/L), although locally some water may contain concentrations of dissolved solids ranging from 1,000 to more than 3,000 mg/L. In the Upper Colorado Region water

TABLE II-5.--Results of selected chemical analyses of water collected in 1975-76 under the 208 water quality project for the five-county area[1]

[constituents in milligrams per liter]

Location		Total dissolved solids (TDS)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Chloride (Cl)	Sulfate (SO_4)	Bicarbonate (HCO_3)	Arsenic (As)	Cadmium (Cd)	Chromium (CR)	Selenium (Se)	Zinc (Zn)
Escalante River	Min.	438	58	35	47	2.9	12	120	318	0.001	0	0	0	0
near Escalante	Max.	960	106	71	75	7.9	31	267	492	0.058	0.004	0.004	0.20	0.060
Escalante River	Min.	307	38	14	11	2.7	8	69	153	0.001	0.001	0.001	0.001	0.020
near Lake Powell	Max.	680	116	24	40	7.3	49	270	195	0.021	0.004	0.006	0.092	0.150
Last Chance Creek	Min.	1,830	178	25	283	2.3	28	1,050	200	0.001	0.001	0.001	0.01	0.003
near Lake Powell	Max.	5,985	484	242	1,030	26.1	66	3,940	232	0.055	0.160	0.030	0.353	0.048
Wahweap Creek	Min.	1580	108	51	293	7.4	80	810	71	0.001	0.001	0.001	0.01	0.010
near Lake Powell	Max.	12,030	572	314	2,890	19.5	612	7,500	373	0.853	0.058	0.001	1.170	0.092
Paria River at	Min.	414	102	16	33	3.5	10	126	144	0.001	0	0	0	0
U.S. Hwy. 89	Max.	4,240	424	253	390	19	166	2,850	283	0.029	0.002	0.008	0.170	0.087
Buckskin Gulch at U.S. Hwy. 89	Only sample	549	12	6.2	130	11.2	4.0	160	226	0.046	0.250	0.001	0.335	0.061
Johnson Wash at	Min.	758	35	84	66	3.2	44	230	402	0.001	0.001	0.004	0.001	0.001
U.S. Hwy. 89	Max.	1,350	92	116	115	15.8	62	382	548	0.012	0.002	0.01	0.240	0.04
Kanab Creek at U.S.	Min.	240	49	21	4	0	4	48	182	0	0	0	0	0
89 north of Kanab	Max.	544	84	67	68	9.7	17	405	260	0.004	0.001	0.003	0.008	0.05
Kanab Creek south	Min.	986	96	66	42	2.1	20	302	368	0.002	0.001	0.001	0.001	
of Kanab	Max.	1,240	161	125	115	9.4	53	430	594	0.022	0.006	0.008	0.045	0.001
E. Fork Virgin	Min.	220	45	29	0.39	0	2	20	251	0	0	0	0	0
Rvr. at Glendale	Max.	556	65	48	38	15.6	10	58	364	0.016	0.001	0.01	0.01	0.088
Virgin River	Min.	430	58	20	29	0.43	24	112	151	0.003	0.001	0.001	0.001	0.006
near Virgin	Max.	1,125	226	35	104	6.94	78	585	217	0.007	0.001	0.001	0.030	0.080
Virgin River at	Min.	880	90	27	138	0.15	152	227	176	0.001	0.001	0.001	0.01	0.012
U-17 near Harrisburg Jct.	Max.	3,220	299	67	610	49.2	798	1,040	276	0.090	0.001	0.01	0.132	0.189
Sevier River	Min.	112	36	14	3.0	1	1	2	187	0	0	0	0	0.001
at Hatch	Max.	316	45	22	12.6	2.28	9.5	23	236	0.019	0.002	0.002	0.016	0.012

[1]Beaver, Garfield, Iron, Kane, and Washington Counties.

at depths less than 1,000 feet contains concentrations of dissolved solids ranging from less than 500 mg/L to 3,000 mg/L. Ground water generally contains less than 500 mg/L of dissolved solids throughout the headwater areas of the Escalante and Fremont Rivers, along Cottonwood and Hackberry Canyons, and in the immediate vicinity of Lake Powell.

Within the Kaiparowits Plateau, the concentration of dissolved solids in ground water ranges from less than 1,000 mg/L to about 3,000 mg/L, with the greatest concentration being along the southern margin of the Plateau. The distribution of dissolved solids in ground water throughout the Upper Colorado Region is shown very generally on a map by Price and Waddell (1973). More detailed maps showing distribution of dissolved solids on a large scale are available for the Frement River Basin (Price, 1972), nearly all of the Escalante and lower Lake Powell Basins (Price, 1972, 1977a), and larger parts of the Halls Creek and Paria River Basins (Price, 1977a).

Ground water in the Lower Colorado Region (Kister, 1973) varies widely in quality. Water from wells in the Navajo Sandstone generally contains less than 1,000 mg/L of dissolved solids but may contain more than 3,000 mg/L in places. Water from springs in the Navajo and Cretaceous sandstones generally contains less than 500 mg/L of dissolved solids. Water from wells and springs in other formations contains concentrations of dissolved solids ranging from less than 500 mg/L to more than 1,000 mg/L.

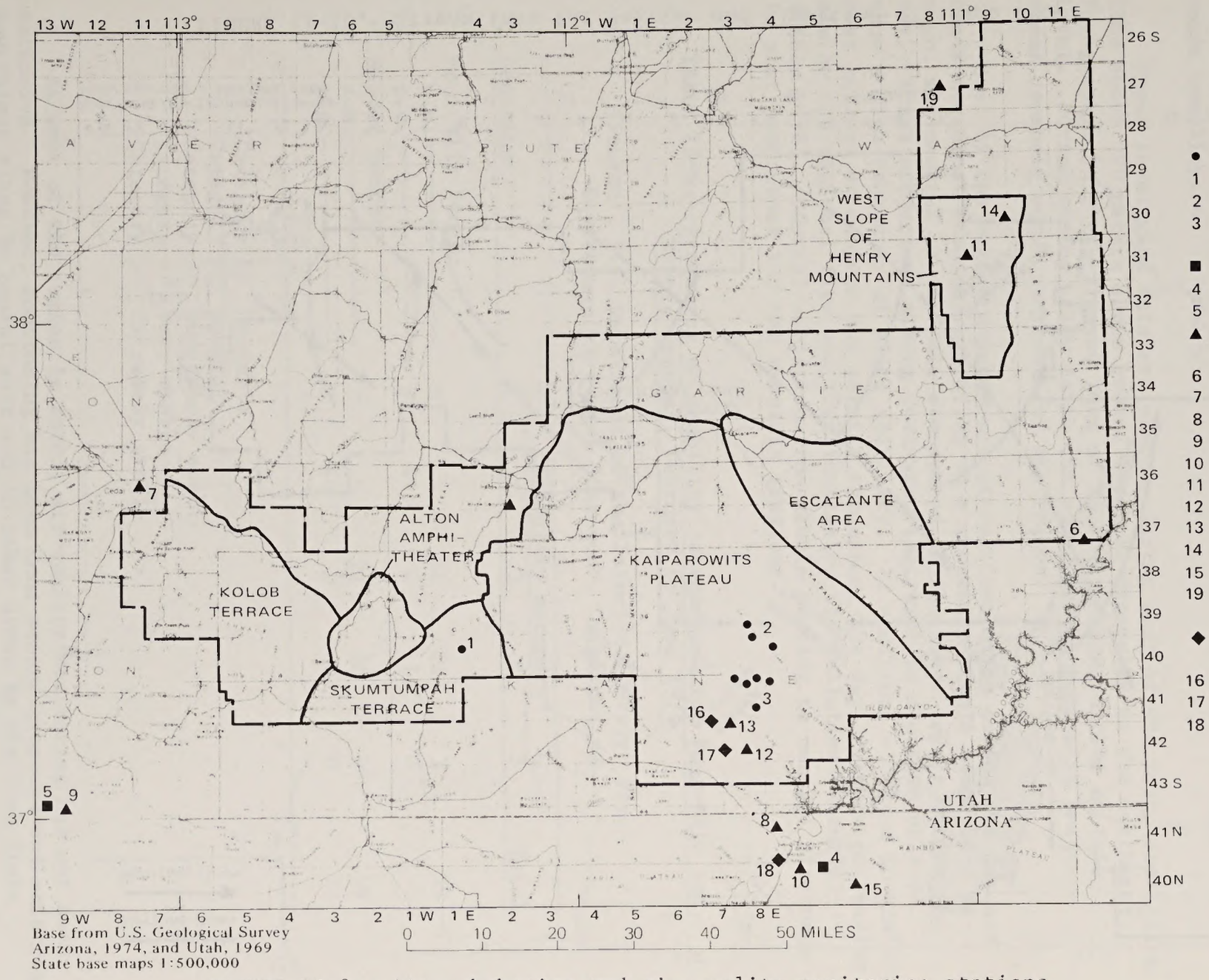
4. Air

The information presented in this section is described in greater detail in two reports prepared under contract with the USGS (AeroVironment, 1977, 1978). The terrain of the study area is both varied and rugged. All aspects of the meterology (surface and upper level wind flow, atmospheric stability, turbulence, etc.) are strongly influenced by the rugged terrain.

Most of the study area lies within the Upper Colorado River Air Basin. An air basin concept or assumption of air flow that is contained within the basin is most valid and accurate under drainage or light flow conditions. Under vigorous, large-scale flow, the assumption is invalid, and mixing between air basins occurs with relative ease. Within the larger air basins lie many smaller "sub-basins" (fig. II-9). These are areas in which meteorologic conditions are uniform enough to assume relatively homogeneous dispersion characteristics.

Night airflow is primarily drainage flow and generally follows river drainage systems (fig. II-10). As the flow is induced by the descent of dense, cold air, the atmosphere generally tends toward stability under these circumstances. Wind speeds are generally light. However, in locations exceptionally favorable to drainage flow, higher wind speeds may result.

Typical day flow is strongly influenced by surface heating. Solar heating of the surface and rising of the layer of warm air near the surface



Base from U.S. Geological Survey
Arizona, 1974, and Utah, 1969
State base maps 1:500,000

FIGURE II-9.--Air sub-basins and air quality monitoring stations.

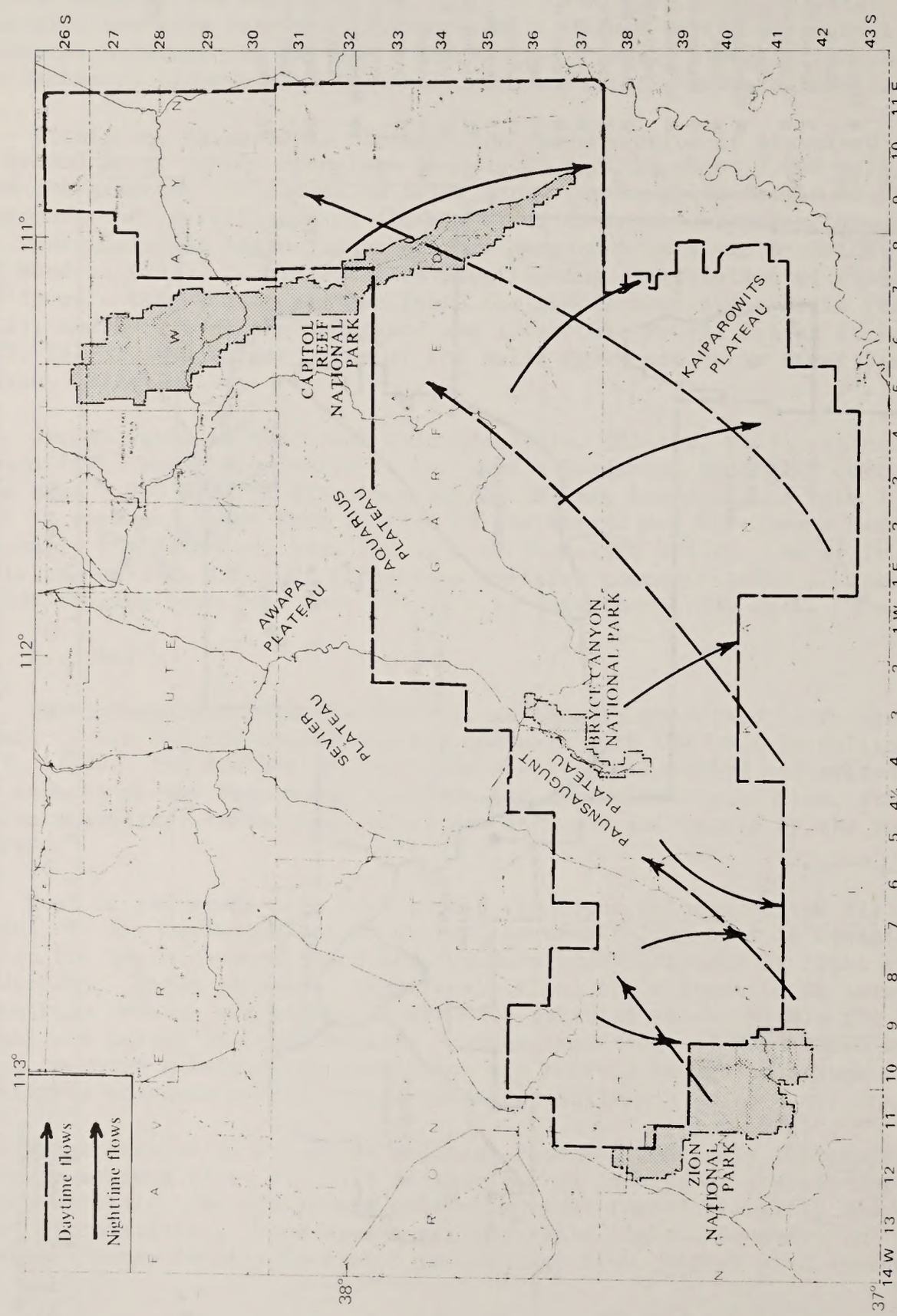


FIGURE II-10.--Streamlines for daytime and nighttime drainage flow.

tends to create mixing. A neutral or unstable atmosphere is the result, and mixing is generally strong enough to cause the surface flow to link with the flow aloft, resulting in a general flow from the southwest toward the northeast (fig. II-10). Terrain is a constraint to the flow however, and valleys may alter this pattern. Day flow in rugged terrain tends upvalley.

Upper level wind data are scarce; during most of the year, prevailing flow above 500 meters above ground level is generally to the northeast. Topographic barriers present less of an obstruction to flow at this level. During winter, flow is to the southwest because high pressure areas commonly occur northwest of the region.

Most of the region experiences strong insolation during the day and rapid nocturnal cooling, resulting in a generally stable atmosphere at night and neutral or unstable atmosphere in the lower layers during the day. Areas subject to strong drainage flow, such as mountain valleys, show a high frequency of night stability. In addition, elevated inversions over valleys or canyons may persist throughout the day, further decreasing mixing and regional flow and thus increasing air-pollution potential (table II-6). Diurnal variation from stable morning to neutral afternoon is most pronounced for the mountain stations.

TABLE II-6.--Frequency of stability categories[1] for Four Mile and Nipple Benches, February to June 1974

[Source: U.S. Department of the Interior (1975): Final Environmental Impact Statement, Kaiparowits]

Location	Stability category[1]					Total
	1	2	3	4	5	
Four Mile Bench:						
a.m.----------	0	4	31	21	3	59
p.m.----------	8	44	2	1	0	55
Nipple Bench:						
a.m.----------	0	6	22	28	3	59
p.m.----------	2	48	3	0	0	53

[1] Category 1: Unstable
Category 2: Neutral
Category 3: Moderately stable
Category 4: Very stable
Category 5: Extremely stable

As most of the region is rural, air-quality monitoring has not been extensive. However, monitoring has been done around proposed and existing powerplant sites by consultants and in other areas by the Utah State

Division of Health (fig. II-9). Wherever possible, 1975 was used as a base year. Many locations were not monitored in 1975, so most recently available data were used. The National Ambient Air Quality Standards (NAAQS) have annual limitations for selected pollutants and these limitation values are used for comparison with monitored records. However, monitoring was performed at certain stations for less than a year; in these places, averages for the monitoring period were compared with annual average standards.

Monitoring of total suspended particulate (TSP) in the study area is relatively extensive. Ten stations exist and five of these stations recorded observations during 1975. Table II-7 presents the annual geometric mean (AGM) and the maximum 24-hour average TSP values at these stations. Primary annual NAAQS were not exceeded. Primary standards for the 24-hour average was exceeded at three stations, and the secondary standard was exceeded at two additional stations.

TABLE II-7.--Total suspended particulates[1] in the air near the Alton coal fields

[Data from Aerovironment, Inc., 1977]

Location	Period of observation	Maximum 24-hour average ($\mu g/m^3$)	Annual geometric mean ($\mu g/m^3$)
Southern Utah:			
Wayne County-	summer 1974	--	12
	fall 1974	--	21
Bullfrog-----	6/75-12/75	183	14
St. George---	1976	131	22
Cedar City---	1975	226	47
Wahweap------	1975	342	19
Warner Valley	11/74-5/75	367	19
Page---------	1975	742	41
Leche-E------	1972	78	34
Caineville---	8/74-9/74	70	41
Fremont River	1974-76[2]	90	16
		70-742 (range)	26 (average)

[1]Although the average annual background TSP concentrations are within the annual ambient air quality standards the short-term standards were exceeded periodically by particulates being violations of the secondary standard were recorded at five locations.

[2]Three seasons.

Sulfur dioxide ambient air concentration data are available from 10 locations near the study area and from nine of these for 1975 (table II-8). No exceedances of the NAAQS for SO_2 have been recorded in or near the study area.

TABLE II-8.--Sulfur dioxide annual average and maximum 24-hour and 3-hour average concentrations

[Values are in $\mu g/m^3$]

Location	Period of observation	Annual average	Maximum 24-hour average	Maximum 3-hour average
Bullfrog----------	6/75-12/75	--	26	78
Caineville---------	8/74-9/74	13	13	13
Cedar City---------	1975	42	288	1,100
Four Mile Bench----	7/74-2/75	6	--	--
Fremont River------	[3]1974-1976	13	13	13
Nipple Bench-------	7/74-2/75	4	--	--
Page[1]------------	1975	--	36	176
Page[2]------------	1975	7	22	--
Wahweap------------	6/75-12/75	3	26	78
Warner Valley------	11/74-10/75	1	39	121

[1]Station west-southwest of Page.
[2]Station at Page airport.
[3]Three seasons.

Oxidants are traditionally thought to be an urban pollutant but recent evidence indicates unexpectedly high concentrations of ozone in rural areas. Ozone at Salt Wash (Fremont River) and Page in 1975 shows no exceedance of the NAAQS (table II-9) although the concentrations at Salt Wash are high. Monitoring of proposed oil-shale tracts many miles to the northeast (AeroVironment, 1976) shows that ozone concentrations in excess of the NAAQS occurs in rural Utah. No exceedances of the NAAQS for SO_2 have been recorded in or near the study area.

TABLE II-9.--Maximum hourly oxidant concentrations ($\mu g/m^3$)

Location	Period of observation	Maximum hourly average
Southern Utah:		
Fremont River----------	1974-1976 (3 seasons)	131
Page-------------------	1975	80
Utah oil shale tracts-----	1975	190

Four locations have monitored NO_2 near the study area, and NO_x has been monitored at one other (table II-10). Annual averages are well below NAAQS. The highest 24-hour average was 96 $\mu g/m^3$ in Warner Valley, but this included NO as well as NO_2.

TABLE II-10.--Nitrogen dioxide annual average and maximum 24-hour concentrations ($\mu g/m^3$)

Location	Period of observation	Average	Maximum 24-hour average
Southern Utah:			
Wayne County	1974	--	55
Warner Valley	11/74-10/75	--	[1]96
Page	1975	13	27
Caineville	summer 1974	11	[2]--
Fremont River	1974-1976 (3 seasons)	14	[3]--

[1] NO_x
[2] Maximum hourly average was 39 $\mu g/m^3$.
[3] Maximum hourly average was 36 $\mu g/m^3$.

No data for carbon monoxide are available. Because the area is rural, carbon monoxide levels probably are low. Monitoring in other rural or suburban parts of Utah and Arizona has shown maximum 8-hour averages of 5 $\mu g/m^3$ at Lindon, Utah, 1 $\mu g/m^3$ at Florence, Ariz. and 3.7 $\mu g/m^3$ at the remote proposed oil-shale tracts in the Uinta Basin or northeastern Utah. Thus, exceedances of any NAAQS in the study area are unlikely.

Hydrocarbons have not been monitored but, because of the relatively few automobiles and lack of industry, concentrations probably are low. Measurements in the Uinta Basin and in Florence, Ariz., exceed NAAQS between the hours of 6:00 and 9:00 a.m. At the present time the data base is inadequate for computation of the baseline pollutant concentrations in the region generally.

Visibility degradation is not included under current regulations. However, visibility is a necessary esthetic, and "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas" has been declared a national goal in the Clean Air Act Amendments of 1977. The National Park Service currently is instrumenting visibility measurement stations at Capitol Reef, Canyonlands, Bryce Canyon and Zion National Parks in cooperation with EPA, Environmental and Support Laboratory, Las Vegas, Nevada. EPA is required to promulgate visibility regulations and standards by August, 1979.

Degradation of visibility results mainly from scattering of light by gas molecules, fine particles, and liquid droplets. Also a factor is absorption of light, as by dense soot clouds, for example. Nitrogen

dioxide also absorbs light (blue-green), giving the atmosphere a yellow-brown discoloration proportional to the NO_2 concentration. The conversion of SO_2 to sulfate also reduces visibility.

Median visibilities in non-urban areas of the southwestern United States are 65 to 85 miles, according to Trijonis (1978). Measurements taken at Cedar Mountain, east of Castle Dale and southeast of Price, Utah, have monthly averages ranging from 54 miles, in April 1977, to 94 miles, in November and December 1976 (Pueschel and others, 1978). Values of visual range calculated from measurements of light scattering made in the period February 1976-June 1977 at the Alton, Utah area, averaged 56.5 miles. Daily averages ranged from 22.4 to 86.3 miles. Average visual range in the Huntington area (25 miles south of Price, Utah), using light-scattering measurements from an integrating nephelometer, was 67 miles during September 1970 to March 1971. Analysis of photographs taken at Clawson, Utah, during January-June 1974 indicated 50-mile visibility 49 percent of the time. Visibility was less than 5 miles only 12 percent of the time. Median Local Visual Range (LVR) in Page, Ariz., from 1970 through 1974 was slightly greater than 60 miles. Some reduction began in 1972. Estimates using a camera and telescope indicated an average LVR of 72 miles in 1974. These estimates also showed some reduction that began in 1972. A yellow discoloration associated with the Navajo generating station has also been observed.

5. Vegetation

Vegetative cover differs considerably over the region. Figure II-11 (in pocket) shows the distribution of vegetative types and locations of plants proposed for endangered and threatened status (Welsh, 1977). The cover ranges from low desert shrubs to conifer stands as described below. More complete lists of the common species are contained in the Task Force files. Vegetative production ranges from no forage to 1,500 lbs/acre, dry weight. Most of the area that would be disturbed is Pinyon-Juniper type and contains less than 50 lbs/acre, dry weight. Change in altitude, with associated moisture and temperature changes, is the chief factor in the variety of vegetative types; topography, aspect, and soil also modify the variety (fig. II-12).

The vegetative cover is divided into 11 vegetative types: (1) Nonproductive, (2) Agricultural land, (3) Streamside, (4) Grassland, (5) Desert Shrubs, (6) Sagebrush-Grass, (7) Pinyon-Juniper Woodland, (8) Mountain Brush, (9) Ponderosa Pine, (10) Aspen, (11) Conifer-Aspen.

The Nonproductive type includes areas of little if any vegetation-rock outcrops, large bodies of water, roads, railroads, conveyors, buildings, and urban development. Many of these areas are too small to map separately.

The Agricultural Land type includes both irrigated and dryland farms, generally where soils are better in alluvial fans and valley bottoms. Because of the better soils, productivity is higher than in the other vegetative types. Crops vary from dry and irrigated pasture to

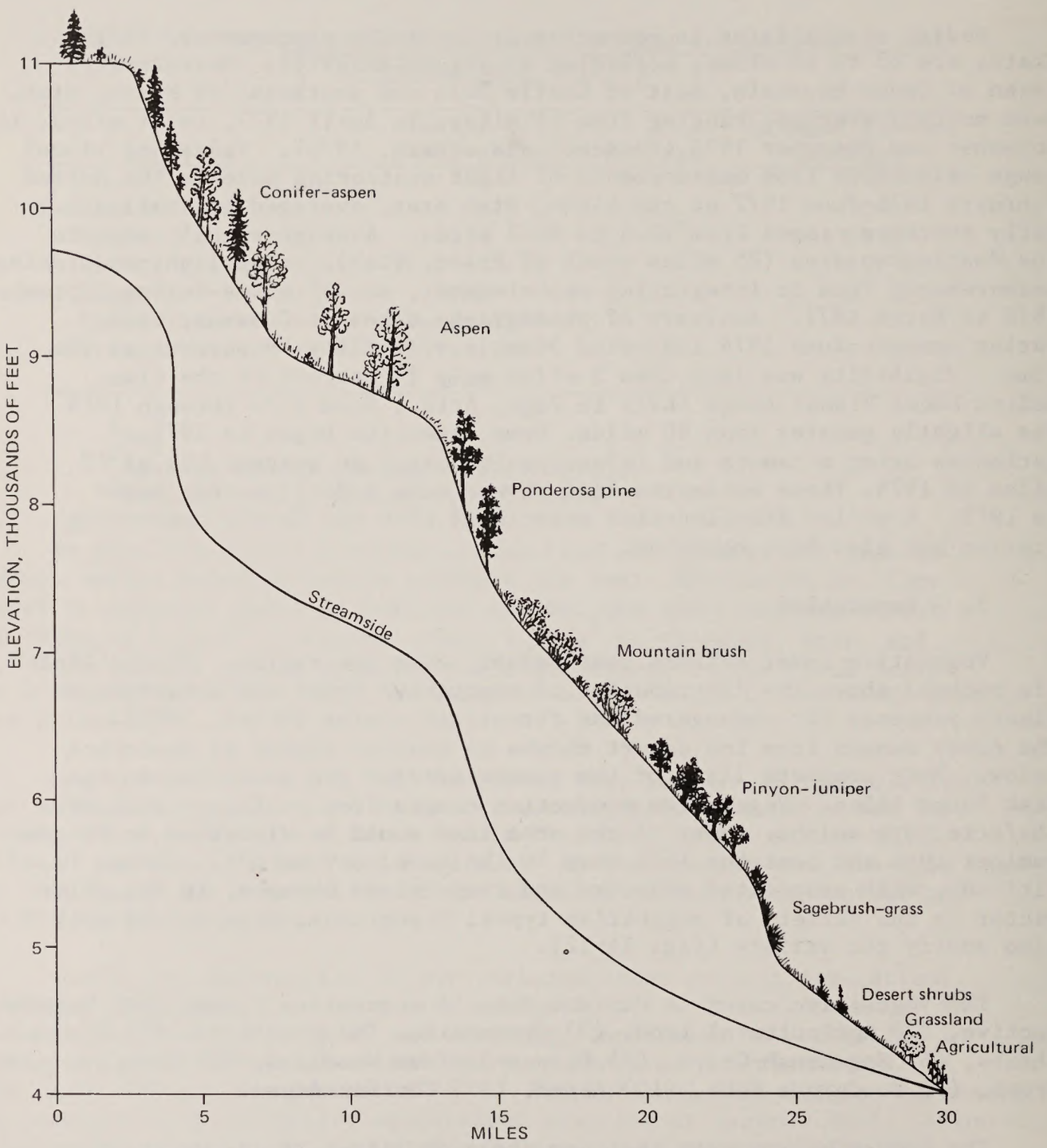


FIGURE II-12.--Typical vegetation changes with altitude.

hay, small grains, some row crops, and a few orchards. Precipitation ranges from 6 to 16 inches per year and is usually supplemented by irrigation water. Very few acres of this type are in the region. Ground cover varies with the crop and the season, although it is usually good to excellent during the growing season, unless the land lies fallow in summer. Poor ground cover prevails after harvest.

The Streamside type occurs along the edges of streams and ponds or in areas of high water table. It includes areas that may be flooded. Sedges, rushes, horsetails and cattails grow adjacent to the water, along with willows, cottonwoods, saltcedar, and greasewood. Pondweed, algae, and mosses grow in the water. Soils are generally deep, soft water-laid sediment. Although widely scattered, very few acres of this type are in the region. This type grows within all precipitation ranges where streamflow provides enough moisture. It is found with or next to all other vegetative types. Because of the deep soils and high moisture content, this type produces an abundance of growth, which provides good to excellent ground cover.

The Grassland type is scattered through the lower elevations, but also includes seeded grasses in range-improvement projects at all elevations. Native grasses include galleta grass, sand dropseed, wheatgrasses, and threeawn, along with lesser amounts of forbs and shrubs. Ground cover and production are generally low in the native grasses because of past disturbance. The seeded grasses are primarily crested wheatgrass at lower elevations and various mixtures at higher elevations, including intermediate wheatgrass, orchard grass, bluegrass, smooth brome, and Indian ricegrass. Ground cover and production vary from poor to good, depending upon the species, management, precipitation, and success of seeding. The type grows in a range from 6 to 16 inches of annual precipitation. Soils are usually moderately deep and well drained.

The Desert Shrub type includes a wide variety of shrubs and some associated grasses and forbs. Species such as shadscale, blackbrush, rabbitbrush, big sagebrush, sand dropseed, and threeawn occur in this type. Moderately well-drained sites from the valley floors to the dry slopes of the foothills support much of this type, although it may exist on dry, impervious, saline soils. Large acreages are located in the southeast and east parts of the region. Plant density is rather sparce and the type has relatively low productivity. Erosion pavement covers much of the surface. Annual precipitation ranges from 6 to 12 inches.

The Sagebrush-Grass type generally grows between the Desert Shrub type and the Pinyon-Juniper Woodland type. Because sagebrush is aggressive, this type often extends through other types at lower altitudes along alluvial deposits and may grow at altitudes of 9,000 feet. The community is variable, but generally occupies the deeper, more permeable, salt-free soils of well-drained valleys and foothills. It grows where precipitation exceeds 12 inches annually or where ample ground water is available. Species include big sagebrush, black sagebrush, rabbitbrush, Indian ricegrass, wheatgrass, Sandburg bluegrass, needlegrass, and blue grama.

Where undisturbed, this type provides moderate ground cover and fair to good production. Much of the agricultural lands were once covered by the Sagebrush-Grass type.

The Pinyon-Juniper Woodland type forms an open forest, with trees 10 to 30 feet high. Shrubs, grasses, and forbs constitute a generally sparse understory, although dense stands of shrubs may occasionally be found on sites of high moisture content. This community mixes considerably with Sagebrush-Grass or alternates with it. Generally sandy, gravelly, or rocky soils prevail. Precipitation averages between 10 and 14 inches annually. This is the most common and most widespread vegetative type in the region and occupies vast areas at medium elevations. Utah Juniper, Rocky Mountain juniper, and pinyon pine in various mixtures generally form the overstory. Buffalo berry, bitterbrush, cliffrose, sagebrush, galleta grass and Indian ricegrass form the understory. Productivity is generally low to moderate. This vegetative type is most often chosen as sites for revegetation projects to benefit livestock and wildlife.

The Mountain Brush type generally grows at altitudes higher than the Pinyon-Juniper Woodland, but may alternate with that type and include ponderosa pine stands. Dominant species differ with location, and several species may grow at the same altitude. Deeper soils may allow sagebrush and grasses to join the overall community. This vegetative type has a wide range of soil tolerance but generally grows on moderately deep, medium textured, well-drained soils. Common species are Gambel oak, mountain mahogany, mountain maple, sagebrush, bitterbrush, serviceberry, chokecherry, snowberry, bluebunch wheatgrass, and needle-and-thread grass. Ground cover and productivity are moderately high.

The Ponderosa Pine type is dominated by this tree. When mature, these large trees typically develop open, parklike stands, with a light understory of brush and (or) grass. The type normally occupies favorable sites between the Mountain Brush and Conifer-Aspen types, although individual trees or groups grow with the other types. Precipitation ranges from 15 to 20 inches annually. A wide variety of soils support the type, but it prefers moist to dry gravelly loams. Other species include juniper, pinyon, Gambel oak, bearberry, bitterbrush, manzanita, serviceberry, slender wheatgrass, and oatgrass. Ground cover and productivity are generally good. This, like other timber types, occurs on scattered sites at higher elevations.

The Aspen type grows mixed with Douglas fir, white fir, and spruces, over much of their common ranges. Occasionally, aspen dominates an area large enough to be mapped as a separate type. These pockets of aspen usually grow along streams, depressions, or flats, where soils are deep and moisture is abundant. Annual precipitation ranges from 20 to 40 inches. The conifers previously mentioned plus sagebrush, bluegrasses, Oregon grape, arnica, and larkspur grow in the aspen stands. Ground cover is generally good to excellent, and productivity is high.

The Conifer-Aspen type grows at higher elevations throughout the region. Engelmann spruce and alpine fir dominate the upper areas, whereas

white fir, Douglas fir, and aspen dominate the lower, with considerable mixing in the middle. These trees generally require rather high moisture to grow and are on deep soil types, which may or may not be well drained. Common juniper, deerbrush, pinegrass, elk sedge, and larkspur are found with this type. Annual precipitation ranges from 20 to 40 inches. Production is generally good, but the shorter growing seasons at the higher elevations tend to reduce production.

Fires average 71 per year in the region. Approximately 30 percent of these are caused by man, the remainder by lightning. The average fire covers 20 acres in the more vegetated areas. The fire occurrence by land ownership follows:

National Forest----------	40
Public Lands (BLM)---------	14
State of Utah----------	17
Private----------	unknown
Total----------	71

Seldom do fuels above 8,000 feet become dry enough to sustain fires very long or over large areas. June 1 through October 31 is the period of greatest fire danger. At other times, when grass and other fuel become dry enough to burn, the cool nights tend to slow fire spread.

Historically, fire has affected the total plant community through repeated burning of some areas, which has kept vegetation in a subclimax stage. With better fire protection, vegetation has tended more toward climax, but better protection has allowed more litter to collect, which has the potential to produce larger and hotter fires.

The Endangered Species Act of 1973 authorized the Secretary of the Interior to designate threatened and endangered species (including plants). The Act also directed the Smithsonian Institution, in conjunction with other agencies, to prepare a list of plants considered to be threatened or endangered.

Threatened and endangered plants in the southern region (Welsh, 1977) consist of perennial herbs, subshrubs, a few annuals, some shrubs, but no trees (table II-11, fig. II-11). All growth forms exist in arid or moderately moist sites, with aquatic and semiaquatic representatives lacking. Forty-six species or varieties are cited in Federal Register publications as either threatened or endangered. Welsh states that 10 of the 18 species or varieties listed as endangered are judged as having critical current status, and 10 of the 28 species cited as threatened are probably critical. Generally, these plants do not grow in the same areas where coal is found. However, because of the lack of time for a comprehensive survey and the shortage of growing moisture during 1977, the presence or absence of these plants on lease or facility areas could not be determined. Some of the threatened and endangered plants may grow on areas subject to urban development and recreational use.

TABLE II-11.--Summary of endangered (E) and threatened (T) plant species, status, county, and critical habitat

Species		Status[1]	County[2]	Critical habitat
Astragalus ampullarius	(T)	C	W., K.	Chinle formation
Astragalus barnebyi[3]	(T)	C?	Wy., Ga.	Emery sandstone, Carmel, Morrison
Astragalus harrisonii	(E)	C	Wy.	Navajo sandstone
Astragalus lancearius	(T)	NC	K., W.,	Various
Astragalus loanus	(E)	NC	Wy.,Ga.,P.,Se.	Volcanic gravels
Astragalus malacoides	(E)	C?	Kane	Mesaverde Group
Astragalus nidularius	(T)	C?	Ga.,Wy.,SJ.	Navajo sandstone
Astragalus pardalinus[4]	(E)	NC	Ga.	Sand
Astragalus perianus	(E)	C	Ga.	Volcanic gravels
Astragalus serpens	(E)	NC	Ga.,I.,K.,P.,Wy.	Volcanic gravels
Astragalus striatiflorus	(T)	C?	Ka.,W.	Sand
Castilleja aquariensis	(E)	C	Ga.	Clay loam
Castilleja revealii	(E)	C	Ga.	Wasatch limestone
Cryptantha ochroleuca	(E)	C	Ga.	Wasatch limestone
Cymopterus minimus[5]	(E)	C	I.	Wasatch limestone
Cymopterus newberryi[6]	(T)	NC	Ga.,K.,W.	Various
Draba subalpina	(T)	C?	Ga.,I.,K.	Wasatch limestone
Erigeron flagellaria var. trilobatus	(E)	?	I.	Unknown
Erigeron relgiosus	(E)	C?	W.,Ka.	Sand
Erigeron sionis	(E)	?	W.	Unknown
Eriogonum aretioides	(E)	C	Ga.	Calcareous outcrops
Eriogonum cronquistii	(E)	C	Ga.	Granitic pediments
Eriogonum panguicense var. alpestre[7]	(T)	C	I.	Wasatch limestone
Eriogonum thompsonae	(T)	C	K.	Chinle formation
Eriogonum zionis	(E)	C?	W.,K.	Sand
Euphorbia nephradenia	(T)	NC	E.,K.,Wy.	Various, sandy
Geranium marginale	(T)	NC	Ga.,I.,K.,Se.	Various
Gilia caespitosa	(E)	C	Wy.	Sand
Gilia mcvickerae[8]	(T)	C?	Ga.,K.,P.,Se.	Modified volcanics
Haplopappus scopulorus	(T)	C?	I.,K.,SJ.	Various, sandy
Hymenopappus filifolius var. tomentosus[9]	(T)	NC	K.,W.	Sandy
Lesquerella rubicundula	(T)	C	Ga.,I.,K.	Wasatch limestone
Lomatium minimum	(T)	C	Ga.,I.,K.	Wasatch limestone
Lupinus marianus	(T)	NC	P.,Se.	Various
Nama retrorsum	(T)	NC	Ga.,Gr.,K.	Various, sandy
Penstemon caespitosus var. suffruticosus	(T)	C?	B.,Ga.,P.	Volcanic gravels
Penstemon leiophyllus	(T)	NC	Ga.,K.,I.,W.	Various
Penstemon parvus	(T)	C	Ga.,Wy.	Wasatch limestone, volcanic gravel
Peteria thompsonae	(T)	NC	E.,Gr.,K.,W.	Various
Phacelia cephalotes	(T)	C	K.,W.	Shale, clay, mudstone
Phacelia constancei	(T)	C?	E.,Ga.,K.,SJ.	Shale, silt, mudstone
Phlox gladiformis[10]	(T)	C	Ga.,I.,W.	Wasatch limestone
Primula specuicola	(T)	C	Gr.,K.,SJ.,Wy.	Hanging gardens
Psoralea epipsila	(T)	C	Kane	Shales, siltstones
Psorothamnus thompsonae[11]	(T)	NC	E.,Ga.,K.,SJ.,Wy.	Various
Viguieta soliceps	(E)	C	Kane	Tropic shale

[1] C = Critical, NC = Not Critical, ? = Uncertain

[2] County abbreviations: B. = Beaver, E. = Emergy, Ga. = Garfield, Gr. = Grand, I. = Iron, K. = Kane, P. = Piute, SJ. = San Juan, Se. = Sevier, W. = Washington, Wy. = Wayne.

[3] Published as Astragalus desperatus var. conspectus.

[4] Published as Phaca pardalina.

[5] Published as Aulospermum minimum.

[6] Published as Peucedanum newberryi.

[7] Published as Eriogonum pauciflorum var. panquicense.

[8] Published as Bigelovia menziesii var. scopulorum.

[9] Published as Hymenopappus tomentosus.

[10] Published as Phlox longifolia var. gladiformis.

[11] Published as Parosella thompsonae; better known as Dalia thompsonae.

6. Wildlife

Wildlife in the region is characterized by diversity of species and low population. The region is home for a large variety of species because of the range of life zones from hot desert to high mountain forest. Species in the area include: 86 mammals, 328 birds, 36 reptiles, and 11 amphibians. Only species of significant human interest, and unique, rare, or endangered species are discussed here. A complete list of wildlife species in the region is contained in the task force EIS files.

A relatively large amount of data are available for game species; however these data were collected for management units that generally do not conform to boundaries of the impact area. Data on nongame species are not generally available, and except in isolated instances, little quantifiable information on distribution, population numbers, and trends is known. Data relating to big game species, cougar, bear, and furbearers, are discussed in terms of Utah Division of Wildlife Resources (UDWR) management units. Information on upland game birds, waterfowl, cottontail rabbits, and snowshoe hare is given by counties, as compiled by UDWR. Figures on current population are not available; but trends are known, and relative abundance of game species can be inferred from harvest statistics (tables II-12, II-13).

The region includes all or part of State deer herd units 29, 50, 51B, 52, 57B, 58, 59, 60A and 60B (fig. II-13). Deer populations have trended downward in recent years, but studies by UDWR indicate that range conditions are good and that the range could support more deer. Deer highway mortality is significant. During July 1, 1970, to June 30, 1976, an average of 163.5 deer per year were killed by vehicles. The magnitude of this loss is compounded by the fact that approximately 50 percent of the total reported casualties were mature does.

Elk are found in limited numbers in the region. Two elk herd units, where hunting has been allowed, are within or adjacent to the area. During the winters of 1976-77 and 1977-78, the UDWR transplanted 150 elk to the Boulder Mountain area (fig. II-14). Its success cannot be determined at this time. Limited populations of antelope are found in Johns Valley, and on East Clark Bench. Bighorn sheep were widespread in southern Utah before white men first came to the area. The larger populations are east of the Colorado River, and expansion to the west is blocked by Lake Powell. Buffalo were transplanted to the Henry Mountains in 1941 and 1942. The first hunt was held in 1950, and a restricted harvest has been allowed since that time. The herd is the only free-roaming, hunted buffalo herd in the United States.

Mountain lion (cougar) are found throughout the region where suitable habitat exists. Mule deer are their principal prey, and lion are usually associated with deer populations in remote areas. Cougar population characteristics and distribution data are not available for Utah, but studies of hunted cougar populations in California, Nevada, Idaho, and British Columbia showed home range sizes from 15 to 43 square miles.

TABLE II-12.--Big game

Species	Herd unit or area	Vegetation type	Hunting pressure 1976 Hunter days	Hunting pressure 1976 Percent of state total	Harvest 1976 Number	Harvest 1976 Percent of state total	Remarks
Mule deer[1]	29, 50, 51B, 52, 57B, 58, 59, 60A, 60B	Summer: Mountain Meadow, Conifer-Aspen, Aspen, Mountain Brush. Winter: Sagebrush-Grass, Pinyon-Juniper, Mountain Brush.	41,051	6.0	2,922	5.1	Largest populations on Markagunt and Paunsaugunt Plateaus, Kolob Terrace, and the Boulder Mountains. There is a total of 1,644,000 acres of summer range and 4,126,600 acres of winter range on these units.
Elk[1]	16, 19	Summer: Mountain Meadow, Conifer-Aspen. Winter: Sagebrush-Grass, Mountain Brush.	1,955	2.0	32	1.3	Unit 16 (Dutton) has 362 mi^2 on National Forest Lands. Unit 19 (Cedar Mountain) has 576 square miles of mostly private lands. Elk were transplanted to Boulder Mtns. during the winter of 1976-77 and 1977-78 and are also found in the Henry Mountains.
	Boulder Mountain		(4)	(4)	(4)	(4)	
Antelope	Johns Valley, East Clark Bench.	Desert Shrub, Sagebrush-Grass, Pinyon-Juniper.	(4)	(4)	(4)	(4)	These herds are the result of transplants by UDWR (Johns Valley, 1975, East Clark Bench, 1970, 1971).
Bighorn sheep	Zion Park, East Moody Canyon, Capitol Reef, Rock Creek, Henry Mtns., Little Rockies.	Desert Shrub, Sagebrush-Grass, Pinyon-Juniper, Mountain Brush.	(4)	(4)	(4)	(4)	Population consists of scattered bands in remote canyons and plateaus.
Buffalo[1]	Henry Mtns.	Pinyon-Juniper, Sagebrush-Grass, Desert Shrub.	36	100	10	100	Transplanted in area in 1941-1942. Herd ranges primarily on west side of Henry Mtns.
Black Bear[2]	Deer herd units 51B, 57B, 60A.	Conifer-Aspen, Mountain Brush.	4	0.6	0	0	Bear harvest for 10 year period, 1967-77, was 5 bear from deer herd units 51B and 57B.
Cougar[3]	Deer herd units 29, 50, 51B, 52, 57B, 58, 59, 60A, 60B.	Same as mule deer.	268	12.8	25	15.8	In the 6-year period, 1971-77, hunters took 161 lion (22 percent of total state harvest for that period) from this region.

[1]Big Game Harvest Report (UDWR, 1977a).
[2]Black Bear Harvest Report 1976-1977 (UDWR, 1977b).
[3]Cougar Harvest Report 1976-1977 (UDWR, 1977c).
[4]No hunts held in these areas.

TABLE II-13.--Upland game and waterfowl in the southern region[1]

Species	Vegetation type	Hunting pressure 1976		Harvest 1976		Remarks
		Hunter days	Percent of state total	Number	Percent of state total	
Cottontail rabbit[2]	Agricultural land, streamside, Sagebrush-Grass, Pinyon-Juniper, Mountain Brush	12,116	9.6	15,856	6.7	Generally found throughout region at elevation below 8,000 feet.
Snowshoe hare[2]	Conifer-Aspen, Mountain Meadow	544	2.7	536	3.5	Generally limited to the Markagunt and Paunsaugunt Plateaus, Kolob Terrace, and Boulder Mountains.
Ringnecked pheasant[2]	Agricultural land	6,228	2.9	4,544	3.0	Most of the harvest (2.3 percent) comes from Washington County.
Quail[2]	Agricultural land, streamside, Desert Shrub	2,785	21.0	6,215	43.0	Most of the harvest (40 percent) comes from Washington County.
Chukar[2]	Grassland, Sagebrush-Grass, Desert Shrub, Pinyon-Juniper	943	2.0	1,312	3.0	In arid areas, population are associated with springs and perennial streams.
Mourning dove[2]	Agricultural land, streamside, Pinyon-Juniper	7,506	6.9	27,462	9.2	Doves nest in the region during spring and summer and leave in the fall.
Band-tailed pigeon[2]	Conifer-Aspen, Mountain Brush (7,000 to 9,000 feet elevation)	69	42.6	39	32.8	Pigeon densities are low, averaging 2 to 4 pigeons per square mile in areas of primary range.
Sage grouse[2]	Sagebrush-Grass, Mountain Meadow, Streamside	2,267	8.0	2,405	9.8	The largest populations are in Wayne and Garfield Counties.
Forest grouse[2]	Conifer-Aspen, Mountain Meadow, Mountain Brush	1,241	2.2	1,396	2.2	Blue and ruffed grouse in the region; however, ruffed grouse are uncommon residents in southern Utah.
Turkey[2]	Mountain Brush, Ponderosa Pine, Aspen, Pinyon-Juniper	209	65.0	18	86.0	The larger populations are on the Boulder Mountain and Kolob Terrace (East Zion) in Kane County.
Waterfowl[3]	Streamside, Agricultural land, streams and bodies of water	3,529	1.5	4,448	1.0	Waterfowl habitat is limited; there are no developed waterfowl management units in the region.

[1]Harvest data is for Garfield, Iron, Kane, Washington, and Wayne Counties.
[2]Harvest data from Upland Game Annual Report (UDWR, 1977d).
[3]Harvest data are 10-year averages for the period 1962-71 (Jensen, 1974).

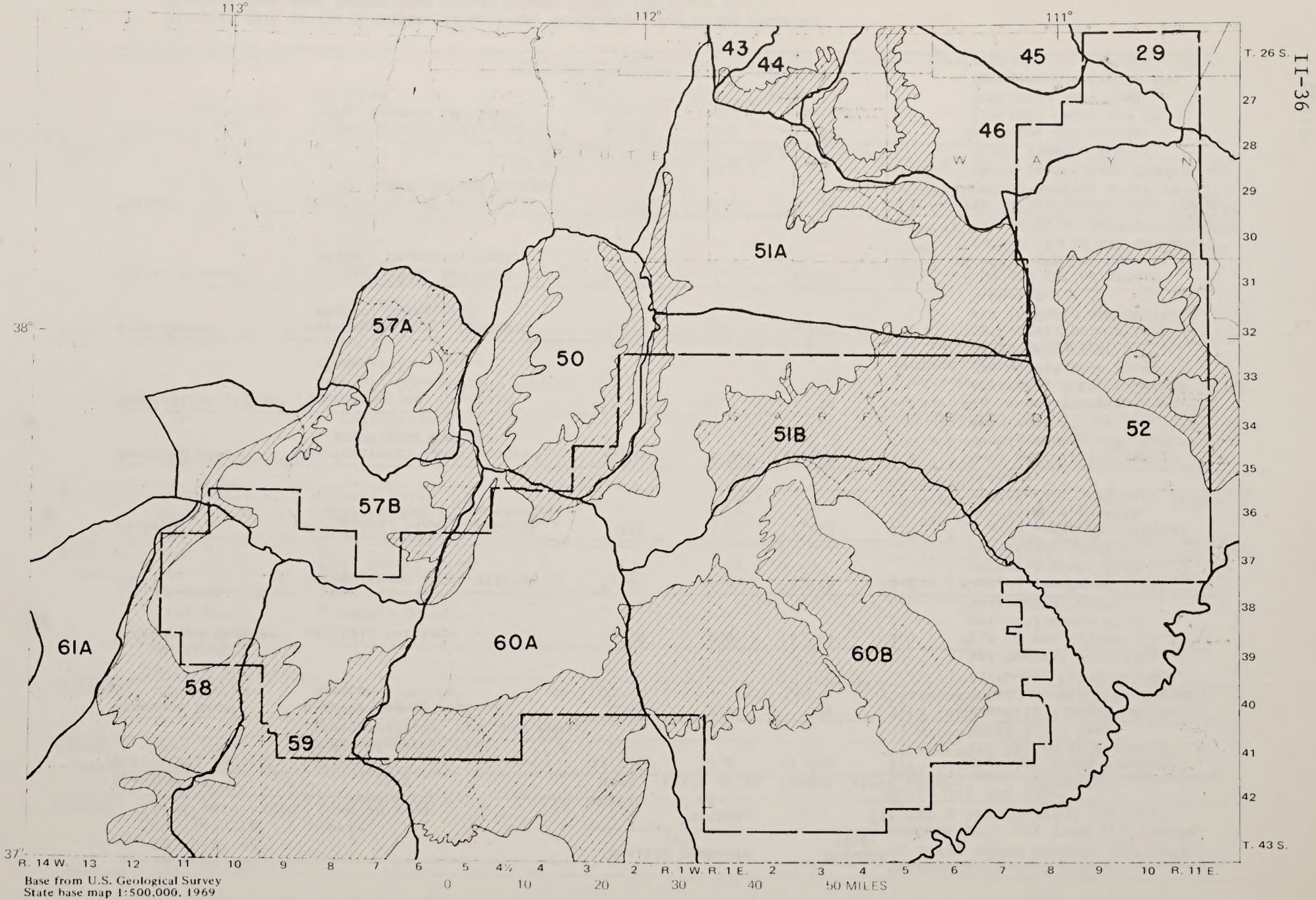


FIGURE II-13.--Deer management areas and mule deer winter range.

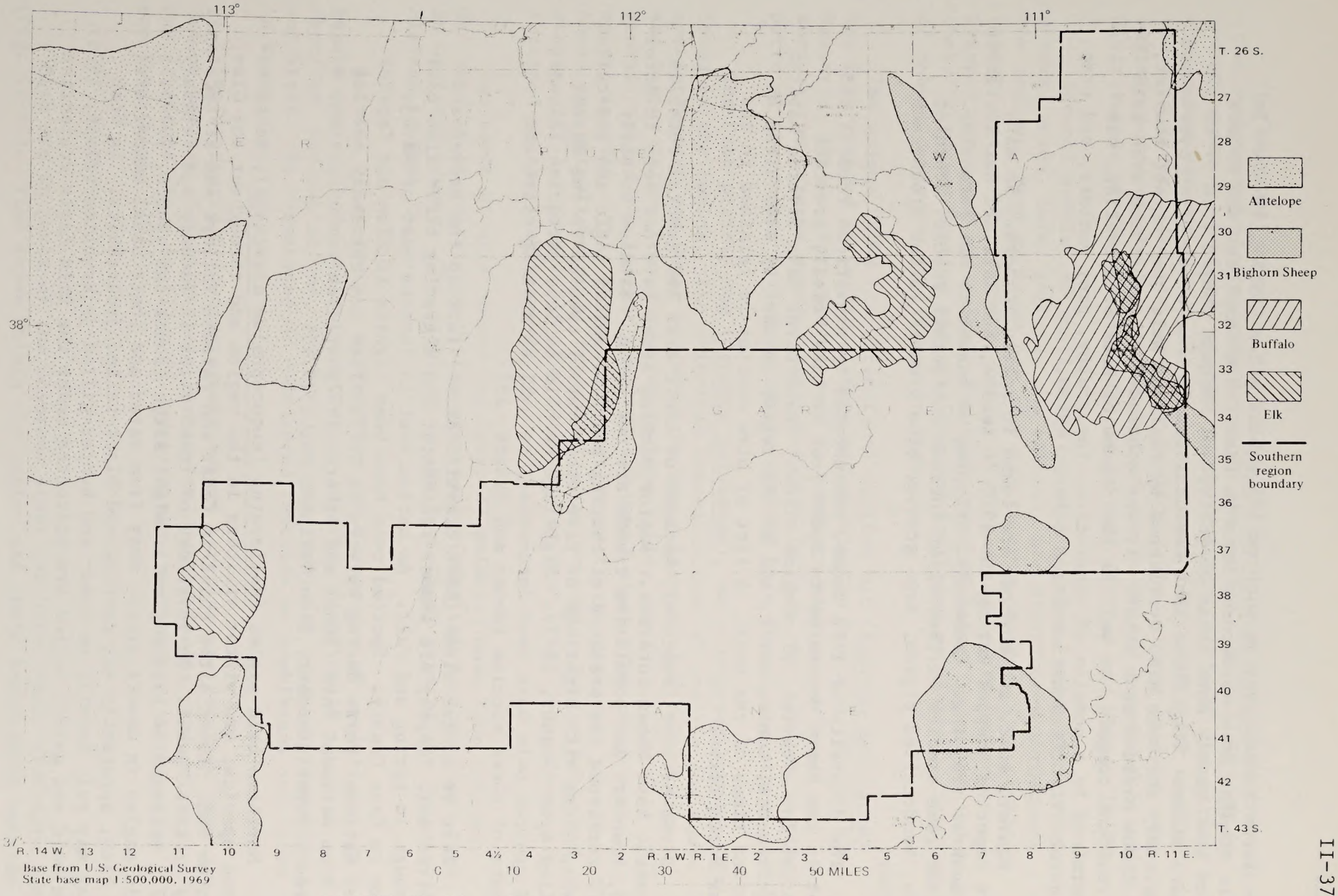


FIGURE II-14.--Distribution of big game animals.

Some lions ranged over as much as 175 square miles (USFWS, 1976). In their studies in a wilderness area in Idaho, Siedensticker and others found that yearly home areas of individual animals ranged from 67 to 175 square miles. They found that resident female home areas often overlapped completely and were also overlapped by resident male home areas; however, the lions avoided each other. It was concluded that the home area used by resident cougars, as well as the degree of home area overlap, was determined by a complex of vegetation, topography, prey numbers, and prey vulnerability (Siedensticker and others, 1973).

Beaver, mink, and muskrat are found in sparse numbers. No mink were reported trapped during the 1975-76 season, and data are not available on muskrat trapping. Commercial trapping of beaver is not extensive. Upland game species in the region include cottontail rabbit, mourning dove, band-tailed pigeon, sage grouse, blue grouse, ruffed grouse and turkey.

The diversity of life zones, represented by elevations from 11,615 feet in the Henry Mountains to 3,600 feet at Lake Powell, provides habitat for a variety of nongame birds. These birds have diverse habitat requirements; consequently, all of the region is used by some birds at various times of the year. A list of bird species is retained in the Task Force files.

Birds of prey (raptors), because of their size and general conspicuousness, have human interest. Raptor nesting sites have not been inventoried, however, and population trends are not known. Studies in early 1977 confirmed the presence of nesting pairs of golden eagle and red-tailed hawks, along with sightings of five other raptor species in the Warner Valley area (Wagner, 1977). Sightings of bald eagles, peregrine falcons, and spotted owls have been documented, as well as nesting sites and roosts of these species (Boner and others, 1977).

Rare or unique birds (UDWR classification) include the osprey and spotted owl. Osprey are summer residents, and migrating birds also pass through in spring and fall. An active nest is located east of Navajo Lake in Kane County. Spotted owls have been sighted in Zion and Capitol Reef National Parks during surveys in 1977. They are currently nesting in Zion National Park (Boner and others, 1977; written communication, Robert Heyder, Superintendent, Zion National Park, 1977).

Northern bald eagles (Haliaeetus leucocephalus alascanus), an endangered species, are winter visitors in the region and throughout the Glen Canyon NRA. Roost sites exist in Cedar and Parowan Valleys and at Escalante Bay on Lake Powell. An inventory of these sites in January and February 1977, recorded 64 bald eagles at eight sites (Boner and others, 1977). Bald eagles in desert areas, away from water and their usual summer diet of fish, apparently eat carrion and black-tailed jackrabbits. In Utah they may rely heavily on road- and hunter-killed jackrabbits (Platt, 1976). The bald and golden eagles are protected under the Bald Eagle Protection Act.

The American peregrine falcon (Falco peregrinus anatum) is the only other endangered bird species known in the region. Most sightings in recent years are probably migrant birds; however, at least two active eyries are present. Peregrine falcons prefer high cliffs for nesting nearby a river, lake, or marsh for hunting. The extreme eastern and western parts of the region are part of the known and suspected breeding distribution of the peregrine falcon in Utah (Porter and White, 1973).

Several species of small mammals, such as mice, rats, squirrels, shrews, moles, bats, gophers, and rabbits, are distributed throughout the region. Many of these are prey for raptors, badger, fox, coyote, bobcat, and skunk. Rabbits, bobcat, fox, and coyote are hunted or trapped for sport and pelts. The high price of bobcat pelts has led to their increased hunting and trapping and declining population. Trapping of bobcat currently is illegal in Utah.

The unique (UDWR classification) spotted bat (Euderma maculatum) has been sighted in Garfield, Kane and Washington Counties (Poche 1976; Easterla, 1965). Fort Pierce wash in southern Washington County may support the largest spotted bat population in Utah, but studies in other parts of the region failed to locate spotted bats (Boner and others, 1977).

The Utah prairie dog (Cynomys parvidens), an endangered species, is found in the region. The principal concentrations of prairie dog towns are in Parowan and Cedar valleys, the Bryce Canyon-Johns Valley area, and Sevier Valley from Panguitch to Long Valley Junction. The fall 1977 census yielded the largest count (3,429 dogs) since UDWR began such counts in 1975. This increase is attributed to the discovery of new towns and establishment of transplant sites on public lands (Boner and others, 1977). Maps indicating locations of Utah prairie-dog towns are retained in the Task Force files.

Two bands of wild horses (at least 17 animals) have been located. One band is in the Circle Cliffs area west of Capitol Reef National Park in Garfield County. The other is in the Rock Creek area of the Kaiparowits Plateau in Kane County.

A total of 36 species of reptiles and 11 species of amphibians are in the area. They feed on vegetation, insects, fish, small mammals, reptiles, and amphibians, and are, in turn, prey for predatory mammals and birds. No threatened or endangered reptiles or amphibians are known in the region.

The protected Gila monster and desert tortoise are found in the warm desert habitat of southwestern Washington County, Nevada, and Arizona. The status of these reptiles is undetermined, but population densities are low (Coombs, 1976).

7. Fisheries

Fish are in parts of the Colorado River and Great Basin drainages (fig. II-15). Fish known within the region and those immediately outside

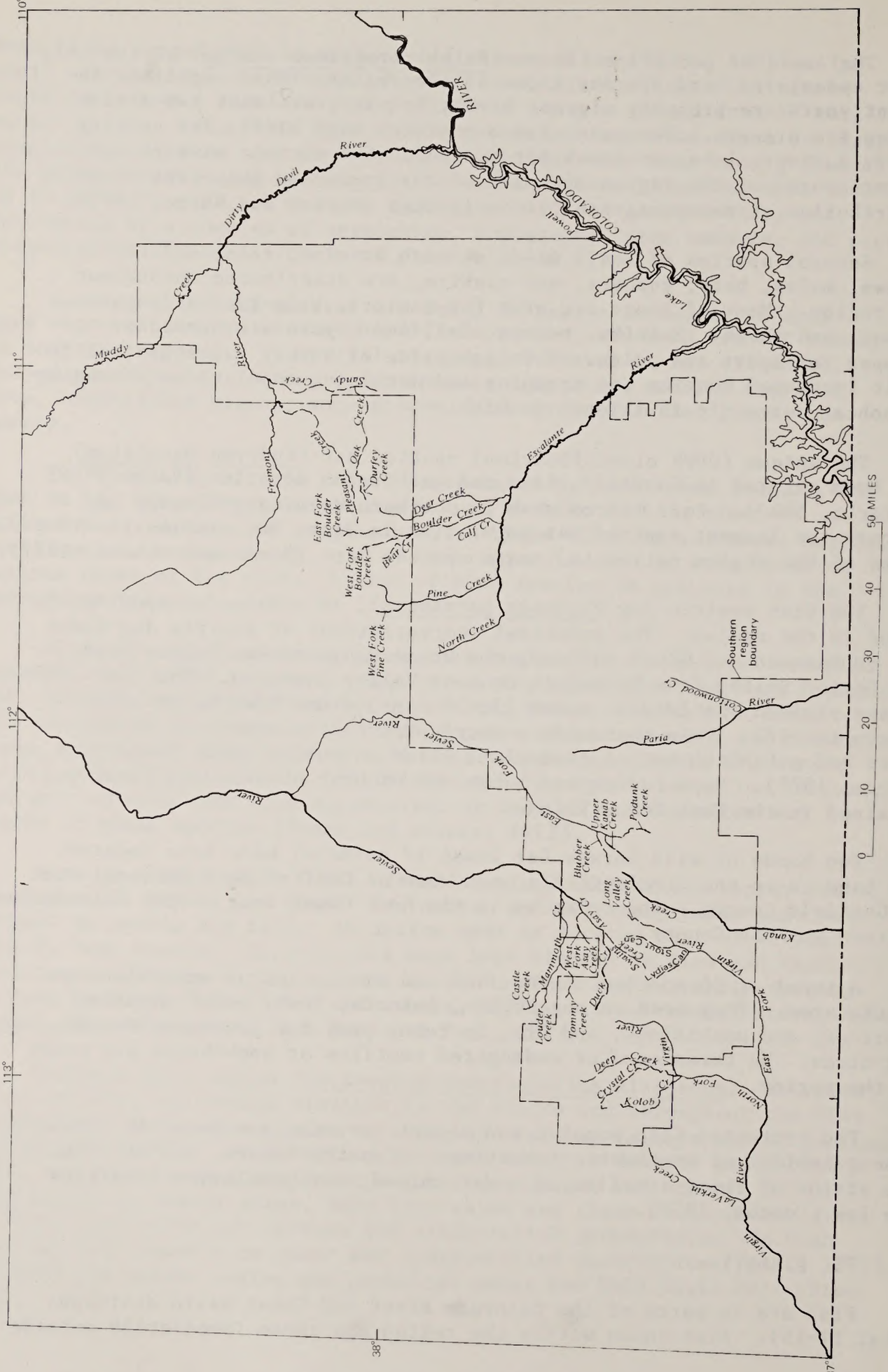


FIGURE II-15.--Waters with fishery values.

it in water originating in the region include about 40 species or subspecies (McAda and others, 1977). The better known are cutthroat, rainbow, brown, and brook trout; channel catfish; red shiner; speckled dace; flannelmouth suckers; largemouth bass; green sunfish; and the endangered woundfin. Although not now officially listed as endangered, the rare Virgin River roundtail chub and Virgin River spinedace are also present and have been proposed for endangered status. Instream flow to support fish is not recognized as a "beneficial use" of water under Utah laws. Except for interference with other rights, water may be withdrawn and used for any legally defined "beneficial use."

In general, tributaries in the headwaters of the Dirty Devil, Escalante, Paria, and Virgin Rivers and Kanab Creek are cool and clear and capable of supporting trout. As stream-flow increases downstream, irrigation withdrawals prevent stream growth; upper midsections of streams are usually dewatered. Downstream characteristics include warm temperature, high turbidity, heavy sediment load, high hardness and conductivity, fluctuating flow, many sections dewatered at times, and scarce fish.

Fish habitat in the Dirty Devil River, lower Muddy Creek, and the Fremont River is quite poor and does not support gamefish or endangered fish. These streams are broad and shallow, with few pools, and long reaches are dry during the summer. The stream bottoms are mostly shifting sand and silt throughout. Gamefish inhabit the Fremont River tributaries, Pleasant and Oak Creeks.

Fish in the Escalante River system were investigated by McAda and others in their survey of fish in the southeastern Utah streams (McAda and others 1977). It provides most of the fish data for this stream system. Although occasional trout are found in the Escalante, it is not classified as a sportfish stream by the Utah Division of Wildlife Resources. There are no reported endangered fish in the river. Seven streams tributary to the Escalante River have fish populations: Deer, Calf, Sand, Death Hollow, Pine, North, and Birch Creeks. Sections of Boulder and Pine Creeks are dewatered for irrigation, whereas sections of Sand, Lake, and Death Hollow Creeks have slickrock substrates and steep gradients, limiting their capacities to produce fish.

Lake Powell fishes are mostly warm water varieties, are fished at less than capacity and provide excellent warm water fishing. Major warm water fish include largemouth bass, black crappie, channel catfish, walleye, and threadfin shad. Some hatchery rainbows are released near the dam, and striped bass (a sea bass) have been introduced. Endangered Colorado squawfish and humpback chubs are occasionally recorded. Some gamefish contain mercury that exceeds levels considered safe for human consumption. Mean mercury level in Lake Powell water is 0.01 part per billion (ppb) but it is bio-accumulated through the food web and concentrations of more than 500 ppb were detected in some large walleye and largemouth bass (Standiford, 1973). Bussey and others (1976) found selenium in edible portions of Lake Powell fishes that exceeded the toxic safety threshold. Lake Powell has little productive littoral zone considering the size of the impoundment. Wahweap and Warm Creek bays have extensive littoral zones.

High lead content was found in the gills of three species, which is indicative of recent exposure to high lead concentrations in the water. Data showed a correlation between the lead content in the surface water and recreational use of the reservoir. Bussey and others (1976) proposed that the high levels in the gills resulted from outboard motors.

The Utah Division of Wildlife Resources does not classify the Paria River as a gamefish stream, and in McAda's survey (1977) they found only speckled dace at six sampling stations, both inside and outside the region. The Arizona Game and Fish Department attempted to establish woundfin (Plagopterus argentissimus) in the stream, but was unsuccessful (McAda and others, 1977).

Little information on fish in Kanab Creek is available; however, it is known that a 3-mile section in the headwaters supports a fishable, self-sustaining population of cutthroat trout. The size of the stream limits its sportfish value.

The Virgin River receives waters originating in the southern Utah coal region and is of critical fishery value because it supports a population of the endangered woundfin (Plagopterus argentissimus). Woundfin also are found in the lower 6 miles of La Verkin Creek, a tributary to the Virgin River. (See chapter III.) Notice of intent to declare the main channel of the Virgin River, from the crossing of U-15, near Hurricane Utah, to Lake Mead, and a part of its La Verkin Creek tributary, critical habitat for the woundfin was published in the Federal Register on November 2, 1977, vol. 42, no. 211, pages 57329-57330. The stream is also populated by the unique Virgin River roundtail chub and the Virgin River spinedace, which have been recommended for inclusion on the endangered species list. According to Cross, the Virgin River roundtail chub may be the most threatened of these three rare fish (Cross, 1975).

Low water and competition from introduced exotic fish are threats to the endangered woundfin and Virgin River roundtail chubs. Woundfin can tolerate conductivity up to 12,000 micromhos, but less than 4,000 is probably preferred. Water temperature also is important to fish. High temperature and low flows often occur together in mid-summer. The temperatures may reach 91°F in July, while the flow of the Virgin River is 50 cfs or less. Lethal temperature for woundfin is 94°F but temperature greater than 86°F for extended periods is probably unsuitable.

Gamefish and (or) endangered fish are in La Verkin Creek, North Fork of the Virgin River, and East Fork of the Virgin River. La Verkin Creek is populated by endangered woundfin, Virgin River roundtail chubs, Virgin River spinedace and other nongame fish. The North Fork of the Virgin River and its tributaries, Deep, Crystal, and Kolob Creeks, are populated with rainbow, brown, and cutthroat trout; Virgin River Spinedace; desert suckers (Pantoesteus clarki); and other fish. The North Fork system has 78 stream miles of classified sportfish waters, but most of the streams are small, and fishing is restricted. Upper Kolob Creek is a major cutthroat spawning area for Kolob Reservoir; below the reservoir it is

not recognized as a sportfish stream. The East Fork of the Virgin River and its tributary system of Long Valley and Stout (Main) Canyon Creeks contain rainbow and brown trout, Virgin River spinedace, speckled dace, and flannelmouth and desert suckers. This system has 24 stream miles of classified sportfish waters, but most of the gamefish streams are small, and fishing is restricted. The lower 17 miles of the East Fork has minnows and suckers. A 5-mile reach between the Orderville diversion and Orderville bridge is periodically dried by irrigation withdrawals.

The Sevier River is in a closed basin and once terminated in Sevier Lake northwest of Milford. Irrigation use now prevents the streamwater from reaching the lake. Available water limits fish in the Sevier drainage. Trout streams are probably fished at or above their production level now. These streams are unlikely to produce any more trout by 1990.

Garfield, Iron, Kane and Washington Counties have 60 reservoirs and (or) lakes classified as gamefish waters, excluding Lake Powell. Most are trout waters; however, several have warm water species. Only 5 of these reservoirs cover more than 200 acres and more than half of them cover less than 5 acres.

8. Invertebrates

Two snails were proposed for listing as endangered and (or) threatened: the St. George (Fontelicella deserta), and the Zion (Physa zionis). The latter snail is found only in Zion National Park and will not be impacted by coal development. A new species of Fontelicella, closely related to the St. George snail, has recently been discovered; it will probably be proposed for listing when it is described. Final ruling on these species is pending.

Aquatic mollusks in southwestern Utah, as in many western areas, have extremely small distribution. The St. George snail is known only from seven springheads and (or) upper spring runs, whereas the new snail is known only from six different, but similar, habitats. These snails are unique because they represent paleontologically old forms with specialized evolutionary features.

B. CULTURAL ENVIRONMENT

1. Lands

The region boundaries include about 4 million acres under various ownerships (table II-14; fig. II-16, in pocket). The proposed coal-mining or coal-related activities are not in conflict with applicable land-use regulations or plans except where specifically noted otherwise in this statement. No prime farmlands have been identified on areas that would be affected by the proposed mining activities, according to available soil surveys and consultation with the Soil Conservation Service (1978). Several alluvial valleys occur within the Alton mine area and some may be classified as "alluvial valley floors" as defined by OSM regulations.

Final classification will be made by the State of Utah. The State has not received data from U.I.I. necessary to make the determination, (oral communication, Utah State Division of Oil, Gas and Mining, December 13, 1978).

TABLE II-14.--Land ownership acreage for the southern Utah coal region

	Acreage	Percentage of total
Federal:		
BLM----------	2,603,520	65
USFS----------	460,800	11
NPS----------	276,480	7
Total Federal------	3,340,800	83
Total State--------	443,520	11
Total private------	253,440	6
Total in region----	4,037,760	100

Five natural areas exist on public land in the region: Escalante Canyon, North Escalante Canyon, Joshua Tree, The Gulch, Phipps Death Hollow, and Devil's Garden (fig. II-17). They will be studied for their wilderness suitability or nonsuitability by the BLM prior to 1980 as required by the Federal Land Policy Management Act (FLPMA) of 1976.

The BLM is also conducting an inventory of all public lands under its administration to determine areas suitable for additional study to assess their wilderness potential. Several areas tentatively considered roadless are between Alvey Wash and Straight Cliffs, southeast of Escalante, the Circle Cliffs northeast of Escalante, lands north of U-12 to the Dixie National Forest, and lands surrounding Devil's Garden and north to Escalante Canyon. "Roadless" refers to the absence of roads that have been improved and maintained by mechanical means to insure relatively regular and continuous use. A way maintained solely by the passage of vehicles does not constitute a road in determining roadless areas. None of these potential roadless areas have yet been formally inventoried and deemed suitable for further study prior to final classification.

The USDA Forest Service RARE II study has identified three roadless areas on the Dixie National Forest within the Southern Coal Regional Boundary namely, Ashdown Gorge (No. 4-253), Henderson Canyon area (No. 4-258), and Box Death Hollow (No. 4-259) (fig. II-17). The management direction for these areas is to maintain their roadless character until a decision is made in the study regarding their suitability for inclusion in the wilderness system.

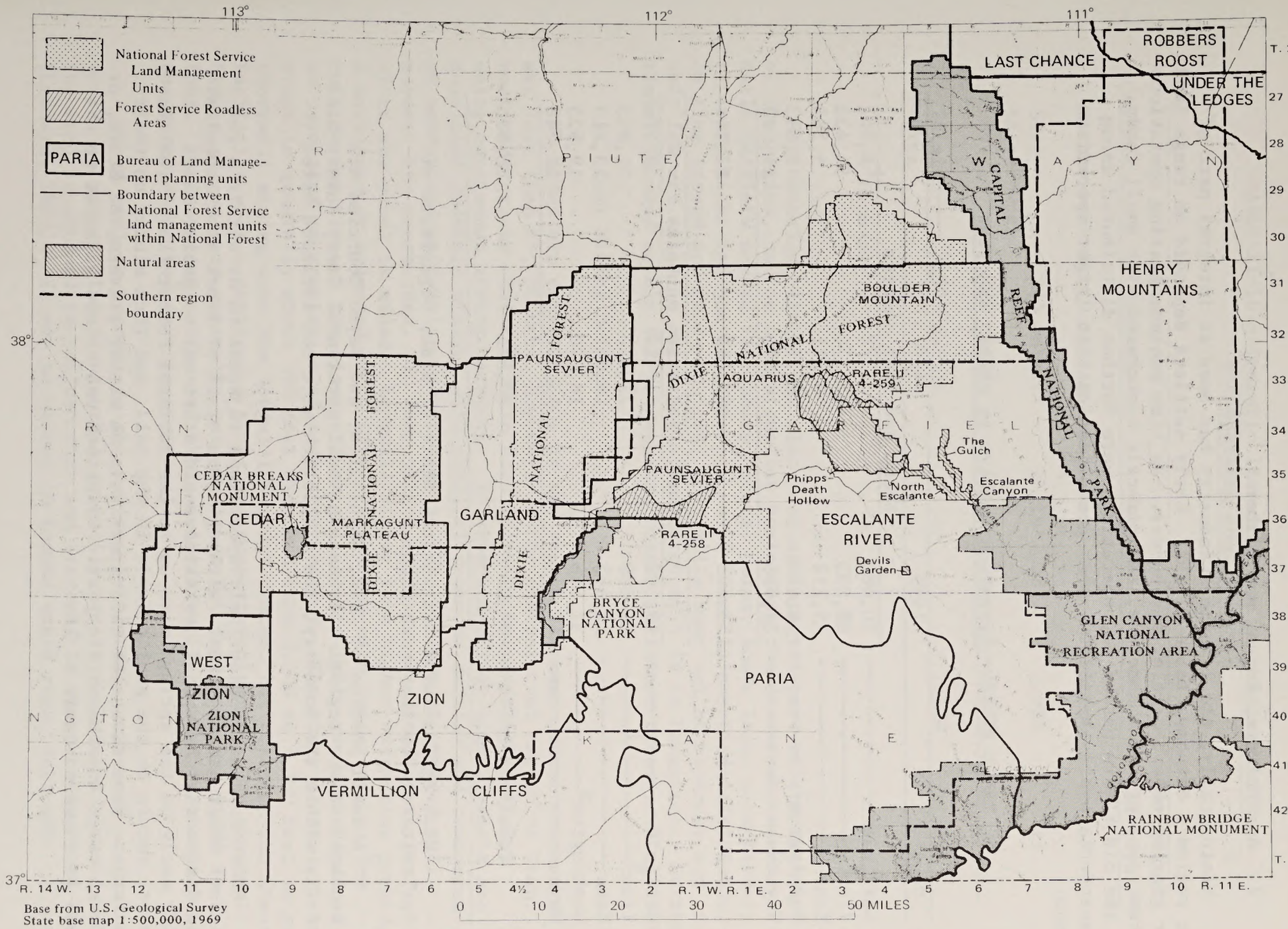


FIGURE II-17.--Planning units and USFS RARE-II areas.

2. Agriculture, Range, and Timber

Historically, the livestock industry has been an integral part of the region's economy (table II-15). Early settlers depended on range land for grazing sheep, cattle, and horses. As time passed, grazing operations became smaller, more numerous, and directly associated with small farms. As the old timers passed on, operations were further distributed among descendents until about 1960, when consolidation into larger operations began.

TABLE II-15.--Livestock numbers by county and year[1]

County	1959	1969	1974
	Sheep and lamb numbers		
Garfield----------	20,682	13,778	6,561
Iron[2]----------	88,833	62,270	54,438
Kane----------	15,212	9,611	5,583
Washington[2]----------	6,680	2,151	1,653
Wayne[2]----------	27,096	14,440	14,029
Total----------	158,503	102,250	82,264
	Cattle and calve numbers		
Garfield----------	19,600	16,619	19,286
Iron[2]----------	16,680	22,420	21,853
Kane----------	12,665	10,042	13,113
Washington[2]----------	32,558	18,670	19,925
Wayne----------	12,841	13,120	12,748
Total----------	94,344	80,871	86,925

[1]Utah Agricultural Statistics, State of Utah, Department of Agriculture, for the years shown.

[2]A small portion of Iron, Washington, and Wayne Counties are included in the region. Although a small portion of Emery County also falls within the boundary, the statistics were not included here.

Ranchers usually base their operations adjacent to or within a few miles of their grazing areas, although some trail or truck stock considerable distances. A typical operation would start out on public lands (BLM) early in the spring, move up to the National Forest (USFS) for the summer, return to the public lands in the fall, and then winter on their own lands. Some livestock will graze only on either private, or State, or Federal range for the entire year. Livestock use on and adjacent to the mines is shown on table II-16.

TABLE II-16.--Domestic livestock use on grazing units encompassing coal leases

Mine	Kinds and numbers	Season	AUM's[1]	Percentage of total
Alton-------	1,110 cattle	Summer, about 4.5 months	5,130	67
Blue--------	225 cattle	10/16-2/28	1,010	13
Kaiparowits No. 5------	220 cattle	11/01-5/31	1,550	20
Total------	1,555 cattle	--	7,690	100

[1]Glossary.

Historically, timber has also been an integral part of the economy of the region, but on a much smaller scale than the livestock industry. Early settlers needed fenceposts, corral poles, house logs, mine timber, railroad ties, and boards; numerous small sawmills supplied local needs. As time passed and needs changed, most mills went out of business and only few are still in operation. One large mill is in Panguitch. Currently, timber is used mainly for fenceposts, poles, Christmas trees, and sawtimber.

3. Coal Mining Methods

No mines are operating now in the region and past annual production was less than 55,000 tons. However, in the central coal region of Utah, most underground coal mining in Utah is by room-and-pillar methods, using continuous mining machines. In room-and-pillar mines, panels are developed (advance mining) with parallel rooms or entries and connected as needed and uniformly with crosscuts. The pillars of unmined coal support the overburden. In many places, pillars are mined on retreat, after the panel is mined. Longwall mining is a higher extraction method. A developed or selected block of coal is mined with successive narrow cuts on one site of the block and no pillars are left; caving is induced or permitted on completion of each shear or cut. The block of coal to be mined is generally about 500 feet wide and from 2,500 to 7,500 feet long. Shortwall mining uses the longwall support system, but replaces the shear facilities with a continuous miner and support equipment. The shortwall blocks of coal are generally not more than 300 feet wide and 3,000 feet long. Various combinations of these methods would be used in the proposed new mines described in this statement.

Mined coal is brought to the surface by electric conveyors or trains where, in preparation plants that generally are in the mineplant area, the coal is crushed to uniform size and screened to remove waste rock (Leonard, 1968). It may be washed to remove waste rock, dust and

dust, and sulfur, or it may be delivered after crushing, without washing. Dry waste is disposed in land-fills. Wet waste is disposed in settling ponds, and the water may be recycled.

Basic mine-support facilities include an office building, maintenance shop, bathhouse or wash room, storage yard, stockpiles, preparation plant, and fan houses. The surface area required for these various facilities depends upon the amount of coal preparation needed, size of stockpiles, and layout selected. A typical arrangement in Utah would require about 40 acres.

Although there are no strip mines in the region, a brief description of this mining method (see also Pfleider, 1968) is given because coal beds in the Alton and other coal fields can be strip mined. In areas being strip mined, vegetation and overburden are removed to the surface of the coal bed. The ratio of overburden removed to thickness of coal currently ranges from 8:1 to 12:1 in western coal fields with conditions similar to those in Utah. Unconsolidated material is generally removed by scrapers or front-end loaders and trucks. If necessary, level spots or benches are created by bulldozers to accomodate drilling equipment. The overburden, if consolidated, is broken by drilling and blasting. The broken overburden is removed by mechanical shovels, front-end loaders, or draglines. It is hauled from the pits by trucks and dumped, usually adjacent to the initial cut. Overburden from subsequent cuts is usually used to fill cuts that have been mined-out. After the overburden is removed, the coal is broken by drilling and blasting or by other mechanical means. The broken coal is removed by dragline, shovel, or backhoe and loaded into trucks for transportation to a processing plant.

4. Socioeconomics

The coal mining potential in southern Utah occurs in an economic region containing Beaver, Garfield, Iron, Kane, and Washington Counties (southwestern Multi-County District (SWMCD)). The town of Page, in Coconino County, Arizona, probably would also share impact from coal development in southern Utah. It is the largest and least densely populated region in the State. The proposed new coal mines are located in Kane and Garfield Counties. These counties are geographically isolated from the more populated Washington-Iron County area (fig. II-18) by absolute distances and by rough terrain.

The region had a 1970 population of 35,224 which occupied an area of 17,373 square miles, resulting in a population density of 2.0 persons per square mile. By contrast, the United States--including Alaska and Hawaii--had a 1970 density of 57.5 persons per square mile.

Garfield and Kane Counties are even more thinly populated than is the region as a whole. With respective land areas of 5,158 and 3,904 square miles, the two counties are larger than some states. Only 5,578 people lived there in 1970 (0.6 persons per square mile). Sixty percent of that total resided in the communities of Kanab, Kane County, and

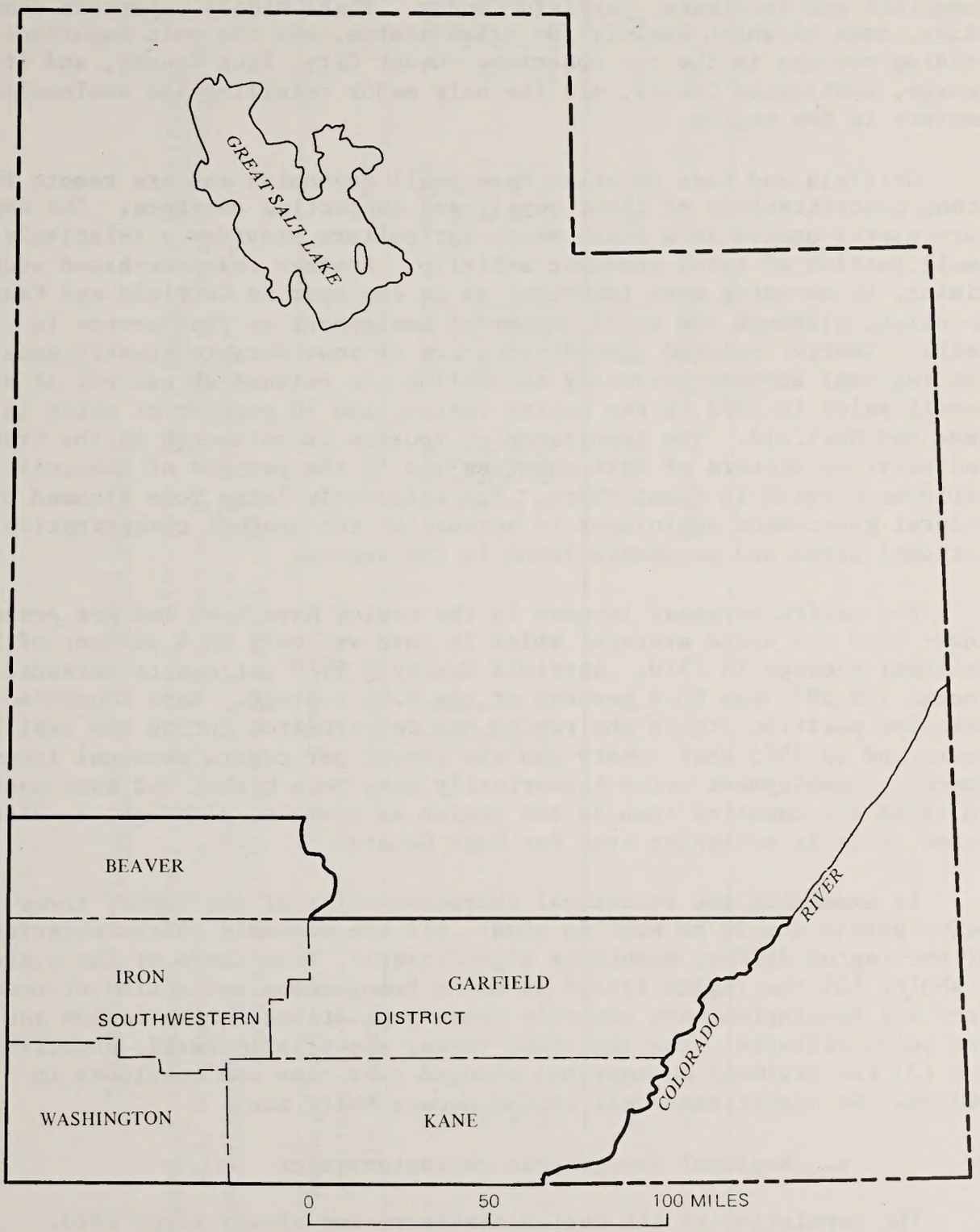


FIGURE II-18.--Southwestern planning district and counties.

Panguitch and Escalante, Garfield County. These widely separated communities, none of which qualify for urban status, are the only important trading centers in the two counties. Cedar City, Iron County, and St. George, Washington County, are the only major retailing and wholesaling centers in the region.

Garfield and Kane Counties have small economies and are remote from urban concentrations of labor supply and supporting services. The important farm sector occurs in a state where agriculture provides a relatively small portion of total economic activity. Another resource-based sector, mining, is becoming more important as an employer in Garfield and Kane Counties, although the total amount of employment in that sector is small. Tourist-related expenditures are of considerable significance to the regional economy--directly accounting for perhaps 20 percent of all retail sales in 1972 in the entire region, and 50 percent of sales in Kane and Garfield. The importance of tourism is reflected in the trade and services sectors of both counties and in the pattern of seasonal employment which is found there. The relatively large role assumed by Federal government employment is because of the unusual concentration of national parks and monuments found in the region.

Per capita personal incomes in the region have been and are presently lower than the state average, which in turn was only 81.4 percent of the national average in 1970. Garfield County's 1970 per capita personal income ($2,397) was 60.4 percent of the U.S. average. Kane County's relative position within the region has deteriorated during the last 25 years and in 1975 that county had the lowest per capita personal income there. Unemployment rates historically have been higher and more unstable in these two counties than in the region as a whole, although, as discussed below, this is no longer true for Kane County.

In examining the structural characteristics of the SWMCD, three major points should be kept in mind: (1) the economic characteristics of the region differ, sometimes significantly, from those of the state as a whole; (2) the region itself is not a homogeneous collection of counties. Iron and Washington have the only urban populations in the region and are quite different from the other three, essentially rural, counties; and (3) the regional economy has changed over time and continues to evolve. No significant coal mining occurs there now.

a. Regional demographic characteristics

The population of the region has increased slowly since 1950. Since 1970, fairly rapid growth has occurred in three of the counties and small but positive rates of growth have occurred in Beaver and Garfield Counties (table II-17).

The components of population change illustrate the close relation between the regional or local economy and changes in population (table II-18). Net migration, which is related to local economic conditions, is an important determinant of the net change in population. Though the

TABLE II-17.--Population of the SWMCD by county

[Sources: U.S. Bureau of the Census, Census of Population, 1950-1970, Utah: Number of Inhabitants (Washington, D.C.: U.S. Government Printing Office). U.S. Bureau of the Census, Current Population Reports, Population Estimates and Projections, series p-25, no. 692 (Washington, D.C.: U.S. Government Printing Office, April, 1977)]

County	Annual Growth rate of population, 1950-70 (in percent)	Annual growth rate of population, 1970-75 (in percent)	1950	1960	1970	1975
Beaver	-1.2	+1.3	4,856	4,331	3,800	4,086
Garfield	-1.4	+0.8	4,151	3,577	3,157	3,300
Iron	+1.2	+3.4	9,642	10,795	12,177	14,609
Kane	+0.3	+6.3	2,299	2,667	2,421	3,384
Washington	+1.7	+5.3	9,836	10,271	13,669	18,127
SWMCD total	+0.7	+3.9	30,784	31,641	35,224	43,506
Utah	+2.2	+2.4	688,862	890,627	1,059,273	1,207,000

TABLE II-18.--The components of population change: natural increase vs. net migration

[(Sources: U.S. Bureau of Census, Current Population Reports, Series P-23, No. 7; and Series P-25, No. 461 (Washington, D.C.: U.S. Government Printing Office)]

	Components of change 1950-60				Components of change 1960-70			
	Net change	Natural increase	Net migration	Percentage change	Net change	Natural increase	Net migration	Percentage change
SWMCO---------	857	7,088	-6,231	2.8	3,583	4,717	-1,134	11.3
Beaver--------	-524	955	-1,480	-10.8	-531	406	-937	-12.7
Garfield------	-574	766	-1,340	-13.8	-420	375	-795	-11.7
Iron----------	1,153	2,544	-1,391	12.0	1,382	1,766	-384	12.8
Kane----------	368	601	-233	16.0	-246	448	-694	9.2
Washington----	453	2,222	-1,787	4.4	3,398	1,722	1,676	33.1

region experienced a large natural increase in population between 1950 and 1960, sizeable out-migration occurred and the net result was a very small increase in total population. During the next 10 years, net outmigration declined in importance as a component of population change, except in Kane County, which experienced an increase in net out-migration. Thus, the slow population growth seen in the region during the 1950-70 period was a consequence of net out-migration. Net in-migration did occur in Washington County during the 1960-70 period, but that was due in large part to a movement of retired persons into the county.

Although the region's population was younger than the rest of the State in 1950, the 20-year period of slow population growth significantly changed the age composition of the population. In 1970, about 10.2 percent of the population was 65 years of age and over. The corresponding State figure was 8.6 percent. Decreases in the percent of the population 20-44 years of age (an important component of regional labor supply) also occurred. For the State, 31.6 percent of the population was in this age group; for the region, 27.1 percent. Garfield and Kane Counties have still lower percentages of the population who are 20-44 years of age (table II-19).

TABLE II-19.--Population of the United States, Utah and the southwestern counties by age distribution and percentage breakdown, 1970

[Sources: U.S. Bureau of the Census, Census of Population: 1960-1970, Utah: General Population Characteristics; and U.S. Summary: General Population Characteristics (Washington, D.C.: U.S. Government Printing Office)]

	Under 5	5-14	15-19	20-24	25-44	45-64	65-older	Total
Southwestern	3,482	7,664	4,497	2,833	6,738	6,408	3,602	35,224
	9.9	21.8	12.8	8.0	19.1	18.2	10.2	100.0
Beaver-----	319	820	400	196	731	894	440	3,800
	8.4	21.6	10.5	5.2	19.2	23.5	11.6	100.0
Garfield---	258	780	355	139	631	685	309	3,157
	8.2	24.7	11.2	4.4	20.0	21.7	9.8	100.0
Iron-------	1,273	2,441	1,661	1,433	2,446	1,994	929	12,177
	10.5	20.0	13.6	11.8	20.1	16.3	7.7	100.0
Kane-------	244	569	233	98	498	538	241	2,421
	10.1	23.5	9.6	4.0	20.6	22.2	10.0	100.0
Washington-	1,388	3,054	1,848	967	2,432	2,297	1,683	13,669
	10.2	22.4	13.5	7.1	17.8	16.7	12.3	100.0
Utah--------	111,798	240,751	116,607	97,859	237,509	177,188	77,561	1,509,273
	10.6	22.8	11.0	9.2	22.4	16.8	7.3	100.0
United States-----	8.4	20.0	9.4	8.1	23.6	20.6	9.9	100.0

Growth in the region's nine major communities (table II-20) has been substantially the same as that for the counties in which they are

found, and in most instances community population growth was the major factor affecting county growth rates. The rapid growth of the only urban areas in the region, Cedar City and St. George, has determined the urban/rural population mix of the entire region.

TABLE II-20.--Total population selected communities in the southwestern counties

[Sources: U.S. Bureau of the Census, Census of Population, 1950-70, Utah: Number of Inhabitants (Washington, D.C.: U.S. Government Printing Office); U.S. Bureau of the Census, Current Population Reports, Population Estimates and Projections, series P-25, no. 692 (Washington, D.C.: U.S. Government Printing Office, April, 1977]

Community	1950	1960	1970	1975
Beaver	1,685	1,548	1,453	1,750
Cedar City	6,106	7,543	8,946	10,349
Escalante	773	702	638	652
Hurricane	1,271	1,251	1,408	1,725
Kanab	1,287	1,645	1,381	2,088
Milford	1,673	1,471	1,304	1,283
Panguitch	1,501	1,435	1,318	1,314
Parowan	1,455	1,486	1,423	1,764
St. George	4,562	5,130	7,097	8,760

b. Regional economic characteristics

Examination of an area's economic base (those industrial sectors which produce goods and services for markets located outside the area being studied) is essential in order to determine probable future conditions in the economy and, from this, to estimate future characteristics of the area's population. Basic industrial sectors are a determining force within the local economy. Circumstances of sector growth or decline can be illustrated by the use of county employment and income data.

1) Employment

Sectors which generate most regional employment are government, trade, agriculture, services, manufacturing, transportation, communication, and public utilities. The importance of each sector in each county varies considerably, as shown in table II-21.

The regional economy differs significantly from that of Utah and the nation. The farm sector, for example, employs 2.5 times more workers in the region than is the case nationally (though the State's farm sector is less important to its economy than the farm sector is nationally).

The government sector is a relatively more important employer in the region than it is in the nation, though large State and local government employment is the main reason for this. Manufacturing is, relatively, a very small employer in the region, as are such sectors as services, finance, insurance, and real estate. For reasons of efficiency these sectors tend to be concentrated in higher order urban and regional centers.

TABLE II-21.--Percentage of 1975 employment in four largest employment sectors in the southwestern counties[1]

[Source: U.S. Department of Commerce, Bureau of Economic Analysis tapes]

Sector	Beaver	Garfield	Iron	Kane	Washington	SWMCD
Government	18.8	25.6	25.5	27.6	22.5	23.9
Farm	17.3	16.7	9.9	15.2	8.4	11.2
Trade	17.4	--	23.0	21.0	26.7	22.2
Services	--	14.1	--	11.9	11.5	--
Manufacturing	--	14.7	5.9	--	--	--
Transportation, communication, public utilities	9.9	--	--	--	--	--

[1]Some information has been suppressed to preserve confidentiality.

Table II-22 shows the composition of employment by sector. A comparison through time (1950-75) will indicate the changing relative importance to the regional economy of each sector. Table II-23 contains employment information for Garfield County, and table II-24 the same for Kane County. What should be noticed is the extremely small size of the employment sectors in the two counties.

In Garfield, government employment increased from 1950 to 1967, but has been constant since. Farm employment has decreased by 45 percent during the period, trade has been constant throughout the period, and manufacturing and services have grown.

Farm employment has declined in Kane County also (a 24 percent decrease). Service employment has declined and trade has been quite constant. Government is the only sector to sustain positive growth during the 25-year period, principally due to growth in State and local government employment. (The Federal employment component of the government sector is relatively more important in Garfield than in Kane.)

2) Sources of income

The pattern of employment and the sources of personal income in an economy are closely related. Income derives not only from employment

TABLE II-22.--Employment by type and broad industrial sector in the southwestern counties

[Sources: 1950 and 1960 data were obtained from Census of the Population, Vol. 2: Characteristics of the Population, Utah. The census data were aggregated according to the 1967 Standard Industrial Classification Manual (Washington, D.C.: Office of Statistical Standards). 1970 and 1975 data were aggregated on the basis of county data from the Bureau of Economic Analysis tapes]

Employment categories	1950		1960		1970		1975	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Non-farm:								
Private:								
Manufacturing--	376	4.0	637	6.2	D[1]	---	D	---
Mining---------	465	4.9	643	6.2	D	---	D	---
Construction---	724	7.7	832	8.0	561	4.2	688	4.3
Transportation, communications and public utilities-----	891	9.4	833	8.1	D	---	D	---
Trade----------	1,512	16.0	2,220	21.5	2,560	19.0	3,534	22.2
Finance--------	116	1.2	158	1.5	D	---	444	2.8
Services-------	1,185	12.5	1,700	16.4	1,516	11.3	D	---
Other----------	221	2.3	176	1.7	D	---	52	0.3
Subtotal---	5,490	58.0	7,199	69.6	8,366	62.1	10,323	64.8
Government-------	1,064	11.2	1,302	12.6	3,276	24.3	3,811	23.9
Total non-farm--	6,554	69.3	8,501	82.2	11,642	86.4	14,134	88.8
Farm----------	2,907	30.7	1,839	17.8	1,831	13.6	1,791	11.2
Total employment	9,461	100.0	10,340	100.0	13,473	100.0	15,925	100.0

[1]D, suppressed to prevent disclosure of confidential data.

TABLE II-23.--Employment by type and broad industrial sector in Garfield County, 1950-75

[Source: Bureau of Economic Analysis tapes]

	1950	1960	1970	1975
Total employment	1137	1185	1496	1579
Total farm	476	242	274	264
Total non-farm	661	943	1222	1315
Number of proprietors	---	---	390	384
Farm	---	---	222	204
Non-farm	---	---	168	180
Wage and salary	---	---	1106	1195
Farm	---	---	52	60
Non-farm	---	---	1054	1135
Government	126	202	389	405
Total Federal	---	---	108	122
Federal civilian	---	---	108	122
Military	---	---	---	---
State and local	---	---	281	283
Private non-farm	535	741	665	730
Manufacturing	60	182	D[3]	232
Mining	8	61	D	39
Construction	105	102	36	24
TCU[1]	48	17	D	49
Trade	146	212	130	150
FIRE[2]	4	12	D	14
Services	126	144	223	222
Other	38	11	D	---

[1]Transportation, communications, and utilities.
[2]Finance, insurance, and real estate.
[3]D, suppressed to prevent disclosure of confidential data.

TABLE II-24.--Employment by type and broad industrial sector in Kane County, 1950-75

[Source: Bureau of Economic Analysis tapes]

	1950	1960	1970	1975
Total employment	696	848	1,000	1,159
Total farm	232	129	183	176
Total non-farm	464	719	817	983
Number of proprietors	---	---	285	284
Farm	---	---	148	136
Non-farm	---	---	137	148
Wage and salary	---	---	715	875
Farm	---	---	35	40
Non-farm	---	---	680	835
Government	78	111	240	320
Total Federal	---	---	42	44
Federal civilian	---	---	42	44
Military	---	---	---	---
State and local	---	---	198	276
Private non-farm	386	608	440	515
Manufacturing	57	128	D[3]	D
Mining	2	0	D	D
Construction	80	99	17	23
TCU[1]	34	9	D	D
Trade	95	197	180	243
FIRE[2]	0	12	11	31
Services	101	155	148	138
Other	17	8	D	---

[1]Transportation, communications, and utilities.
[2]Finance, insurance, and real estate.
[3]D, suppressed to prevent disclosure of confidential data.

(wage and salary income) but also from transfer payments and property incomes (dividends, rents, and interest payments). Thus, employment and income should be viewed separately to gain a complete picture of the regional economy. Table II-25 shows sources of personal income. Note that considerable variation exists. Net earnings are a less important component of personal income regionally than nationally, meaning the region is typical of areas having below average income levels. It is consistent with other regional ecomonic characteristics that property income and transfer payments are larger shares of personal income in the region than in the State or nation. This income pattern derives in part from a high ratio of nonworking to working residents, a larger than typical portion of the population either young or old, an occupational mix offering few high-paying jobs, and a high unemployment rate. Many people, however, live in the region by choice and willingly accept a lower income and perhaps unemployment.

Table II-26 traces the growth path of total personal income in the region by county. Table II-27 converts this information to a per capita basis and allows a ready comparison with the State. The region's most populous counties, Washington and Iron, account for the bulk of its total personal income. The small size of Garfield and Kane are apparent in table II-26. Since 1950, per capita personal income in the counties has been below that of the State.

The percentage breakdown in table II-28 allows a comparison of sources of earnings between Utah, the region, and the U.S., in 1975. The percentage of earnings generated in the farming sector is Utah (2.1 percent) is considerably lower than in the nation (3.0 percent). In 1975 Beaver County was the most farm-oriented county in the region (20.8 percent). The large amount of earnings that are generated in the manufacturing sector in Garfield County is unusual among the region's counties. Table II-28 also suggests that the region is particularly reliant on tourism which generates a relatively large percentage of activity in the trade sector; and on State and local government, which though not a large sector in absolute terms is large in relation to the region's generally depressed economy.

In summary, the regional economy is significantly different from that of the State and the nation. Substantial diversity exists among the five counties themselves. The farm sector is very important in this region. Its contribution has been relatively greater than the national average in each county during the 1970s. Although the farm sector is the second and third largest employment sector in Garfield and Kane Counties, in 1975 its contribution to total personal income was negligible. The trade and government sectors, on the other hand, contribute more to total personal income than they do to total employment in Garfield and Kane Counties. Services also account for a greater share of total personal income than of total employment in Kane County, but that is not the case in Garfield County.

TABLE II-25.--Personal income in southwestern counties by source

[Sources: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System file. For the 1975 U.S. figure, see U.S. Department of Commerce, "Personal income by major sources, 1973-76," Survey of current business, vol. 57, no. 8 (August 1977). Top entry is in dollars, bottom entry is in percent of total, 1975]

	U.S.	Utah	Beaver	Garfield	Iron	Kane	Washington
Net earnings[1]--	$899,350,000	$4,377,856	$11,775	$7,890	$43,625	$7,739	$38,299
	72.1	73.5	64.7	64.2	71.1	66.2	57.8
Property income--------	$170,318,000	$ 860,616	$ 2,877	$2,037	$10,004	$2,041	$15,381
	13.7	14.5	15.8	16.6	16.3	17.4	23.3
Transfer payments------	$176,833,000	$ 715,909	$ 3,545	$2,534	$ 7,730	$1,918	$12,529
	14.2	12.0	19.5	19.2	12.6	16.4	18.9
Total personal income------	$1,246,501,000	$5,954,381	$18,197	$12,281	$61,359	$11,698	$66,139
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1]Labor and proprietors' income less personal contributions for social insurance by place of residence.

TABLE II-26.--Total personal income in southwestern counties residence adjusted (thousands of dollars)

[Source: 1970-75, U.S. Department of Commerce, Bureau of Economic Analysis, Local Area Personal Income 1970-1975, vol. 8; 1950, 1959, 1965; Bureau of Economic Analysis Tapes]

	1950	1959	1965	1970	1971	1972	1973	1974	1975
Utah---------	$911,500	$1,675,400	$2,368,800	$3,439,462	$3,760,483	$4,216,337	$4,814,051	$5,349,770	$5,954,381
Southwestern counties:									
Beaver-----	5,900	6,000	8,300	10,384	11,821	13,067	15,669	17,409	18,197
Garfield---	3,800	5,400	5,900	7,551	8,664	9,585	10,685	11,156	12,281
Iron-------	10,300	18,600	25,100	33,599	38,567	43,023	49,824	55,155	61,359
Kane-------	2,400	4,600	4,600	6,478	7,611	9,268	10,363	10,828	11,698
Washington-	8,300	15,500	21,500	34,911	38,203	44,400	53,843	58,667	66,139

TABLE II-27.--Per capita income in southwestern counties residence adjusted

[Source: 1970-75, U.S. Department of Commerce, Bureau of Economic Analysis, Local Area personal Income 1970-1975, v. 8; 1950, 1959, 1965, BEA Tapes]

	1950	1959	1965	1970	1971	1972	1973	1974	1975
Utah	$1,310	$1,926	$2,390	$3,227	$3,437	$3,740	$4,185	$4,539	$4,938
Southwestern counties:									
Beaver	1,206	1,424	2,021	2,697	3,112	3,351	3,913	4,347	4,459
Garfield	918	1,533	1,746	2,397	2,709	2,995	3,386	3,616	3,785
Iron	1,054	1,764	2,348	2,732	2,991	3,235	3,632	3,895	4,134
Kane	1,023	1,782	1,760	2,644	3,046	3,196	3,325	3,294	3,527
Washington	834	1,544	2,030	2,512	2,565	2,902	3,366	3,330	3,663

TABLE II-28.--Earnings by industrial source as a percentage of total earnings in southwestern counties, 1975

[Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System File. 1975 U.S. Figures: U.S. Department of Commerce, "Personal Income by Major Sources, 1973-76", vol. 57, no. 8 (August 1977)]

Source/type earnings[1]	U.S.	Utah	Beaver	Garfield	Iron	Kane	Washington
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Farm	3.0	2.1	20.8	-1.2	9.7	0.9	6.9
Manufacturing	25.2	16.9	4.0	21.2	6.3	(4)	7.9
Mining	1.4	4.5	3.2	6.9	(4)	(4)	-0.1
Construction	5.8	7.1	4.1	4.0	6.1	6.0	9.2
Trade	17.0	17.8	14.5	11.8	19.9	25.7	27.4
FIRE[2]	5.2	4.4	3.3	1.0	3.2	3.5	3.3
TCU[3]	7.4	8.4	21.2	6.8	6.5	(4)	4.4
Services	16.4	14.0	7.4	11.4	(4)	17.3	14.0
Federal government, civilian	4.4	11.1	4.2	13.5	6.9	10.2	5.0
Military	1.9	1.5	0.6	0.7	1.3	1.1	2.1
State and local government	11.9	11.9	15.8	23.0	19.5	25.1	18.3
Other	0.4	0.3	0.7	1.0	0.5	0.0	1.6

[1]Labor and proprietor's income by place of work. Detail may not add to total due to rounding.

[2]Finance, insurance and real estate.

[3]Transportation, communications and public utilities.

[4]Not shown to avoid disclosure of individual company information.

3) Unemployment and poverty levels

Where unemployment rates are high and a relatively large proportion of economic activity results from tourism and recreation, one expects to find evidence of seasonal employment patterns. Such patterns are encountered in the southwestern counties. The two least populated counties in the region--Garfield and Kane--have had the highest rates of unemployment historically, although the picture has improved markedly in Kane County since 1970 (table II-29). It is significant that this reduction in Kane County occurred at a time when population increased by almost 1,000 persons. Garfield and Kane have had wide variations in unemployment rates. Rural areas having limited economies are frequently susceptible to undesirable fluctuations in economic activity. Lack of diversity in the employment base helps explain this.

Data indicating poverty conditions in the region is shown for 1970 on table II-30.

c. Community trading relationships

A community's population is only partially suggestive of its relative economic importance. Communities can be ranked on the basis of the economic functions present in each. Such a ranking is given for the region's communities in table II-31. Residents of smaller (lower ranked) communities spend portions of their incomes in higher ranked communities. As all communities in the region are relatively small, even the largest of them cannot provide the full range of goods and services residents may demand, so in varying proportions all are dependent on the State's largest cities.

Even though the region is far from the concentration of population and economic activity on the Wasatch Front, it is considered to be in the Salt Lake City trading area. Although Las Vegas undoubtedly attracts some of the region's purchasing power as well, no data exist to show the size of the flows to these two retailing centers.

Cedar City is a regional center attracting an estimated $16 million in retail sales and services in 1972 from surrounding communities that lie within its trading area. St. George, though of less importance in this sense than Cedar City, attracted about $12.5 million in retail sales and services in that same year. Table II-31 lists service center classifications, current population, current per capita retail sales, and money income per capita for selected communities within the region.

Some communities, notably Panguitch and Escalante, have a retailing importance which is more than would be predicted on the basis of their populations alone. Washington and Parowan, on the other hand, because of their proximity to the large retailing centers, exhibit a retailing dependence upon their larger neighbors.

TABLE II-29.--Unemployment rates in the southwestern counties 1950-76 (by percent)

[Source: For county information for 1950-73 see Utah Labor Market Information, Utah Department of Employment Security, Employment Newsletter, March 1977; for 1974-76 see Utah Industrial Development Information System, Utah, County Economic Facts 1975, 1976, 1977 editions. For state information see Utah Department of Employment Security Annual Report, 1974 and Annual Report, 1977. For U.S. unemployment rates see U.S. Department of Labor, Report on Employment and Training Requirements, Resources, and Utilization, 1977]

Year	U.S.	Utah	Beaver	Garfield	Iron	Kane	Washington	Year	U.S.	Utah	Beaver	Garfield	Iron	Kane	Washington
1950	5.3	5.5	8.6	20.1	5.9	17.1	8.6	1964	5.2	6.0	9.3	13.3	5.7	10.9	6.1
1951	3.3	3.3	5.6	17.6	3.4	13.5	4.7	1965	4.5	6.1	6.9	10.8	3.6	7.5	4.1
1952	3.0	3.2	8.9	15.9	4.2	18.3	5.9	1966	3.8	4.9	6.6	14.2	4.2	10.4	4.9
1953	2.9	3.3	9.4	17.7	3.7	14.4	5.4	1967	3.8	5.2	4.9	14.4	4.6	13.7	5.9
1954	5.5	5.2	9.4	14.1	6.0	12.8	5.2	1968	3.6	5.4	4.1	17.2	4.7	14.4	5.6
1955	4.4	4.1	6.8	15.1	4.8	11.7	5.9	1969	3.5	5.2	5.4	16.5	4.1	13.6	5.4
1956	4.1	3.4	9.2	14.7	4.0	11.3	5.6	1970	4.9	6.1	5.5	21.3	4.6	15.3	5.5
1957	4.3	3.7	8.5	14.7	4.1	7.9	5.7	1971	5.9	6.6	6.4	22.9	4.1	12.8	5.8
1958	6.8	5.3	10.1	13.5	4.6	8.2	4.7	1972	5.6	6.2	6.1	19.3	5.7	11.6	5.5
1959	5.5	4.6	8.5	12.7	4.8	7.3	6.1	1973	4.9	5.8	6.0	14.6	5.6	7.3	4.9
1960	5.6	4.8	8.3	14.6	4.3	6.0	6.1	1974	5.6	6.1	6.4	15.4	5.6	7.1	5.0
1961	6.7	5.3	9.4	15.1	5.1	6.4	5.4	1975	8.5	7.4	8.5	15.0	6.9	7.8	7.7
1962	5.5	4.9	8.3	13.8	3.6	6.4	5.4	1976	7.7	5.2	6.1	12.3	6.6	6.0	5.6
1963	5.7	5.4	7.5	13.4	4.2	6.5	5.4								

TABLE II-30.--Incomes less than poverty level, southwestern counties, 1970

[Source: 1970 Census: Utah Detail Chart]

	Beaver	Garfield	Iron	Kane	Washington
Families	202	101	288	46	488
Percent of all families	19.4	12.3	9.9	7.5	15.2
Mean family income	$1,648	$2,244	$1,942	$3,243	$1,875
Percent receiving public assistance	11.4	22.8	13.2	17.4	10.2
Unrelated individuals	128	69	504	73	496
Percent of all unrelated individuals	55.4	52.7	58.1	67.6	61.5
Mean income	$854	$869	$978	$884	$814
Percent receiving public assistance	6.3	13.0	6.2	6.8	10.3
Persons	718	507	1,537	299	2,488
Percent of all persons	19.0	16.1	13.1	12.4	18.8
Percent receiving Social Security	32.2	13.0	17.8	30.8	20.4
Percent 65 years and over	32.0	14.0	16.7	32.4	19.6
Percent receiving Social Security	83.0	77.5	84.8	88.7	78.0

TABLE II-31.--Service center classifications, current population per capita retail sales, and money income per capita for selected communities

[Source: Supplementary material on community hierarchies available in an unpublished report prepared for the Utah State Planning Coordinator's Office by the Bureau of Economic and Business Research, University of Utah]

Community	Service center ranking[1]	1975 population	1975 per capita retail sales	1974 Money income per capita
Cedar City--	Regional	10,349	$4,794	$3,553
St. George--	Community	8,760	5,580	3,745
Kanab-------	Full	2,088	2,643	4,140
Parowan-----	Partial	1,764	1,002	3,124
Beaver------	Full	1,750	2,757	2,823
Hurricane---	Full	1,725	2,826	3,016
Panguitch---	Full	1,314	3,785	4,529
Milford-----	Full	1,283	1,616	4,863
Washington--	Hamlet	1,245	787	2,451
Escalante---	Partial	652	1,687	4,113

[1]Service Centers were defined (see below) on the basis of economic functions available, as of 1975, in each community. Each higher order service center must meet all of the criteria of service centers ranked below it.

Hamlet--Both a population of 50 and a post office are required.

Partial Convenience Center--Two of three required: bank, high school, or mortuary.

Full Convenience Center--Three of four required: daily or weekly newspaper, medical doctor, new car dealer, or public library.

Community Service Center--Retail sales of at least $16 million plus two of three required: hospital, radio station, or airport with hard surface.

Regional Service Center--Retail sales of at least $40 million plus two of three required: public higher education, daily newspaper, or scheduled air passenger service.

Metropolitan Service Center--Retail sales of at least $160 million.

National Service Center--Retail sales of at least $1.6 billion.

d. Municipal services

Kane and Garfield Counties are of principal concern within the region. They contain small rural communities having limited abilities to provide municipal services. Existing services and facilities provided in Garfield and Kane Counties have been viewed in terms of the current level of services provided, the adequacy of services in meeting community needs, and the current ability to serve more people. It is difficult to judge how well community needs are fulfilled currently, since services provided reflect the particular preferences of a community and cannot be compared to any well-established and accepted standards. In many cases the "output" of a service is not directly measurable, as for example, police protection. In such cases the judgments of local community officials as to adequacy of service delivery are relied upon.

Generally the level of services provided by the communities of principal concern are similar because all are small in size and have limited financial resources. Seven of the 12 towns have a population of less than 200, and two of the others less than 500. Residents in communities with population less than 500 relate to their community in quite different ways than do residents of large urban areas. In the small communities much work is done for the community on a volunteer basis, and governmental functions are often handled by locally elected people who receive little or no financial compensation. As the town grows and the business of operating it becomes more complex and time consuming, this arrangement may not be adequate. The ability to provide services to a large number of additional people does not exist within this type of organization. These small communities more closely resemble neighborhoods than cities. The capital investment in facilities such as water and sewage disposal systems has generally been limited to that which would be necessary to serve relatively stable population.

The following categories, Police and Fire Protection, Libraries and Parks, Streets and Roads, and Waste Disposal and Water Supply, summarize the existing level of services provided by the communities.

1) Police and fire protection

The level of fire protection services provided by the communities varies widely. Several of the communities have neither organized fire department nor equipment. These towns are dependent on volunteers and use equipment from other towns or the Forest Service. In the larger communities active volunteer fire departments serve the town needs. However, adequate equipment is still a problem because of the equipment costs.

The level of police services a community accepts is dependent on the types and magnitude of its problems. Most of the communities rely on the county sheriff's office or have part-time town marshalls. This level of service is usually adequate for meeting the needs of small, remote communities.

2) Libraries and parks

Library services are provided to residents by the State bookmobile system in all the communities. The population required to adequately support a library far exceeds the size of most of them. Exceptions are Kanab and Panguitch, each having a town library.

Only limited park development exists in most of the communities (again, Panguitch and Kanab are exceptions), although several communities are in the process of improving park facilities. For the small communities, maintenance costs are offset by volunteer help.

3) Streets and roads

Street maintenance is very limited in most of the towns. The smaller communities generally do not own any equipment, and often rent it from the county. In Alton, street maintenance is done on a volunteer basis. Panguitch and Kanab own their own equipment, however.

4) Waste disposal and water supply

Solid waste disposal is handled by the county in Garfield, except for the towns of Antimony, Boulder and Escalante. In Kane County, each community has access to a dump. None meets the State Division of Health standards. A community-wide system in Kane County has been discussed, but no specific plans have been made.

In all the towns except Tropic and Kanab, septic tanks are used for sewage disposal. In Garfield County, septic tanks provide an acceptable method of wastewater disposal. In Kane County, however, soil conditions are such that the communities are having problems with the use of septic tanks. Improvements planned by the Long Valley Sewer Improvement District should soon solve problems for Glendale, Orderville and Mount Carmel. Kanab is presently planning a lagoon system.

Based on an assessment of water supply, storage capacities, and distribution systems, Alton and Kanab are the only communities having less than adequate culinary water systems. Both, however, plan to upgrade their systems in 1978. All of the other communities have excess capacity.

e. County services

Counties provide a number of services. Both Kane and Garfield Counties maintain administrative offices in the County Court House and facilities are adequate for current demands. Both counties have a sheriff's department which provides police services to communities as well as to the unincorporated areas. Both sheriffs' departments have an adequate staff and necessary equipment, including jail facilities. In Garfield County, it is proposed to expand the jailing facility. If approved, construction would begin in 1978. The counties have responsibility for maintenance of all county roads and are adequately fulfilling that responsibility. Solid waste disposal is the responsibility of the county in

the rural areas. The State Division of Health has specific standards for required landfill operations. In order to make such an operation economically feasible, county-wide coverage is usually required. Garfield County has such a system, serving all but three towns. Kane County has plans for such an operation but has had problems in securing an acceptable site. Kane and Garfield operate county hospitals in Kanab and Panguitch. The hospitals and the physicians associated with them are the primary source of health care services. Both hospitals provide long-term care as well as acute care facilities. Glendale is regularly served by one of the physicians from Kanab through a program that sets up a temporary office of the physician.

f. Financing

The financing of services provided by the communities and by the counties are usually covered by funds from taxes, State and Federal fund transfers, and fees and fines collected. Because daily operation and maintenance costs are covered by these sources, the level of services provided is limited by the availability of such funds. Generally the most important source of funds is property tax revenues. For large capital investment improvements the communities must turn to State and Federal grants and to borrowing through the issuance of bonds. The ability of a community to issue general obligation bonds is limited to a percentage of its total assessed valuation. The importance of the financial structure of the local levels of government will be more fully discussed in chapter IV.

g. Education

Four schools, Valley Elementary, Valley High, Kanab Elementary, and Kanab High are located in the Kane County School District. The total enrollment in these four schools was 859 at the close of the 1975-76 school year. The district staff consisted of 1 superintendent, 1 clerk, 1 secondary counselor, 1 full-time secondary principal, 3 teaching principals, 35 teachers (full-time equivalent, FTE), 5 secretaries, 5 custodians, and 6 1/2 school lunch workers (FTE).

All schools are relatively new with the exception of parts of the two high schools, which have some older sections that have been remodeled. The Superintendent reports that the Kanab schools are being utilized almost to capacity, with the Valley schools able to absorb moderate growth. There is the possibility of expanding the existing schools in Orderville but not at Kanab.

The current budget for Kane County School District is $1,830,299. The mill levy is 43.15. The estimated assessed valuation is over $9 million, yielding a total bonding capacity of approximately $1,200,000. At present, the district has $275,000 outstanding bonds due to be retired by 1986.

Six schools, Panguitch Elementary, Panguitch High, Bryce Valley school, Antimony School, Escalante Elementary, and Escalante High are

located in Garfield county. The total enrollment was 832 (Antimony secondary students are bused to nearby Piute High) at the close of 1976-77 school year. The district personnel consisted of 1 superintendent, 1 clerk, 1 curriculum director, 1 counselor, 1 maintenance supervisor, 4 1/2 principals (FTE), 40 teachers (FTE), 4 secretaries, 3 teachers aides, 6 school lunch workers, and 5 custodians (FTE).

District personnel report that only the Panguitch Elementary School is currently near capacity. Existing schools could be expanded.

The current budget for Garfield County School District is $1,650,661. The mill levy is 39.00. The estimated assessed valuation is over $14 million, yielding a total bonding capacity of approximately $1,862,000. At present, the district has $290,000 in outstanding bonds due to be retired by 1982.

h. Housing and utilities

The housing situation in all the communities is relatively stable. There is a predominance of single-family homes. Few vacancies exist. In several of the Garfield County towns mobile homes account for a significant proportion of all dwelling units. This is not true in Kane County and there are no mobile home parks established in the county. The development of new residential areas in Kane County will be controlled by uniform codes and ordinances (adopted April 1978) covering the communities of Kanab, Orderville, and Glendale, and Kane County itself. Garfield County adopted a subdivision ordinance in 1966. There are no similar ordinances or codes in the communities there.

Utility services are provided to Kane and Garfield County residents by three electric power companies, two telephone companies, eight fuel oil companies and two liquified gas companies. These companies are adequately meeting the demand for utility services.

i. Out-of-State areas with impact potential

The coal mining potential in the Kaiparowits region is close to the town of Page, Arizona, which is located just south of the Utah-Arizona border near Lake Powell.

The town of Page was created by the Bureau of Reclamation in 1957 to house workers constructing Glen Canyon Dam. The population peaked in 1962 at 6,200 and then declined to about 1,000 in the next 4 years. It boomed a second time in 1970, when construction began on the Navajo generating station. Population peaked at more than 9,000 in early 1975. The Bureau turned over operation of the town to locally elected officials in March 1975, as a result of Public Law 93-493. Seventeen square miles of land, along with all municipal services, were transferred to the town. Current population is estimated to be 4,000-4,500.

The majority of employment in the Page area is in three general areas: employment at the Navajo generating station (transportation

communication and utilities sector); Federal government employment; and tourism-related employment (trade and services sector).

During the rapid growth period and for several years after, municipal facilities and community services were hard pressed to accommodate the population. According to Page city officials, the community could handle a population of about 10,000 without substantial strain on community and municipal services. Improved building lots are available as are about 600 vacant trailer spaces. Some moderate and low income apartments and duplexes are also available.

Water supply and facilities are abundant for the present population. Page is allocated a water supply from Lake Powell sufficient for a population of about 15,000, and present facilities are sufficient to store and distribute water for a population of 10,000. Sewage-treatment facilities were designed for a population of 10,000, with additional settling ponds becoming necessary as population approaches this level. Hydro-electric power is supplied by the Bureau of Reclamation from water released from Lake Powell. Page receives a large enough allocation of power that they sell some of it.

Medical facilities and personnel are adequate. The town has a 25-bed hospital, four doctors, two dentists, and a University of Utah clinic staffed with nurse practitioners. The hospital has a low occupancy rate, 31-32 percent. The physician population ratio is 0.95 per 1,000, somewhat lower than the 1.53 national average, but satisfactory for a nonurban area. The dentist population ratio (0.48 per 1,000) is the same as the national average.

Law enforcement is more than adequate, about two law enforcers per thousand inhabitants. Page has two full-time firemen; the rest of the fire department are volunteers. Ambulance service is also available.

City finances have no problem areas according to city officials, particularly as virtually all vacant land is owned by the city, and thus provides revenue to the city as land is sold. Page has no debts and no locally-levied property taxes.

School facilities in Page are excellent. Kindergarten through twelfth grade is housed (newly constructed) on the same campus. Present enrollment is about 1,800, with a low student-teacher ratio of 17:1. The physical facilities have a capacity to accommodate substantial increases in students.

Page's population is expected to be between 5,500 and 6,000 in 1985 and between 6,000 and 7,000 in 1990, according to the Page Comprehensive Plan. Little would need to be done to accommodate this growth.

The Harry Allen powerplant proposed near Las Vegas, is discussed in detail in the site specific being prepared by the BLM. Because of location, socioeconomic impacts are not cumulative to the coal region and

because construction and operation would add very little to the socioeconomic structure of Las Vegas, it is not detailed in this report.

The communities of Fredonia and Page are adjacent to the coal region in Coconino County, Arizona and might be influenced by regional coal development. Fredonia, population 1,200, is located 7 miles south of Kanab on US-89A and shares social and economic growth with Kanab. It provides a home for a major sawmill employing 300 mill and woods workers and an oil refinery and crude oil processing plant. Fredonia community services, except for the grade school, have been improved and can support additional growth. The community has expanded its city limits and has adequate privately owned land that could be used for growth.

5. Transportation

Only two major through highways serve the region (fig. II-19). I-15 extends northeastward through St. George and Cedar City and U.S. Highway 89 extends from Page, Ariz., westward to Kanab, then northward through Panguitch and Richfield. Both highways pass through Salt Lake City (off the map). The rest of the region is served by secondary feeder routes.

The proposed Warner Valley powerplant can be reached by partly improved roads alined to the south from Hurricane. Access to Hurricane from the north and southwest is via I-15 and U-15. Access from the east is via U-15, however this route is restricted by steep grades, sharp curves, and a tunnel in Zion National Park. Access from the southeast, through Fredonia over A-389 and U-59, is relatively unrestricted, although the road is not heavy-duty.

Access to the Alton coal field from the north, west, and south is via U.S. 89, a two-lane, medium-duty road. Traffic volumes on this highway in 1975 were 1,020 vehicles per day (vpd) at the mouth of Johnson Canyon, 9 miles east of Kanab and 1,650 vpd at Alton Junction, 40 miles north of Kanab. Direct access to the coal field is by a partly asphalted and improved road through Alton from the north, an improved county road from Glendale on the east, and a partly asphalted and improved road through Johnson Canyon from the south. A partly improved county road accesses the coal field from U-12 at Cannonville (fig. I-2).

Highway access to the Kaiparowits Plateau is from U.S. Highway 89 at Glen Canyon City on the south, and U-12 at Escalante on the north, the latter a feeder highway with restricted outlet to the east. One graded road connects U.S. 89 at Glen Canyon City to U-12 at Escalante and crosses the Plateau. Between U.S. 89 and the boundary of the Glen Canyon NRA, this road is a part of the State highway system U-277. It has 26 feet of road surface and is built on a 50-foot right-of-way. Within the NRA, the road narrows and is maintained as-is by Kane County. Built on public lands before the creation of the NRA, this part of the road has no formal right-of-way. The Park Service and BLM recognize a prescriptive right-of-way and use. Any improvements beyond the present road prism, however, must be approved by BLM and NPS. There are many

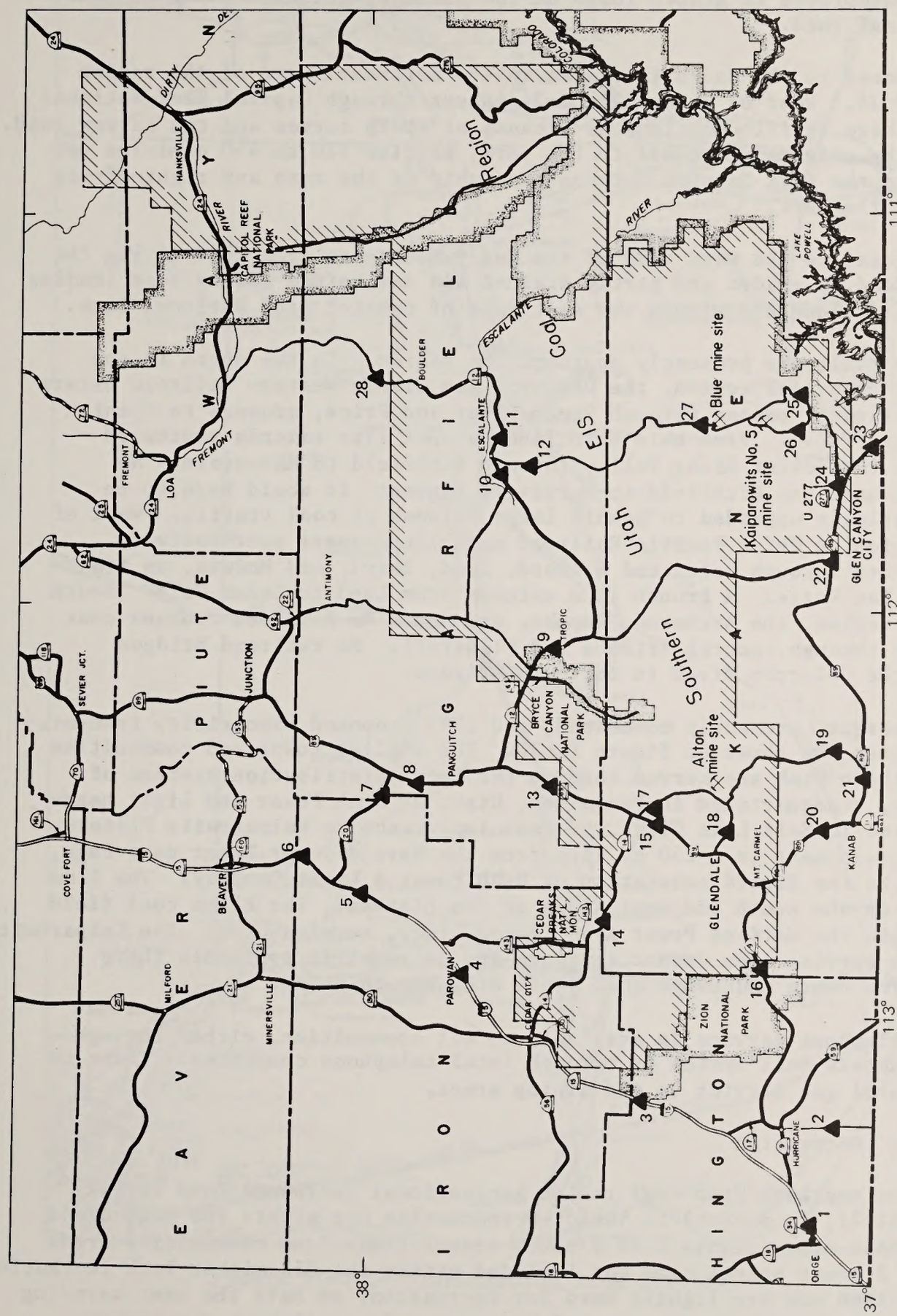


FIGURE II-19.--State highway network in southern Utah.

other unimproved to graded roads on the plateau, all connecting to this one spinal road.

Access to the Hanksville area in the northeast part of the region is by U-24. West of Hanksville U-24 passes through Capitol Reef National Park, where traffic bottlenecks because of sharp curves and the narrow road. It is the only major access to the park, carries 320 to 450 vehicles per day, and the Park Service retains ownership of the road and right-of-way through the park.

Access to the west side of the Henry Mountains from U-24 is via the Notom Road, a graded and partly drained and maintained county road leading southward along and within the east edge of Capitol Reef National Park.

No railroads presently approach the region. To the north in the Central Utah coal region, the Denver & Rio Grande Western Railroad enters from Colorado, passes through Green River and Price, crosses to Spanish Fork, and Provo. From this main line, a spur line extends southward through the Sevier River Valley through Richfield to Marysvale. No traffic uses the Richfield-to-Marysvale segment; it would have to be substantially upgraded to handle large volumes of coal traffic. West of the region, a Union Pacific Railroad main-line passes southwestward from Provo through Delta and Milford, Lund, Beryl, and Modena, on its way to Las Vegas. A branch line extends from Lund to Cedar City. South of the region, the Atcheson, Topeka, and Sante Fe Railroad crosses east to west through central Arizona and Flagstaff. No railroad bridges cross the Colorado River in northern Arizona.

Present, presently committed, and 1995 proposed electricity transmission lines are shown on figure II-20. The smaller towns and communities in southern Utah are served through the local distribution systems of GarKane, headquartered in Panguitch, Utah, or Utah Power and Light headquartered in Salt Lake City. Of most importance to Kaiparowits Plateau coal development is a 230 kV line from the Navajo Power Plant near Page, Ariz., to the Sigurd substation of Utah Power & Light Company. The line passes on the south and west sides of the Plateau. The Alton coal field is within the GarKane Power Association, Inc., service area. The Kaiparowits Plateau service area is not assigned and no power is available there now. The Henry Mountains coal field also has no power.

Telephone service is available to all communities, either through the Mountain Bell System or through local telephone companies. There is no natural gas service to the mining areas.

6. Recreation

The southern Utah coal region Recreational Influence Zone or RIZ (fig. II-21, in pocket) is based on recreation use within the region and recreation areas within 1 to 3 hours travel times from communities Areas within 2 hours travel time not included within the RIZ either lack recreation attractions and are lightly used for recreation, or have the user carrying capacity to accommodate projected increases of use without impairment

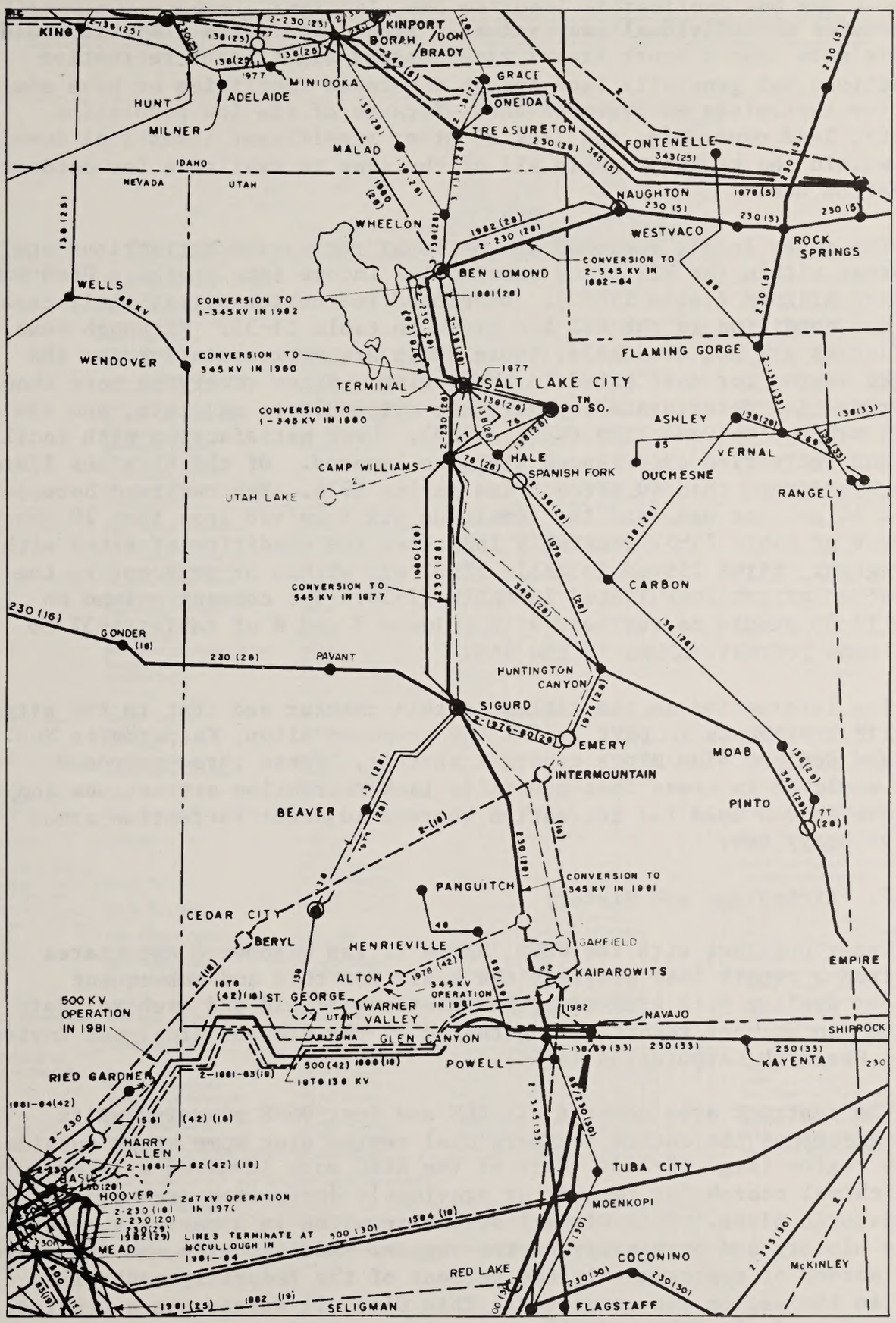


FIGURE II-20.--Transmission line network.

of resource or individual user values. Areas within the RIZ that would require more than 2 hours travel time possess significant recreation attractions but generally lack enough developed facilities or have administrative restraints on types of use. Because of the low population density, land ownership, and lack of other significant industrial development within the region, nearly all of the area is available for outdoor recreation use.

The major local, regional and national recreation attractions and use areas within the RIZ bring substantial income into southern Utah and northern Arizona (table II-32). Developed recreation sites, their capacity, use, and condition in the RIZ are given in table II-33. Although some use figures are not available, those shown are representative for the managed season for most sites in the region. Sites receiving more than 40 percent use deteriorate rapidly, are difficult to maintain, and are highly subject to vandalism (USFS, 1965). User satisfaction with facilities and recreation experiences are also lowered. Of the 41 sites listed, 25 received more than 40 percent use during 1976. Ten received between 20 and 40 percent use, and the remaining six received less than 20 percent. Column 8 of table II-32 generally indicates the condition of sites with the region. Sites listed in table II-32 are within or adjacent to the recreation attractions listed in table II-33. The comment column on table II-33 should be reviewed with columns 7 and 8 of table II-32 to understand recreation use in the RIZ.

The information in the tables in this chapter and that in the site-specific statements in part II for the proposed Alton, Kaiparowits Nos. 1-5, and Red and Blue mines contrast sharply. These three proposed mines would be in areas that generally lack recreation attractions and that are seldom used for recreation whereas adjacent recreation areas receive heavy use.

7. Archeology and History

Under contract with the USGS, Wayne T. Van Wagoner & Associates submitted a report that provides the basis for this and subsequent sections dealing with archeology and history. Field and archival data for the Van Wagoner report were gathered by the Archeological and Environmental Research Corporation (AERC).

The contract area covered six BLM and four USFS planning units which encompass the entire southern coal region plus some areas outside of the region (fig. II-22). Part of the AERC work involved a literature and archival search for records of previously documented archeological and historic sites. This Class I survey resulted in a narrative overview of the history and prehistory of the region. Additionally, an intensive field survey of approximately one percent of the Federally controlled lands in the region was completed. This Class II survey was a complete survey of randomly selected 160 acre quarter sections. Some basic results of the AERC study (numbers of sites and site densities by planning unit) are shown on table II-34 and figure II-22.

TABLE II-32.--Local, regional, and national attractions and use areas within the southern Utah coal region recreation influence zone

Administering agency or ownership	Recreation use area or attraction	Recreation visits or visitor days use (where available)	Major recreation user attractions: Scenery	Pleasure driving	Nature study	Wildlife	Archeology	Works of man	Cultural history	Hunting	Fishing	Swimming	Other water sports	Hiking, backpacking	Camp and picnic	Solitude	4-wheel and ORV	Skiing	Snowmobiling	Other winter sports	Gather resource prods	Other	Comments[1]
Bureau of Land Management:																							
	Virgin River Gorge (I-15)		*	*	*			*							*								Heavy use-interstate highway.
	Cocks Comb		*		*	*	*			*				*	*	*	*							Light use-geological formation.
	Cottonwood Canyon		*	*	*	*	*			*				*	*	*	*							Light use-geological formation.
	Paria Primitive Area		*		*	*	*			*				*	*	*								Light use-spring and fall.
	Paria Townsite		*	*				*	*					*	*									Moderate use-spring/summer/fall.
	Movie Sets	Recreation use records	*	*			*	*	*							*								Moderate use-summer
	Cane Beds	not kept for these	*	*	*									*	*	*	*							Light use-yearlong.
	Coral Pink Sand Dunes	areas, but area	*	*	*	*	*			*				*	*	*	*							Heavy use-off-road vehicle.
	Escalante River	administrators	*		*	*	*							*	*	*								Moderate use-primitive values.
	Calf Creek	estimate accumulative	*	*	*	*	*			*				*	*	*								Heavy use-local; fall and spring.
	Hole in the Rock Trail	use in excess of	*	*	*	*	*	*	*					*	*	*	*							Moderate use-historical value.
	Honeymoon Trail	700,000 visits	*		*			*	*					*	*	*								Light use-historical value.
	Hackberry Canyon	annually.	*		*	*	*			*				*	*	*								Light use-natural environment values.
	Phipps-Death Hollow		*		*	*	*			*				*	*	*								Light use-natural environment values.
	Vermillion Cliffs		*	*	*	*				*				*	*	*	*							Light use-spring and fall.
	Dominguez-Escalante Trail		*					*	*					*	*	*								Moderate use-historical values.
	Temple Trail		*					*	*					*	*	*								Moderate use-historical values.
U.S. Forest Service:																							
Dixie National Forest	Pine Valley Mountains	52,800 visitor days.	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*		Heavy use-summer and fall.
	Navajo Lake Area	652,800	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		Heavy use-summer/fall/winter.
	Duck Creek Springs Area	visitor days.	*	*	*	*		*	*	*	*			*	*	*	*	*	*	*	*	*		Heavy use-summer/fall/winter.
	Mammoth Creek Area	296,300 visits to	*	*	*	*				*	*	*	*	*	*	*	*	*	*	*	*	*		Heavy use-summer.
	Panguitch Lake Area	developed sites	*	*	*	*		*	*	*	*			*	*	*	*	*	*	*	*	*		Extreme use-summer and fall.
	Brianhead Ski Area	special interest	*	*	*	*		*		*				*	*	*	*	*	*	*	*	*		Heavy use-winter skiing.
	Cascade Falls Area	areas.	*	*	*	*			*					*	*	*	*		*					Moderate use-summer.
	Lava Beds		*	*	*	*				*				*	*	*								Light use-except viewing.
	Red Canyon	328,800	*	*	*	*				*				*	*	*							*	Heavy use-spring/summer/fall.
	East Fork of Sevier River	visitor days.	*	*	*	*				*	*			*	*	*	*	*	*	*	*	*		Moderate use-summer.
	Barney Top	80,000 visits to	*	*	*	*				*	*			*	*	*	*	*	*	*	*	*		Moderate use-summer.
	Griffin Top	special interest	*	*	*	*				*	*			*	*	*	*	*	*	*	*	*		Moderate use-summer.
		areas and developed sites.																						
Fishlake National Forest	Beaver Canyon	197,000	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		Heavy use-yearlong.
	Puffer Lake	visitor days.	*	*	*	*	*	*		*	*			*	*	*	*	*	*	*	*	*		Heavy use-summer and fall.
	Big Flat		*	*	*	*	*			*				*	*	*	*	*	*	*	*	*		Heavy use-summer and fall.
Kaibab National Forest	Jacobs Lake	263,000	*	*	*	*	*			*				*	*	*	*	*	*	*	*	*		Heavy non-resident travel.
	North Kaibab Plateau	visitor days.	*	*	*	*	*			*				*	*	*	*	*	*	*	*	*		Heavy non-resident and fall
		922,200 visits.																						hunting use.
National Park Service:																							
Pipe Springs Nat'l Mon.	Pipe Springs Nat'l Mon.		*	*	*			*	*						*									Moderate to light visits.
Zion National Park	Zion Nat'l Park	1,090,000	*	*	*	*	*	*	*		*	*		*	*	*								Extreme summer; heavy
		visits.																						spring and fall.
Bryce Canyon Nat'l Park		626,200 visits.	*	*	*	*	*	*	*	*					*	*	*			*				Heavy use-summer and fall.
Grand Canyon Nat'l Park	North Rim	433,000 visits.	*	*	*	*	*	*	*						*	*	*			*				Extreme use-summer.
Cedar Breaks Nat'l Mon		411,300 visits.	*	*	*	*				*				*	*	*			*	*				Heavy use-summer.
Capitol Reef Nat'l Park	South District	25,000 visits.[3]	*	*	*	*	*								*	*	*	*						Light use.
Glen Canyon Nat'l Rec Area			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*						Heavy use-yearlong.
	Lake Powell (total)	1,061,700	*	*	*	*	*		*	*	*	*	*	*	*	*	*							Extreme use-spring/summer/fall.
	Carl Hayden Visitor Center	223,300	*				*	*																Extreme use-yearlong.
	Glen Canyon Dam	Not available.	*	*			*	*																Extreme use-yearlong.
	Wahweap Rec Complex	701,300	*	*	*	*		*	*		*	*	*	*	*	*	*							Extreme use-spring and fall.
																								Heavy summer use.
	Lee's Ferry	95,700 visits.	*	*	*		*	*		*	*	*	*	*	*	*	*							Heavy use-yearlong.
Navajo Indian Reservation	Monument Valley	Figure not	*	*	*	*	*		*					*	*	*	*							Moderate visits and use.
	Navajo Nat'l Mon. (3)	maintained.	*	*	*		*		*					*	*	*								Moderate visits and use.
	Navajo Bridge		*	*	*			*																Moderate visits and use.
Utah State Division of Parks and Recreation:[2]																							
	Snow Canyon	130,300 visits.	*	*	*	*	*	*	*	*				*	*	*	*							Extreme spring-fall visits.
	Gunlock Reservoir	63,900 visits.	*	*	*	*		*	*	*	*	*	*	*	*	*	*							Heavy yearlong fishing pressures.
	Minersville Reservoir	70,300 visits.	*	*	*	*		*	*	*	*	*	*		*		*							Heavy use-spring/summer/fall.
	Coral Pink Sand Dunes	47,600 visits.	*	*	*	*	*			*				*	*	*	*							Heavy spring-fall ORV use.
	Kodachrome Basin	11,900 visits.	*	*	*	*	*		*	*				*	*	*	*							Moderate to light visits.
	Otter Creek Reservoir	25,500 visits.	*	*	*	*	*		*	*	*	*		*	*	*								Heavy use-spring/summer/fall.
	Escalante Petrified Forest	No statistics.	*	*	*	*	*		*	*				*	*	*	*							Light use-undeveloped.

[1]Light use--generally below environmental and designed carrying capacity.
Moderate use--approaching carrying capacity.
Heavy use--at carrying capacity during most of use period, but above carrying capacity on weekends and holidays.
Extreme use--usually above acceptable carrying capacity for major use facilities and environment areas visited during managed or open season.

[2]Visits are to developed portion at State Parks only. Total visits to attractions being served are not recorded.

[3]Estimated.

TABLE II-33.--Selected developed recreation sites; their capacity, use, and condition for the southern Utah coal region recreation influence zone

Administering agency or ownership	Developed site name and type	Season of use snd length of seasons	PAOT[1]	1976[2] recreation visits	1976[3] recreation visitor days use	1976[4] use (percent of capacity)	Comments: Condition and needs at facilities, season of use, intensity of use compared to carrying capacity, etc.
1	2	3	4	5	6	7	8
Bureau of Land Management:							
Dixie Resource Area	Red Cliff rec. site	1/1 to 12/31(365 days)	155	7,200	10,800	30	Good condition; heavy spring and fall use; needs some additional facilities.
Arizona Strip Resource Area	Virgin River rec. site	1/1 to 12/31(365 days)	570	NA[5]	---	---	New site adjacent to Interstate 15.
Vermillion Cliff Resource Area	Ponderosa Crove campground	5/1 to 11/30(214 days)	55	NA	NA	35-40	Satisfactory condition; heavy spring, summer, fall use.
Escalante Resource Area	Calf Creek rec. area	4/1 to 11/30(245 days)	250	15,000	7,000	30-40	Good condition; heavy spring-fall use, moderate summer use.
U.S. Forest Service:							
Dixie National Forest	Pine Valley campground	6/1 to 9/15(107 days)	215	17,500	14,700	32	Moderate summer use; some rehabilitation needed.[6]
	Oak Grove csmpground	6/1 to 10/15(137 days)	90	10,000	5,600	23	Moderate use; good condition.
	Navajo Lake campground	6/15 to 9/15(93 days)	190	11,500	28,600	81	Extreme summer use; reconstruction and expansion needed.
	Te-Ah campground	6/15 to 9/15(93 days)	210	11,500	28,900	74	Extreme summer use; needs expansion and rehabilitation.
	Panguitch Lake North campground	6/1 to 9/15(107 days)	210	16,500	41,300	92	Extreme summer-fall use; needs expansion and rehabilitation.
	Spruces campground	6/15 to 9/15(93 days)	180	9,500	22,000	66	Very heavy summer use; needs expansion and rehabilitation.
	Duck Creek campground	6/1 to 9/15(107 days)	620	44,000	108,900	82	Extreme summer use; needs expansion and rehabilitation.
	Panguitch Lake South campground	6/1 to 9/15(107 dsys)	90	9,900	13,000	67	Very heavy summer use; needs expansion and rehabilitation.
	Pine Lake campground	6/15 to 9/15(93 days)	170	---	16,400	52	Heavy summer use; good condition; needs expansion.
	Blue Spruce campground	6/15 to 9/15(93 days)	30	---	4,200	75	Extreme summer use; fair condition; needs expansion and rehabilitation.
	Posy Lake campground	6/15 to 9/15(93 days)	170	---	13,600	43	Moderate to heavy summer use; good condition; expansion needed.
Fishlake National Forest	Little Cottonwood campground	5/15 to 11/15(185 days)	93	35,500	14,000	41	Same as above.
	Little Reservoir campground	6/1 to 10/30(152 days)	67	19,600	9,000	44	Heavy summer use; expansion and rehabilitation needed.
	Kents Lake campground	6/1 to 10/15(137 days)	212	20,300	14,800	25	Moderate summer use; some rehabilitation needed.
	Anderson Meadow campground	6/1 to 9/15(107 days)	50	16,500	6,200	58	Heavy summer use; some rehabilitation and expansion needed.
	Ponderosa picnic area	5/1 to 10/30(183 days)	120	9,700	6,600	31	Moderate summer use; good condition.
Kaibab National Forest	Jacobs Lake campground	5/15 to 11/1(170 days)	240	NA	30,000	80	Extreme summer-fall use; needs expsnsion and rehabilitation.
	DeMott campground	5/15 to 11/1(170 days)	100	NA	11,000	80	Ssme ss above.
U.S. Park Service:							
Cedar Breaks, New Mex.	Point Supreme campground	6/15 to 9/15(92 days)	100	NA	NA	25-35	Moderate summer use; good condition.
	Point Supreme picnic site	6/15 to 9/15(92 days)	40	NA	NA	25-35	Same as above.
Zion National Park	South campground	5/15 to 9/15(108 days)	730	177,400	177,400	35	35 percent yearlong percent of capacity; extreme spring, summer, fall use; needs supplemental campgrounds outside of National Park. 75 percent cspacity use in spring, summer and fall.
	Watchman campground	1/1 to 12/31(365 days)	1,175				
Bryce Canyon Nat'l Park	North campground	5/1 to 11/1(214 days)	555	NA	NA	50	Extreme summer use, light in spring and fall; good condition.
	Sunset campground	6/1 to 9/10(102 days)	625	NA	NA	50	Same as above.
Glen Canyon National Recreation Area	Wahweap campground snd marina	1/1 to 12/31(365 days)	1,550	701,300	102,900	7	Extreme use; good condition; needs expansion.
	Lee's Ferry	1/1 to 12/31(365 days)	280	95,700	49,800	96	Same as above.
	Carl Hayden visitor center	1/1 to 12/31(365 days)	NA	223,300	NA	NA	Hesvy use; parking needs expansion.
North Rim Grand Canyon	North Rim campground	5/1 to 12/30(184 days)	700	205,100	165,100	128	Extreme use; fair condition; needs expansion.
Capitol Reef Nat'l Park	Cedar Mesa campground	1/1 to 12/31(365 days)	32	3,600	NA	31	Moderate use; good condition.
Pipe Springs Nat'l Mon.	---	1/1 to 12/31(365 days)	NA	27,500	NA	NA	Light use; good condition.
State of Utah Parks and Recreation:	Snow Canyon campground	1/1 to 12/31(365 days)	[7]146,000	130,300	NA	89	Facilities good condition; extreme fall and spring use; needs expansion.
	Cunlock Reservoir campground	1/1 to 12/31(365 days)	[7]120,000	63,900	NA	53	Same as above.
	Minersville campground	1/1 to 12/31(365 days)	[7]100,000	70,300	NA	70	Extreme summer, fall use; good condition; needs expansion and traffic control.
	Coral Pink Sand Dunes campground	1/1 to 12/31(365 days)	[7]81,000	47,600	NA	59	Hesvy spring and fall use (ORV); needs expansion.
	Kodachrome Basin campground	1/1 to 12/31(365 days)	[7]60,000	11,900	NA	20	Light to moderate use; good condition.
	Otter Creek campground	5/1 to 11/30(214 dsys)	[7]54,000	25,500	NA	47	Heavy summer use; fair condition; needs expansion and rehabilitation.
	Escalante Petrified Forest campground	1/1 to 12/31(365 days)	undeveloped	NA	NA	---	Needs developed facilities.

[1]Theoretical developed capacity of developed site, expressed in the number of people the site can accomodste st one time (PAOT).

[2]Recreation Visit - one person visiting the site - no time element cslculated or involved.

[3]Recreation Visitor Day Use - an aggregate of 12 hours by one or more persons.

[4]Use as a percent of capacity is based on the managed season of use (length of season x PAOT). Well managed sites generally receive between 20 percent and 40 percent use. Beyond 40 percent sites deteriorate rapidly, require heavy maintenance, and user experience levels diminish from overcrowding (i.e., loss of privacy and solitude, increase in noise, disturbances, etc.).

[5]NA - not available or not applicable.

[6]Rehabilitation may include hard-surfacing (psved roads, trails, parking spurs, etc.) of parts of sites to protect soils and vegetation. It may also include installation of traffic control devices (barriers) to prevent ORV encroachment and damage to adjacent soil and vegetation resources.

[7]Yearlong capacities as determined by Utsh State Division of Parks and Recreation.

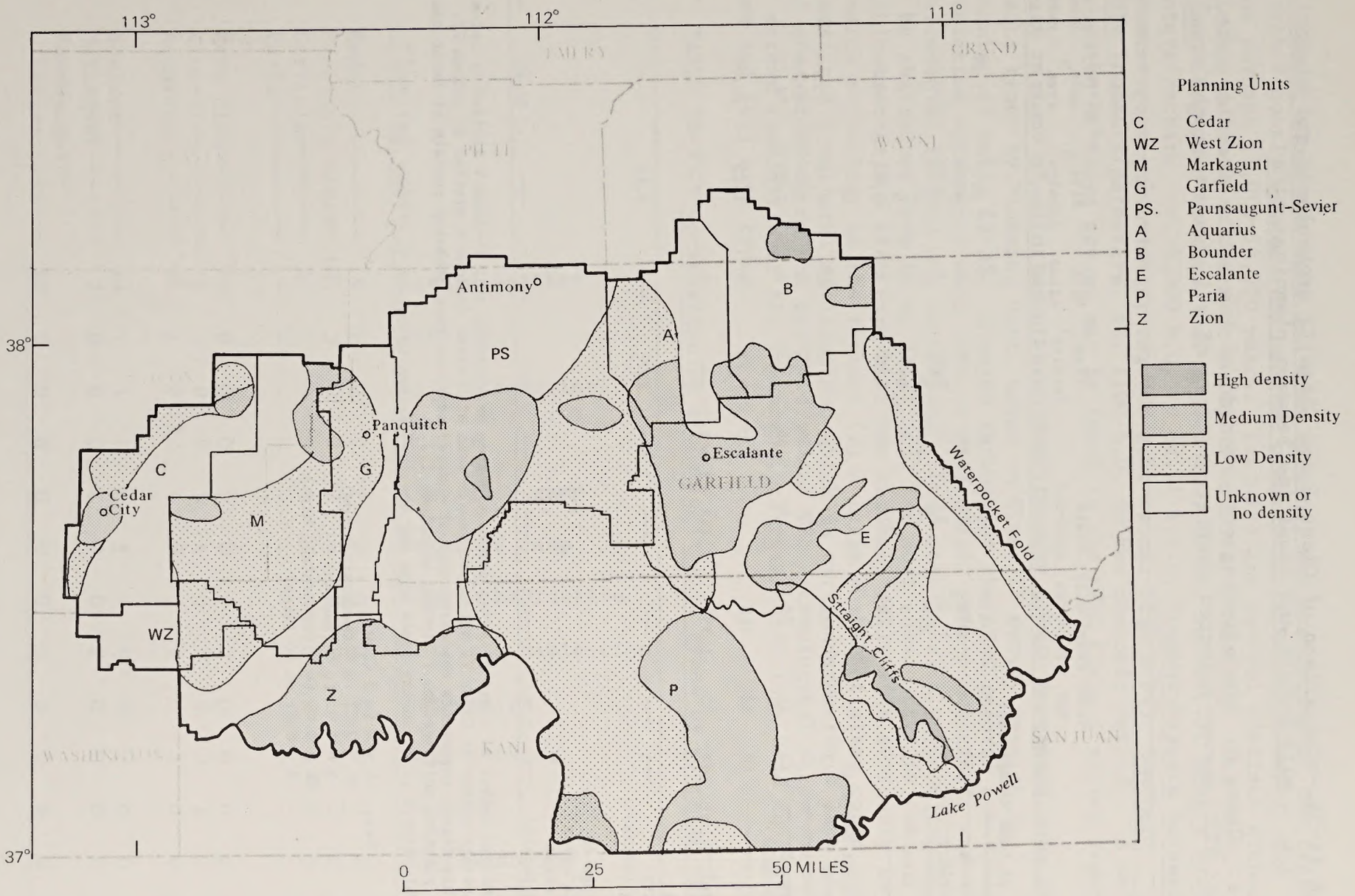


FIGURE II-22.--Archeologic site density by Federal planning unit.

TABLE II-34.--Comparison of Class I and Class II archeologic and historic site totals and densities between planning units

[Note: Class I: the existing site records of the entire planning unit.
Class II: survey selected quarter sections of a 1 percent sample area]

Column	1	2	3	4	5	6	7	8	9	10
Planning units	Totals	Without site	Previously recorded Class I	Newly recorded Class II	Totals	Site density[1] Class II	With sites Class II	Site density[2] Class II	Percent of planning unit area[3] Class II	Density ranking[4] Class II
Bureau of Land Management:										
Cedar---------	4	1	47	10	57	2.50	3	3.33	75.00	ML
Escalante-----	72	23	698	199	897	2.76	49	4.06	68.10	M
Garfield------	6	0	2	23	25	3.83	6	3.83	100.00	ML
Paria---------	0	0	354	0	354	0	0	0	0	---
West Zion-----	1	1	1	0	1	0	0	0	0	L
Zion----------	10	2	76	21	97	2.10	8	2.63	80.00	ML
U.S. Forest Service:										
Aquarius------	17	5	28	53	81	3.12	12	4.42	70.60	M
Boulder-------	3	0	110	24	134	8.00	3	8.00	100.00	MH
Markagunt-----	15	11	78	8	86	0.53	4	2.00	26.70	L
Paunsaugunt-Sevier------	40	32	160	10	170	0.25	8	1.25	20.00	L
Total-------	168	75	1,554	348	1,902	---	93	---	---	---
Overall density (from totals)	---	---	---	---	---	2.07	---	3.74	---	ML
Percentage of sample areas with sites (from totals)	---	---	---	---	---	---	---	---	55.40	---

[1]Average number of Class II sites per sample area by planning unit (column 4 divided by column 1).
[2]Average number of Class II sites per sample area with sites (column 4 divided by column 7).
[3]This figure represents the percentage of quarter sections that probably contain at least one site in each planning unit (column 7 divided by column 1).
[4]This figure is a ranking based upon the density ratings in column 8.

Key: L = 0 to 2 (low)
ML = 2.01 to 4 (moderately low)
M = 4.01 to 6 (medium)
MH = 6.01 to 8 (moderately high)
H = 8.01 to 10 (high)

Except along the east and west margins, the prehistory of the region is rather poorly known. The outline prehistory is known, however, and spans perhaps 12,000-14,000 years. Included are several distinct archeologically defined cultures or cultural periods, including: The Paleo Indians (big game hunters, ca. 12,000 B.C. to ca. 500 B.C.), Desert Archaic (hunters/gathers, ca. 6,000 B.C. to ca. 1 A.D.), Fremont-Kayenta Anasazi (sedentary agriculturistic, ca. 700 A.D. to ca. 1250 A.D.), Southern Paiute (hunters/gatherers, ca. 1100 A.D. to the historic period). A detailed discussion of these groups may be found in the AERC Class I survey report.

A variety of site types were identified by AERC. A correlation of site types by Planning Unit, based on Class II survey results is presented in table II-35. Located throughout the AERC reports are tables correlating site types with various geological, geomorphological, and environmental factors and variables. Three particularly germane points can be abstracted from these data: (1) The most common site is the "lithic scatter," a site type that has not been dealt with seriously in research archeology in the region; (2) a large number of sites could not be assigned a cultural affiliation, which in part underscores a lack of full understanding of the prehistory; and (3) archeological sites are not spread randomly over the landscape; certain conditions tend to cluster sites and (or) site types.

TABLE II-35.--Correlation of archeologic site types by planning unit

Planning units	Lithic scatter	Hunting	Kill-butchering	Quarry	Temporary camp	Extended camp	Single habitation	Multiple habitation	Petroglyph	Rock shelter	Granary	Miscellaneous	Total
Cedar----------	9	0	0	0	1	0	0	0	0	0	0	0	10
Escalante River-	103	3	0	3	37	16	18	9	1	4	3	2	199
Garfield--------	20	0	0	0	3	0	0	0	0	0	0	0	23
Paria----------	-	-	-	-	-	-	-	-	-	-	-	-	-
West Zion-------	0	0	0	0	0	0	0	0	0	0	0	0	0
Zion------------	9	0	0	0	5	6	0	0	0	0	1	0	21
Aquarius--------	34	1	0	12	4	0	0	1	0	1	0	0	53
Boulder---------	14	1	1	1	4	1	1	0	0	1	0	0	24
Markagunt-------	7	0	0	0	1	0	0	0	0	0	0	0	8
Paunsaugunt-Sevier--------	10	0	0	0	0	0	0	0	0	0	0	0	10
Total------	206	5	1	16	55	23	19	10	1	6	4	2	348

The first documented non-Indian passage through southern Utah was by the Dominguez-Escalante expedition of 1776-77. The somewhat later trade-oriented Spanish Trail passes through the extreme western part of the region. The region was also visited in the earlier 1800's by the government explorer John C. Fremont and the famed trapper Jedediah Smith.

Very soon after their arrival in the Salt Lake Valley in 1847, the Mormons initiated exploration/colonization missions on a substantial scale. One of the the initial thrusts was into the Parowan/Cedar Valley area (which is slightly outside the region), with a view to both settlement and development of iron ore west of present day Cedar City. Settlement in other areas of the region came later and did not succeed as readily as in the western parts, due in part to Indian problems in the 1850's and 60's. The Long Valley area, Panguitch, and Kanab were initially settled sparsely with subsequent spreading out to the east from Panguitch and Kanab. The region was settled primarily for agriculture and stock raising, although lumbering was a factor in Panguitch.

Few historic sites were recorded by the AERC Class I and II surveys, in part, because many are on private land. Also, much of the historic resource is still in use. Further, obvious historic sites have not been documented in the individual records used by AERC. There are however, several sites that are of considerable historic interest, particularly those associated with early settlement.

Archeological sites and some historic sites have special characteristics that make them extremely vulnerable to certain types of activities. They are localized and immovable, individually unique, nonrenewable, and located on or near the ground surface. They are very valuable to science when undisturbed, but next to valueless when badly disturbed. Further, they are of general interest to the public at large and considered as personal private playgrounds by relic collectors.

As a result, cultural resources have traditionally been highly sensitive to any form of ground disturbing activity, whether construction/development related or related to the vandalism of people who dig and collect for "recreational," acquisitional, and even profit motives. Thus, to date, a great deal of resource has been destroyed or damaged, both intentionally and unintentionally, to the point that sites of any size or substance that do not show some damage are almost nonexistent. While better safeguards now mitigate against construction/development loss, still few really effective checks exist to prevent vandalism and loss from this source.

The February 7, 1978, Federal Register has been reviewed along with lists provided by the Utah State Historical Society. Several properties in the region are either on the National Register or have been formally nominated to the Register, but none will be directly impacted by coal development, as presently conceived. Other sites may be found during preconstruction surveys; and these will be evaluated in accordance with 36 CFR 800 regulations.

8. Esthetics

Visual impact on landscape character that would be affected, other than those addressed for the site-specific proposals in part 2, include: (1) the communities of Kanab, Mt. Carmel, Glendale, Orderville, and Alton, Utah; and (2) seen areas along primary and secondary travel routes where ancillary facilities would be added to support the proposed mining operations described in part 2.

Kanab, the largest of the five communities, has a well defined business district that has developed over the past 40 years to encourage and support tourism and the movie and television industry. Some facilities (trailer parks, motels, rock shops, cafes, etc.) have also been developed in Mt. Carmel, Glendale, and Orderville to attract tourists using U.S. Highway 89. These communities have more of a rural-ranching character and residential lots are generally located in connection with small ranch and farming operations, whereas Kanab's residential district is more urban.

The community of Alton has a totally rural-ranching character with no commercial facilities. Buildings are generally older, wooden frame, and on large lots associated with farming and ranching operations.

No single building architectural style predominates in any of the communities, and the style varies from pre-1870 two-story, brick, masonary, and sandstone structures to modern single-story dwellings. Some historical building may exist, dating back to early attempts by the Mormon Church to establish the "United Order."

Straight Cliffs and steep slopes form an enclosed landscape between Long Valley Junction and Mt. Carmel Junction. Vegetation includes ponderosa pine, aspen, and manzanita on side slopes with wet meadows, willow and cottonwood in the canyon bottoms. Viewing is generally restricted to less than 1 mile. Land ownership is mixed Federal, State, and private. The natural landscape character has been modified to include the communities of Glendale, Orderville, and Mt. Carmel, as well as fenced pastures, outlying ranches, powerlines, and some scattered summer homes.

The area between Mt. Carmel and Page, Arizona primarily presents a panoramic viewshed where viewing long distances is both possible and important. The predominant vegetation type between Mt. Carmel and Kanab is pinyon juniper, but some cottonwood, big sage, tamarisk, and willows are found in the canyon bottoms along perennial and intermittent water course. Foreground-middleground (up to 5 miles) areas between Kanab and Page, Arizona are generally sparsely vegetated with desert shrubs, grasses, and forbs. Background (beyond 5 miles) areas are made up of varied geological formations such as the Straight Cliffs Formation comprising the southern extreme of the Kaiparowits Plateau and the Cockscomb.

Man-made intrusions between Mt. Carmel and Page, Ariz. include the community of Kanab, some scattered ranches, fences, and powerlines. The

majority of these intrusions do not generally detract from the viewing experience or natural landscape character of the area.

Scenic quality or variety is common (typical) to much of that found throughout the general area. Lake Powell and Glen Canyon Dam, however, are considered to be outstanding visual attractions. In both cases, activities of man dominate the landscape character (dam is man-made and has created an artificial lake). Few people view these man-made intrusions as offensive or as detracting from the landscape character of the area.

C. FUTURE ENVIRONMENT WITHOUT THE PROPOSED FEDERAL ACTION

1. Natural Environment

Soils will be disturbed by a population increase because of normal anticipated growth, some soil will be lost by wind and water erosion, and land use will change from natural or agricultural crop production to community use. The paleontologic resources of the region may be affected by the population increase which might result in more people looking for fossil material. Use of water will increase with the population, probably at the expense of agricultural use. The air quality would be basically as described earlier in this chapter.

Better management of domestic livestock grazing has helped to increase the amount and quality of vegetation over the last thirty years. This trend is expected to continue into the future. The present trend toward fewer sheep numbers and a leveling-off or slight upswing in cattle numbers should continue over the next several years.

The projected population increase will cause added pressure on wildlife in the region. Some encroachment on mule deer, turkey, forest grouse, pheasant, and mountain lion ranges would result from urbanization and recreational home development. Some areas would be irreversibly committed to an urban environment, with a loss of species that are incompatible with man's activities and an increase in species adaptable to urbanization. The direct loss of wildlife from illegal shooting, highway mortality, and other activities would increase. Small populations of rare or unique species may be eliminated. Range improvements, water developments, and better management practices will increase habitat and carrying capacities of some wildlife. Planned transplants of game and nongame species will increase the range of some species and introduce new ones into the area.

Trout streams in the region are probably fished at, or above their production level now. The streams are unlikely to produce any more trout for the expected 1990 population. Local springs near St. George, Utah are the habitat of the St. George snail, which is proposed for threatened and endangered listing. Historically, the towns of southern Utah have used these and other similar springs for their domestic supplies.

2. Cultural Environment

While the exact character of the lands that would be converted to community use without coal production cannot be accurately predicted, it is assumed that 50 percent of the range would be useful for grazing. Based on this assumption, 75 AUM's per year would be lost from domestic livestock grazing starting in 1985, and 100 AUM's per year starting in 1990. The level of use of forest products will increase in the future.

Population is expected to increase because of normal growth in the region without coal development. Population is expected to increase by 16,200 from 1975 to 1990 (table II-36). As a result of this growth, community enlargement will require about 900 acres of land currently used for other purposes. Much of the recent and projected expansion of population in Garfield and Kane Counties is the result of individuals moving in search of acceptable economic or social conditions. Table II-37 portrays the changes in population growth as not being dramatic and the small increases over time would easily be absorbed in existing low density settlements, assuming newcomers are willing to accept prevailing standards of municipal and economic services.

Actually, some communities in the region have had larger population in the past than could be expected under this projection in the year 1990. For example, Garfield County's largest enumerated population was 5,253 in 1940; without coal development, it would not reach that amount even by 1990. Under prevailing and expected economic circumstances, the region's population will continue to be concentrated in Washington and Iron Counties. A discussion of the reasons for this is to be found in the opening pages of the socioeconomic section in chapter IV.

The uranium mine and mill proposed by Plateau Resources limited in Shootering Canyon would result in a population increase of 600-800, most of whom would live in a proposed new town about 10 miles north of Bullfrog marina on Lake Powell. Vehicle traffic would increase an unspecified amount on State Highways 276 and 95 to Hanksville and to Green River, Utah (fig. I-2).

Other impacts expected as a result of normal growth at the low level of production (0-1 mty) and with no Federal action are described in chapter IV and used there as a basis for evaluating impacts at the projected level of 12 mty including the Allen-Warner Valley Energy Project.

Population and commercial activity increases that will occur in southern Utah without coal mining activity will result in an increase in highway traffic. Table II-38 present projections of average daily traffic levels on the selected highway segments shown on figure IV-2. These levels will occur if there is no coal development in the region.

There are several plans proposing new highway segments in the southern Utah region. The decision whether or not to build these segments will be made independent of decisions concerning coal development. The enabling

TABLE II-36.--Baseline population and components of change estimated for counties (thousands of persons)

[Source: 1970; U.S. Census of Population. Projection Years and Intervals for Counties; UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

TABLE II-36.--Baseline population and components of change estimated for counties (thousands of persons)

[Source: 1970; U.S. Census of Population. Projection Years and Intervals for Counties; UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

County	1970 population	Interval components of change: Natural increase	Interval components of change: Migration	1975 population	Interval components of change: Natural increase	Interval components of change: Migration	1980 population	Interval components of change: Natural Increase	Interval components of change: Migration	1985 population	Interval components of change: Natural increase	Interval components of change: Migration	1990 population
Garfield---------	3.2	0.2	+0.1	3.4	0.2	+0.2	3.9	0.3	+0.3	4.4	0.3	+0.3	5.0
Kane----------	2.4	0.1	+0.1	3.6	0.3	+0.3	4.2	0.3	+0.0	4.5	0.3	+0.3	5.1
Garfield and Kane--------	5.6	0.3	+1.1	7.0	0.5	+0.5	8.0	0.6	+0.3	8.9	0.5	+0.6	10.1
Beaver and Iron----------	16.0	1.4	+1.0	18.4	1.7	+0.7	20.9	1.5	+0.6	23.0	1.3	+0.2	24.5
Washington-------	13.7	1.2	+2.1	17.0	2.2	+1.8	21.0	2.1	-0.4	22.7	1.7	-0.3	24.1
Beaver, Iron, Washington------	29.6	2.7	+3.1	35.5	3.9	+2.6	41.9	3.7	+0.1	45.7	3.0	-0.1	48.6
Total, five county[1]---------	35.2	2.9	+4.3	42.4	4.4	+3.1	49.9	4.3	+0.4	54.6	3.5	+0.5	58.6

[1]Detail may not add to totals because of independent rounding.

TABLE II-37.--Community population projections
(future environment without the proposed Federal actions)

	1980	1985	1990
Garfield County:			
Antimony	148	168	190
Boulder	176	199	225
Cannonville	144	164	185
Escalante	772	877	989
Hatch	152	173	195
Henrieville	195	222	249
Panguitch	1,553	1,761	1,987
Tropic	425	483	545
Kane County:			
Alton	55	49	46
Glendale	173	157	152
Kanab	3,041	3,335	3,842
Orderville	368	329	324

TABLE II-38.--Projected average daily traffic (ADT) levels on selected segments of Utah highways base line

Segment[1]	1975 ADT	1980 ADT	1985 ADT	1990 ADT	1990 Trucks
1--------	5,580	6,718	7,331	7,785	1,332
2--------	0	0	0	0	0
3--------	4,660	5,611	6,123	6,502	1,095
4--------	4,940	5,683	6,289	6,702	1,058
5--------	4,000	4,601	5,092	5,426	1,009
6--------	4,275	4,917	5,441	5,798	1,088
7--------	300	325	358	393	46
8--------	1,390	1,505	1,658	1,816	314
9--------	415	474	538	607	88
10--------	290	331	376	424	58
11--------	125	143	162	183	22
12--------	0	0	0	0	0
13--------	1,475	1,719	1,885	2,124	274
14--------	355	412	442	486	48
15--------	1,650	1,924	2,109	2,377	310
16--------	810	997	1,077	1,144	71
17--------	135	121	110	105	4
18--------	20	18	16	16	0
19--------	30	38	42	48	3
20--------	1,590	2,002	2,191	2,520	301
21--------	1,020	1,230	1,418	1,633	232
22--------	890	1,073	1,237	1,424	200
23--------	890	1,073	1,237	1,424	200
24--------	55	121	1,450	1,800	90
25A-------	0	0	0	0	0
26--------	0	0	0	0	0
27--------	20	24	30	35	0

[1]See figures II-19, IV-2.

legislation for the Glen Canyon National Recreation Area directed that the Secretary of the Interior, together with the Utah Department of Transportation, study proposed road alinements to determine a route between Glen Canyon City and the Bullfrog Basin. This road is described in the legislation as a "low speed scenic highway." Four feasible routes were identified in 1974 and were discussed in the General Management Plan, Wilderness Proposal Road Study Alternative and Draft Environmental Statement, Glen Canyon NRA (fig. II-23). A final route selection and an appropriation of funds from Congress is necessary before any of these plans are developed.

The Utah Highway Functional Classification and Needs Report, 1972-95, prepared by the Utah Department of Highways (now DOT) included two parts of these routes for the future. One is a paved highway between Escalante and Hole in the Rock. The other is a route similar to route D1 in the Glen Canyon NRA Road Study. This route is on the north side of Lake Powell between Glen Canyon City and the Bullfrog Basin, almost entirely in the NRA. This route (both the State study and the NPS study) would incorporate the present U-277 from U.S. 89 to the NRA boundary and the present county road inside the NRA from the boundary to the Warm Creek Recreation site (fig. II-23). The State study also includes a direct route between Kanab and Interstate route I-15 that bypasses Zion National Park.

In 1973, the Utah Department of Highways (now UDOT) and the National Park Service (NPS) made the Arches/Canyonlands/Capitol Road Transportation study (fig. II-24). This study described roads deemed appropriate and necessary for full utilization of the parks. The roads from Escalante to Hole in the Rock, and from Glen Canyon City to the Bullfrog Basin were among those studied and may be proposed for Federal funding through the NPS's authority to improve exterior park access. Any proposals, however, would have to be submitted to Congress for legislative action and such a submittal must await completion of the Glen Canyon NRA road study and the general management plans and wilderness studies for all four NPS units. The NPS has indicated that other road improvements discussed in this study including, paving the Cannonville to Cottonwood Canyon Road, the Boulder to Torrey Road, the Boulder to Burr Trail Road, U-72 between I-70 at Fremont Junction and U-24 were proposed by the State Department of Highways. These roads are considered beyond the scope of the exterior park access requirements and would not be eligible for funds through NPS.

The Kane County Planning Commission proposed a highway in 1976 along the route from Glen Canyon City to Henrieville originally proposed as a State highway in the Kaiparowits Environmental Impact Statement. This highway would pass along the west side of the Kaiparowits Plateau.

There are no plans to expand utility service into the area. The increased demands for utilities resulting from growth in population and commercial activities will result in the expansion of existing systems. No railroad construction is projected for the region in the absence of major coal development.

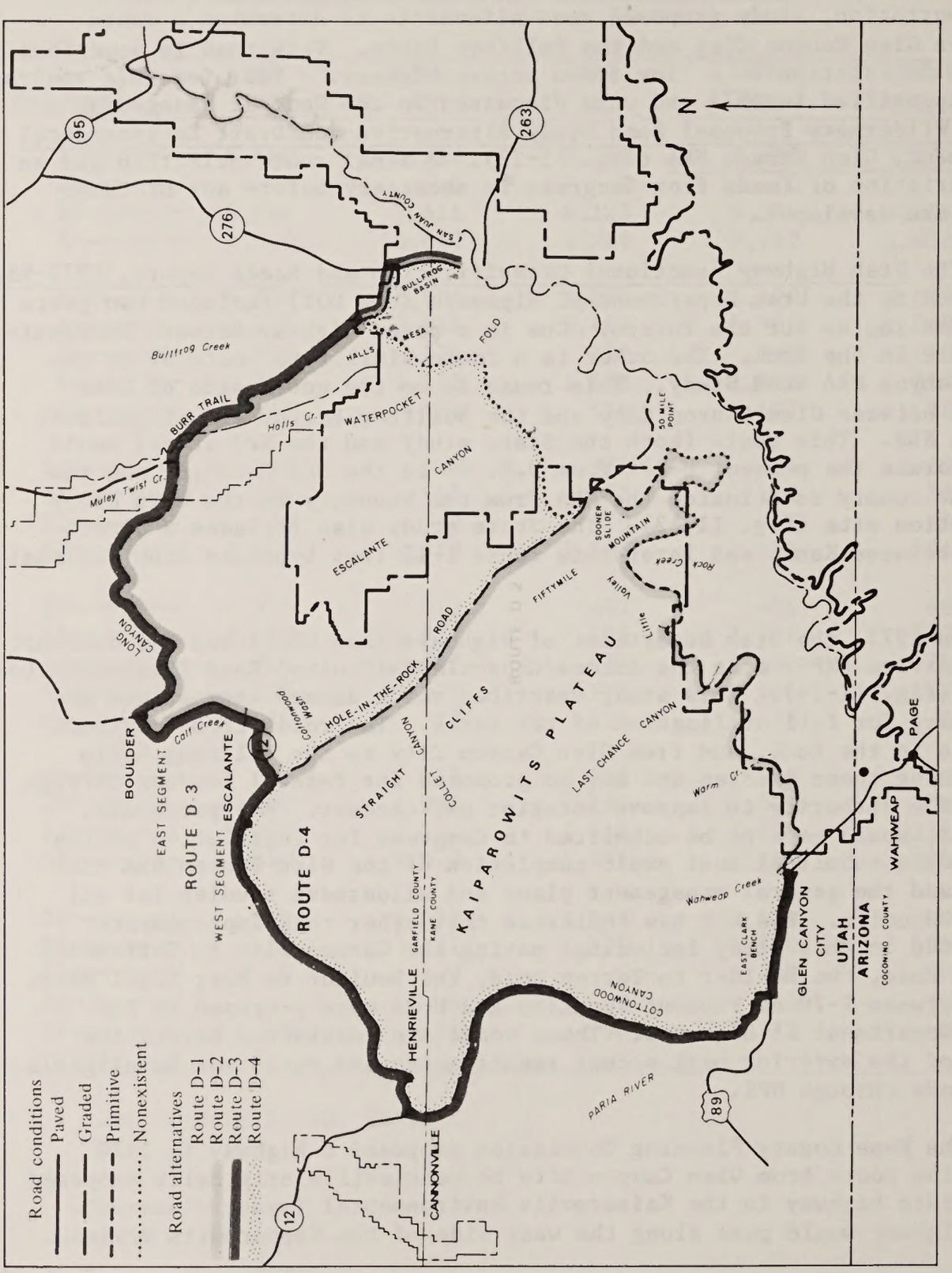


FIGURE II-23.--Glen Canyon NRA road study alternatives.

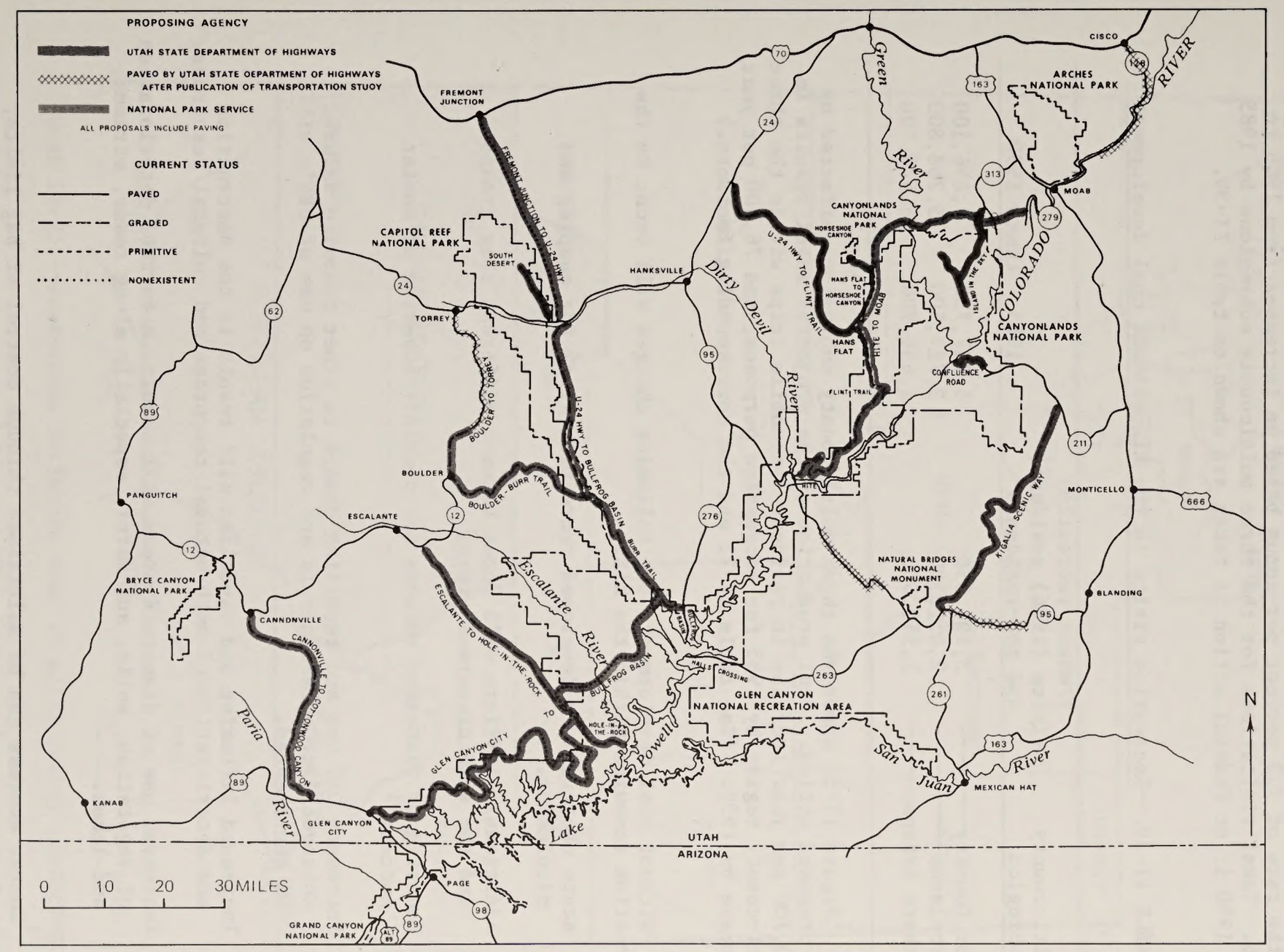


FIGURE II-24.--Road proposals of the Arches/Canyonlands and Capitol Reef transportation study.

Recreation visits and use will continue to increase within the RIZ at the rate of 7.2 percent per annum based on increases from 1966 to 1976. Total visitations for the three multicounty subregions by 1985 and 1990 if no Federal action is taken are shown on table II-39.

TABLE II-39.--Recreation visits in the RIZ without coal development[1]

Multi-county subregion	Present recreation visits (1976) residents and non-residents	1985	1990
Color Country--------	3,791,350	6,957,750	9,856,100
Canyonlands----------	2,051,300	3,717,500	5,268,800
Northern Arizona-----	2,550,000	4,636,900	6,570,500

[1]Figure II-25 shows the three multi-county subregions affected by the proposed action. Coal production at the projected level results in a 53,700 per year increase in resident automobile trips within the three multi-county region by 1985 for recreation purposes, and 76,300 per year increase by 1990. (See table IV-22 and the corresponding footnote.)

Without coal development, the following changes will occur to the recreation resource within the RIZ:

- Acute shortages in developed recreation sites for camping and picnicking.
- Additional conflicts will occur between different user groups and the same dispersed areas.
- Lowering of fisherman success and possible lowering of hunter success.[1]
- Increased ORV use and resulting damage to other resource values. Consequently, more controls and regulation on use of ORV's will be implemented.
- Increased littering and vandalism will result in the destruction and deterioration of both natural resources and cultural resources.
- Increased use of dispersed areas will result in further deterioration of vegetation, soils, and water, especially along roads, streams, and lakes.

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[1]Hunter success can be maintained through control of bag limits, length of season, and so forth. Numbers of hunters afield may be lowered, however.

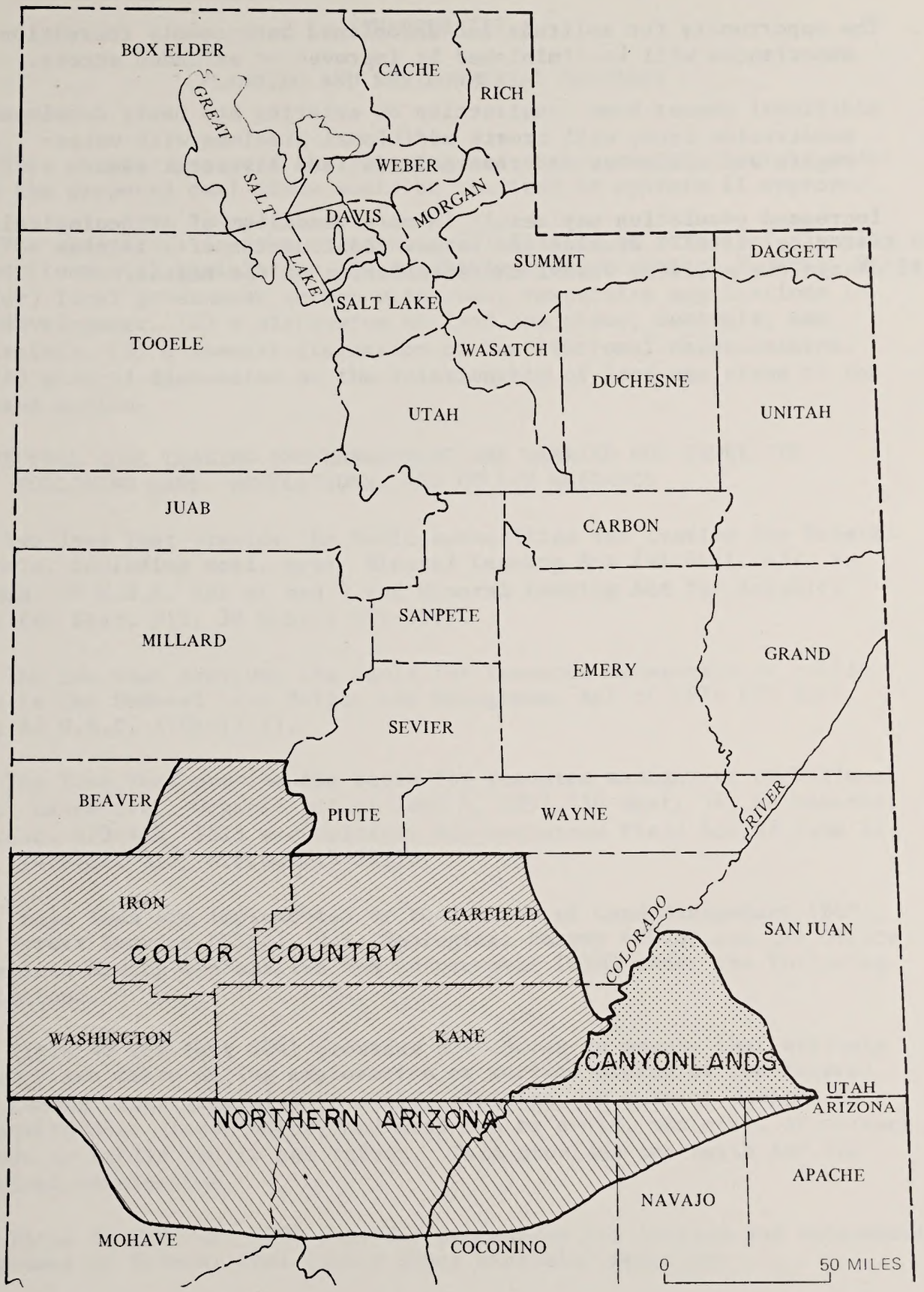

FIGURE II-25.--Recreation influence zone by multi-county subregion.

- The opportunity for solitude and unconfined back-county recreation experiences will be diminished by improved or extended access.

- Additional summer home construction on existing and newly developed subdivision lots, will create additional problems with water-rights and utilities and remove lands from livestock use.

Increased population may result in more vandalism of archeological and historical sites. Housing and normal construction of utilities will change the existing visual characteristics of the region.

CHAPTER III

PLANNING AND ENVIRONMENTAL CONTROLS

This chapter presents the planning and environmental controls under which the proposed coal mines would be required to operate if approved.

The chapter is in four sections: (1) listing of principal planning and environmental legislation and regulations which control Federal, State, and (or) local government action with their respective applications to coal development, (2) a discussion of land use plans, controls, and constraints, (3) a summary discussion of institutional relationships, and (4) general discussion of the relationship of land use plans to the proposed action.

A. FEDERAL COAL LEASING AND MANAGEMENT ARE CARRIED OUT UNDER THE FOLLOWING LAWS, REGULATIONS, AND POLICY GUIDANCE

Two laws that provide the basic authorities for leasing the Federal minerals, including coal, are: Mineral Leasing Act (41 Stat. 437, as amended; 30 U.S.C. 181 et seq.) and Mineral Leasing Act for Acquired Lands (61 Stat. 913; 30 U.S.C. 351-359).

The law that provides the basis for resource management on public lands is the Federal Land Policy and Management Act of 1976 (90 Stat. 2743; 43 U.S.C. 1701-1771).

The laws that provide the basis for resource management on National Forest Lands are: Organic Act of June 4, 1897 (30 Stat. 34, as amended; 16 U.S.C. 473-482, 551) and Multiple Use-Sustained Yield Act of June 12, 1960 (74 Stat. 215; U.S.C. 528-531).

These laws are implemented by the Bureau of Land Management (BLM), USDA Forest Service (USFS), U.S. Geological Survey (USGS) and the Office of Surface Mining Reclamation and Enforcement (OSM) under the following regulations.

Title 43 CFR Part 3041 provides procedures to ensure that adequate measures are taken during exploration or surface mining of the Federal coal (among other minerals) to avoid, minimize, or correct damages to the environment (land, water, and air) and to avoid, minimize, or correct hazards to public health and safety. This provides the basis for the technical examination.

Title 43 CFR Part 3500 provides procedures for leasing and subsequent management of Federal coal (among other minerals) deposits.

Title 43 CFR Part 2800 establishes procedures for issuing rights-of-way to private individuals and (or) companies on public lands.

Title 30 CRF Part 211 governs operations for discovery, testing, development, mining, and preparation of Federal coal under leases, licenses, and permits pursuant to 43 CFR Part 3500. The purposes of the current regulations in Part 211 are to promote orderly and efficient operations and production practices without waste or avoidable loss of coal or other mineral-bearing formation; to encourage maximum recovery and use of coal resources; to promote operating practices which will avoid, minimize, or correct damage to the environment, including land, water, and air, and avoid, minimize, or correct hazards to public health and safety; and to obtain a proper record of all coal produced.

Surface Mining Control and Reclamation Act of 1977 regulates the surface mining of all coal deposits and is implemented by the Office of Surface Mining Control and Reclamation (OSM) in consultation with the BLM and USGS under the regulations in Title 30 CFR Part 700. The Act and regulations provide for:

- environmental performance standards for surface coal mining and reclamation operations;
- inspection and enforcement procedures, including the assessment of civil penalties;
- assistance to small operators in meeting permit application requirements;
- requirements and approval procedures for State programs;
- development of performance standards for the Federal lands program;
- development of the initial regulatory program to be incorporated into coal mining permits issued under State law;
- requirements and procedures for approval of State mining permits; and
- requirements for posting, release, and forfeiture of reclamation performance bonds.

In all cases, pursuant to Section 515 of SMCRA and Federal Regulation 30 CFR 715.13, coal mining operations will be required, as a minimum, to restore the lands affected to a condition capable of supporting the use which it was capable of supporting prior to any mining, or higher or better uses of which there is reasonable likelihood. Mining and reclamation plans will not be approved unless the applicant has demonstrated that reclamation to the proposed postmining land use can be accomplished under the mining and reclamation plan.

1. Air Quality

Applicable legislation and regulations relating to air quality include:

- Clean Air Act, as amended in 1977;
- National Ambient Air Quality Standards (NAAQS);
- New Source Performance Standards (NSPS);
- National Emissions Standards for Hazardous Air Pollutants (NESHAP);
- Prevention of Significant Air Quality Deterioration Regulations (PSD) of June 19, 1978;
- Fugitive Dust Policy: SIP and New Source Review (EPA, August, 1977); and
- Utah Ambient Air Quality Regulations.

The Clean Air Act of 1970 specified that each State would be responsible for ensuring the air quality within its borders and for specifying the way it would be achieved and maintained.

On April 30, 1971, the EPA officially announced the primary and secondary NAAQS (Federal Register 1971). The primary standards were established to protect human health, whereas the secondary standards were established to protect the public welfare from any known or anticipated adverse effects. Standards were put into effect for suspended particulate matter, sulfur oxides, nitrogen oxides, photochemical oxidants, carbon monoxide, and hydrocarbons.

Utah Air Conservation Regulations presently in effect were promulgated September 25, 1971, and revised May 22, 1977. These regulations do not officially adopt the NAAQS, but NAAQS are enforceable in the State. Changes to the Utah regulations are presently being considered by the Air Conservation Committee and are presently in public hearing (December 1978).

The Clean Air Act mandated division of each State and appropriate interstate area into air quality control regions (AQCRs). The Clean Air Act Amendments of 1977 require the States to identify regions and parts of regions that do and do not meet the NAAQS by December 7, 1977, thereby determining which areas are governed by Prevention of Significant Deterioration (PSD) and nonattainment (NA) requirements, respectively. In January 1978, the State of Utah submitted to EPA its initial list of seven NA areas in Utah. The only area potentially impacted by development in this region would be the Cedar City area.

EPA promulgated PSD regulations to protect air quality in those areas where present quality is better than required under NAAQS. The State of Utah was initially classified a Class II area with the exception of five national parks: Arches, Canyon Lands, Capitol Reef, Bryce, and Zion, which are mandatory Class I. Of these five Class I areas, Capitol Reef

and Bryce Canyon National Parks are located in the region (fig. II-23). At present, neither the State of Utah nor the Indian Tribal Councils have definite plans to reclassify any other areas of the State.

Fugitive dust resulting from mine operations is not subject to requirements of the PSD regulations. However, a review is required to determine the Best Available Control Technology (BACT) where potential fugitive dust emissions are equal to or greater than 250 tons per year. Each mine operator will have to employ the Best Management Practices for fugitive dust regardless of predicted concentrations during operation. Thus, each mining plan and the Department's approval thereof shall use, at a minimum, an appropriate combination of the following fugitive dust controls:

- Pavement or equivalent stabilization of all haul roads used or in place for more than one year;

- Treatment with semipermanent dust suppresant of all haul roads used or in place for less than one year or for more than two months;

- Watering of all other roads in advance of and during use whenever sufficient unstabilized material is present to cause excessive fugitive dust;

- Reduction of fugitive dust at all coal dumps and truck to crusher locations through use of negative pressure bag house or equivalent methods. Inclusion of conveyor and transfer point covering and spraying and the use of coal loadout silos.

In the 1977 Clean Air Act amendments Congress declared as a national goal "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairments result from manmade air pollution." The EPA is required to develop regulations regarding visibility in mandatory Class I areas by August 1979.

2. Paleontology

Applicable regulations include the Utah State Antiquities Act (Utah State Code Annotated Sec. 63.18.2-38). This act includes paleontology and requires that a paleontological survey shall be undertaken before mining activities begin, on State land and all provisions of the State Antiquities Act shall be complied with. In the event that paleontological resources are discovered on federally owned lands, proper Federal authorities shall be notified and their recommendations followed.

When completed, the provisions of these documents will serve as a basis for management of paleontological resources and appropriate protective programs.

3. Water Quality

Applicable legislation and regulations include:

- Federal Water Pollution Control Act (FWPCA), as amended in 1972; National standards to restore and maintain the chemical, physical, and biological integrity of the Nation's waters were promulgated by the Federal Water Pollution Control Act (FWPCA), as amended in 1972.

- Colorado River Basin Salinity Control Act, P.L. 93-320, authorizes the construction, operation and maintenance of certain works in the Colorado River Basin to control the salinity of water delivered to users in the United States and Mexico.

- Minute No. 242 of the International Boundary and Water Commission, United States and Mexico, constitutes an interpretation of the 1944 Treaty with Mexico. The principal provision of Minute No. 242 is a U.S. commitment to maintain a salinity differential of not more than 115 parts per million between Imperial Dam (the lowest major U.S. diversion point) and Morelos Dam (the major Mexican diversion point).

- Water Quality Standards for Utah, June 21, 1976--Utah water quality standards were issued under authority of Utah Code Annotated, 1953, as amended in 1967. Under Title 73, chap. 14 of the Code, the Utah Bureau of Water Quality is empowered to enforce these water-quality standards. Important prescribed standards include those which specify maximum permissible concentrations of dissolved solids, minimum permissible concentrations of dissolved oxygen, and the permissible temperatures of the waters of the State. Other important aspects of the standards are an anti-degradation policy and a stream classification system with specific criteria for numerous classes of waters. Effluent standards and limitations specifying the maximum amounts of pollution and waste which may be discharged into State waters are described.

4. Cultural Resources

Applicable authorities include:

- Antiquities Act of 1906 (34 Stat. 225; 16 U.S.C. 431-433);

- Historic Sites Act of 1935 (49 Stat. 666);

- Reservoir Salvage Act 1960 (74 Stat. 220);

- National Historic Preservation Act of 1966 (80 Stat. 915; 16 U.S.C. 470);

- National Environmental Policy Act of 1969 (33 Stat. 852; 42 U.S.C. 4321, et seq.);

- Executive Order (E.O. 11593);
- Historical and Archealogical Data Preservation Act of 1974 (88 Stat. 174, 16 USC 469);
- Federal Land Policy and Management Act of 1976 (90 Stat. 2743);
- Utah State Antiquities Act (Utah State Code Annotated Sec. 63.18.2-38)--The State of Utah has an antiquities law, applicable to State lands, that is similar in scope to the Federal Act of 1906. Additionally, the various Federal agencies have specific authority to add stipulations to leases, licenses, permits, etc. such as are deemed necessary to protect the environment, including cultural resources.

The Bureau of Land Management and the State of Utah have entered into a Cooperative Agreement outlining actions and interactions that have or will be taken to insure full compliance pursuant specifically to the National Historic Preservation Act and EO 11593. (See chapter IX.)

A similar Cooperative Agreement exists between the USGS and BLM for "Protection of Cultural Resources Related to Onshore Mineral Lease Operations Exclusive of Oil, Gas, Geothermal, and Oil Shale."

Both Federal and State antiquities acts regulate antiquities excavation and collections, and both protect historical values on public lands. They provide for fines and (or) imprisonment for violators of their provisions. The Historic Preservation Act requires that certain Federal undertakings be submitted for review by the Advisory Council on Historic Preservation. The Alton, Kaiparowits Nos. 1-5, Red, and Blue mines will comply with Section 106 of the National Historic Preservation Act of 1966 (16 USC Section 470f, as amended, 90 Stat. 1320) and the Advisory Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800) prior to approval of any undertaking which will affect cultural properties included in or eligible for inclusion in the National Register of Historic Places. Executive Order 11593 requires all Federal agencies to cooperate with the nonfederal agencies, groups, and individuals to insure that Federal plans and programs contribute to the preservation and enhancement of non-federally owned historic and cultural values.

No mining or rights-of-way will be approved until the surface management agency has coordinated professional cultural resource (cultural resources include archeological, architectural, and historical remains) surveys with the Utah State Historic Preservation Officer and received his written comments, and review. Additional surveys and mitigation may be necessary if surface evidence indicates further evaluation is necessary.

5. Railroads

The Interstate Commerce Act (49 Stat. 543, 49 U.S.C. 1(18)) requires the prior approval from the Interstate Commerce Commission for the extension or new construction of a line of railroad or the abandonment of operation

of a line of railroad. Exempted from this authority are spur, industrial tram, switching, or side tracks located wholly within one state. Commission certification is based on a balancing of the relevant economic, technical, and environmental factors.

6. Mineral Protection

Oil and gas leases are in effect for much of the area. Priorities for mining or drilling for oil and gas on public lands are established by the Conservation Division of the U.S. Geological Survey. Mining operations must be approved in accordance with 30 CFR 211.11 if they approach wells or bore holes that may liberate oil, gas, water, or other fluid substances. Impacts on oil and gas areas can be mitigated largely by agreements among operators where the potential impact on oil well siting or pipeline location is significant. In extreme instances of conflict, technology is adequate through directional drilling, drainage practice, recovery of wells lost, pipeline and flow line relocation, pillar recovery, and mining methods to adequately mitigate potential impacts.

7. Endangered Species

Applicable authorities include the Endangered Species Act of 1973 (87 Stat. 844). This Act provides protection for listed species (both flora and fauna) and their critical habitat. Prior to authorization of any significant disturbance of lands under lease or permit, the Department of the Interior will require that a survey be made to determine if listed species or their habitat may be present. If it is determined that listed species or their habitat may be present and may be affected by the proposed activities, appropriate consultation with FWS will be carried out. No activities will be authorized until consultation is completed as per 50 CFR 402 (January 4, 1978). The Virgin River is populated by the endangered woundfin (Plagopterus argentissimus) and alteration of the flow, that might affect the woundfin, is subject to this act.

8. Wildlife and Fishes

Applicable authorities include the Bald Eagle Protection Act of 1969 (16 U.S.C. 668-668c). Under this law mining operations will not be permitted in any area where such activities would molest or disturb bald and (or) golden eagles and (or) their nests.

Fish and Wildlife Coordination Act (16 USC 661 et. seq.)--states that whenever waters of any stream or other body of water are controlled or modified, adequate provisions will be made for conservation and maintenance of wildlife resources and their habitat.

Migratory Bird Treaty Act (40 Stat. 755 as amended, 44 Stat. 1555) provides protection for song birds and other wild migratory birds.

B. LAND USE PLANS, CONTROLS, CONSTRAINTS

In the region, a large number of separate entities exercise land and resource use controls. The Federal sector includes the National Park Service (Capitol Reef, Bryce Canyon National Parks, Glen Canyon National Recreation Area, and Cedar Breaks National Monument), USFS (Dixie National Forest), and the BLM (public lands and mineral estate under certain private lands).

Development, management, use, and control of use on Federal lands has been delegated to these agencies. Controls are effected through issuance or non-issuance of a variety of leases, permits, licenses, etc. Each authorization to use Federal lands contains provisions to control that use. Controls exercised by the Federal government for the subsurface estate are governed by the statutes authorizing the disposition and use of that estate. Foremost among these statutes is the authority for leasing coal deposits and authority to require, as a condition of such leases, an operation-management plan and a reclamation-restoration plan.

A number of State agencies have development and administrative authority over State of Utah owned lands. The State does not have a land use planning act.

Except where controls have specifically been delegated by statute to counties or municipalities, Utah retains total jurisdiction over nonpublic and privately-owned lands. Certain of these lands were conveyed to the State as part of the Act admitting Utah to the Union. This legislation granted Sections 2, 16, 32 and 36 of every township to the State for education purposes. Use and control of these lands (including mineral leasing, rights-of-way, etc.) is governed by Utah law.

Under Utah statutes, counties have authority to effect a wide variety of controls in matters not specifically reserved to the State. The authority applies only to those portions of the county that are unincorporated. A county may regulate and restrict location and use of buildings and structures, and use, condition of use, or occupancy of lands for residency, recreation, agriculture, industry, commerce, public use, and other purposes.

Local government regulations directing land development in the region include Washington, Iron, Garfield, Kane, Wayne and Emery County zoning ordinances, County Master Plans, County planning documents by the Five County Association of Governments, and directives from municipal and county development and planning councils. General recommendations and directives permit the following actions:

- Mining is permissible under present zoning ordinances. Environmental stipulations for specific use authorizations may be required as well as close coordination with local officials.

. Ancillary facilities and mine development must meet local or county utility and service requirements.

C. INSTITUTIONAL RELATIONSHIPS

1. U.S. Geological Survey (USGS)

The Area Mining Supervisor, acting for the Director, reviews the mining plans and when the plan is determined to be acceptable, makes recommendations to the Office of Surface Mining (OSM) for approval. Under provisions of 30 CFR 211, he has further responsibility in prospecting, exploration, testing, development, mining, coal preparation and handling, and abandonment operations on Federal coal leases. Inspections can be made by the authorized representative of the Secretary on the basis of information indicating a violation of the Surface Mining Control and Reclamation Act of 1977 or of the terms contained in the mining lease and approved Mining and Reclamation plan. Inspections are also made on a random basis of at least one complete inspection each 6 months (30 CFR 721.11(c)).

2. Bureau of Land Management (BLM)

The BLM, in consultation with OSM, formulates the requirements to be incorporated in the reclamation plan for the protection of the surface and nonmineral resources and for reclamation obligations and standards of performance required of the leasee on public lands as specified in 30 CFR 211 and 700. An area of operations for each lease is established by agreement between the BLM, USGS, and OSM and includes that area of the leased lands required for development, production, and processing operations, including all related structures and facilities. The BLM is responsible for compliance on the lease outside the geographical area of operations. Inspections are conducted at least once annually. The BLM must concur with reclamation plans as they pertain to surface management before approval is granted. Standards and requirements upon which BLM concurrence is based are specified in 43 CFR 3041 and 30 CFR 700.

BLM is responsible for authorizing various ancillary facilities such as access road, power lines, communication lines, and railroad spurs on public lands not covered by leases. Rights-of-way are granted pursuant to Title V of the Federal Land Policy and Management Act of October 21, 1976 (P.L. 94-579, 90 Stat. 2743).

The rights-of-way would be approved subject to standard requirements for duration of the grant, right-of-way widths, fees or costs, and bonding to secure obligations imposed by the terms and conditions applicable to the right-of-way grants. The terms and conditions applicable to the rights-of-way are those in 43 CFR 2800 plus any other specific standard requirements and terms and conditions for the rightof-way applications in the proposed actions.

Ancillary facilities on the lease area of operations which are owned by the operating company and are a normal part of the mining and

reclamation plan are approved by USGS as part of the mining and reclamation plan.

3. USDA Forest Service (USFS)

The USFS, in consultation with the appropriate legal authority, formulates the requirements to be incorporated in the mining and reclamation plans for the protection of the surface and nonmineral resources and for reclamation obligations and standards of performance required of the lessee on National Forest System Lands as specified in 30 CFR 211.40.

The USFS must concur with mining and reclamation plans as pertains to surface management before approval is granted for commencement of mining operations. Concurrence may or may not be given. Standards and requirements upon which USFS concurrence is based are specified in 43 CFR 3041.

The USFS is responsible for authorizing various ancillary facilities such as access roads, powerlines, communication lines, and railroad spurs on National Forest lands not covered by leases. Rights-of-way are granted pursuant to Title V of the Federal Land Policy and Management Act of October 21, 1976 (P.L. 94-579, 90 Stat. 2743).

The rights-of-way would be approved subject to standard requirements for duration of the grant, right-of-way widths, fees or costs, and bonding to secure obligations imposed by the terms and conditions of the right-of-way grants.

Ancillary facilities on the lease area which are owned by the operating company and are a normal part of the mining and reclamation plan are approved by USGS as part of the mining and reclamation plan.

4. National Park Service (NPS)

Special land use permits will be required for any crossing of NPS lands for new roads, improvement to existing roads that require additional rights-of-way, utility lines, water supply lines or other activity.

5. Office of Surface Mining Reclamation and Enforcement (OSM)

The OSM was created to carry out the provisions of the Surface Mining and Reclamation Act of 1977 (P.L. 95-87) (SMCRA). Some of the stated purposes of the Act are:

- to establish a national program to protect society and the environment from the adverse effects of coal mining;
- to prohibit mining where reclamation as required by the Act is not feasible;
- to assure that reclamation occurs as contemporaneously as possible with the mining;

- to strike a balance between protection of the environment and agricultural productivity and assuring adequate coal production;
- to assist the States in developing, administering, and enforcing regulatory programs which achieve the purposes of the Act;
- to achieve reclamation of areas previously mined;
- to provide appropriate procedures for public participation in the development of regulations, standards, and programs under SMCRA;
- to encourage full utilization of coal resources through development of underground mining techniques; and
- to encourage and provide a means for the conduct of research and the gathering of additional information in the fields of mining, mineral, and reclamation technology.

The Act sets forth minimum environmental protection performance standards which apply to coal exploration, surface coal mining and reclamation operations, surface effects of underground coal mining operations, and surface coal mining in special areas or in special circumstances (such as auger mining, anthracite coal mines, coal mines in Alaska, alluvial valley floor mining, mining on prime farmland, steep slope mining, and surface mining concurrent with underground mining). Persons who propose to conduct surface coal mining and reclamation operations (which includes surface effects of underground mining by definition) must apply for and receive permits which incorporate the provisions of the Act and regulations.

Other major provisions of the Act include the establishment of the abandoned mine reclamation fund for use in acquisition and reclamation of previously mined areas, special procedures for mining on land owned by the United States, designation of certain lands as unsuitable for all or certain types of coal mining and procedures for future designation of termination of other lands as unsuitable for all or certain types of surface coal mining operations, procedures for inspection and enforcement, and provisions for judicial review.

The Act provides further that any State may assume primary jurisdiction over the regulation of surface coal mining and reclamation operations on non-Federal and non-Indian lands through submission of a program for implementation, enforcement, and administration of the provisions of the Act. A State's program becomes effective after review and approval by the Secretary of the Department of the Interior (Secretary). OSM maintains a limited role in a State with an approved program. This role includes (1) such inspections as necessary to evaluate administration of State programs, (2) enforcement against imminent hazards (Section 521 (a)(2) of the Act), (3) partial substitution of a Federal for a State program when a state is not enforcing a part of its approved program (Section 504 of

the Act), or (4) Federal enforcement during a State program under Section 521(b) of the Act.

The Secretary must prepare and implement a Federal program for a State which chooses not to submit a State program, fails to submit an acceptable State program, or fails to implement, enforce, and maintain a State program previously approved. The Secretary and a State with an approved program may enter into a cooperative agreement which provides for joint State-Federal regulation of surface coal mining and reclamation operations on Federal lands within that State. Utah has entered into such a program with the Secretary.

The Office of Surface Mining, the U.S. Geological Survey, and the Bureau of Land Management have entered into a cooperative agreement (June 6, 1978) that assigns to one of the three agencies responsibilities for pre-lease and post-lease functions.

6. Department of Energy (DOE)

The Department of Energy Organization Act (P.L. 95-91) of August 4, 1977 transferred to the Secretary of Energy the functions of the Secretary of Interior to promulgate regulations under the Mineral Lands Leasing Act and the Mineral Leasing Act for Acquired Lands which relate to:

- fostering of competition for Federal leases (including, but not limited to, prohibition on bidding for development rights by certain types of joint ventures);
- implementation of alternative bidding systems authorized for the award of Federal leases;
- establishment of diligence requirements for operations conducted on Federal leases (including, but not limited to, procedures relating to the granting or ordering by the Secretary of the Interior of suspension of operations or production as they relate to such requirements);
- setting rates of production for Federal leases; and
- specifying the procedures, terms, and conditions for the acquisition and disposition of Federal royalty interests taken in kind.

7. State of Utah

Division of Oil, Gas, and Mining.--This division and the Office of Surface Mining are preparing rules and procedures to implement the applicable initial regulations of the SMCRA.

Division of Health.--Reviews air pollution sources, culinary water sources, water treatment and solid waste disposal areas.

Division of Lands.--Utility lines, roads, and railroads crossing state land would require easements from the division.

Division of Water Rights.--This division authorizes diversion structures, channel modifications, slurry lines and water use.

Department of Transportation.--Relocation of highways, highway access, utility line crossings of State and Federal aid highways, and wide and heavy loads require authorization from the department.

Division of Wildlife Resources.--Administers all wildlife within the State of Utah, not held in private ownership legally acquired, as property of the State and is charged with its protection, propagation, management, conservation, and distribution throughout the State.

D. RELATIONSHIP TO LAND USE PLANS

1. BLM Planning

The Management Framework Plans (MFP) for the Cedar, Garfield, Escalante, Paria, Zion, San Rafael and Henry Mountain Planning Units include the entire southern region and were completed from 1971 to 1975. Escalante, Paria, and Zion MFP were updated in April and May of 1977 to include the site specific coal proposals. The Escalante, Paria and Zion MFP will be updated by the end of 1979. The recommendations and decisions of the MFP allows the development of coal from the Alton, Red and Blue and Kaiparowits Nos. 1-5 mines.

No management decisions were made for the conceptual proposals of Utah Power and Light, Sunoco, and UPB due to the conceptual nature of their plans.

2. USDA Forest Service Planning

The USFS planning governing management in the southern region is included in the Paunsaugant-Sevier, Aquarius and Boulder Land Management Plans (LMP). A draft Paunsaugant-Sevier LMP and EIS will be published in February 1979. The Aquarius and Boulder LMP were published in October 1973 and April 1975 respectively. The site specific mine and reclamation plan proposals are not located on National Forest land. Management direction in these LMP will not prohibit coal development.

The following management direction relating to coal development is found in the LMP:

- Prohibit enlarging the road through Red Canyon on the Paunsaugunt Plateau beyond the present right-of-way.

- Restrict utilities corridor to the canyon south of Wilson Peak and westward toward Hillsdale.

- Protect and maintain Henderson Rim seen production areas in development of the Jesse Knight property.

- Mining operations on the Jesse Knight property would not be allowed within view of Pine Lake Recreation area.

- Limestone development would be allowed if scenic views from Powell Point are protected.

- Manage exploration and development of mineral and energy resources to protect esthetics and scenic views from the proposed Table Cliff Scenic Area.

3. National Park Planning

Management objectives of the Revised Statement for Management of Capitol Reef National Park (8/77) relating to coal development in the region include:

- Protect and preserve the environment within the natural area of Capitol Reef National Park. Permit biological, geological, and other natural processes to function with a minimum of human disturbance.

- Cooperate with the Forest Service, BLM, other State and Federal agencies, private organizations and interests, and members of the public in:

    1) Ensuring that grazing, mining, and other land uses in the park's vicinity are conducted in a manner that minimizes adverse impacts on park resources.

    2) Ensuring that regional energy development does not result in deterioration of the Park's air quality, scenic resources, or the experience of its visitors.

    3) Close all unnecessary roads into Capitol Reef National Park and restore sites to as natural an appearance as possible.

Management objectives for the Glen Canyon National Recreation Area, Cedar Breaks National Monument, and Bryce Canyon National Park relating to coal development or transportation of coal include:

- Propose a utility planning corridor below the dam for the location of transportation and (or) utility systems. (See Glen Canyon NRA Draft EIS 8/77.)

- Manage the Escalante River drainage as wilderness. Utility rights-of-way would not be permitted in this wilderness and natural zone. (See Glen Canyon NRA Draft EIS 8/77.)

- The proposed zoning will not directly affect the mining of coal within the recreation area (except in the vicinity of Spencer and Navajo Points, where the coal is not considered of commercial value, as noted previously). The removal of the recreation area's coal may be permitted, subject to the regulations of a subsequent mineral resources management plan. (See Glen Canyon NRA Draft EIS 8/77.)

- Manage to provide intensive water-recreation use, and visitor services and maintain facilities at Wahweap/Lone Rock and Warm Creek areas. These areas are designated development zones which are existing developed areas, relatively elaborate and permanent structures necessary to support recreational activities. Mining is prohibited, however, utility structures are permissible.

- Close the area of Hall's Creek to vehicles in Capitol Reef National Park and Glen Canyon NRA and restore the area as nearly as possible to its natural state.

- Make a concentrated effort to acquire all lands and interests in the lands, including mineral interests within the parks.

- Establish a system for the protection and enhancement of the cultural environment; preserve, restore and maintain objects of historical, architectural and archeological significance.

Management objectives for Zion National Park include:

- Continue observations to determine the effects of heavier visitor use and the changing land use practices in the surrounding area on air and water quality, wildlife and plant life.

- Maintain the quality and flow of water from all natural water sources that have been traditionally important in serving domestic needs and in perpetuating the Park's ecological communities.

- Cooperate with other governmental agencies, local communities, private organizations and members of the public in:

    1) Ensuring that grazing, logging, mining, summer home development and other land uses in the Park's immediate vicinity are compatible, to the greatest degree possible, with long-term perpetuation of the Park's scenic and natural values.

    2) Ensuring that energy development in the Park's airshed is implemented in a manner that preserves existing air quality in the Park.

    3) Studying and monitoring air and water quality in the Park's airshed and watershed in order to develop programs for their improvements.

CHAPTER IV

IMPACT ANALYSIS

A. NATURAL ENVIRONMENT

1. Land

Coal mining and the other projects included in the projected level scenario would impact the configuration of the land surface, the paleontologic and minable mineral content of the land, and the soil. An estimated 18,584 acres would be disturbed, anticipated to 1990 for population growth and over the entire life of the projects for disturbance at and near the project sites (table I-4). An estimated 1,725 acres would permanently change in land use, because of facilities that would remain beyond the life of the several projects (table I-4, footnotes). The 1,187 acres committed to the Water project (A-WV) would result in improved irrigation and agricultural production from about 10,000 acres. An estimated 463 acres would be needed to accommodate the population growth that would accompany coal production at the projected level and operation of the A-WV energy system.

During its existence, the Alton strip mine would affect 8,280 acres of land surface. Highwalls as high as 150 feet and spoil piles would be created in as many as four areas at a time during mining. Affected land would be returned to its approximate original contour in accordance with the Surface Mining Control and Reclamation Act of 1977; differences in detail would remain, however, and drainage patterns would be slightly altered. About 300 acres would be permanently altered by grading. All these changes would alter erosion.

Installation of the Allen-Warner Valley powerplants and the auxiliary coal-slurry pipelines, coal-preparation plant, and necessary powerlines and roads would require some modification of 9,588 acres. Most of this impact is site specific and remote from the southern coal region and therefore does not cumulate on impact caused by mining. Except for analysis of the fuel source, the entire project is the subject of an environmental statement being prepared by BLM.

On the Kaiparowits Plateau, an underground mining area, subsidence could affect about 3,000 acres in addition to the 253 acres disturbed by surface facilities (table I-4). Studies of subsidence have been made by Brauner, 1972, 1973; Dunrud, 1976; Osterwald and Dunrud, 1977; and Wardell, 1971. These authors present formulae and methods for determining subsidence; their results, however, cannot be used to predict or accurately quantify subsidence in the region. A reasonable estimate of maximum subsidence, after Dunrud (1976), is from 50 to 90 percent of the mined thickness of the underlying coal beds. The greater subsidence occurs where overburden is thinnest and coal-extraction is greatest. Subsidence could be less than expected for deeper beds, depending on mining conditions. The surface area subject to subsidence would range from 90 to about 130 percent of the area of the mine workings.

Surface expression of subsidence would include open and closed fractures in the bedrock; buckled and buldged bedrock; and sinkholes and other depressions. In the areas discussed by the authors cited above, tension cracks, owing to subsidence from mining 900 feet below the surface, have been found in outcrops of massive sandstone (Dunrud, 1976, p. 9). The cracks range in width from less than an inch to 3 feet and some are hundreds of feet long. Except where the surface is soil-free sandstone, the fractures generally are filled with soil or debris. Subsidence could increase the potential for rockfalls and landslides. Coal beds that overlie mine workings would be subjected to stress and possible rupture by subsidence; it could cause caving, and thereby complicate or preclude future mining.

Construction and mining near and below cliffs could increase the frequency of land and rockslides. Any single induced landslide, however, would probably involve only a few acres. Colton (in Sargent and Hansen, 1976, p. 81, 82) has pointed out the most susceptible formations. It is anticipated that enforcement of 30 CFR part 211 regulations by the U.S. Geological Survey will avoid most of this potential impact.

Mining induced earthquakes with Richter magnitudes greater than 4.9 are not anticipated. This magnitude is the highest recorded earthquake within the region. Mine-stress releases, however, could prove hazardous to mine workings, potential landslide areas, and poorly designed and located earth dams and foundations.

Impacts to paleontological resources would consist of losses of plant, invertebrate, and vertebrate fossil materials for scientific research, public education (intepretative programs), and to other values. Losses would result from destruction, disturbance or removal of fossil materials as a result of coal mining activities, unauthorized collection, and vandalism. A beneficial impact of development would be the exposure of fossil materials for scientific examination and collection which otherwise may never occur except as a result of overburden clearance, exposure of rock strata, and mineral excavation. All exposed fossiliferous formations within the region could also be affected by increased unauthorized fossil collecting and vandalism as a result of increased regional population. The extent of this impact cannot be presently assessed because of a general lack of specific data on such activities. Because of the present lack of data and accepted evaluatory criteria for determination of significance, no meaningful assessment can be presently made as to the extent and nature of the loss of these paleontological values to science or education, or to the significance of potential impacts on the fossil record.

The major impact on coal would be non-recovery. About 50 percent of minable coal is nonrecoverable in underground and about 10 percent in surface mines. If longwall mining methods can be used in underground mines, non-recovery would be reduced to about 35 percent. Non-recovery of coal in underground mining generally may be attributed to the following:

- coal is left in pillars and barriers to protect against subsidence and caving;
- beds are too thin to be safely or economically recovered;
- beds are too thick (more than 12 or 14 feet, dependent on mining equipment) to be completely recovered by current mining techniques;
- coal is in multiple beds that are too close together to be safely mined.

The minable (recoverable) and unminable coal at the projected level of mining (50 to about 90 percent extraction) is given below in millions of tons:

Proposed mine	Estimated in-place coal (in minable beds)	Approximate recoverable coal	Non-recoverable minable coal and (or) unminable coal
Alton strip mine (Nevada Electric Investment Co. and Utah International, Inc.)[1]	212.0	199.0	13.0
Blue underground mine (El Paso Coal Co.)	12.0	4.5	7.5
Kaiparowits underground No. 5 mine (Mono Power Co., et al)	89.0	44.5	44.5 (est.)
Total	313.0	248.0	65.0

[1]Utah International, Inc., estimates an additional 125 million tons is recoverable under deeper cover, from holdings of Federal, State and private lands.

Coal-bed fires can cause loss of an unknown amount of coal. Fires can occur through spontaneous combustion and lightning. Such fires can and do occur in abandoned mine workings, generally near the surface; and they may be uncontrollable, especially where air is supplied through subsidence cracks.

Methane and other mine gases can escape to the surface through mine openings and subsidence fractures. The gases can be harmful to vegetation close to the vents.

At a production level of 12 mty, the impact on other minable minerals would be minimal. Lime dust used in underground mining would require about 10 pounds per ton of coal produced or about 7,500 tons per year. The amount is insignificant, and impact relative to additional limestone quarrying and truck haulage cannot be quantified until a source is selected.

Soils would be affected wherever the surface is disturbed by mining, powerplants, ancillary facilities and transportation systems. Secondary impacts would also result from population growth and subsequent increased recreational activities.

Total projected acreage of soil disturbance is 18,584 acres; 8,533 acres from developing the three mines at the projected production level, 9,588 acres from developing the Allen-Warner Valley power project and 463 acres from associated community development (table I-4). Of the total acreage, 1,725 acres probably would change in use owing to permanent occupation by facilities or housing (table I-4). As a result of the increased population, an additional but unquantifiable acreage of soil would be disturbed by increased recreation use, especially by ORV's.

Of the soils that would be disturbed by the proposed activities (excluding the Allen-Warner Valley power project), about 42 percent are moderately deep, 20 percent shallow and rocky (including rock outcrops), and 38 percent deep (greater than 40 inches). The major portion of soil disturbance would occur in the Alton coal field where soil and climatic conditions indicate a fair to good potential for reclamation. After successful reclamation, which would require special soil handling soil amendments, reseeding, transplanting, and possibly irrigation, the disturbed soils would be returned to at least 90 percent of their original productivity.

The greatest amount of soil erosion would occur when soils are bare of vegetation or other protective materials, especially during construction phases and strip mining. In compliance with the Surface Mining and Reclamation Act of 1977, erosion by water would largely be controlled, so that the sediment would remain within disturbed areas. Wind erosion would be more difficult to control but will be mitigated by provisions required by EPA (chapter III, Air).

Increased onsite erosion rates of 1.0 to 50 yds^3/acre/yr could be expected by water erosion and 6 to 90 yds^3/acre/yr by wind erosion on disturbed bare soils. An average erosion increase of 10 yds^3/acre/yr is

anticipated in this analysis.[1] Actual erosion would be determined by length of time the soil was exposed, surface configuration, and the weather during that period. After reclamation, soil erosion rates should be lower than under natural conditions over much of the area, owing to reduced slopes, installation of erosion control structures, mulching, and reestablishment of vegetation.

Research at the Alton coal field by the Intermountain Forest and Range Experiment Station, in cooperation with BLM and Utah International, Inc., indicates that reclamation (with emphasis on revegetation) can be successful in that area (oral communication, Neil Frishknecht and Bob Ferguson, Intermountain Forest and Range Experiment Station, 1977, 1978).

Soil impacts from subsidence would not be expected to include much more than some loss of soil in subsidence cracks and local loss of soil moisture owing to rapid infiltration of runoff into subsidence cracks.

2. Water

Surface runoff may be diverted into cracks because of subsidence and subsequent cracking. The quantity of water that might be so diverted, if any, cannot be predicted, but it could not exceed the average annual runoff (30 acre-ft) from the areas involved and would probably range from zero to one-fourth of the annual runoff. Thirty acre-ft per year is about one-half of 1 percent of the runoff from the Kaiparowits Plateau. Water so diverted into the ground would not be lost but would add to ground-water storage and would eventually be discharged elsewhere in the same drainage.

Mining that drains water from coal beds or saturated beds above the coal will cause local water-level declines, and change the direction of ground-water flow near the mine. Subsidence and associated cracking could possibly drain saturated sandstone beds above extracted coal and thereby increase recharge to lower beds. Less than one-half of the mining at each proposed site would be in or below saturated beds and might therefore affect ground-water flow. Accordingly, the amount of ground water and saturated sandstone that would be affected is very small--less than one-tenth of 1 percent of that in the region. Formations and possible saturated sandstone that would be disrupted in the Kaiparowits Plateau would include the John Henry and Drip Tank Sandstone Members of the Straight Cliffs Formation and the Wahweap Formation; those in the Alton area would include the Dakota Sandstone and alluvial deposits.

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[1] Onsite erosion estimates by water are based on the universal soil-loss equation described by the USDA Soil Conservation Service (1976). The maximum rate of erosion was determined for a fresh spoil pile composed mostly of clay-shale material, with a slope length of 120 ft and a gradient of 60 percent. Wind erosion estimates are based on the system described by the USDA Soil Conservation Service (1967, rev. 1977). Sandy soils have the highest wind erosion rates.

The chemical quality of the water is not likely to be affected by drainage of acid waters from mines because, (1) the sulfur content of the coal is low, generally less than 1 percent, (2) the quantities of water and rates of water movement associated with the coal and the overburden material are small--average is less than 40 acre-feet per year per square mile--and (3) most of the water in the study area is highly alkaline--concentrations of bicarbonate are 100-300 mg/L, which would buffer acidity. A recent study of mine drainage and water quality in Colorado shows essentially no coal-mine drainage problems, which is attributed mainly to the low sulfur content of western coal (Wentz, 1974).

The chemical quality of water in the strip-mine area near Alton would deteriorate owing to leaching from disturbed material. Contamination would consist mainly of increased concentrations of sodium, sulfate, and nitrate. Effects on ground water would be restricted to the mined area, as little water movement is expected through the replaced overburden. The concentration of dissolved solids in runoff from the mined area may increase as much as 10 percent, based on data from Black Mesa, Ariz. (Verma, 1977); this increase would have little effect locally and would probably be imperceptible in flows to the Colorado River because the mined area is less than one-half of one percent of the total watershed involved. Because mitigating control measures may not be completely effective, particularly during heavy rainstorms, sediment movement from spoil piles may cause local increases in sediment loads in tributaries of Kanab, Skutumpah, and other washes directly intercepted by strip mining. However, increased sediment movement to the Colorado River would be insignificant (less than 0.2 of 1 percent) because the source area (the spoil piles) at any given time would be extremely small compared to the total contributory areas of Kanab Creek or the Paria River.

Mine drainage may contain concentrations of trace elements, particularly arsenic, iron, manganese, and selenium, slightly greater than normally found in natural streams of the region, as in some coal mines in central Utah, based on unpublished data from Southeastern Utah Association of Governments, 208 Water Quality Program, 1977. However, quantities of mine drainage would be small--probably less than 10 acre-feet per year--and reasonable enforcement of mitigations regarding effluent standards should prevent any contamination of streams and aquifers. Water pollution from mine facilities, such as storage and loading areas, tailing ponds, waste piles, and conveyor belts, will be prevented by adequate enforcement of Utah effluent standards and limitations.

Water for mines and possible new communities (table I-4) would likely preempt water presently used for other purposes, mainly agriculture. Present diversion points are fixed by established water rights and are not expected to change. Such a change in water use would not likely affect Utah's share of Colorado River water or the salinity of the Colorado River. About half the water used domestically would be discharged as effluent from sewage treatment plants. Sewage effluent usually contains dissolved solid concentrations about 300 mg/L greater than the supply water (Weinberger and others, 1966) but is suitable for some agricultural use. For purpose of

analysis, it is assumed that sewage effluent would be used for agriculture. If 830 acre-feet per year (half of the 1,660 acre-feet community supply, table I-4) of sewage effluent were eventually discharged into the Colorado River, the calculated increase in salinity of the river would be less than 0.05 mg/L.

Water requirements for the projected scenario, but excluding the water project (A-WV) would be 43,940 acre-feet per year (table I-4) of which all would be consumed except 830 acre-feet per year of sewage effluent. If water can be made available, as much as an additional 18,000 acre-feet per year would be consumed by the Allen-Warner Valley water project; this water would supplement present irrigation of about 10,000 acres, and resultant increases in agricultural production are anticipated. Ground water would be withdrawn from the Navajo Sandstone in the Alton area to supply 160 acre-feet to the Alton mine, 1,256 acre-feet to the coal processing plant and 8,284 acre-feet to the slurry lines (table I-4), adding to a total of 9,700 acre-feet per year. The two powerplants would consume 7,000 acre-feet of water per year extracted from the slurry and 32,500 acre-feet per year derived from other sources; (27,250 acre-feet per year from Las Vegas Wash and 5,250 acre-feet per year from the Washington County Water Conservancy District); details are described in the Allen-Warner Valley site specific EIS being prepared by BLM. Long term ground-water withdrawal from the Navajo Sandstone in the Alton area would cause water-level declines of more than 100 feet within a 2-mile radius of the wells, but decline would be less than one foot at a distance of 10 miles from the wells (written commun., BLM, 1977). As water levels lower, yields of wells and springs that tap the Navajo Sandstone would be decreased or dried up. It is impossible, with the data available, to isolate impacts to specific wells or springs. The impact probably is long term; recovery after pumping stops might require 35 years or more. Other impacts on water that would be attributable to the Allen-Warner project include: (1) the State of Utah would gain a portion of its entitlement to Colorado River water by the capture of 36,000 acre-feet per year of Virgin River flow; (2) the proponent proposes to divert about 6,000 acre-feet (part of the 8,284 acre-feet, table I-4) of ground water per year to Nevada through the slurry line to the Harry Allen powerplant (interstate diversion of water not permissible under present Utah law); (3) the average salinity of the Virgin River at Littlefield, Arizona would increase from 1,900 mg/L to 2,200 mg/L, but owing to the decreased inflow from the Virgin River, the salinity of the Colorado River would decrease about 2 mg/L; (4) the salinity of the Colorado River at Lake Mead would decrease about 7 mg/L owing to reduced inflow from Las Vegas Wash. Details of these impacts are discussed in the Allen-Warner Valley site specific EIS (BLM).

3. Air

Present and projected emissions sources in the region are: (1) the three coal mines at a production of 12 mty as described in chapter I, (2) the Allen-Warner Valley powerplants and the Navajo powerplant near Page, Arizona (fig. I-2), and (3) other area sources, such as population activity, traffic, etc. Coal mining emissions would be mainly fugitive dust raised at the mining sites and from roads leading to the sites.

Powerplant emissions analysis considers only stack emissions. The area-source emissions would be from activity incidental to mining (i.e., traffic, urban fuel combustion, etc.), as well as from activity of secondary population growth. The year 1975 was selected as a base year for defining present air quality conditions. The air quality impacts summarized below are based on detailed analyses made by AeroVironment (1977, 1978).

Emissions of SO_2, CO, HC, and NO_x would result from fuel combustion. As it is anticipated that electric equipment would be used for underground mining and that traffic from trucks and automobiles would be low in comparison to major highway traffic, these emissions would be negligible. However, numerical values have been computed (AeroVironment, 1977).

The regional air-quality impact from coal development was modeled by using the complex terrain models (AVMSTM and modified CDM) to determine the regional TSP, SO_2, and NO_2 impacts under reasonable worst-case meteorologic conditions for short-term averaging times and under representative meteorologic conditions for the annual average. The worst-case meteorologic conditions were based on sensitivity analysis and were adjusted based on actual meteorologic data collected in the study area. The analysis combined the impacts from all coal development and related sources to determine the combined impact. Pollutant concentrations were calculated to compare with the National Air Quality Standards and with the prevention of significant deterioration (PSD) requirements of the Clean Air Act Amendments of 1977. Pollutants not significantly increased by coal development were not modeled but were assessed qualitatively.

Coal mining transport could contribute fugitive dust to the air; generally the impact is highly localized. Of the calculated total potential fugitive dust emission from the three mines, vehicle travel modeled on unpaved roads accounts for 99 percent at the Alton strip mine (table IV-1). Watering is 50 percent efficient in reducing dust emissions from roads (PEDCO, 1976, 1977) oiling about 50-75 percent efficient, and paving or equivalent stabilization approaches 100 percent efficiencies. Paving or equivalent stabilization (Best Available Control Technology-BACT) is required by EPA and would essentially eliminate the potential of fugitive dust to create a significant adverse impact to the air quality. (See chapter III.)

TABLE IV-1.--Potential fugitive dust emissions at Blue, Kaiparowits No. 5, and Alton mines

[Data from AeroVironment, 1977, 1978]

Mine	Total potential dust emissions tons/year	Potential dust emissions from haul and access roads tons/year	Potential dust emissions from haul and access roads percentage of total
Blue----------	7,040	7,020	99
Kaiparowits No. 5--	10,080	10,040	99
Alton----------	18,530	16,330	88

Impacts from fugitive and non-fugitive dust at the Alton mine would be very small. Maximum impact at Zion National Park is expected to be less than maximum impacts at Bryce Canyon National Park because pollutants would diffuse more in traveling the longer distance to Zion. In addition, the frequency of impact occurrence at Zion would be less than at Bryce Canyon because winds blow toward Zion less frequently. Modeling of emissions in the mine area, based on watering control of dust emission from unpaved roads, indicates that mine activity would increase the annual average particulate concentration by about 20 $\mu g/m^3$; added to the annual geometric mean of 17 $\mu g/m^3$, the total concentration would be less than the National Ambient Air Quality Standard (NAAQS) of 60 $\mu g/m^3$. Similarly, at Bryce Canyon and Zion National Parks, the modeled increase in concentration would be less than 0.1 $\mu g/m^3$. Reduction from the modeled results would accrue because of the mandatory requirements of BACT (EPA, see chapter III); the annual average particulate concentration in the mine area would be about 2 $\mu g/m^3$ and at the National Parks, would approach zero.

The short term (24 hour maximum average) total concentration of particulates would be less than 5 $\mu g/m^3$ beyond the boundaries of the Alton West and Alton East properties. The average 24 hour TSP background concentration is 21.5 $\mu g/m^3$ and the resultant concentration of less than 26.5 $\mu g/m^3$ would be well under the federal standard of 150 $\mu g/m^3$. Excluding fugitive dust sources, to enable comparison with PSD regulation, the impact at the closest Class I area of Bryce Canyon would be about 0.1 $\mu g/m^3$, well within the PSD incremental standards. Additional control required by BACT (EPA, see chapter III) would further reduce these impacts.

The effects of SO_2 emissions were modeled for all sources within each general source type for each modeling area. The impacts from specific sources were combined for cumulative analysis. The major sources that affect SO_2 concentrations are the powerplants (fig. IV-1); SO_2 emissions from mining activities are negligible and those from the Warner Valley powerplant would not exceed PSD incremental limitations for any potentially affected class I and class II areas. Consistent with the worst-case approach, maximum possible impact was predicted by modeling possible wind directions that overlapped plumes from several powerplants or that carried plumes into nearby class I nondegradation areas. Impacts remain well below the ambient air quality standards for both 3 hours and 24 hours. The 24 hour average SO_2 concentrations are within the class II incremental standards and are within the class I increment at all potentially affected class I areas in the southern region (AeroVironment, 1977). The annual average SO_2 impact from the proposed Warner-Valley powerplant would be small. No class I areas would be impacted by more than the class I annual standard, and no class II areas would be impacted by more than 1 $\mu g/m^3$. The maximum total annual average SO_2 concentration would be under 8 $\mu g/m^3$, which is well under the Federal ambient standard of 80 $\mu g/m^3$ (AeroVironment, 1977).

Although the regional analysis by AeroVironment did not indicate potential class I or class II PSD violations owing to the A-WV project, additional studies will be presented in detail in the site specific A-WV Environmental Statement being prepared by BLM. These studies will address

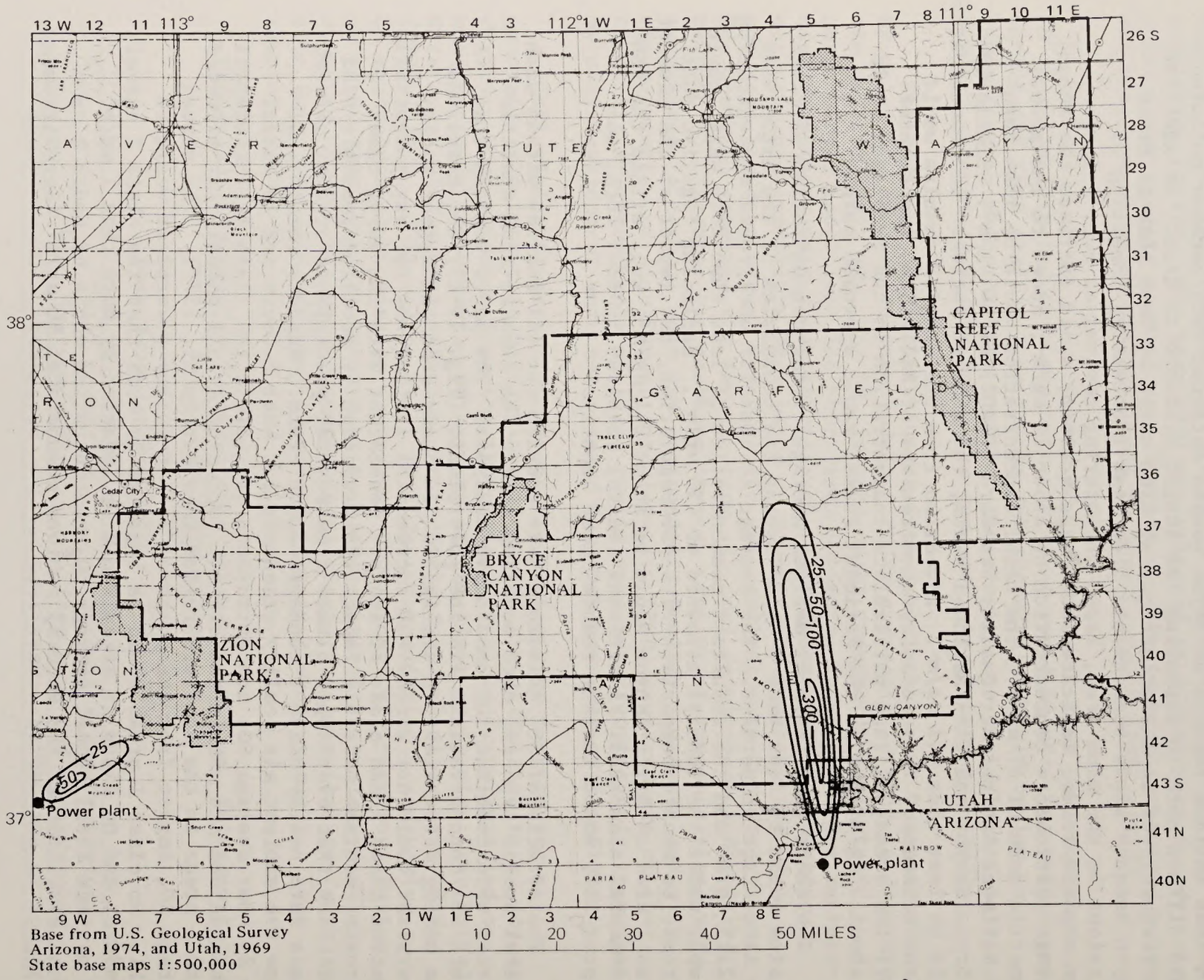


FIGURE IV-1.--Calculated maximum 3-hour SO_2 concentrations ($\mu g/m^3$) from existing and proposed powerplants, for the projected production level.

the following potential effects: (1) a pollution increase at Warner Valley during frequent winter inversion periods; (2) possibility of violations of class II PSD limitations; (3) possible violations of class I PSD standards at Zion National Park; and (4) visibility impacts in Zion National park.

NO_x impacts are primarily associated with powerplant emissions. The emissions from the powerplants would result in NO_2 annual average concentrations (even assuming 100 percent conversion of NO_x emissions to NO_2) of less than 15 $\mu g/m^3$, including a background of 10 $\mu g/m^3$. This is well under the Federal standard of 100 $\mu g/m^3$.

Population increase would commit the air quality near towns to some degradation because of particulate, CO, SO_2, HC, and NO_x emissions. The concentrations and distribution cannot be accurately quantified, but no NAAQS violations are anticipated, because of the expected dispersion and modest size of the increase.

Any discussion of visibility must first note that visibility is poorly defined, mainly because it is physiometrically determined. Esthetic visibility also differs from functional visibility, and the color of the obscuring medium will play a role in an esthetic evaluation of visibility degradation to scenic vistas. No visibility standards presently exist, but EPA will issue visibility regulations by August, 1979. The visual impact of the projected scenario would be a general degradation of atmospheric clarity because of particulate matter emitted from the facilities. A detailed discussion of the assumptions and methodology used in the visibility analysis is given in AeroVironment, Inc. (1978).

According to E. Robinson (1968), a brown discoloration of a white target at 2 miles will probably be apparent when a concentration of 0.25 ppm (500 $\mu g/m^3$) NO_2 is present. Other pollutants, mainly particulates, can also affect color and visibility in the atmosphere. Because the annual average NO_2 concentration would be less than 15 $\mu g/m^3$ (even assuming all NO_x converts to NO_2), there would be no general brown discoloration in the region. A brown discoloration may be apparent for specific powerplant plumes whenever very stable atmospheric conditions limit plume dispersion.

The potential reduction in visibility owing to mining was calculated by use of TSP concentrations. Modeling, assuming a 50 percent reduction of fugitive dust emission by watering of unpaved roads, indicated a maximum 24-hour average TSP concentration increase of about 1 $\mu g/m^3$ at Bryce Canyon National Park. Added to the background particulate concentration of 21.5 $\mu g/m^3$, the sums are used to calculate visibility. (See chapters II and III.) The calculations indicate that the visual range at Bryce Canyon would be reduced 2 miles (2 percent reduction) from the current calculated 87 miles. The worst-case meteorological conditions used in calculating this visual reduction occurred once in 17 months. The visual range calculation was made without guidance from EPA, which is required to promulgate visibility regulations by August 1979. In summary, because

of application of BACT, the potential impact on visual range at Bryce Canyon would be reduced further.

4. Vegetation

Over the life of the coal mines and including community development at the projected level, 8,996 acres of vegetation would be removed. A similar acreage would be removed by the proposed Allen-Warner Valley project, but mostly in areas distant from the mine projects and the regional boundaries so the impact is mainly site specific and not cumulative. The A-WV site specific impacts are being addressed in a separate statement being prepared by BLM. Vegetation impact, caused by the Alton, Kaiparowits No. 5 and Blue mines and by population growth, are itemized by vegetative type (table IV-2). Of the impacted acreage, most would be in the Pinyon-Juniper Woodland (77 percent), and Sagebrush-Grass (13 percent) vegetative types. Mine mouth structures, roads, plantsites, coal conveyors, powerlines, and strip mines would replace this vegetation. Urban development would damage 463 acres of vegetation. The influx of people owing to mining may also contribute to vegetation loss through off-road vehicle use, accidental wildfires and other careless acts. The location and extent of the impact, however, cannot be identified. The permanent loss or long-term change induced by mining and the A-WV project would affect 1,725 acres (table I-4, footnotes).

Current annual forage production of the affected vegetative types range from almost nothing to as much as 1,500 pounds per acre dry weight, with an average of about 200 pounds per acre (oral communication, Larry Sip, BLM Area Manager, Kanab, 1977).

Some of the disturbed sites that receive low precipitation and have poor soils will be difficult to revegetate. However, experience has shown and research (Aldon and Springfield, 1977; Thames, 1977; Vories, 1976) is showing that, with proper procedures and care, most areas can be revegetated. Irrigation may be required on all sites receiving less than 10 inches of precipitation per year (National Academy of Sciences, 1974). There have been many successful revegetation projects in the Pinyon-Juniper type. The vegetative type accounts for over 75 percent of the area planned to be disturbed. By 3 years after seeding and planting, 90 percent of the disturbed areas will be revegetated to a level of usable forage at least as high as before disturbance (BLM, 1975). It is assumed that after 5 years these sites will produce more usable forage than their present low level (Phillips, 1976). Mitigation for the loss of native vegetation shall first be aimed at maintaining or restoring the watershed function and soil productivity. In conjunction with that step, disturbed areas shall be revegetated to provide for the planned land uses after completion of the project.

The Pinyon-Juniper Woodland type contains a few fenceposts, Pinyon nuts, and Christmas trees per acre. Most of these products would be removed and thus salvaged before construction. However, these products

TABLE IV-2.--Acres of impact by vegetative type

[Vegetative types; NP, nonproductive; AL, agricultural land; G, grassland; DS, desert shrub; SG, sagebrush-grass; PJ, pinyon-juniper woodland; MB, mountain brush]

Project	NP	AL	G	DS	SG	PJ	MB	Total
Mines:								
Alton	50	420	65	---	1,070	6,360	315	8,280
Blue	---	---	---	---	---	33	---	33
Kaiparowits No. 5	---	---	---	15	---	---	---	15
Subtotal	50	420	65	15	1,070	6,393	315	8,328
Percentage	0.6	5.0	0.8	0.2	12.8	76.8	3.8	100
Ancillary facilities	---	---	---	---	---	---	---	205
Community (1990)[1]	---	---	---	---	---	---	---	463
Total								8,996
Total acreages in southern region by vegetative type	1,300	26,900	163,800	1,052,200	169,000	1,786,900	220,200	---

[1] Present data are insufficient to breakdown impacts by vegetative type.

would not be regrown during the projects. Regrowth would take from 20 to 60 years after rehabilitation.

Mitigations should prevent direct impact on threatened or endangered plants from coal production. However, there may be some inadvertent impact (probably minor) caused by urban development and activities of the increased population. The distribution and density of growth of these plants is not well enough known in the areas of potential impact to allow better quantification of the probable impact.

The Endangered Species Act of 1973 requires that all Federal departments and agencies shall protect such species. Some steps which will be taken are: (1) all lands planned to be disturbed by coal mining operation will be intensively surveyed to determine whether threatened and endangered plants are present; (2) distribution of threatened and endangered plants will be plotted on maps of proposed disturbed area; (3) size of construction activities will be limited to the minimum; and (4) critical plants and habitats will be avoided in all construction and operation activities.

A projected minor increase in man-caused fires and acreage burned will not cause much impact on the presently small fire problem in the area.

5. Wildlife

The total wildlife habitat that would be occupied, disturbed, or otherwise altered by coal mining and total community development at the projected level is 8,996 acres. Of this amount, 222 acres of wildlife habitat is irrigated cropland, which may be lost owing to change of water use from agricultural to industrial and domestic. After completion of mining, road and urbanized area would remain, and 538 acres of habitat would be premanently changed or lost (permanently converted in land use, 463 acres for community development and 75 acres for roads, see table I-4). The remaining area, although reclaimed over 5 to possibly as much as 60 years, may be altered so that some former wildlife inhabitants may find it unsuitable. Consequently, some species would have a permanent loss of habitat.

Hunting, fishing, hiking, ORV, camping, and other uses would cause direct losses of wildlife and displacement of species from heavily used areas. Disturbance during nesting, calving, or fawning seasons would lower productivity, and eggs or young would be abandoned. The projected population increase attributable to coal mining and energy development is only 30 percent of the total population increase expected in the area by 1990. (See recreation section for areas of use and numbers of participants.) The possible development and use of recreational lots on remote private lands would cause an additional loss or abandonment of habitat but, lacking data on location, the impact cannot be further quantified.

Demand would increase for hunting and other recreation related to wildlife. (See recreation section.) Legal hunting and harvest would be regulated by appropriate regulations and bag limits, but illegal activities

related to wildlife would increase. Arrests for game law violations in the State increased an average of 16 percent per year from 1971 to 1975. Enforcement personnel remained essentially the same. In Carbon and Emery Counties, which had a population increase related to energy development, the number of wildlife citations increased 41 percent from 1973 to 1975. Figures from Wyoming indicate an almost direct correlation between population growth during 1970-77 and increased arrests for wildlife violations during the same period (Repsis, 1977). Studies in Idaho and New Mexico suggest that the illegal harvest of some game species may exceed the legal harvest (Vilkitis, 1968; Pursley, 1977).

Construction of access roads and increased traffic would increase wildlife highway mortality. Wildlife highway mortality is directly proportionate to the density and speed of traffic and adjacent wildlife populations (McClure, 1951; Oxley and others, 1974). The vulnerability of species varies; however, young animals or animals inexperienced with high-speed traffic seem to be most susceptible (Hodson, 1960; McClure, 1951). No data are available on the present mortality, except for deer and raptors; mortality cannot be quantified for other species. Studies in other states show an average rate of yearly highway losses ranging from 0.09 to 2.5 wildlife victims per mile (McClure, 1951). The rate for southern Utah would probably fall within that range. Species most susceptible to highway mortality include:

Deer	Kestrel
Rabbits	Rough-legged hawk
Skunks	Golden eagle
Porcupine	Short-eared owl
Mice	Great horned owl
Ground squirrels	Burrowing owl
Pheasant	Common and lesser nighthawks

According to UDWR records of reported raptor mortality in the State during 1974-76, highway mortality (66 birds) was the second most common cause of death. Death by shooting (71 birds) was the most common. Based on the present rate of deer highway mortality, increased traffic by 1990 would increase highway mortality by 50 percent, or 60 deer annually.

Adding 70 miles of new utility lines would provide perching sites for raptors. This would be beneficial, especially on the Kaiparowits Plateau, where tall trees are scarse. Perching and nesting sites along roadways or in areas open to significant human access, however, would expose raptors to shooting and disturbance. Studies in Utah revealed greater raptor mortality (because of shooting) along utility lines paralleled by a road (Ellis and others, 1969). The incidence of shooting generally increases with the size of the raptor (Brown, 1974), and diurnal raptors are most susceptible (Glue, 1971). The extent of such mortality cannot be quantified; but it would be significant for species of national interest, such as bald and golden eagles. Of the known causes of eagle mortality reported in the State during 1973-76, shooting caused 42 eagle deaths compared to electrocution, the most common cause of reported deaths (52 eagles killed).

New utility lines would create additional flight hazards for all birds, and some would be killed (Stahlecker, 1975; Weir, 1976). Such losses would reduce local populations; however, losses of the peregrine falcon or bald eagle would be of national significance. The proposed lines would not conflict with the hunting territories of nesting peregrine falcons in the area, but migrant birds could be killed (Herren, 1969).

Cumulative impacts on deer, from mining, would include loss of habitat from occupation by structures or other facilities and displacement from habitat or reduced use from disturbance. The acreage that would be affected is shown on table IV-3. The loss of deer winter range would be 738 acres; the effect would be a local impact on the total of 4,126,660 acres of regional deer winter range (table II-12). Data are not available on deer numbers, forage production or potential carrying capacity; therefore, the number of animals that would be affected cannot be quantified. The impacts to deer would continue for the life of the mines or until facilities are removed and areas reclaimed.

TABLE IV-3.--Impacts on mule deer habitat

[Data are in acres affected]

Component	Summer range		Winter range	
	Occupied	Reduced use[1]	Occupied	Reduced use[1]
Alton Mine----------	[2]8,280	205	---	---
Alton Mine----------	---	---	---	512
Blue Mine----------	---	---	33	---
Kaiparowits No. 5---	---	---	15	---
Ancillary facilities	---	---	205	2,944
Urbanization--------	---	---	138	---
Total----------	8,280	205	391	3,456

[1]50 percent reduction in use within 1/10 mile of perimeter of disturbance center.

[2]360 acres would be disturbed per year; reclamation would require about 5 years.

Elk range in the Cedar Mountain-Kolob area may be reduced by summer homes. The amount of range that may be lost cannot be quantified, however. Development on remote areas of the Kaiparowits Plateau may halt the establishment of bighorn sheep bands in areas of historical range. Human activity can cause bighorns to avoid or abandon otherwise suitable range (Irvine, 1969). Encroachment on mountain lion home ranges by mining activities and disturbance would reduce local populations. This reduction cannot be quantified because of lack of data on populations and distribution.

The loss of 463 acres of agricultural and raw land from urbanization attributable to development would reduce local populations of cottontail

rabbits. Additional habitat would be lost to mining. A total of 8,996 acres of habitat would be disturbed. Of that area, approximately 463 acres would remain permanently occupied by homes. Cottontail rabbits are found throughout the region at altitudes below 8,000 feet (table II-13); the consequent reduction in populations owing to loss of 8,996 acres of habitat cannot be quantified.

About 180 acres of pheasant habitat would be lost to urbanization. Additional habitat, as much as 222 acres, mainly of irrigated cropland, may also be lost because of irrigation water diverted to domestic and mining uses.

About 2,000 acres of sage grouse range (about 50 birds), which constitutes about 50 percent of the present habitat would be eliminated or significantly altered by strip mining. An undetermined amount of additional habitat may be lost because of urbanization in the Panquitch-Hatch Bench area. The amount or location of this impact cannot be predicted. Present populations are low; therefore, only a small number of birds would be affected. Loss of this habitat, however, would reduce the potential for expansion of flocks.

Although the largest turkey populations in the region (table II-13) would not be impacted the Alton strip mine would eliminate or significantly alter approximately 350 acres of summer turkey range and 6,000 acres of winter range. Additional habitat in the Navajo Lake, Strawberry Point, and East Zion areas may also be lost due to occupation by summer home developments and disturbance by recreationists in that area. The result would be a reduction in the long-term productivity of turkey and a reduced potential for expansion of present flocks.

The most significant impacts to raptors would be caused by increased population. Illegal shooting and highway mortality were discussed previously, and it seems that little can be done to eliminate these impacts. The bald and golden eagles have been protected by law for several years; however, significant man-caused losses still occur. This trend probably will continue. Loss of mature ponderosa pine trees from strip mining in the Alton area would eliminate some roosting and nesting sites for raptors. The temporary elimination of small mammals and reptiles because of strip mining, recontouring, and occupation of habitat by structures would eliminate raptor use on affected areas. After reclamation, the areas may be enhanced for some prey species, and raptors adapted to hunting open country broken by clumps of retained trees would be benefitted.

The endangered Utah prairie dog would not be directly impacted by the proposed mining. Urbanization could encroach on prairie dog habitat on private lands in Cedar, Parowan, and Sevier Valleys. Resulting losses may be partially offset by ongoing transplant programs.

Impacts to wildlife from the Allen-Warner Valley Energy system, exclusive of the Alton mine, are discussed in the site specific environmental statement being prepared by BLM. Major identified impacts include: disturbance of 9,588 acres of habitat; loss or disturbance of rare species

such as the Gila monster, desert tortoise, and desert bighorn sheep; potential disturbance of nesting raptors in Warner Valley and along the Hurricane Cliffs; and a long-term lowering of native wildlife productivity. Beneficial impacts would be creation of resting and feeding areas for waterfowl and shorebirds, and an increase of pheasant habitat on 10,000 acres of irrigated cropland in Washington County.

6. Fisheries

Fishes and their habitat in the Virgin River and Kanab Creek would be affected by population growth associated with mining and water use for the Allen-Warner Valley Energy system. The principal anticipated cause of adverse fishery impact would be water depletion, pollution and overfishing. Overfishing would be the major impact in the Escalante, Dirty Devil, and the Upper Sevier tributary streams and the numerous small reservoirs and lakes.

Changing water use from irrigation to domestic use may cause a change in the diversion points (very unlikely, see Water section), which in turn could impact fish habitat: moving diversions upstream would adversely affect fish habitat; moving diversions downstream would cause no change.

Water may be polluted by point source effluents and non-point source effluents. Point source discharges are regulated under Utah effluent standards and limitations. Reasonable enforcement will avoid impact of fisheries. Non-point pollution will come mainly from surface runoff or infiltration to ground water. The deleterious products include suspended sediment, trace elements and dissolved solids. Sediment and trace elements have been suggested as being the most injurious to fish (McAda and others, 1977). Although mining would cause no increase in sediment concentrations (see Water section) increased human activity, such as road improvement, subdivision construction, etc., in the region, may increase sediment concentrations. Fish habitat in Lake Powell's Wahweap and Warm Creek bays and the East Fork Virgin River could be impacted if sediment concentrations are increased.

Increased population associated with coal production would increase the demand for fish resources. In 1975 about 31 percent of all the people in Utah fished; in the region, this would amount to 15,000 residents (USFWS, 1977). At the projected coal production level, resident Utah fishermen would increase to around 20,000 and resident Arizona fishermen would increase to about 3,500 in the area adjacent to the coal region by 1990. (See Recreation.)

Trout fishing in southern Utah is limited to the few small streams and reservoirs supporting fishable populations which may be in equilibrium with present fishing pressure, and their fish management programs. An increase in fishermen numbers would increase the amount of waters being "fished out." It is generally recognized that this point is reached when the average catch rate falls below 0.5 fish creeled per hour and fishing pressure declines. Overfishing would adversely affect fish

populations in the Virgin River tributaries, Kanab Creek, Upper Sevier River tributaries, Escalante River tributaries and the small reservoirs, lakes and ponds on Boulder Mountain within the region. (See Recreation.)

A biological opinion on the impact of the proposed Warner-Valley energy system to the critical habitat of the endangered woundfin was stated in a memorandum (April 3, 1978; Regional Director, Fish and Wildlife Service to the State Director, Bureau of Land Management):

> "It is our opinion that the Warner Valley Project as now proposed will be likely to jeopardize the continued existence of the endangered woundfin by adversely modifying its present habitat in the Virgin River. This habitat is considered essential for survival of the species and has been proposed for designation as "Critical Habitat," as provided for by the Endangered Species Act of 1973, in the Federal Register, Vol. 42, No. 211, Wednesday, November 2, 1977."

However, the same opinion recognized that "the project would have a beneficial impact during the low flow months of July through September. . . "which" would. . .improve conditions. . .and result in a larger woundfin population surviving the summer. . . .This beneficial impact would be negated by the reduced habitat available during the winter and spring periods." The opinion further presented recommendations, the most critical being "if these flow recommendation can be maintained at the Hurricane Gaging Station. . .the project's adverse impacts on the woundfin can be eliminated."

7. Invertebrates

No impact owing to coal mining at the projected level is anticipated on snails proposed for threatened or endangered species listing. Increased use of water in Warner Valley and Washington County, Utah, owing to the increased population, may reduce habitat of the St. George snail. The snail is proposed for threatened of endangered listing and the potential impact will be considered in the site specific environmental statement being prepared by BLM.

B. CULTURAL ENVIRONMENT AND LAND USE

1. Lands

Mining plans for development off the Kaiparowits Plateau near the Glen Canyon National Recreation Area indicate the following potential conflicts:

- Blue and Kaiparowits No. 5 mine and truck-haul routes would require improved access onto the plateau. Transportation options include improving a county road which crosses the NRA and extends to Glen Canyon City. (See chapters II and IV, Transportation.) If the projected work force settles in Page, this route would become a major employee access, as well as a truck hauling route. (See chapter IV, Socioeconomics and Transportation.) This transportation system includes development of coal and transporting

coal from Nipple Bench and Four-Mile Bench, both potential roadless areas. (See chapter II.) Nipple Bench is adjacent to the NRA, and transportation of coal would be visible from the NRA.

- Upgrading the road between Escalante and the Blue mine to facilitate traffic to Escalante or to provide access to a preliminarily proposed Utah Power and Light railroad terminus would include crossing a potential roadless area contiguous to Devil's Garden outstanding natural area and a potential roadless area contiguous to Escalante Canyon.

- Owing to the increase in population, some lands may be converted from present uses to use for recreation homes but the amount and location cannot be quantified. Some private lands that are generally remote may be these affected.

Contingent upon the EIS, the BLM Paria Planning Unit management framework plan (MFP), recommends providing public lands to satisfy demands for access rights-of-way and tramroads to prospective industrial sites and coal leases in a manner most consistent with managing other resources.

The Zion Planning Unit MFP identifies the following coal-related impacts within the planning unit, which includes the Alton coal field:

- Black, Buck, and Bald Knoll cinder cones are unique features adjacent to or within the proposed Alton mine and should be protected from actions allowing removal of material or interferring with recreational values. The cinder cones are not on the coal lease but may have secondary recreational impacts from increased population in Longview Valley.

- Also near the Alton minesite, archeologic sites along Glendale Bench may have secondary impacts from population expansion in Long Valley.

- Private land surrounding Muddy Creek near Mt. Carmel has a high potential for speculative development. This area is presently highly susceptible to floods; no surface disturbance should be allowed unless rehabilitation is immediate and effective. Geodes are common throughout the area, which could result in increased surface disturbance from rockhounds. Zoning and use regulations may be required.

- The present means of solid-waste disposal in Long Valley communities does not meet Utah health standards and should be negotiated before development.

Coal-related impacts within the Garfield County BLM planning unit include potential expansion of undeveloped subdivisions on public lands, unregulated by county planning or zoning ordinances. Specifically, subdivisions include Bryce Woodland, secs. 2, 3, and 10, T. 38 S., R. 5 W.,

and Sevier River Estates, secs. 12 and 13, T. 37 S., R. 6 W. No coal development is proposed within the Garfield Planning Unit. Garfield County is developing permanent regulations for land-use zoning.

2. Agriculture, Range, and Timber

Construction and operation of the Alton, Kaiparowits No. 5 and Blue mines, and total urban development would remove 8,996 acres of vegetation (table I-4). Some of these losses would be recovered through revegetation. The net loss of grazing capacity would be 1,729 AUM's (see glossary) over the life of the projects, or enough forage to feed 144 cows for 1 year (table IV-4). These impacts would accrue on lands of all ownerships. A similar acreage and about 280 AUM's per year of grazing would be removed by the proposed Allen-Warner Valley energy project; over the A-WV project life of 40 years, the total loss would be 11,200 AUM's. However, the water project (A-WV) would result in improved irrigation and agricultural production from about 10,000 acres.

TABLE IV-4.--Range impacts

Project	AUM's per year	Years	Total AUM's	Percentage of total
Alton-------	[1]8-46	23	830	48
Blue mine---	2	12	24	1
Kaiparowits No. 5-----	1	35	35	2
Roads-------	4	30	120	7
Powerlines--	1	30	30	2
Communities-	23	30	690	40
Total----	39-77	--	1,729	100

[1]About 8 AUM's would be lost in the beginning of the operation. Loss would increase to 46 AUM's during peak project years, and would reduce to 8 AUM's toward the end of the project. Average loss is 36 AUM's.

The increased population at the projected scenario would require as much as 1,660 acre-feet of water annually. If this water were obtained by purchase of existing agricultural water rights, 222 acres, or less than 1 percent of the region's irrigated cropland in tillage rotation, might be removed from production.

Construction of the various facilities would block some stockwater sources. Roads and facilities would disrupt normal livestock grazing and watering patterns, although these same roads would aid in hauling water for livestock. Rustling would increase with population increase.

Some corral poles, fenceposts, mine timbers, pinyon nuts, and Christmas trees would be lost. Also, the potential production of these areas would be lost for the duration of the various projects. Demand for local timber, especially mine timbers, would increase as a result of mining and associated activities.

The impacts summarized in this section would be important and possibly critical to affected individuals, but they would be minor on a regional basis.

3. Socioeconomics

The regional analysis of the impact of coal mining at the projected level assumes coal production of 12 mty (with mining employment of 1,040) by 1990 (table IV-5). No coal is mined in the region at present. Included also is development of the Allen-Warner Valley Energy System (chapter I). Most of the immediate social and economic impacts of coal mining and associated development will be centered in Kane and Garfield counties. These two counties are related economically to others in the region, though mainly to Washington and Iron Counties which contain regional trading centers. Indirect impacts of coal mining will be felt throughout the region.

Important basic economic activity in the region is concentrated in agriculture, mining, construction, manufacturing, transportation, trade, services, and government. Future economic growth and decline will be directly associated with changes in these basic sections. Thus, projections of the economic and demographic consequences of new economic activity, such as coal mining, are based on conditions assumed by each of these sectors. They are briefly highlighted here to provide a picture of plausible future regional economic conditions.

The agricultural sector serves both the region and markets beyond it. Farm employment was assumed to fall over time by about 1 percent per year. Because of healthy local economy, this rate of decline is less than has been assumed for the nation as a whole. The total of farm proprietorship plus wage and salary employment would decline from 1,760 in 1975 to 1,560 in 1990. The future of the mining sector is bound up with potential coal production, so no significant change was assumed to occur in either the magnitude or county location of other types of mining employment. The construction sector was assumed to employ about 450 persons annually who could be considered part of the regional economic base. In addition, as much construction is undertaken to provide structures for residents of region, some of the sectors activity and employment was projected to increase with population in a manner similar to the expected national experience.

Employment in manufacturing has been about 80 percent basic (that is, producing goods locally for markets outside the region) and the remainder produces goods consumed within the region. Substantial increases in basic components of the sectors were assumed, somewhat in

TABLE IV-5.--Coal production work force, southern region: low, projected, medium, and high levels

[Work force estimates are based on 15 tons per worker-shift for underground mining and 75 tons per worker-shift for strip mining]

Coal production scenarios	Locality	Production (mty) 1980	1985	1990	Work force 1985	1990	Projected work force residence
Low; 0-1 mty (No new Federal actions).	Henry Mountains	None					
	Kaiparowits Plateau	None					
	Alton	None					
Projected level, 12 mty; includes Allen Warner Valley energy system; Blue, Kaiparowits No. 5, and Alton mines.	Henry Mountains	No detailed proposal					
	Kaiparowits Plateau		1.0	1.5	290	440	Kane Co. or Page
	Alton		5.0	10.5	290	600	Kane Co.
	Total		6.0	12.0	580	1,040	
Medium level, 29.3 mty, includes full production from Blue and Kaiparowits Nos. 1-5 and Alton mines and Allen Warner Valley energy system.	Henry Mountains	No detailed proposal					
	Kaiparowtis Plateau		13.5	18.8	1,174	1,635	Garfield Co.
					2,739	3,815	Kane Co. or Page
	Alton		8.8	10.5	510	600	Kane Co.
	Total		22.3	29.3	4,423	6,050	
High level, 46.0 mty, includes middle level development and potential future development on other lands.	Henry Mountains		1.0	2.0	0	0	Garfield Co.
					2,580		
	Kaiparowits Plateau		17.8	33.5		4,855	Garfield Co.
					2,580	4,855	Kane Co. or Page
	Alton		9.6	10.5	560	600	Kane Co.
	Total		28.4	46.0	5,720	10,310	

line with recent experience, and the remaining portion was assumed to continue to vary directly with regional population change. Transportation was assumed to increase in importance to the region, particularly if large-scale coal mining occurs. Trade and services are important sectors in the regional economy as much basic economic activity is generated by travel and tourism. It was assumed that tourist-related employment would increase by 3 percent per year to 1990. Finally, that part of government employment which is basic to the regional economy was assumed to remain relatively constant to 1990.

Changes in the above sectors induce further changes throughout the economy (this is the reason for denoting them "basic"). Such secondary changes can be traced in order to judge the total effects on the economy of any initial stimulus (such as an increase in coal mining employment). Thus, it was determined that each 1,000 jobs in the coal industry necessitates an additional 3 jobs in communications, 13 jobs in electricity, gas, and sanitation services, 37 jobs in transportation, and so on, to a total of 182 jobs in 17 employment sectors. Of course, such jobs are not necessarily to be filled from within the region alone; some of the employment impact of expanding coal production would occur outside the region. A portion of the added employment in these sectors was assumed to be provided from within the region (107 of the 182 jobs). This same estimation procedure was followed for each of the basic sectors described above.

A final type of employment must be mentioned. Some employment occurs simply to provide goods and services to the residents of the region (providing eductional services to area children is an example). Estimates of such employment were based on the relation of the regional sectors to national employment trends. Local projections, therefore, assume changing labor productivity, changing consumption patterns, and the effects of higher energy prices on the American economy, as these are portrayed in the work of the Bureau of Labor Statistics.

In many parts of the region, particularly in Kane and Garfield Counties, goods and services are not produced locally but are imported from elsewhere. Should high rates of population growth materialize owing to expanding coal mining, some of this importation should decline as new firms, finding a local market of sufficient size, begin operation. Otherwise, both the structure of ecomomic activity within the region and its relationship to the national economy will not change substantially during the next 15 years.

a. Population projections

The social and economic impacts of expanded coal mining will occur in an area having a recent experience of relatively high rates of growth. But such impacts would exceed anything currently being encountered. The recent 1970 to 1975 growth (table IV-6), has occurred at rates above 3.5 and 4.3 percent per year respectively for the region and the combined area of Garfield and Kane Counties. Although these rates are above the

TABLE IV-6.--Population and components of change (thousands of persons)

[Source: 1970; U.S. Census of Population. Projection Years and Intervals for Counties; UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

County	1970 population	Interval components of change: Natural increase	Interval components of change: Migration	1975 population	Interval components of change: Natural increase	Interval components of change: Migration	1980 population	Interval components of change: Natural increase	Interval components of change: Migration	1985 population	Interval components of change: Natural increase	Interval components of change: Migration	1990 population
Garfield-----	3.2	0.2	+0.1	3.4	0.2	+0.3	3.9	0.3	+1.1	5.3	0.4	+0.4	6.1
Kane---------	2.4	0.1	+1.0	3.6	0.3	+0.4	4.2	0.3	+4.2	8.8	0.8	+2.5	12.1
Garfield and Kane----	5.6	0.3	+1.1	7.0	0.5	+0.6	8.1	0.6	+5.4	14.1	1.2	+2.9	18.2
Beaver and Iron--------	16.0	1.4	+1.0	18.4	1.7	+0.9	21.0	1.6	+0.7	23.2	1.4	+0.1	24.6
Washington---	13.7	1.2	+2.1	17.0	2.2	+3.9	23.1	2.4	-2.3	23.1	1.7	-0.7	24.1
Beaver, Iron, Washington--	29.6	2.7	+3.1	35.5	3.9	+4.7	44.1	4.0	-1.7	46.4	3.0	-0.6	48.8
Total, Five Counties[1]---	35.2	2.9	+4.3	42.4	4.4	+5.3	52.2	4.6	+3.7	60.5	4.2	+2.3	67.0

[1]Detail may not add to totals because of independent rounding.

corresponding 2.5 and 0.8 percent per year experiences of the State of Utah and of the nation, they involve small absolute numbers of persons in sparsely populated counties. As stated in chapter II, the sparsely populated character of the region established the kinds of impacts to be expected from expanding economic activity.

The impacts of the 12 mty coal production are evident in 1980 although coal production is not expected by that year. This is the result of assumed mine and coal-washing facility construction in Kane County (table IV-6). The larger volume of activity in Washington County associated with the Allen Warner-Valley energy system boosts projected 1980 county population to 23,100.

The stimulus to the Washington County economy evidenced in 1980 is in large part transitory. A comparison of tables II-36 and IV-6 shows an increase in population by 1985 of about 400 persons. That number is further reduced over time, and by 1990 the difference between no new coal mining (low level scenario) and the projected level is negligible in Washington County. The "construction boom" nature of the impact yields a relatively large out-migration in an otherwise growing region.

Kane County will contain both the sites of employment and the residences of miners for coal production from the Kaiparowits Plateau and Alton mines in 1985 and 1990. The large direct increases in jobs would transform the Kane County economy between 1980 and 1985. By 1985 the county would be adjusting to accomodate a population almost double that expected with no mining. The resulting net in-migration alone over the 5-year interval would approximately equal the total 1980 population.

The larger population and increased in-migration in Garfield County at the projected level are consequences of induced and secondary economic expansion. These impacts reflect the importance of Panquitch as a trading center, and result in localization of the Garfield County expansion in the Hatch-Panguitch area. Similarly, projected increases in the Beaver-Iron County area occur because Cedar City is the regional service center. Impacts would be localized at Cedar City. Appreciable impacts of the 12 mty production probably would not occur in the Tropic-to-Escalante regions of Garfield County.

b. Comparison of impacts, projected level to low level

In the following pages, the important impacts of expanded coal mining will be discussed. Magnitudes will be derived by comparing the two cases. The focus will be on the age composition of the population, housing requirements, labor market conditions, and employment changes.

1) Age composition

Higher growth rates not only increase the total size of the population but also induce significant alterations in the pattern of distribution over the various age groups (table IV-7). Such alterations are most

TABLE IV-7.--Projections of population by age group; low level and projected level scenarios; counties of Garfield and Kane and remainder of southern Utah coal EIS region[1]

[Source: 1970: U.S. Census of Population; 1975 and projected years: UPED Model Projections, Bureau of Economic and Business Research, University of Utah. (Population in thousands)]

Age group	1970	1975	1980		1985		1990	
			Low level	Projected level	Low level	Projected level	Low level	Projected level
Garfield County								
0-4----	.258	.31	.41	.41	.48	.57	.49	.62
5-14---	.780	.64	.62	.62	.80	.97	.98	1.19
15-24--	.494	.79	.86	.86	.74	.96	.73	.90
25-44--	.631	.62	.90	.90	1.27	1.57	1.63	2.09
45-64--	.685	.67	.67	.67	.66	.72	.67	.76
65+----	.309	.37	.42	.42	.47	.52	.49	.55
Total--	3.157	3.41	3.89	3.90	4.42	5.31	4.99	6.10
Kane County								
0-4----	.244	.32	.48	.48	.48	.89	.47	1.26
5-14---	.569	.69	.70	.72	.83	1.64	1.02	2.34
15-24--	.331	.86	.84	.86	.74	1.83	.78	2.04
25-44--	.498	.74	1.14	1.16	1.42	2.86	1.68	4.44
45-64--	.538	.62	.61	.61	.60	.92	.68	1.24
65+----	.241	.34	.38	.38	.42	.66	.44	.78
Total--	2.421	3.57	4.15	4.23	4.49	8.80	5.06	12.09
Remainder of southern Utah coal EIS region								
0-4----	2.980	3.85	4.86	5.04	4.79	4.91	4.31	4.29
5-14---	6.315	6.48	7.55	7.94	8.98	9.10	9.62	9.64
15-24--	6.505	8.32	7.73	8.38	6.97	6.91	7.59	7.59
25-44--	5.609	7.54	11.32	11.98	13.89	14.32	15.47	15.58
45-64--	5.185	5.51	5.97	5.97	5.78	5.87	5.93	6.02
65+----	3.052	3.76	4.64	4.74	5.29	5.28	5.67	5.63
Total--	29.646	35.45	41.89	44.05	45.70	46.38	48.57	48.76

[1]Details may not add to totals because of independent rounding.

pronounced in Kane County because the induced 1980 to 1985 net migration is very large--approximately the magnitude of the 1980 population.

The willingness of persons to move in search of economic opportunity varies with age. Hence, in Kane County in 1985, the 5- to 14-year age group approximately doubles as the population increases. The more mobile 15- to 24-year-olds increase from 740 to 1,830, or 2 1/2 times. The 25- to 44-year-old age group roughly doubles, while the older workers and those of retirement age increase by about 50 percent in the projected scenario.

Differences in age composition can have major consequences. For instance, a disproportionate expansion in the number of women of child-bearing age results in more children under 5 years of age in 1990 in the regional analysis as compared to growth with no new mining (low level scenario). Those of school age (the 5- to 14-year age group) reach 2,340 in Kane County, more than double the 1,020 expected under the no mining assumptions. A 50 percent increase in school age population is predicted, excluding mining, by 1990. If Kane County coal production reaches the projected level, the resulting school age population will be 3 1/2 times greater than currently.

The same character of change, but with much smaller magnitudes, will occur in Garfield County and in the remainder of the region. The numbers involved, especially for Garfield County, are larger than at present, but demonstrate the limited impacts owing to the projected coal production and associated activity.

A relatively small increase is expected in the number of the elderly (300 more than under low level scenario by 1990) in Kane County. But the elderly can be adversely affected by rapid economic growth conditions. While economic expansion will increase total and average incomes in the region, the elderly often have fixed incomes and are vulnerable to the adverse effects of rising prices associated with strong economic expansion. To the extent an elderly person does not have a marketable skill or an ownership position in a local commercial or land enterprise, he will face a deterioration in cash flow as prices, fees, and taxes paid in the local economy increase faster than money income. Moreover, the older person has less time in which to realize a return on an investment in retraining or skills acquisition. Thus, the large increase in area population (largely newcomers) with resultant change in the age composition of the local population will erode the political basis by which the elderly can work to alleviate their economic distress.

Changes over time are anticipated in the age composition of the population (table IV-8). One important consequence of such changes is the decreasing number of persons who participate but little in the labor force for every person who does (expressed as the "dependency ratio"). In Garfield County, for example, 35.1 percent of the population in 1970 was 0-15 years of age, and 9.8 percent, 65 years of age or older (in all, 44.9 percent of the county total). Those in the traditional working

TABLE IV-8.--Characteristics of the age composition; low and projected levels, with comparisons to the United States and State of Utah

[Source: 1970: U.S. Census of Population or derived therefrom United States: Bureau of the Census Current Population Reports, P-25, #643 and 704, Series II. Utah: Office of State Planning Coordinator, Alternative Future Zero (1974). Counties: UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

	Garfield County		Kane County		Remainder of southern Utah coal EIS region		State of Utah	United States
	Low level	Projected level	Low level	Projected level	Low level	Projected level		
1970								
Percent of population: 0-15---	35.1		35.5		34.0		35.5	30.4
65+--	9.8		10.0		10.3		7.3	9.8
Dependency ratio----------	.82		.84		.79		.75	.67
Median age----------	26.6		27.5		23.1		23.1	28.0
1975								
Percent of population: 0-15---	30.4		30.7		31.2		33.0	27.1
65+--	11.0		9.5		10.6		7.4	10.5
Dependency ratio----------	.71		.67		.72		.68	.60
Median age	24.5		24.0		24.0		23.9	28.8
1980								
Percent of population: 0-15---	28.6	28.6	30.3	30.2	31.3	31.1	31.5	24.3
65+--	10.9	10.9	9.2	9.1	11.1	10.8	7.4	11.2
Dependency ratio----------	.66	.65	.65	.65	.74	.7	.64	.55
Median age----------	25.6	25.6	25.5	25.5	25.8	25.6	25.0	30.2
1985								
Percent of population: 0-15---	30.3	30.2	30.8	30.4	31.7	31.7	30.9	23.7
65+--	10.7	9.8	9.4	7.5	11.6	11.4	7.6	11.7
Dependency ratio----------	.70	.67	.67	.61	.76	.7	.63	.55
Median age----------	26.9	26.2	27.1	25.2	27.4	27.5	26.6	31.5
1990								
Percent of population: 0-15---	30.9	31.2	30.9	31.3	30.4	30.3	29.2	23.8
65+--	9.9	9.0	8.6	6.5	11.7	11.6	7.8	12.1
Dependency ratio----------	.69	.67	.65	.61	.72	.7	.59	.56
Median age----------	28.1	27.6	28.1	26.4	28.9	29.2	28.2	32.8

years were 55.1 percent of county population. The dependency ratio (.449 divided by .551) was .82. The corresponding U.S. figure was 0.67. The ratio will fall as relatively more persons are employed, and hence, would fall, as coal mining increases in Garfield and Kane Counties. The current ratio of nonworking to working persons in the area helps explain the relatively low per capita incomes found there.

Changes in dependency ratios are paralleled by changes in median age (that at which half the population is younger and half older). It has been increasing rapidly for the Nation and the State but has been falling for the counties of Garfield and Kane as a result of in-migration. Continued in-migration will decrease the proportion of the population in the traditional retirement years. But the strong expansion of the projected coal development will further decrease the percent 65 and over (in 1990, 6.5 percent instead of 8.6 percent of the population). As a consequence, the special needs of persons in this age group may be given little weight in the process of responding to burgeoning requirements for schools, single-family housing, sanitation systems, etc.

2) Housing

Expected population impact in Kane County amounts to slightly over 7,000 persons by 1990, a difference in population between the projected level and the low level (no Federal action) of nearly three times the entire 1970 Kane County population. This population will require over 1,900 more dwelling units than in the low level scenario, a total requirement much greater than the 1970 Kane County stock of occupied housing. Smaller impacts are expected in Garfield County and the remainder of the region (table IV-9). For housing projection purposes, the implications of large in-migration for average household size should be noticed, especially in Kane County. Out-migration prior to 1970 decreased average household size to an abnormally low level.

Since 1970, in-migration has caused it to increase, but with economic and demographic changes arising from coal mining, average household size will begin to decline once again. It will remain, however, higher than the corresponding figure for the State throughout the projection period.

Single-family homes predominate in the area. However, much of the projected housing demand would be met by the use of mobile homes. This type of shift has several implications for the communities. The types of services demanded may change with different lifestyles that may be associated with different housing preferences. These types of changes are difficult to anticipate. The financial structure of the community might be adversely affected since tax yields are lower on mobile homes than single-family homes.

3) Labor market

As a result of the changing age composition of the population, the number of jobs available regionally should grow more rapidly than will population (table IV-10). This is also owing to changes in the rates at

TABLE IV-9.--Housing requirements; low and projected level estimates and projections with comparisons to the State of Utah

[Sources: 1970: U.S. Census of Population. Other years: State of Utah: Alternative Future Zero, Office of State Planning Coordinator (1974). Counties: UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

	Garfield County		Kane County		Remainder of southern Utah coal EIS region		State of Utah
	Low level 0-1 mty	Projected level 12 mty	Low level 0-1 mty	Projected level 12 mty	Low level 0-1 mty	Projected level 12 mty	
1970							
Percent of population in in dwelling units-----	100		100		96.3		97.3
Occupied dwelling units--	0.923		0.718		8403		297,934
Average household size---	3.42		3.37		3.40		3.46
1975							
Occupied dwelling units--	0.970		0.990		9850		349,530
Average household size---	3.51		3.61		3.47		3.36
1980							
Occupied dwelling units--	1,140	1,150	1,190	1,210	12,170	12,740	428,760
Average household size---	3.40	3.40	3.48	3.48	3.31	3.33	3.23
1985							
Occupied dwelling units--	1,330	1,570	1,330	2,490	13,650	13,870	496,400
Average household size---	3.32	3.40	3.37	3.54	3.22	3.22	3.11
1990							
Occupied dwelling units--	1,500	1,820	1,520	3,480	14,790	14,870	584,120
Average household size---	3.31	3.35	3.34	3.48	3.16	3.16	3.02

TABLE IV-10.--Projected expansion in regional population and employment, low and projected levels

[Source: UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

	1975	Interval growth rate (percent per year)	1980	Interval growth rate (percent per year)	1985	Interval growth rate (percent per year)	1990
Low level:							
Population------	42.430	(3.25)	49.930	(1.80)	54.620	(1.41)	58.620
Labor force-----	16.040	(3.32)	18.940	(1.89)	10.820	(2.09)	23.110
Jobs (full and part time)----	15.700	(3.66)	18.850	(2.20)	21.040	(2.09)	23.360
Proprietor------	3.050	(1.70)	3.320	(0.77)	3.450	(0.46)	3.530
Wage and salary-	12.660	(4.09)	15.530	(2.50)	17.600	(2.39)	19.830
Projected level:							
Population------	42.430	(4.14)	52.190	(2.96)	60.500	(2.03)	66.960
Labor force-----	16.040	(4.31)	19.900	(3.12)	23.260	(2.70)	26.620
Jobs (full and part time)----	15.700	(4.64)	19.800	(3.44)	23.520	(2.69)	26.910
Proprietor------	3.050	(2.70)	3.490	(1.11)	3.960	(0.69)	3.820
Wage and salary-	12.660	(5.07)	16.310	(3.91)	19.830	(3.04)	23.090

which persons will participate in the labor force (low in the area currently), decreases in the numbers of persons who work part-time or hold more than one job, and a decreasing unemployment rate. All are consequences of regional economic growth.

The low growth anticipated for proprietorships (table IV-10) is a reflection of the extraordinarily high rates of self-employment currently observed within the region. In the region, 18.9 percent of all employment is accounted for by proprietorships. The corresponding State figure is 9.4 percent. Some of this difference is the result of the unusual regional importance of agriculture, and some is due to differences in the regional mix of industries. But high rates of proprietorship are found in labor markets with a history of relatively restricted job opportunities. Accordingly, the projections for the low and projected levels show decreases in rates of proprietorship for all sectors other than farming, from 1.6 times the 1975 State experience to a factor of 1.3 by 1990.

Variations between the region and the State also occur in the rates at which persons participate in the labor force. Where job opportunities are limited, a lower rate of participation is not unusual. Both the low and projected level analysis indicate expanded job opportunities, so regional labor force participation rates should increase over the projected period until about equal to projected 1990 State rates.

The changes over the projection intervals in assumed labor force participation rates, rates of occurrence of proprietorship by sector, unemployment rates, and the projected changes in the age composition of the population have two immediate implications. First, the current population has some capacity to supply increasing amounts of labor as job opportunities increase. This however, is limited by the small numbers of people currently residing within commuting distance of the areas of immediate impact. Second, the relative increase in jobs and the expected relative expansion in high wage employment sectors will increase personal income per person relative to the State, to other regions, to current conditions in the region itself.

4) Employment

Coal mining (projected level) will expand Kane County's economic base by an amount 20 percent greater than total 1975 nonagricultural employment (1,040 to 857). This magnitude of change will restructure the economy of Kane County. But impacts are not limited to that county only. There are appreciable direct and indirect consequences of the associated construction activity in Washington County, and important effects, both positive and negative, on the government, trading, and service sectors outside the immediate Kane and Garfield County areas.

Magnitudes and composition of regional employment are important aspects of the differences between the low and projected level growth experiences (table IV-11). This is well illustrated by the agriculture sector. Agricultural employment will decline in both cases, but the

TABLE IV-11.--Employment by sector; low and projected levels estimated for 1975, projected for 1980, 1985, and 1990 for the southern Utah coal EIS region

[Source: UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

		1980		1985		1990	
	1975	Low level (0-1 mty)	Projected level (12 mty)	Low level (0-1 mty)	Projected level (12 mty)	Low level (0-1 mty)	Projected level (12 mty)
Agriculture---	1,860	1,820	1,820	1,760	1,780	1,710	1,730
Mining--------	420	420	420	420	1,020	420	1,490
Construction--	1,060	1,170	1,540	1,290	1,540	1,400	1,600
Manufacturing-	1,090	1,520	1,530	1,960	1,990	2,400	1,440
TCU[1]----------	710	820	860	900	1,160	960	1,280
Trade---------	4,120	5,240	5,440	5,780	6,280	6,280	7,010
FIRE[2]---------	550	720	760	850	950	980	1,130
Services------	2,320	2,990	3,090	3,510	3,770	4,030	4,430
Government----	3,590	4,150	4,330	4,570	5,020	5,160	5,810
Total[3]------	15,700	18,850	19,800	21,040	23,520	23,360	26,910
			Percentage-allocation				
Agriculture---	11.8	9.6	9.2	8.4	7.6	7.3	6.4
Mining--------	2.7	2.2	2.1	2.0	4.3	1.8	5.5
Construction--	6.7	6.2	7.8	6.1	6.5	6.0	5.9
Manufacturing-	6.9	8.0	7.7	9.3	8.5	10.3	9.1
TCU[1]----------	4.5	4.4	4.4	4.3	5.0	4.1	4.7
Trade---------	26.2	27.8	27.5	27.5	26.7	26.9	26.0
FIRE[2]---------	3.5	3.8	3.8	4.1	4.0	4.2	4.2
Services------	14.8	15.8	15.6	16.7	16.0	17.3	16.5
Government----	22.8	22.0	21.9	21.7	21.3	22.1	21.6

[1]Transportation, communication, and utilities.
[2]Finance, insurance, and real estate.
[3]Details may not add to totals because of independent rounding.

fact that there will be more people for the sector to serve yields slightly less overall decrease at the projected level.

Changes in employment composition are clearly indicated by percentage (table IV-11). Again, using agriculture as an example, in 1975 it offered approximately 12 percent of five-county area jobs. By 1990, it will account for approximately 7 percent. Manufacturing will grow more rapidly in both cases over the 15-year time period than will the population itself. The 1975 to 1990 regional population increases are 38 percent and 58 percent respectively for the low and projected levels. The corresponding changes for manufacturing employment are 120 percent and 124 percent.

The economic impact on Garfield County of expanding coal production consists of relatively small employment growth comparing the low level to the projected level (table IV-12). The expansion is concentrated in the transportation, trade, financial, and service sectors.

Kane County, on the other hand, will experience much larger impact, four times more jobs by 1990 at the projected level than in 1975, and 2 3/4 times more than at the low level (table IV-13).

The introduction of large-scale economic enterprises and a more than 200 percent increase in population between 1975 and 1990 in Kane county will result in some change in economic activity in the broader region. Employment in the trade and services sectors will expand in Kane County relative to the projected growth in St. George (Washington Co.) and Cedar City (Iron Co.) as Kane and Garfield Counties develop higher-level population and industrial service activities (tables IV-13, IV-14). Still, it cannot be argued that the economy of the entire region (unlike that of Kane County alone) will be restructured because of the growth levels of the projected coal production of 12 mty.

5) Income

Because average wages and salaries in the region tend to be much lower than salaries in construction and mining, a rapidly expanding population due to in-migrating workers would increase, perhaps dramatically, area cost of living. Large numbers of new, high income recipients would compete for available land and housing for food and other services. Though demand would rapidly rise, it would be difficult to augment supply as quickly. The result would be pressure, forcing prices upward. Also, as high wage-paying employers, mining operations would draw labor from other employers in the area, generally paying lower wages. (For more information on income, current and projected changes associated with the coal production levels, see "Personal Income and Earnings Projections, Southern Utah Coal EIS Region," Bureau of Economic and Business Research, University of Utah.)

Those area residents dependent upon fixed incomes or who are low income recipients having no chance for higher paying jobs would be

TABLE IV-12.--Garfield County employment by sector; full- and part-time and percentage allocation; low and projected levels; estimated for 1975 and projected for 1980, 1985, and 1990

[Source: UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

		1980		1985		1990	
	1975	Low level (0-1 mty)	Projected level (12 mty)	Low level (0-1 mty)	Projected level (12 mty)	Low level (0-1 mty)	Projected level (12 mty)
Agriculture-----	280	270	270	260	260	250	250
Mining----------	60	60	60	60	60	60	60
Construction----	90	120	120	130	180	140	170
Manufacturing---	250	260	260	340	340	420	430
TCU[1]----------	40	40	40	50	60	60	80
Trade-----------	320	380	380	440	590	500	710
FIRE[2]----------	20	30	30	40	60	40	80
Services--------	320	370	370	430	480	490	580
Government------	290	330	330	380	430	440	510
Total[3]--------	1,660	1,850	1,860	2,110	2,480	2,410	2,880
				Percentage-allocation			
Agriculture-----	16.6	14.5	14.4	12.3	10.5	10.4	8.8
Mining----------	3.3	3.0	3.0	2.6	2.3	2.3	1.9
Construction----	5.7	6.5	6.6	6.2	7.5	6.0	6.0
Manufacturing---	14.8	13.9	13.8	15.9	13.7	17.6	15.0
TCU[1]----------	2.2	2.4	2.4	2.4	2.6	2.4	2.6
Trade-----------	19.3	20.7	20.6	20.6	23.9	20.7	24.8
FIRE[2]----------	1.4	1.6	1.6	1.8	2.6	1.9	3.0
Service---------	19.4	19.8	19.8	20.2	19.5	20.5	20.1
Government------	17.4	17.7	17.7	18.0	17.4	18.3	17.8

[1]Transportation, communication, and utilities.
[2]Finance, insurance, and real estate.
[3]Details may not add to totals because of independent rounding.

TABLE IV-13.--Kane County employment by sector; full- and part-time and percentage allocation; low and projected levels; estimated for 1975 and projected for 1980, 1985, and 1990

[Source: UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

		1980		1985		1990	
	1975	Low level (0-1 mty)	Projected level (12 mty)	Low level (0-1 mty)	Projected level (12 mty)	Low level (0-1 mty)	Projected level (12 mty)
Agriculture-----	180	180	180	170	180	170	180
Mining----------	0	0	0	0	600	0	1,070
Construction----	70	80	100	90	280	100	260
Manufacturing---	80	90	90	110	130	140	170
TCU[1]----------	40	50	50	50	170	60	220
Trade-----------	250	300	310	330	720	380	1,000
FIRE[2]----------	20	30	30	40	110	40	170
Services--------	260	300	300	350	520	400	720
Government------	220	270	280	310	560	370	830
Total[3]--------	1,120	1,300	1,330	1,450	3,270	1,670	4,630
				Percentage-allocation			
Agriculture-----	16.1	13.4	13.1	11.7	5.5	10.0	4.0
Mining----------	0.2	0.2	0.1	0.1	18.3	0.2	23.1
Construction----	6.1	6.0	7.2	5.9	8.4	6.1	5.7
Manufacturing---	6.9	7.0	6.8	7.8	4.1	8.5	3.7
TCU[1]----------	3.4	3.7	3.8	3.6	5.1	3.5	4.8
Trade-----------	22.0	23.2	23.0	23.0	21.9	22.8	21.7
FIRE[2]----------	2.2	2.5	2.5	2.5	3.4	2.7	3.8
Service---------	23.0	23.2	22.8	23.8	15.9	24.0	15.5
Government------	20.1	20.8	20.6	21.5	17.3	22.4	17.8

[1]Transportation, communication, and utilities.
[2]Finance, insurance, and real estate.
[3]Details may not add to totals because of independent rounding.

TABLE IV-14.--Beaver, Iron, and Washington County employment by sector; full- and part-time and percentage allocation; low and projected levels; estimated for 1975 and projected for 1980, 1985, and 1990

[Source: UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

		1980		1985		1990	
	1975	Low Level (0-1 mty)	Projected Level (12 mty)	Low Level (0-1 mty)	Projected Level (12 mty)	Low Level (0-1 mty)	Projected Level (12 mty)
Agriculture----	1,400	1,370	1,380	1,330	1,330	1,240	1,290
Mining---------	360	370	370	360	360	360	360
Construction---	900	970	1,320	1,070	1,080	1,160	1,160
Manufacturing--	760	1,170	1,180	1,520	1,520	1,840	1,830
TCU[1]----------	630	730	760	790	930	850	980
Trade----------	3,550	4,560	4,750	5,010	4,970	5,400	5,300
FIRE[2]----------	500	660	680	780	770	900	880
Services-------	1,740	2,320	2,420	2,740	2,770	3,140	3,130
Government-----	3,070	3,550	3,720	3,880	4,020	4,350	4,470
Total[3]-------	12,920	15,690	16,600	17,480	17,760	19,280	19,400
			Percentage-allocation				
Agriculture----	10.9	8.7	8.3	7.6	7.5	6.7	6.7
Mining---------	2.8	2.3	2.2	2.1	2.1	1.9	1.9
Construction---	6.9	6.2	8.0	6.1	6.1	6.0	6.0
Manufacturing--	5.9	7.5	7.1	8.7	8.5	9.5	9.4
TCU[1]----------	4.9	4.7	4.6	4.5	4.4	4.6	4.5
Trade----------	27.5	29.0	28.6	28.6	28.0	28.0	27.3
FIRE[2]----------	3.9	4.2	4.2	4.5	4.4	4.6	4.5
Service--------	13.5	14.8	14.6	15.7	15.6	16.3	16.2
Government-----	23.8	22.6	22.4	22.2	22.6	22.6	23.0

[1]Transportation, communication, and utilities.
[2]Finance, insurance, and real estate.
[3]Details may not add to totals because of independent rounding.

adversely affected by increased cost of living. Their real income would decline as the prices they pay for the essentials of life increase.

As a result of increased mining, the area's economic structure would change, particularly in Kane and Garfield Counties. The local economy may come to depend on mining as its principal basic employment sector. Such a lack of economic diversity can subject an area to the economic fortunes-the ups and downs of a single industry.

c. Municipal services

Assuming 12 mty coal production, the population impacts resulting from increases in employment differ significantly between Kane and Garfield Counties. A comparison of the low and projected levels shows small differences in community populations by 1990 in most of the towns in Garfield County. The resultant impacts on municipal services are therefore, relatively small. In Kane County, the comparison indicates projected population changes which are typical of "boom-town" growth rates (table IV-15).

TABLE IV-15.--Community population projections at the projected level

	Total population projection			Population increase	
	1980	1985	1990	1985	1990
Garfield County:					
Antimony------	148	195	223	27	43
Boulder-------	176	227	258	28	33
Cannonville---	144	253	296	89	111
Escalante-----	772	1,125	1,301	248	312
Hatch---------	152	208	239	35	44
Henrieville---	195	310	360	88	111
Panguitch-----	1,553	1,886	2,143	125	156
Tropic--------	425	686	801	203	256
Kane County:					
Alton---------	55	372	500	323	454
Glendale------	173	738	968	581	816
Kanab---------	3,041	4,239	5,112	904	1,270
Orderville----	368	1,007	1,276	678	952

The impacts on municipal services include projected service expansion needs and the major capital costs. Most facility improvements require a lead time of 1 to 2 years for planning and construction. These are not reflected in the summaries. The expansion needs and costs are related to the coal production schedules (table IV-16).

TABLE IV-16.--Projected community needs; year and cost of installation at all four production levels

[Total needs at higher levels include the needs listed at lower levels]

TABLE IV-16.--Projected community needs; year and cost of installation at all four production levels.
The total needs at higher levels include the needs listed at lower levels.

Community	Production levels			
	No new Federal action (0-1 mty)	Projected level (12 mty)	Medium level (29.3 mty)	High level (46.0 mty)
Garfield County				
Antimony	None	1980 Improve fire department $45,000	1980 Upgrade solid waste disposal 1985 Add to administrative staff 1990 Add to office space Park department Improve water system 1980 - $50,000 1990 - $197,000	1985 Expand police force 1980 - $60,000 1985 - $30,000 1990 - $589,000
Boulder	None	1980 Improve fire dept. 1990 Improve water sys. 1980 - $45,000 1990 - $77,000	1985 Add to administrative staff Park and cemetary development Add to office space	1985 Improve police service 1980 Solid waste disposal 1980 - $45,000 1985 - $83,000 1990 - $818,000
Cannonville	None	1980 Improve fire department 1980 - $45,000	1980 Improve fire department Add to administrative staff Add to office space Expand police department Add to office space 1990 Water system 1980 - $97,000 1985 - $109,000 1990 - $930,000	1985 Solid waste disposal 1980 - $241,000 1985 - $184,000
Escalante	None	1980 Added staff and office space 1980 - $68,000	1980 Added staff and office space Improve fire department Improve police services Improve cemetary 1985 Add to office space Improve parks, library Ambulance service 1990 Water system 1980 - $274,000 1985 - $296,000 1990 - $924,000	1985 Improve airport 1980 - $448,000 1985 - $1,083,000 1990 - $5,699,000
Hatch	None	1980 Improve fire department 1980 - $45,000	1980 Improve fire department Additional staff 1985 Office space Parks and cemetary development Solid waste disposal Water systems 1980 - $45,000 1985 - $73,000 1990 - $375,000	Greater expanaion of lower level services 1980 - $54,000 1985 - $109,000 1990 - $996,000
Henrieville	None	1980 Improve fire dept. 1990 Water system 1980 - $45,000 1990 - $ 98,000	1980 Add to administrative staff and office space Improve fire and police service 1990 Water system 1980 - $97,000 1985 - $113,000 1990 - $1,096,000	1985 Ambulance service Solid waste disposal 1980 - $196,000 1985 - $416,000 1990 - $1,780,00
Panquitch	1990 Sewage disposal syatem 1990 - $415,000	1985 Office space 1990 Sewage disposal system 1985 - $116,000 1990 - $425,000	1980 Add to staff and office space 1985 Ambulance service Solid waste disposal Airport improvement 1990 Sewage diaposal system 1980 - $140,000 1985 - $202,000 1990 - $560,000	1985 Library improvement Water system improvement 1980 - $167,000 1985 - $416,000 1990 - $1,780,00
Tropic	None	1985 Office space 1990 Water system 1985 - $42,000 1990 - $261,000	1980 Office space Improve fire and police service Cemetary improvement 1990 Water system 1980 - $165,000 1985 - $164,000 1990 - $2,466,000	1985 Library Park department Solid waste disposal 1980 - $211,000 1985 - $448,000 1990 - $6,058,00
Kane County				
Alton	None	1980 Water system Fire department 1985 Sewage disposal system 1980 - $489,000 1985 - $306,000	Same as projected level	Same as projected level
Glendale	None	1980 Stage II sewer improvement Park department Improve fire dept. Expand street maintenance Water system (no cost estimates available) 1980 - $303,000 1985 - $35,000	Same as projected level	Same as projected level
Kanab	1980 Office space Park development Sewage disposal system Street maintenance equipment 1980 - $478,000	1980 Water system improvement (no cost estimates available) Expand police dept. 1985 Improve fire dept. 1980 - $490,000 1985 - $72,000	Expansion of lower level services 1980 - $496,000 1985 - $272,000	Same as medium level
Orderville	None	1980 Stage II sewer improvement project Park and cemetary development 1985 Water system 1980 - $257,000 1985 - $244,000	Same as projected level	Same as projected level

In Garfield County the communities can generally handle the growth generated by the projected level of coal production. The Kane County communities summaries indicate substantial demand for increased municipal services. Except for Kanab, the suggested expansion of services apply to medium and high production levels as well. The additional population generated by coal production on the Kaiparowits Plateau is assumed to reside in a new town, or workers will be commuting from Page, Arizona (fig. I-2).

d. Sources of revenue

1) Taxation

Taxes generating most of the revenue to counties and local communities include: (1) the general property tax used for school districts, municipalities, counties, and special districts; (2) sales and use tax--local option to counties and cities of 3/4 percent of purchase price returned to local units imposing the tax; (3) individual income and Corporation-Franchise Tax allocated to the Uniform School Fund: distribution to local districts under minimum school program; and (4) other taxes collected from Liquor Control profits and Motor Vehicle Registration, etc.

2) Bonding

Local non-monetary fiscal methods used to finance large expenditures for municipal services include local government bonding. The two methods of bonding most commonly used are general obligation bonds and revenue bonds, the issuance and amount of the former being restricted by law.

General obligation bonds are repaid from a property tax on all real property within the taxing jurisdiction. All general obligation bonds must be authorized by a referendum election. Interest costs associated with this method of borrowing are generally the lowest going rates available since the full faith and credit of the municipality are behind the bonds. Each community in Garfield and Kane Counties has a bonding limit that is in proportion to estimated fair market values (tables IV-17, IV-18).

TABLE IV-17.--Bonding limit--government entities in Garfield County

	Bonding capacity based on 1976 assessed values		
Government entity	Estimated fair market value	Maximum bonding limit	Bonding limit on a percent of fair market value
Antimony----------	1,271,500	152,580	12
Boulder----------	1,626,000	195,120	12
Cannonville----------	438,250	52,590	12
Escalante----------	3,699,500	443,940	12
Hatch----------	980,000	117,600	12
Henriville----------	565,750	67,890	12
Panguitch----------	8,642,000	1,037,040	12
Tropic----------	1,645,500	197,460	12
Garfield County-------	68,581,500	1,371,630	2
Garfield County School District-----	68,581,500	2,743,260	4

TABLE IV-18.--Bonding limit--government entities in Kane County

Government entity	Bonding capacity on 1975 assessed values		
	Estimated fair market value	Maximum bonding limit	Bonding limit on a percent of fair market value
Alton----------	309,150	37,000	12
Glendale----------	839,070	101,000	12
Orderville----------	1,680,840	202,000	12
Kanab----------	11,232,580	1,348,000	12
Kane County----------	36,900,635	738,000	2
Kane County School District--	36,900,635	1,476,000	4
Long Valley Sewer District---		361,000[1]	

[1]Estimate based on financing plans in the Long Valley Sewer Improvement District's Facilities Plan - Step 1.

3) General financial situation

In financing services under rapid growth conditions the rural community confronts difficulties stemming from (1) uncertainties related to the causes and probable effects of such growth (when, where, how much); (2) increasing costs of providing facilities and services; (3) the time lag between the demand for services and the revenues available to support them; (4) an inadequate distribution of tax revenues owing to barriers to intergovernmental funds transfers; and (5) the inadequacy of traditional financing mechanisms; for example, constitutional and statutory limitations to the amount of community indebtedness permissible. A further complicating factor is that attention must be paid to ensure an equitable distribution of benefits and costs.

As a result of recent statutory changes affecting community financing, such problems can be met in part. As means of addressing both distribution of revenues and front-end financing problems, a community impact fund has been established to allow intergovernmental funds transfers using the State's share of mineral leasing royalty and bonus payments to support loans and grants to local government. In addition, special services districts can be created for provision of specified services. Such districts can include non-contiguous portions of counties and municipalities, and have the advantages of raising community debt limitations, and providing for issuance of bond anticipation notes and guaranteed bonds. Other legislation now permits prepayment of sales and use taxes by project sponsors in order to make funds available to local communities in advance of anticipated service demands.

e. Education

Garfield County School District--By 1990 the Garfield School District would be serving about 310 more students at the projected level than at the low level. In terms of full-time teacher equivalents (FTE) this

would mean an additional 12.5 teachers. Of the existing facilities, only one would require additional classrooms. The capital cost would be about $225,000.

Kane County School District--An additional 1,100 students would have to be served by 1990 at the projected level. About 37 FTE teachers would be needed. Most of the facilities are relatively new; however, an additional 21 classrooms plus support facilities would be needed to accommodate the increase in students. This is assuming that the Kanab schools build the necessary facilities to handle the increase under the assumptions of growth at the low level (no Federal action). The expansion cost of the Kanab schools is estimated to be $3,187,000. There is no estimate available on the cost of an additional 21 classrooms.

Finance cannot be projected with accuracy because of fluctuations in assessed valuation, mill levies, and weighted pupil units (WPU's). State, local and Federal governments are the three basic sources of funding for Utah Public Schools.

State support is based on a support equalization program. Each school district in Utah receives WPU's according to size, need, and other variables. The dollar value of the WPU has been going up each year for the last 3 years at approximately 10 percent per year. If this pattern holds true, school officials could project a yearly increase in the value of the WPU in the 8 to 10 percent range.

Local funds are accrued by multiplying the school district mill levy by the assessed valuation of the county or geographical area it serves. The best plan for determining the level of local support for the school system would be to make the crucial decisions regarding capital outlay expenditures and arrive at a dollar figure estimate. The county assessed valuation could then be computed for the construction period based on the activities of the development companies at that point. The difference between the estimated need and the projected revenues would have to be made up from bonding, State funds, or other sources.

Federal funds will not play as important a part in financing the projected growth in the school districts as local and State funds.

f. Social change

Lasting social and cultural change can be expected for some communities in Kane and Garfield Counties at the projected and higher levels of coal production. As workers and their families move into these counties from outside the region and State, the communities will reflect less the present rural, Mormon character. A new urban orientation will develop that is consistent with the cultural experiences of the migrants. Current ways of living will change and may cease altogether. The probable impacted communities are tiny (7 of 12 have a current population of less than 200) and easily will be overwhelmed by even relatively small numbers of migrants anticipated under the projected level of coal mining and other developments.

Residents anticipate greater amounts of crime, delinquency, drug and alcohol abuse, and the like; in other words, rapid growth is thought likely to produce more of the same kinds of problems already present or known about. It is not widely accepted or expected that effects on basic community institutions, values, and ways of life would also result. Evidence, however, suggests these unanticipated effects would occur. Moreover, a difference between what is expected and what actually may occur would add to social problems in ways difficult to anticipate. Because the community, as a social entity, is a source of personal identity, kinship, and a sense of belonging for its residents, existing relationships, and the complex assumptions, values, and perspectives on which they are based, are simply taken for granted. Practically speaking, they are subconscious. Through supports for community life, people often become aware of them only after everyday activities have been disrupted. Rapid growth due to coal mining would profoundly alter such relationships. Drastic and rapid alteration of the local economy would yield difficult changes in other areas of life--in family, religions, and political patterns, for example. Kane and Garfield County communities, which would experience the most immediate effects of expanding coal mining, must be prepared not only for economic changes and problems in providing municipal servies, but for other kinds of lasting social and cultural changes as well.

g. Out-of-State areas

Many Kaiparowits Plateau workers would chose to live in Page because of its location and amenities. They would cause little impact on that Arizona community, because the community can easily absorb them. In this scenario Fredonia is on the fringe of the development area and while benefitting from increased jobs, would not attract many new residents and will be able to absorb the growth. The socioeconomic impact of the A-WV project on Las Vegas would not be of major significance.

4. Transportation and Utilities

The activity involved at the projected level would place substantially greater demands on the highway system in southern Utah than existed in 1975. Projections of average daily traffic (ADT) on selected highway segments for future years, (table IV-19, fig. IV-2) are based on projections of production and population increases. The transportation analysis assumed that the increased population would locate in existing communities. (See Socioeconomic section.) The analysis also assumes that projected traffic would be accommodated on the present highway network with modifications as necessary to provide additional capacity, and by adding some new roads to minesites.

Segments of US 89 between Kanab and Glendale and between Glen Canyon City and the Arizona border would require additional capacity, which could be provided by adding passing lanes. In addition, turning lanes would have to be added at the intersection of US 89 and U 277 at Glen Canyon City. The Utah Department of Transportation has no plans for these improvements at this time, therefore the costs involved are unknown. If implemented, the improvements would be financed by a combination of

TABLE IV-19.--Projected average daily traffic on selected segments of Utah highways

Segment[1]	1975 ADT	1980 ADT	1985 ADT	1990 ADT	1990 Trucks
1----------	5,580	7,148	7,462	7,828	1,340
2----------	0	---	---	100	0
3----------	4,660	5,970	6,232	6,538	1,101
4----------	4,940	5,726	6,378	6,757	1,067
5----------	4,000	4,636	5,164	5,471	1,018
6----------	4,275	4,954	5,518	5,846	1,097
7----------	300	325	392	436	51
8----------	1,390	1,505	1,816	2,018	348
9----------	415	474	591	674	97
10----------	290	331	485	561	77
11----------	125	143	207	239	29
12----------	0	0	0	0	0
13----------	1,475	1,719	2,801	3,404	438
14----------	355	415	487	529	52
15----------	1,650	1,924	3,134	3,809	496
16----------	810	1,090	1,135	1,207	75
17----------	135	121	468	643	30
18----------	20	18	582	608	0
19----------	30	38	112	123	4
20----------	1,590	2,002	2,848	3,444	412
21----------	1,020	1,230	1,633	2,080	296
22----------	890	1,073	1,425	1,814	255
23----------	890	---	---	2,336	777
24----------	55	---	---	2,988	612
25A---------	0	---	---	1,188	522
26----------	0	0	0	0	0
27----------	20	25	30	40	0

[1]Segments shown on figure IV-2.

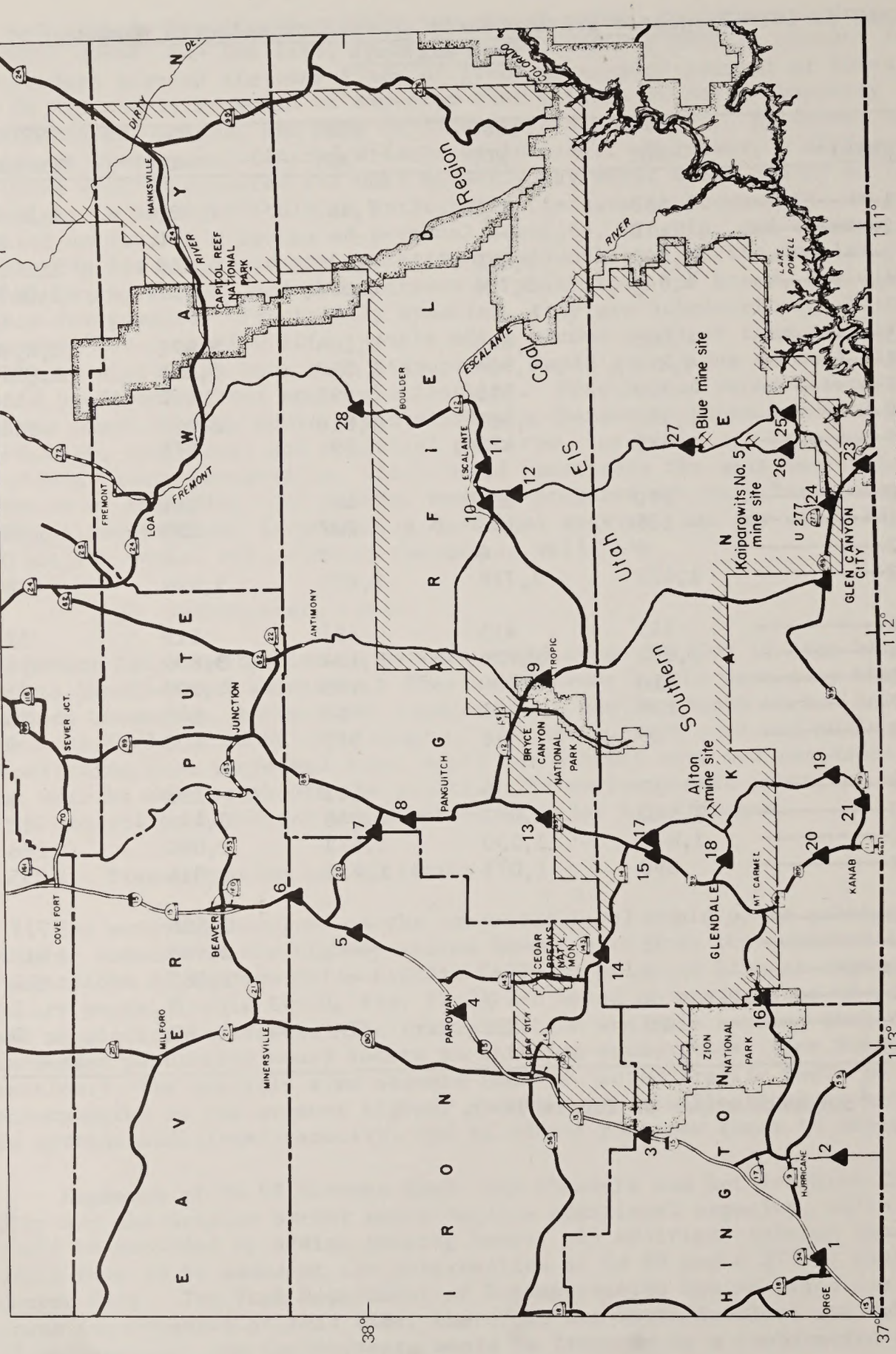


FIGURE IV-2.--Highway traffic count locations in southern Utah.

Federal and State funds based on a formula for "matching funds" set for each class of Federal aid highway by the Federal Aid Highway Act. A potential bar to implementation would be the lack of State funds.

Three miles of asphalt road would be constructed by the proponents to provide access to the Warner Valley power plantsite. Movement of workers and materials necessary to construct this facility would cause a large traffic increase on access routes for 1 to 3 years. Because most construction and plant workers probably would live in the vicinity of St. George and Hurricane, the traffic increases would be most noticeable on the roads south of these two towns. After the plant is in operation, it would generate little traffic. The relatively short duration of the peak traffic levels, therefore, would not justify major highway improvements. More frequent maintenance and localized road improvements, however, would most likely be required. In general, the same is true of the roads leading to the Alton mine. However, the longer time span required to develop the mining operations, the larger operating force envisioned, and the long-term increase in truck traffic would probably require paving the access roads from Alton (north of the minesite) and Glendale.

Coal mined in the Kaiparowits Plateau area would be hauled by truck. This truck traffic will probably reach US 89 from 277 at Glen Canyon City and from that point proceed to destinations in Utah and (or) Arizona by US 89. To Arizona, this traffic would cross the Navajo Bridge across Glen Canyon (fig. I-2). The bridge could accommodate the traffic, as long as legal load limits are not exceeded. Depending on ultimate destination, segments of highways in Arizona may need to be modified.

The transportation analysis concludes that only minor reconstruction of the road northward from the Blue and Kaiparowits No. 5 mines to Escalante would be necessary. Mining plans and subsequent revisions for the Blue and Kaiparowits No. 5 mines have indicated that an existing county road from the mines to State route U 277 and Glen Canyon City would be used for truck haul. This route would also carry all the commuters to the mines, as well as service-truck traffic (fig. IV-3). The 40 mile segment of this county road extending to Escalante would be upgraded to provide mine work force access from Escalante.

Projected traffic from the Blue and Kaiparowits No. 5 mines to Glen Canyon City would require 36 miles of highway designed to accommodate legal State loads, probably consisting of two 12-foot wide travel lanes, with 6-foot shoulders. At a minimum, a 100-foot-wide right-of-way would be desirable, with additional widths needed to maintain cuts and fills. The potential for growth in coal production beyond the projected level, resulting in traffic growth, may influence the county to acquire an even wider right-of-way. Road upgrading would require an unknown amount of cuts and fills. The road would be on the Tropic Shale and clay soils. When wet, this material becomes unstable; therefore, it is unsuitable for a roadbed. The proposed road must either be routed around this soil type or the road foundation must be prepared accordingly.

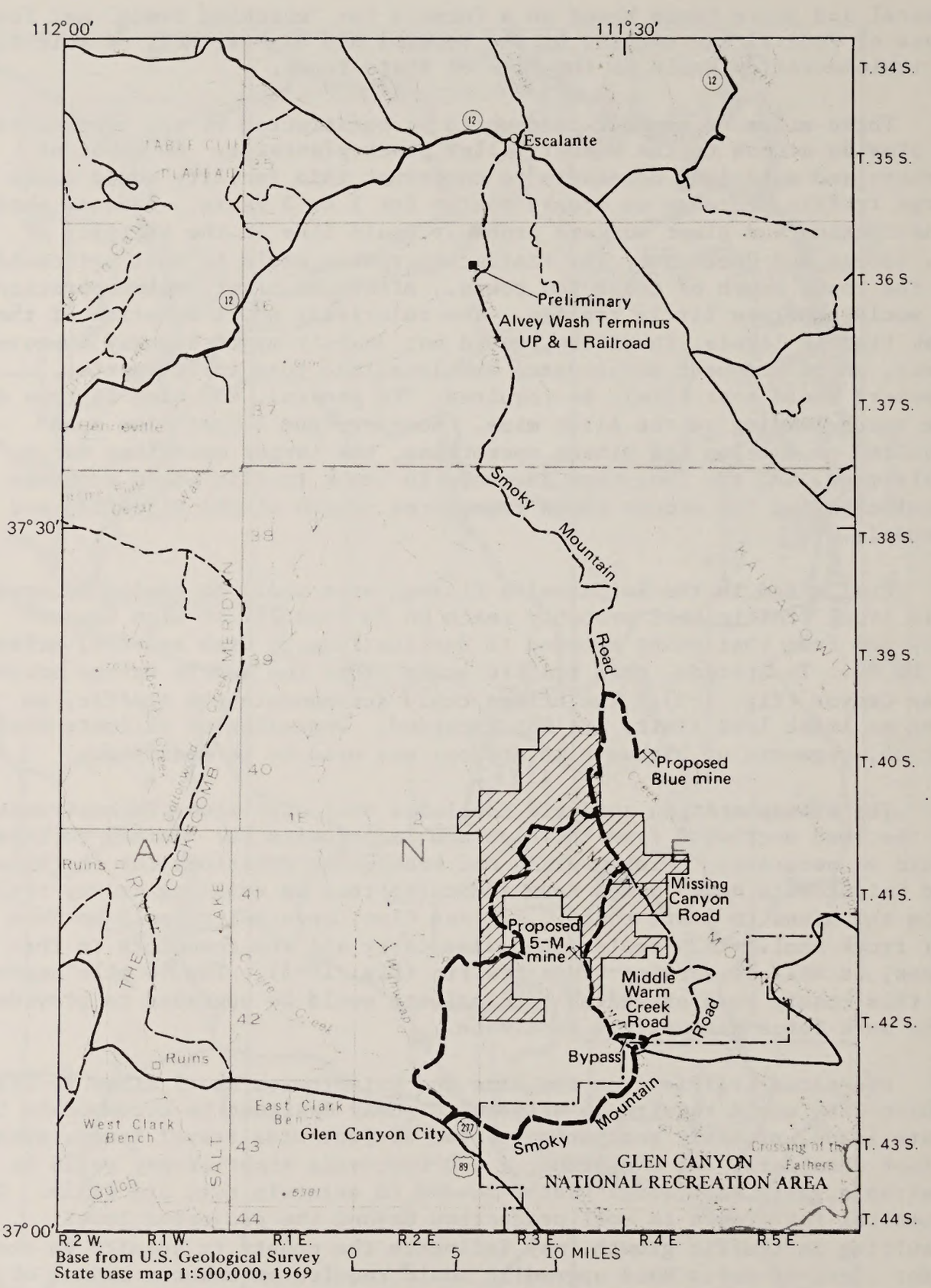


FIGURE IV-3.--Map showing alternative access routes to minesites in Kaiparowits Plateau.

This segment of road was considered in route studies connecting Glen Canyon City to the road system north of the Kaiparowits Plateau (chapter II). The studies, however, envisioned coal development many times greater than the projected level considered in this analysis.

Necessary improvements to the county road in the NRA are in dispute. The county has authority only to maintain this part of the road in its present configuration; it cannot be improved without National Park Service approval. The Glen Canyon NRA enabling legislation specified that the road between Glen Canyon City and the Bullfrog Basin in the NRA be a scenic, low speed road. The NPS interprets this to mean a parkway type road, not necessarily built to present standards, which would be closed to commercial traffic, including coal trucks. Consequently, NPS will not permit improvement of the present road to accommodate coal traffic. The NPS does not exercise control over traffic on the present road; therefore, coal trucks are free to use it. In its present configuration, although not precisely quantifiable, the capacity is significantly below projected traffic levels. Its inadequate width for passing, its lack of pavement with resulting dust problems, and its general impassability in wet weather severely limit traffic capacity. A change in the NPS restrictions would be required before the road could accommodate the projected traffic.

An alternative route (30 miles) is available that would not cross the NRA. This existing, low grade road traverses northward from Glen Canyon City, climbing the west side of Nipple Bench (fig. IV-3). The poor quality road would then turn eastward to the Smoky Mountain county road that passes both the Kaiparowits and Blue mine properties. Segments of the Smokey Mountain road to the mines would then be improved. Such a route, if developed into an adequate access road, could handle the projected traffic. Access to the Alton mine from Alton would require upgrading 21 miles of road. Another 7 miles of road upgrading would provide access from Glendale. (See part 2, Alton mine, fig. 1.) Temporary roads would be constructed in the mining area as needed.

Overall increased highway use in the region would result in several adverse impacts. The most visible would be increased traffic. Based on calculations averaged for all selected points, traffic in the region would be 1.75 times greater than in 1975. Traffic is well below highway capacity. Although the present highway system can accommodate the projected traffic, increased traffic would decrease the present quality of highway travel. More vehicles on the same roads would result in longer travel times and intersections in the more developed areas will be more congested. The incidence of accidents would increase at a rate commensurate with the rate of traffic growth.

Increased traffic, in particular increased numbers of trucks, would accelerate deterioration of highways. This would require that normal maintenance schedules be accelerated. To some degree, increased cost of maintenance would be offset by increased revenues generated by taxes on fuel, although improved fuel efficiencies could reduce these revenues. With respect to highway maintenance, the Utah DOT feels that present funding formulas would be inadequate to meet anticipated demands that would result from coal development.

Increased highway use would result in increased consumption of gasoline and diesel fuel. Based on per capita consumption rates for these fuels in Utah in 1975, highway consumption of fuel in the four southwestern counties of Utah in 1990 would amount to 39,846,000 gallons, approximately 17 million gallons more than in 1975. If the percentage of trucks (relative to lighter and smaller vehicles) increases in 1990 over that in 1975, fuel consumption would be increased accordingly. Fuel efficiency of automobiles and trucks has, and will continue to, increase after 1975. The anticipated increase of 17 million gallons, therefore, is somewhat overstated, although the degree of overstatement is unknown. If average motor vehicular fuel efficiency increases 75 percent between 1975 and 1990, the fuel consumed by motor vehicles in 1990 would be approximately the same as consumed in 1975 (nonpoint-source pollution.

More traffic would increase highway-related wastes, such as fuels, motor oils and related fluids, plastics, rubber, and various metals. Although most of these wastes are initially deposited on or adjacent to highways, storm runoff may wash them into the aquatic environment.

A powerline is only preliminarily proposed by the proponent of the Blue mine. (See site-specific analysis in part 2.) The Kaiparowits No. 5 mine would operate on portable power generated at the site. A powerline from existing transmission lines southwest of Glen Canyon City northward to the Blue mine would be about 25 miles long. Based on a 60-foot right-of-way, about 182 acres would be needed. Surface disturbance, using minimum clearance procedures, would total about 44 acres, including an access road. The right-of-way acquisition could be limited to only about 9 acres if the powerline were to follow an existing road. The latter route would present an illegal shooting hazard to raptors, however. In addition, vegetation over 8 feet tall would have to be topped or removed at midspan, but anything under 40 feet tall at the edge of the right-of-way could be left undisturbed. Other than land disturbance, there may be esthetic intrusion; if the line is built along the access road, however, travelers would view the landscape under the lines. Once built, the powerline might serve also the proposed Kaiparowits and Red mines.

Telephone service would be needed to the same mines. If the modern tendency of burying cable within the highway right-of-way is followed by the telephone company, no additional right-of-way would be needed, and there would be no material environmental impact. Microwave service would require clearing of sites (1 to 2 acres per site), construction of access roads to sites, and the visual intrusion of microwave towers. Overhead telephone lines probably would follow the highways; an additional 10-foot right-of-way would amount to 1.2 acres per mile and surface disturbance would be small. Poles are likely to be more numerous and wires hung lower than for a powerline, so that visual intrusion could be obtrusive.

Transmission lines to be built in conjunction with the Allen-Warner Valley project and the Alton coal field are described in chapter I. The proposed powerline from Warner Valley to St. George would not follow

major highways, although it would cross several, I-15 in particular. The proposed powerline from a proposed Utah Power and Light substation northwest of Panguitch to the Alton minesite would follow the Sevier Valley and US 89, but it would parallel the highway on the opposite side of the valley, near the toe of the mountains, and would not be especially visible.

5. Recreation

At the projected level, impacts would accrue from three basic sources: (1) increased use of recreation facilities and use areas (tables II-32 and II-33) by new residents associated with coal mining and related activities; (2) increased industrial traffic; and (3) exclusion of properties occupied by mine plantsites and some ancillary facilities presently used for recreation.

Overall increases by residents in recreation use are projected (table IV-20) as are increases in visits by main purpose of trip by residents (table IV-21). Projected also are residents and non-residents visits to the three multicounty areas (table IV-22).

Present levels (1976) of recreation use at most developed sites and of recreation use areas and attractions are above or near carrying capacities.

At the projected scenario and by 1985, recreation visits would increase by 53,700 and recreation visitor dyas use would increase by 167,500. By 1990, visits would increase to 76,300 and visitor days use to 238,000. The increased use would further compound impacts described in chapter II (future environment). In addition, increased industrial traffic would create the probability of more accidents, impeding normal flows of recretaion traffic (driving for pleasure and sightseeing), and increased levels of dust, other air pollutants and noise nuisances along and adjacent to travel routes. (See chapter IV, Air Quality.)

Sites occupied by mineplants would be removed from possible recreation use during the life of the mines. Stripping areas at Alton mine would be removed from use when mining was in progress. Recreation use on adjacent land areas would be altered by introducing more people, thus reducing the opportunity for hunting, fishing, backpacking, solitude, and unconfined back-country recreation uses. This type of use is presently limited and is mainly in areas with special features or significant user attractions.

6. Archeology and History

It is not possible to accurately quantify the number of archeological and historic sites that would be directly or indirectly impacted in the southern Utah coal region. A rough estimate can be made by extrapolating the AERC class II inventory data. Eleven archeological sites could be directly impacted for each section of ground disturbed on Federal land.

TABLE IV-20.--Recreation visits (trips) and visitor days use by residents of the region at the projected level

	Scenario		
	Present	Low level	Projected level
Population of region to support coal production[1]:			
1976----------	48,525	--	--
1985----------	--	62,810	68,681 [4](5,871)
1990----------	--	68,096	76,432 (8,336)
Recreation visits by residents[2]:			
1976----------	444,000	--	--
1985----------	--	574,700	628,400 (53,700)
1990----------	--	623,100	699,400 (76,300)
Recreation visitor days by residents[3]:			
1976----------	1,385,300	--	--
1985----------	--	1,793,100	1,960,600 (167,500)
1990----------	--	1,944,100	2,182,100 (238,800)

[1]Population figures from socioeconomics section.

[2]Average out-of-community but with region recreation trips per household for worst case analysis is 9.15 trips per year.

[3]Visitor days equals 12 hours aggragated by one or more persons. Each out-of-community but within region recreation trip in the worst case averages 3.12 visitor days (37.44 hours).

(Both [2] and [3] are from baseline information calculated from figures in Utah Resident Recreation Travel, 1974, 1975, and 1976, J. D. Hunt, W. H. Becker, M. J. Dalton and S. F. McCool of the Institute for the study of Outdoor Recreation and Tourism, Utah State University, Logan, Utah 84322.)

[4]Population, recreation visits and recreation visitor days use above the normal increases for 1985 and 1990 as a result of increased coal production are shown in parentheses.

TABLE IV-21.--Out-of-community outdoor recreation trips by residents of the southern Utah coal region[1] projected level

Recreation activity	1976		Low level				Projected level			
			1985		1990		1985		1990	
	Percent of total[2]	Number	Projected total	Increase	Projected total	Increase	Projected total	Increase	Projected total	Increase
Driving for pleasure and sightseeing	21.7	95,500	124,700	29,200	135,200	39,700	136,400	11,700	151,800	16,600
Fishing	15.0	65,800	86,200	20,400	93,500	27,700	94,300	8,100	104,900	11,400
Hiking and back packing	10.6	46,600	60,900	14,300	66,000	19,400	66,600	5,700	74,100	8,100
Water sports (boating, swim, waterskiing, etc.)	9.4	41,500	54,000	12,500	58,600	17,100	59,100	5,100	65,700	7,100
Picnicking	6.9	30,400	39,700	9,300	43,000	12,600	43,400	3,700	48,200	5,300
Skiing	5.7	25,100	32,800	7,700	35,500	10,400	35,800	3,000	29,900	4,400
Spectator sports (watching sporting events, etc.)	4.4	19,300	25,300	6,000	27,400	8,100	27,600	2,300	30,800	3,400
Camping	4.0	17,700	23,000	5,300	24,900	7,200	25,100	2,100	28,000	3,100
4-wheel, motorcycling, ORV use	3.7	16,400	21,300	4,900	23,100	6,700	23,300	2,000	25,900	2,800
Hunting big game	3.2	14,200	18,400	4,200	19,900	5,700	20,100	1,700	22,400	2,500
Golf	3.0	13,000	17,200	4,200	18,700	5,700	18,900	1,700	21,000	2,300
Hunting small game and target shooting	2.1	9,400	12,100	2,700	13,100	3,700	13,100	1,000	14,700	1,600
Winter sports (snowmobiling, ice skating, tubing, etc.)	2.1	9,500	12,100	2,600	13,100	3,600	13,200	1,100	14,600	1,500
Other (rockhounding, gathering resource products, nature study, etc.)[1]	8.2	35,600	47,000	11,400	51,100	15,500	51,500	4,500	57,300	6,200
Totals	100.0	440,000	574,700	134,700	623,100	183,100	628,400	53,700	699,400	76,300

[1]Participation by present population during sample period was less than one-half of one percent in any one activity.

[2]Individuals may or may not have participated in more than one activity, as listed, during each trip. Figures shown are for major purpose of trip and total 100 percent; as an example, trip may have primarily been for fishing and recorded such; however, several other activities may have occurred on the same trip. No time element is involved in this summary sheet. Based on information from Utah Resident Recreation Travel, 1974, 1975, 1976, Institute for the Study of Outdoor Recreation and Tourism, USU, Logan, Utah, by J. D. Hunt, W. H. Becker, M. J. Dalton, S. F. McCool.

TABLE IV-22.--Recreation visits to multi-county sub-regions

Multi-county sub-region -1-	1976 resident and non-resident visits to each subregion -2-	1985 recreation visits to multi-county regions at 0.0 mty coal production level[1] -3-	1985 recreation visits to multi-county regions at 12.0 mty production level[2] -4-	1990 recreation visits to multi-county regions at 0.0 mty coal production level -5-	1990 recreation visits to multi-county regions at 12.0 mty coal production level -6-
Color Country----	3,791,350	7,088,450	7,142,200	10,035,200	10,111,500
Canyonlands------	2,051,300	3,848,200	3,901,900	5,447,900	5,524,200
Northern Arizona-	2,550,000	4,767,600	4,821,300	6,749,600	6,825,900

[1]Resident and non-resident visits based on a 7.2 percent increase in recreation visits per year (7.2 percent is average annual increase in recreation visits for National Parks, National recreation areas and other major recreation use areas in southern Utah for 1966 through 1976, source: National Park Service records 1966 through 1976. Visitor day use of National Forest lands increased at the rate of 6.5 percent per annum for the period of 1969 through 1976.

[2]7.2 percent increase per year at 0.0 mty production plus increase in recreation use by new residents to produce 12 mty of coal. The total increase (53,700 visits for 1985 and 76,300 visits for 1990) in recreation visits from new coal production (12 mty) population element was added to each multi-county sub-region to present a "worst case analysis".

This estimate ranges from less than 1 per section to 32 per section. A site density map (fig. II-22) prepared by AERC shows the areas in the region that have the greatest and least potential for impacts to cultural resources.

Impacts on sites directly associated with coal mining and related activities would be mainly the result of disturbance by earth moving equipment of previously unidentified (usually buried) sites.

Increased area population, as a result of coal development, coupled with the opening of previously inaccessible areas, would result in increased vandalism, primarily to off-project sites. Some impacts would occur simply through greatly increased area use, even without malicious intent.

Loss of sites through necessary salvage constitutes an adverse impact on research potential, although data extracted from them would be preserved.

With some projects, there would be substantial changes in the setting or context integrity of sites, particularly historic sites. Stabilization, restoration or moving of buildings or artifacts to other locations is also an adverse impact to context and in situ value and integrity.

Positive impacts will also result from coal development. Valuable information has already been generated by the AERC surveys. Other surveys will be necessary prior to any disturbance and will result in the accumulation of data that would otherwise not have been available until sometime in the future, or that may have been lost in the interim. Any salvage excavation that is required will result in the preservation of data and material (including some that might otherwise be lost to vandalism in the long run), although in situ value is lost.

7. Esthetics

Impacts to the visual resource within and adjacent to the lease areas, as well as seen from offsite (i.e., Alton strip mining as seen from the south rim of the Paunsaugunt Plateau and particularly from Bryce Canyon National Park) are described in the individual site specific analyses in part 2.

Communities listed in chapter II would increase in size, as indicated in the socioeconomic section, resulting in changes from small or rural-ranching community character to one of more urbanization. Some older structures within all five communities could be razed.

Ancillary facilities, such as powerlines, water and telephone lines, and improvement and extension of transportation systems, would be necessary. These would increase man-made intrusions (modifications) of the natural landscape character.

Secondary impacts would accrue to the visual resource in the region by increased off-road vehicle use, littering, and vandalism.

CHAPTER V

UNAVOIDABLE ADVERSE IMPACTS

At the present level of technology, about 65 million tons, or 21 percent of estimated inplace coal might not be recoverable. Of this total, about 45 million tons of coal would be unrecoverable at the proposed Kaiparowits No. 5 mine. (See chapter IV, Land.) Subsidence over the proposed Blue and Kaiparowits No. 5 mines would be unavoidable and, on the worst-case basis, might affect as much as 3,000 acres. Locally, fractures, depressions, and surface buckling might accompany the subsidence. Mine fires from spontaneous combustion in abandoned and sealed mines are a remote possibility should air enter through subsidence cracks. In areas of strip mining and mine-portal structures, minor changes in topography and drainage patterns would be unavoidable, as would be increased erosion on disturbed land.

Unavoidable destruction, disturbance, and removal of paleontological resources, both exposed and unexposed, would occur. The extent and significance of this impact cannot be meaningfully assessed owing to the lack of data and evaluatory criteria.

Soils on 18,584 acres (table I-4) would be disturbed for mining, mine facilities, transportation systems, powerlines, slurrylines, water projects, community development, and powerplants. About half of this area would be affected by the three proposed coal mines and half by the Allen-Warner Valley project, and a total of 1,725 acres would be changed in land-use and not reclaimed to its original use. Most of this change involves the water project (A-WV) and the land would be sacrificed to provide irrigation and increased agricultural production from about 10,000 acres. Onsite erosion of disturbed areas by wind and water could increase by an average of ten cubic yards per acre per year on exposed soil. (See chapter IV, Land.) With mitigation, erosion would decrease over time until the area is reclaimed (estimated within 5 years). Soil moved by water erosion would be limited essentially to onsite impacts; however, soil eroded by wind would be moved locally as well as outside the disturbed area. Soil productivity would not be reduced below 90 percent of its original productivity on reclaimed sites.

The projected increase in population would result in increased impacts to soils at developed recreation sites and areas where ORV's are used. ORV's would reduce vegetative cover, loosen, compact, and rut soil, which would result in erosion and movement of soil. Loosening the soil by ORV's would result in severe wind erosion on many of the arid sites in the impact area, possibly adding to the average 6,000 cubic yards per year resulting from soil disturbance associated with the proposed mines and AWV power project. The amount and location of additional ORV use cannot be quantified.

Mining, that drains water from saturated sandstone, will cause local water-level declines and change local flow patterns. The amount

of ground water and sandstone affected, however, would be small--less than one-tenth of 1 percent of that in the region. Ground-water use near Alton for mining and for the Allen-Warner Valley Energy System could decrease the yield of springs and wells that tap the Navajo Sandstone.

A small increase in emissions dust to the air is anticipated because of mining and associated population growth. The anticipated increase in SO_2 and NO_2 because of operation of the A-WV project powerplants would be small and would not violate existing standards. (See chapter IV, Air.) No significant impact to visual range is anticipated.

Vegetation on 8,996 acres would be destroyed by mining and construction of ancillary facilities and urban development. The net loss over the life of the mines would be 1,729 AUM's. Moderate volumes of fenceposts, firewood, Pinyon nuts and Pinyon Christmas trees would also be destroyed. A secondary impact may be caused by probable increased use of wood for mine timbers. A few threatened and endangered plants may be lost along with an unquantifiable amount of vegetation in general to the unplanned actions of construction activities and the activities of the generally increased population. The A-WV project would temporarily displace 9,588 acres of vegetation and 1,187 acres would be a long-term loss. Loss of vegetation would cause an annual reduction of 280 AUM's and a total loss of 11,200 AUM's.

The major impacts to wildlife would be a temporary loss of 9,095 acres of wildlife habitat occupied by project facilities and the permanent loss of about 538 acres of wildlife habitat owing to urbanization, (mines and powerplants), and roads. Deer winter range (738 acres), pheasant habitat, sage grouse habitat (2,000 acres), summer turkey range (350 acres) and cottontail rabbit range (8,996 acres) would be altered. Of this wildlife, turkey and pheasant are scarce and their potential loss could be a significant impact in the Alton area. (See Alton site specific, part 2.)

The A-WV project, including the preparation plant, slurrylines and powerplants, would disturb 9,588 acres of wildlife habitat (table I-4). The major identified impact would be loss or disturbance of rare species and potential disturbance of nesting raptors. The Fish and Wildife Service believes that use of the Virgin River flow as proposed, could jeopardize the continued existence of the endangered woundfin but that an proposed alternative regulation of Virgin River flow may be beneficial for the woundfin. The A-WV project would permanently impact 1,187 acres (table I-4) of wildlife habitat but much of the impact would be a change in habitat type. Increased water needed for the added population in the St. George area may reduce the habitat of the St. George snail which is proposed for threatened or endangered listing.

If water were drawn from existing agricultural supplies to meet increased population needs at the projected level, approximately 222 acres of irrigated cropland in tillage rotation would be removed from production by 1990. If community expansion took place on irrigated lands, 463 acres of agricultural land could be adversely affected.

The potential actions at the projected level would result in a population increase of 8,340 by 1990 (66,960-58,620, table IV-10). Most of the increase would occur in Kane and Garfield Counties; the two counties would have a combined 1990 population of 10,100 with no coal development (table II-36) but would have 18,200 at the projected level of development (table IV-6).

The 1975 population in these two counties is 7,000. Inmigration of workers and their families would occur in numbers sufficient to quickly outnumber the existing labor force in Kane County because the area labor force is small and offers little capacity to supply requirements should coal mining expand rapidly. The diversity of backgrounds of the migrants probably would contrast sharply with social or cultural characteristics of the area's current residents and might lead to social conflicts. Competition for labor would adversely affect existing area businesses because coal mining and construction employees would be paid higher wages than are typical of the area, where few high-paying jobs are to be found at present. Moreover, rising total and average incomes would spur competition for goods, services, and housing, as limitations to a rapid augmentation of supply exist, aggravating the problems of those receiving low or fixed incomes, particularly the elderly. Demand for housing would expand rapidly. Kane County alone would require over 1,900 more dwelling units than would be the case in the absence of coal mining (an amount greater than its 1970 stock of existing housing). Housing quality would decrease temporarily, and much of the incoming population would live in mobile homes.

Temporary unavoidable financial pressure on local government would result from rapid growth. Both the quality and the quantity of some municipal services may decline. This would be truer of communities, in which the growing population would reside, than of counties, where tax revenues would rise due to location there of coal mining activities. Of note in this regard are the effects of rapid growth on water supply, sewage and solid waste disposal, health care and hospitals, social services for personal and family problems, police and fire protection, and education.

Social and cultural problems engendered by rapid growth due to coal mining would not only be greater than those some communities may have experienced before, but would be different and may threaten the fabric of community life.

The addition of significant volumes of highway traffic would result in accelerated deterioration of the regional highway system and increased levels of accidents, fuel consumption, air pollution, noise, and congestion.

More pressures in hunting and fishing would result in a lowering of animal and fish populations and thus hunter and fisherman success, or a decrease in bag limits, seasons, or licensed sportsmen afield. The quality of picnicking and camping in both developed and dispersed areas would depreciate because of use above carrying capacity. Some overcrowding would lower the quality of recreation use on travel routes used for pleasure driving and sightseeing, in back-country areas used for hiking

and backpacking, and at spectator sporting events and in outdoor recreation activities, such as skiing, boating, and golf.

Salvage excavations of threatened archeological or historic sites would preserve data but sites or parts of sites would be lost from the rapidly diminishing reservoir available for future research. Buried archeologic or historic sites may be inadvertently damaged or lost during dirt-moving operations. Changes in settings of sites, either by the introduction of project activities and facilities or by moving certain things to avoid impacts would detract from the value of the site.

Esthetic values would be degraded by the strip-mining operation within the Alton coal field, as viewed from Yovimpa Point in Bryce Canyon National Park, but only during the latter stages of the project and by deterioration or destruction of unique scenic features, archeological or historical sites, and developed facilities by vandalism, littering, ORV use and overcrowding.

Improved access would be considered favorable by some and unfavorable by others. Community growth would be viewed by some as adverse; others would view changes and growth as beneficial.

Regionally, visual impacts would be minor, primarily because of the location of the proposals, the low number of onsite visitors, and the visual quality rating and sensitivity levels designated for the areas (Roy Mann Associates, 1977).

CHAPTER VI

SHORT-TERM USE VERSUS LONG-TERM EFFECTS

Mining would recommence in the southern region but at a greater annual production than in previous years when local mines supplied local markets. Once coal mining, markets, utilities and transportation are developed, it is probable that mining would continue well into the future, although from different mines than considered in the projected scenario. The increased population and economic activity therefore would permanently change the character from rural to semi-industrial of several communities, perhaps Kanab, Escalante and Hanksville, Utah and Page, Arizona and possibly others in Kane and Garfield Counties, Utah. However, the analysis in this chapter evaluates the effect of approving the actions (or equivalents) of the projected scenario as follows: the short term is that period of time that includes the productive life of the projects in the projected scenario plus a few additional years required for reclamation of the sites and other mitigating actions. The long term is that period of time beyond the short term in which subsequent impacts, both adverse and beneficial, would continue to affect the environment.

At the projected level 248 million tons of coal would be removed and topography on 8,280 acres would be permanently modified. Subsidence above underground mines (about 3,000 acres) would continue through the life of the mines and at a reduced rate for a short time thereafter; resultant alteration of the land surface would be minor, but permanent. Coal bed fires are possible, but are probably minor, long-term adverse effects. Activities related to mining would result in impacts to an unknown number of exposed and unexposed fossil localities. These activities would also result in a gain in knowledge of paleontological resources because of surveys and exposure of resources which might never have been found without excavation.

Soil productivity would be lost for the long term on 1,725 acres (table I-4) of land from construction of permanent facilities for mining, and transportation systems, power generation, and community development. However, 1,187 acres of this total would be used for the water project (A-WV) and would result in improved irrigation and agricultural production from about 10,000 acres. After disturbed areas are reclaimed, the projected long-term impacts on soil productivity would be minimal, as the disturbed sites would be returned to a pre-mining condition. Undoubtedly the productivity of some soil would be reduced below its initial capability, but the productivity of other soil would be increased above its initial capability.

The short-term and long-term regional air-quality impacts are small except for the TSP impacts from unpaved roads. Paving or equivalent stabilization of access roads (chapter III) would make all regional TSP impacts small to insignificant.

In the short term, vegetation, including associated range forage and forest/woodland products, would be destroyed by the various mines, mine facilities, and urban growth. In the long term, after successful reclamation, the vegetative productivity and range forage could be increased by about 75 percent overall. A secondary impact may be caused by increased use of wood for mine timbers. Normal watering and grazing patterns for domestic livestock would be disrupted over both the short and long term. Areas committed to facilities such as roads, reservoirs, canals and urban development would be lost from vegetative productivity in the long term (1,7235 acres). Native plant succession would be retarded by the projects. Many years (20 to 60) would be required to reestablish the same plant communities on a given site (especially the Pinyon-Juniper Woodland type). However, overall vegetative cover and productivity would be quickly restored through proper reclamation. Some threatened and endangered plants (chapter II) may be inadvertently lost but this loss cannot be quantified.

The short-term use of 8,458 acres (8533-75 table I-4) of wildlife habitat for the three mines would alter present ecosystems and result in long-term impacts on some wildlife species. The permanent occupation of wildlife habitat by roads and urban uses would cause a long-term loss of 538 acres. These long-term impacts would be of local significance only. Deer, cottontail, pheasant, sage grouse, and turkey would suffer reduced habitat, and long-term productivity would be reduced. In addition to losses of habitat, the increased human population would cause a long-term change in habitat-use patterns. Species such as elk, bobcat, mountain lion, bear, bighorn sheep, turkey, and raptors would avoid areas of extensive human use. The result would be an effective reduction of habitat, even in the absence of physical destruction. The effect would be a long-term reduction in productivity.

The long-term productivity of some species would be enhanced because of changes in vegetative types, topography, and ecosystems. Examples would be: sparrows, starlings, robins, and domestic mice and rats in response to urbanization; small mammals attracted to roadways and reclaimed areas; and raptors and carnivores benefitting from increased prey and more favorable hunting conditions in disturbed or reclaimed areas.

The A-WV project would cause a long-term change in wildlife habitat in 1,187 acres impacted by the water project (table I-4). Extirpation of local populations of species present in small numbers, such as the spotted owl, peregrine falcon, Gila monster, and desert tortoise, would eliminate long-term productivity of those species unless reoccupation occurs. Overfishing the small trout streams would continue beyond the life of the projects.

Coal production at the projected level would generally result in more intensive use of the existing transportation system which would be upgraded as necessary. If coal development were then slowed or terminated, decline of transportation movement would be dependent on the residual population and remaining economic activities and cannot be predicted at this time. Mine access roads may be removed and the right-of-way reclaimed

at the request of the land management agency. However, the major road probably would not be removed because of the present lack of transportation in and through the region. As much as 75 acres needed for road improvement on the Kaiparowits Plateau probably would not be returned to its current use. Utility lines to the individual mines are likely to be salvaged at the cessation of mining, hence are a short-term effect. However, the major distribution lines, transmission lines and other facilities are likely to remain as semi-permanent features, being used to support other mines opening in the same areas.

Short-term coal production, along with the projected increase in recreation use by 1985 and 1990, would have long-term impacts on recreation in the region. Impacts would be expected to continue and increase on a long-term basis. More overcrowding would be expected in major recreation-use areas and at developed sites and facilities. Compromises in use and recreation-experience will be the long-term result. The compromises will include additional or new restrictions and regulations on recreation use and activities, restricted length of stays, ORV restrictions, designated area camping only, lowering of bag or creel limits, and so forth. This situation would result by 1985 and 1990 without coal production. Coal production would, however, add to the long-term effects and impacts by the numbers of visitor and visitor days indicated in chapter IV.

Any active alteration (salvage, context changes, loss of buried/undiscovered sites) of archeologic or historic sites owing directly or indirectly to coal mining would negate or seriously impair their value, particularly to science, over the long term. Vandalism would increase as a result of increased population, population concentrations, and improved access. The cultural resource could eventually be completely altered, and long-term scientific value would be impaired. Non-malicious abuse of the resource, owing to population, and area use, would have the same eventual effect.

Short-term mining would have long-term effects on the visual resource of the region as well as on the lease areas. Ancillary facilities would most likely remain as intrusions or modifications of the natural landscape over the long term. Mining residues and remnants would lower the visual quality onsite. Changes in community size and architecture would also be long-term.

Stripping of vegetation and changes in vegetation and landform patterns within the Alton minesite (Alton site specific, part 2, figs. 11 and 12) would appear as extensions of previously modified adjacent areas to support local ranching. After vegetation is reestablished by rehabilitation, it would not appear as a long-term adverse impact, either onsite or from Yovimpa Point in Bryce Canyon National Park. Adverse impacts from stripping operations at Alton would be short term and would involve only those panels in 5 east (Alton site specific, part 2, fig. 5) during the latter part of the proposed project. After reclamation, strip-mined areas would add some line, form, and texture to the panoramic scene from Yovimpa Point.

CHAPTER VII

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS

The total commitment of coal would be 313 million tons; 248 million tons would be mined, and the remainder would be left in the ground and would not be recoverable by current methods. This total commitment represents 33 percent of the known reserves in the Alton coal field but only 2.5 percent of the reserves in the Kaiparowits Plateau coal field.

Minor, but unquantifiable, subsidence would affect about 3,000 acres on the Kaiparowits Plateau. Surface disturbances because of strip mining would alter the topography of about 8,280 acres in the vicinity of Alton; the resultant minor, but irreversible, changes in topography would probably be beneficial (see Alton site specific analysis, part 2).

Irreversible impacts would accrue to an undetermined number of uninventoried exposed and concealed fossil localities. About 7,500 tons of limestone per year and large, but undetermined, amounts of sand, gravel, and other aggregate would be used. An unknown amount of petroleum products and construction materials (including steel and copper) would be used; some of these materials could be salvaged.

Soils disturbed by mining projects, transportation systems, and housing would be permanently altered from their natural characteristics. The productivity of soils on 538 acres (roads and community development, table I-4) would be lost and on 1,187 acres (water project, table I-4), would be lost but used to facilitate irrigation and improvement of agricultural production from about 10,000 acres. Some soil removed by wind and water erosion would be irretrievably lost from affected sites.

Termination of mining would result in termination of any mining-related emissions to the air. Permanent population growth induced by mining or the A-WV project would cause some long-term deterioration of air quality owing to increased traffic and urban fuel consumption.

Vegetative productivity would be lost from 8,996 acres for the life of the three mines and because of urban development. This would result in a total irretrievable loss of 1,729 AUM's of domestic livestock grazing capacity. The A-WV project would result in a loss of 280 AUM's per year or a total of 11,200 AUM's for the 40-year project life. An unquantifiable volume of forest/woodland products including increased use of mine timbers would also be irretrievably lost. This loss would be moderate locally but very minor statewide. Both the range and woodland products loss would be reversible. Losses of some threatened and endangered plants would probably be irreversible.

The permanent and irreversible loss of springs, seeps, and their associated plant communities will reduce livestock and wildlife use. Increased use of water for industrial and municipal purposes will require

reallocation of agricultural and livestock water on a permanent basis. If the water were drawn from existing agricultural water sources, the use of 1,660 acre-feet of water and 222 acres of irrigated land would be irreversibly committed to population expansion. The total consumptive use of water would be about 43,000 acre-feet per year.

The change in land use from range/woodland to permanent facilities, such as roads, buildings, canals, reservoirs and urban development, would be both irreversible and irretrievable on about 1,725 acres. An estimated 463 acres of land would be irreversibly and irretrievably committed to community growth at the proposed level of action.

Wildlife resources irretrievably lost would include individual animals lost through loss of habitat. The loss of about 1,725 acres of wildlife habitat would be irreversible.

The commitment of resources to new transportation facilities would be small, consisting primarily of new mine access roads which may be removed at the request of the land managing agency. The other only irretrievable commitment of land would result from the possible right-of-way acquisition for the widening of U.S. 89 and selected intersection improvements.

Increased visits and levels of use of the regional recreation resource would be irreversible. The natural landscape would be permanently modified by retained facilities, and any mining remnants and residues. Community growth and development would also be irreversible. Scenic attractions lost as a result of vandalism, overuse, and so forth would be irretrievable.

Any disturbance or removal of archeologic and historic sites would be irreversible and irretrievable.

CHAPTER VIII

ALTERNATIVES

The true alternatives discussed in this chapter are the Administrative Alternatives. The three scenarios are not alternatives, but provide a basis to identify areas of environmental concern or impact sensitivity.

This regional EIS evaluates the impacts of projected coal developments in the southern Utah region. The projected scenario evaluated in chapters IV-VII is dependent in part on Federal approval of mining and reclamation plans (MRP's) on existing Federal leases. However, the Secretary of the Interior is not proposing a particular production level for coal in this EIS region. Instead, he is considering actions within his authority that will allow Federal coal to be available when needed and under environmentally acceptable conditions to meet market demands and the energy needs of the Nation. The approval actions under review at this time are being considered in this context.

In this regional EIS, decisions regarding MRP's in coal related actions are considered on a regional or subregional basis. Accompanying and future related site-specific statements will evaluate alternatives specific to the individual proposals. Thus, alternatives for the MRP's in coal related actions are evaluated on an aggregate basis in this statement, providing a means of responding to regional or subregional environmental problems or social and economic concerns.

Development of alternative sources of energy, energy conservation, Federal development of the coal, and emphasis on coal developments in other regions of the United States are considered in programatic statements by the Departments of Energy and of Interior. A draft coal programatic statement prepared by DOI was filed with EPA on December 15, 1978.

A. ADMINISTRATIVE ALTERNATIVES

The Secretary's action in regard to the mining and reclamation plans under consideration may be approval as proposed, rejection on various environmental grounds, approval in part, or approval subject to such additional requirements or modifications as he may impose under the law. (See also part 2, chapter VIII.) He may also defer decision pending submittal of additional data, completion of required studies or for other valid reasons. If there are serious environmental concerns as to the coal development, the Secretary may exercise his exchange authority as to the coal rights or seek Congressional action cancelling the Federal leases involved.

B. SCENARIOS

The actual coal production obtained in 1990 will depend on demand as well as availability of coal. Factors influencing demand include access and economics in relation to other coal sources, transportation, local as well as Federal approvals, and pollution control requirements

and technology. Availability of coal will depend increasingly on Federal approvals as the production level raises. Production greater than the low level will require Federal approvals of mine and reclamation plans because land ownership patterns make access to much of the State and private coal uneconomical without Federal coal. Further, most of the coal in Utah is in Federal ownership. Production could well occur at significantly lower or higher levels than identified at the projected level. The alternative scenarios provide a display of impact change with less or more production.

1. No Action Alternative and Low Level Scenario (1 mty)

The no action alternative envisages non-approval or rejection of the pending mining and reclamation plans on Federal leases along with any related permits or right-of-ways. Private coal would be developed where support of additional Federal coal is not needed. However Federal coal could be made available to avoid bypass from ongoing private coal development. Without Federal approval of mining and reclamation plans and associated land use applications, as much as 1 mty could be produced from State and private land (table VIII-1). These are scattered tracts and in most cases could be developed economically only in conjuction with Federal lands.

Impacts related to the no action alternative include:

- Coal from this area would not be available in other than minor amount. Therefore, coal either would have to be produced elsewhere or a gap in supply would result.

- Potential for new jobs and business opportunities would be lost in an economically depressed area.

- The impacts accompanying coal production in this area would be avoided (chapters IV, V).

The future environment projected to 1990 without the proposed Federal actions but including minor production from State and private lands is analyzed in chapter II.

2. Medium Level Scenario (29.3 mty)

This scenario includes: full production from eight mines as proposed in the detailed mining and reclamation plans (MRP's) submitted to USGS for approval (table I-1), associated ancillary facilities (table VIII-2) and and the A-WV project. The MRP's are analyzed in detail in part 2 and an A-WV project site specific EIS is being prepared by BLM.

Attainment of 29.3 mty by 1990 is dependent upon: (1) Federal approval of mining and reclamation plans, (2) approval of land-use applications, (3) development of the proposed Allen-Warner Valley Energy System (A-WV), (4) development of a major transportation system to

TABLE VIII-1.--Preliminary mining plans, potential producers by 1990

Proponent	Mine (type)	Proposed production (mty)	Area (acres)
Fulton and Denton-------	Shakespeare (underground)	0.03	80
Hiko Bell Mining-------- and Oil Co.[1]	S. Nipple Butte (underground)	0.5	10,070
King Cannel Coal Co.----	King Cannel (underground and strip)	0.02	[2]240
Meadowlark Farms[3]-------	Garfield County (underground and strip)	2.0	11,360
Sunoco Energy Dev. Co. (Sun Oil Co. Delaware)[3]----------		3.0	18,374
Utah Power & Light Co.[3]-	Garfield County	4.0	18,325
Woods Petroleum[3]--------	White Mountain (underground and strip)	5.0	13,609
5 M Corp[4] -------------	Kaiparowits (underground)	1.0	640

[1]640 acres, preference-right-lease application.
[2]120 acres, private surface.
[3]Preference-right-lease applications.
[4]State land.

TABLE VIII-2.--Medium production level (29.3 mty) summary of facilities

Facility type	Number proposed	Water requirements acre feet/year	Miles	Acreage requirements			
				Included in project	Disturbed	Reclaimed	Unreclaimed
Water project-------	--	--	--	2,993	1,187	0	1,187
Powerplants---------	2	32,500	--	[3]10,182	[3]5,475	5,475	0
Mines underground[1]--	2	[4]4,100	--	[3]36,600	[3]2,764	2,764	0
Mines strip[1]--------	1	[4]1,416	--	8,280	8,280	8,280	0
Slurry lines--------	2	[5]8,284	183	2,220	1,100	1,100	0
Powerlines----------	--	0	70	140	140	140	0
Roads---------------	--	0	115	530	530	30	500
Added community-----	--	9,160	--		2,437	0	2,437
Total------------	--	55,460	--	60,945	21,913	17,784	4,124

[1]Total proposed coal production of 29.3 mty.
[2]includes the entire area to be mined.
[3]does not include potential subsidence.
[4]7,000 acre-feet per year would be extracted for use by powerplants.
[5]includes water for coal processing plant.

transport coal from the Kaiparowits Plateau, and (5) securing market for the proposed production from the plateau.

In the MRP's submitted to USGS are several preliminary proposals for transporting coal from the Kaiparowits Plateau (tables VIII-3, VIII-4). Detailed plans have not been developed and right-of-way applications have not been filed for any of these proposals.

a. Geology, topography, paleontology

At this level slightly more than 36,000 acres on the Kaiparowits Plateau could be disturbed by subsidence. The potential for mine fires would increase as a result of the increased level of activity. Both adverse and beneficial impacts will occur to paleontological resources in approximate proportion to the level of regional development and the area disturbed.

b. Soils

The soil impacts from the Alton-A-WV area would be the same as at the projected level; additional impacts would occur in the Kaiparowits coal field where the total impacts would be the sum of impact acruing because of development of the Red and Blue and Kaiparowits Nos. 1-5 mines (part 2, chapters III, IV). The soil disturbance on a total of about 21,913 acres on the Kaiparowits Plateau would be within Soil Associations 69 and 36. (See chapter II.) Unit 69 consists dominantly of rockland, and unit 36 of generally shallow, light-colored soils on plateaus and terraces. These soils are usually dry and annual precipitation is only 8 to 14 inches. Soil materials consist of silty clay where formed from shale, and loamy sand to loam where formed from sandstone.

Vegetative cover is sparse over the Kaiparowits Plateau and natural soil erosion is quite evident. The sandy soils are most susceptible to wind erosion whereas the clayey soils are more susceptible to water erosion. During constructional phases the soil erosion rates would increase, but after facilities have been constructed the overall soil movement should be less than under natural conditions as a result of the surface protection offered by the structures. Some additional soil erosion and land taken out of natural vegetative production would result from the upgrading of haul roads.

About 2,437 acres would be needed for community development by 1990 as a result of increased populations related to mining activities. This compares with 463 acres that would be needed by 1990 under the projected level. The additional acreage impacted would almost entirely fall within the Kaiparowits Coal Field influence area, basically from Page, Ariz., to Escalante, Utah. Community development would result in a use change of the soils from a natural or agricultural system to urban. Sediment production would increase temporarily during construction periods. Wind erosion on sandy soils would probably be the greatest impact to soils and would have local effect on air quality.

TABLE VIII-3.--Preliminary proposed railroads ancillary to mining coal in southern Utah

	Proponent				
	Union Pacific RR Co.	Union Pacific RR Co.	Denver Rio Grande RR	Santa Fe RR Co., Inc.	Utah Power & Light Co.
Proposal----------	railroad	railroad	railroad	railroad	railroad
Map reference:					
Location----------	Kaiparowits to Cedar City	Kaiparowits to Lunch	Kaiparowits to Marysvale	Kaiparowits to east of Flagstaff, Arizona	Kaiparowits to Marysvale
Termini or route---	via East Clark Bench, Arizona Strip, and Hurricane, Utah	via East Clark Bench, Alton, Panguitch, Minersville	via Cockscomb, Henriville, Johnson Valley, Antimony, and Kingston		via Alvey Wash, Griffen Top, Johnson Valley, Antimony, and Kingston.
Mileage----------	270 miles	260 miles	104 miles	186 miles	94 miles
Acreage requirement	3,270 acres	3,150 acres	1,260 acres	2,250 acres	1,150 acres
Mines benefitted---	Kaiparowits Nos. 1-5 mines, Red & Blue mines, Sunoco Energy Development mines, Utah Power & Light mines (see comment)	Kaiparowits Nos. 1-5 mines, Red & Blue mines, Sunoco Energy Development mines, Utah Power & Light mines (see comment), Alton mine	Utah Power & Light mines, Sunoco Energy Development mines, Red & Blue mines, Kaiparowits No. 1-5 mines	Kaiparowits Nos. 1-5 mines, Red & Blue mines, Sunoco Energy Development mines	Utah Power & Light mines, Sunoco Development mines, Red & Blue mines, Kaiparowits Nos. 1-5 mines
Federal agencies responsible--------	BLM - right-of-way ICC	BLM - right-of-way USFS - right-of-way ICC	BLM - right-of-way USFS - right-of-way ICC	BLM - right-of-way Bureau of Indian Affairs ICC	BLM - right-of-way USFS - right-of-way ICC

TABLE VIII-4.--Preliminary proposed coal slurrylines ancillary to mining coal in southern Utah

	Proponent			
	El Paso Energy Resource Co.	El Paso Energy Resource Co.	El Paso Energy Resource Co.	Utah Power & Light
Proposal----------	Slurryline	Slurryline	Slurryline	Slurryline
Map reference:				
Termini and (or route----------	Kaiparowits to Cedar City via east Clarks Bench, Arizona Strip and Hurricane.	Kaiparowits to east of Flagstaff, Arizona, via Page and Cameron	Kaiparowitz to Walsenburg, Colorado via Page, Arizona, and New Mexico	Kaiparowitz to west of Nephia via Escalante
Mileage----------	163 miles	164 miles	474 miles	151 miles
Acreage----------	650 acres	655 acres	1,900 acres	600 acres
Mines benefitted-	El Paso Red & Blue mines	El Paso Red & Blue mines	El Paso Red & Blue mines	Utah Power & Light mines
Federal agencies responsible----	BLM - right-of-way BIA - right-of-way	BLM - right-of-way BIA - right-of-way	BLM - right-of-way BIA - right-of-way USFS - right-of-way	BLM - right-of-way USFS - right-of-way
Major environmental concerns:				
General comments-	Crosses Kaibab Indian Reservation	Crosses Navajo Indian Reservation	Crosses Navajo and Jicarilla Apache Indian Reservations	

c. Water

Impacts on water resources of the mine areas would be very minor, and would involve less than 1 percent of the region. Changes in the chemical quality of water flowing to the Colorado River would be imperceptible.

d. Air

Paving or equivalent stabilization of haul and access roads (table VIII-5), which is required under Best Available Control Technology related to Prevention of Significant Air Quality Deterioration would essentially eliminate regional air quality impacts that might result from fugitive dust at all mines. (See chapter III.) Particulate impacts from the Alton mine would be the same as under the projected level and as described in detail in part 2. Impacts from powerplants are the same as discussed under the projected level. Visibility impacts owing to the Alton mining operations would be the same as described in part 2.

TABLE VIII-5.--Air quality impact sources by modeling regions

Modeling region	Sources		
	Mines	Powerplants	Area sources
Escalante area and North Kaiparowits Plateau----------			Escalante
South Kaiparowits Plateau----------	El Paso Red and Blue Kaiparowits Nos. 1-5	Navajo	
Kolob and Skutumpah Terrace, Alton Amphitheater----------	Alton		Alton Glendale Orderville Hatch Henrieville Tropic
Warner Valley----------		Warner Valley	

Population increase would commit air quality near cities and towns to some degradation because of particulate, carbon monoxide, sulfur dioxide, nitrogen oxide and hydrocarbon emissions. Significant concentrations would result, possibly exceeding the NAAQS for particulates in the larger urbanized areas. (See part 2, Red and Blue mines, chapter III, Air section.)

e. Vegetation

Essentially the same kind and level of mitigations would be applied under this level as under the projected level. Therefore, residual impacts

would be of essentially the same kinds, but of greater extent. The loss of 22,555 acres of vegetation would result in a loss of about 490 AUM's of domestic livestock forage per year. Over the average 30-year life of the projects, the total livestock forage lost would be 14,700 AUM's. The loss of forest/woodland products would be moderate on a local scale, but minor statewide. Impacts caused by one or more of the preliminary transportation systems (tables VIII-3, VIII-4) would be similar, but unquantifiable. These impacts would be relatively minor on a regional basis, but may prove major locally.

f. Wildlife

Impacts to wildlife and its habitat would be as described in chapter IV but greater in intensity because of the increased area of disturbance and greater human population increase. Wildlife habitat disturbed would total 22,555 acres. An enhanced transportation system would increase the area of disturbed wildlife habitat by a minimum of 790 to 3,270 acres (table VIII-3). Loss of this amount of habitat would decrease the wildlife population potential for the life of the projects.

Proposed coal mines on the Kaiparowits Plateau would occupy approximately 1,000 acres of deer winter range. A new town, if developed on East Clark Bench, would occupy approximately 600 acres of antelope range. Conversion of irrigated agricultural lands to housing lots would reduce pheasant habitat by 500 acres. In addition, the demand for second home or recreational developments by the increased population would reduce deer, elk, cougar, turkey, and forest grouse habitat by and inferred 130 to 550 acres. About 4,200 acres of wildlife habitat occupied by communities, roads, reservoirs, and recreational developments would be irreversibly committed and long-term wildlife productivity on those lands would be changed or lost. The remaining disturbed areas would be reclaimed following termination of the projects.

Impacts to wildlife from use of 2,437 acres for urbanization would be displacement or elimination of small mammals and a subsequent reduction in use of the area by predators. Responses of bird populations to urbanization would be a decrease in the number of species and an increase in numbers of some species. Species benefitted by urbanization would be omnivores and species that nest on buildings. Species that nest on or near the ground would be eliminated (DeGraff and Thomas, 1976). In Tucson, Ariz., newly created urban habitat had a 26-fold increase in number of individual birds compared to those of the native desert habitat. Exotic (not native) species made up 65 percent of the urban bird population (Emlen, 1974).

Increased traffic would increase wildlife highway mortality. The projected 95 percent increase of traffic on roads where deer kill has been significant would increase deer highway mortality. The average (1975-77) kill of 118 deer per year on these roads would increase to 229 deer per year by 1990. Loss of these deer would be irretrievable.

Disturbance, harassment, and illegal killing or collecting of wildlife would increase, and the use of off-road vehicles (ORVs) would contribute significantly to these impacts. Snowmobiles would be used for legal and illegal hunting, fishing, and trapping in areas formerly inaccessible, and game would be harassed by snowmobilers (Stace-Smith, 1975). At the least, harassment would cause increased forage intake and decreased carrying capacity of winter range; at worst, it would cause the death of animals during critical periods (Geist, 1971). Harassment need not be intentional to cause problems. Deer often move out of an area when snowmobiles move in; however, in some areas snowmobile trails are beneficial, allowing deer to move about more freely (Price, 1975). Winter mortality of small mammals would increase in areas under snowmobile compaction (Schmid, 1972). Uncontrolled use of motorcycles, four-wheel drive vehicles, and dune buggies would also impact wildlife directly by killing or injuring individuals and indirectly by destroying nests, cover, and food sources. Impacts of ORV's would be pervasive and long lasting because habitats are altered, and rare or unique species with restricted or remote ranges are threatened (Geological Society of America, 1977). Species that may be impacted include those described in chapters IV and V. The remote character of the area would be irreversibly committed to being more developed with frequent human disturbance. The result would be a long-term reduction of wildlife productivity.

The increased level of mining on the Kaiparowits Plateau would subject a much larger area to possible subsidence and possible subsequent loss or alteration of local surface water sources. Loss of surface water and riparian vegetation would reduce available habitat for amphibians, deer, bighorn sheep, and chukar. The number of individuals that would be affected is small.

g. Fisheries

At the medium level, impacts to fish described in chapter IV would occur, and these additional impacts would be expected. Fish habitat affected by converting agriculture water to domestic supplies for the new population in the Escalante basin would depend upon the relation of the new diversions to those now used. Moving diversions upstream would adversely affect fisheries; moving them downstream may increase fish habitat; and using present diversions may cause no change. At the medium level the number of resident Utah fishermen would increase by 49 percent over the low level and resident Arizona fishermen would increase by 19 percent. Trout streams and several southern Utah reservoirs would be overfished. An increased number of fishermen would fish for warm water species of gamefish, probably at Lake Powell.

h. Lands

The Paria Canyon Primitive Area (fig. II-21), the only designated primitive area within the region is now crossed by the existing Navajo-McCulloch powerline. Only secondary impacts resulting from the proposed coal developments are expected to influence the Paria Canyon Primitive Area. These include increased recreational usage and human disturbance

and possible detrimental effects upon recreational, scenic, historical, and primitive values within the adjacent Paria-hackberry potential roadless area.

i. Socioeconomics

The medium level scenario differs from the projected level in both the kind and the magnitude of impacts. In 1975 the estimated population of Garfield plus Kane County was nearly 7,000. At the medium level, over 6,000 workers would be employed in coal mining alone by 1990. This is nearly six times the coal employment assumed in the projected level. The relative change would be enormous and would affect Garfield County in particular.

Expansion of coal production could result in 1,174 miners residing in the central Garfield County by 1985, and 1,635 by 1990. As the total enumerated population of that part of Garfield County (the Escalante and Tropic Census County Divisions) was only 1,608 in 1970, the potential magnitude of change is apparent.

In Kane County, a further alternative must be considered. Rather than live in the county, miners who work there may live in Page, Ariz., instead. The high capital costs of extensive new community development in Kane County to provide residences for area miners may be partly avoided or largely postponed if miners commute from Page. Thus, two variations must be considered. One variation assumes no commuting from Page. A second assumes that 90 percent of the Kane County portion of area miners commute from Arizona. Large differences would occur in the effects on Kane County population and economic structure between the variations. Additionally, there are minor implications for the economics of Garfield County and that of the region. These would result from alteration of regional trading relationships.

Projected populations are presented in tables VIII-6 and VIII-7. Coal production at the medium level would produce explosive growth in Kane County during the 1980-85 period. To reach the projected 1985 population an inmigration in 5 years equal to five times the total 1980 Kane County population would be required. A population growing at an average rate of 36 percent per year cannot be absorbed and serviced at contemporary standards.

Potential inmigration would affect the age composition of the population as shown in tables VIII-8 and VIII-9. The demographic characteristics of areas having high immigration become less like those of the indigenous population and more like those of the immigrants. Lack of mobility of the elderly, plus their inability to respond to changing economic incentives, would result in unusually small proportions of the population 65 years of age and older.

Housing requirements and average household size, consistent with the age composition of the evolving population, are summarized in table VIII-10.

TABLE VIII-6.-- Medium level scenario, population and components of change by county in southern Utah

[Source: 1970; U.S. Census of Population. Projection Years and Intervals for Counties, UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

County	1970 Population	Interval components of change: Natural increase	Interval components of change: Migration	1975 Population	Interval components of change: Natural increase	Interval components of change: Migration	1980 Population	Interval components of change: Natural increase	Interval components of change: Migration	1985 Population	Interval components of change: Natural increase	Interval components of change: Population	1990 Population
Garfield---	3,200	200	+100	3,400	200	+300	3,900	300	+9,000	13,200	1,300	+3,200	17,700
Kane-------	2,400	100	+1,000	3,600	300	+400	4,200	300	+21,200	25,800	2,900	+7,800	36,500
Total, Garfield and Kane-	5,600	300	+1,100	7,000	500	+600	8,100	600	+30,200	38,900	4,200	+11,000	54,200
Beaver and Iron-----	16,000	1,400	+1,000	18,400	1,700	+900	21,000	1,600	+1,700	24,300	1,400	+200	25,900
Washington-	13,700	1,200	+2,100	17,000	2,200	+3,900	23,100	2,400	-3,000	22,500	1,600	-700	23,400
Total, Beaver, Iron, Washington---	29,600	2,700	+3,100	35,500	3,900	+4,700	44,100	4,000	-1,300	46,800	3,000	-500	49,300
Total, five county[1]--	35,200	2,900	+4,300	42,400	4,400	+5,300	52,200	4,600	+28,900	85,700	7,300	+10,500	103,500

[1]Detail may not add to totals because of independent rounding.

TABLE VIII-7.--Medium level scenario, population and components of change by county in southern Utah assuming commuting from Page, Arizona

[Source: 1970; U.S. Census of Population. Projection Years and Intervals for Counties; UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

County	1970 Population	Interval components of change: Natural increase	Interval components of change: Migration	1975 Population	Interval components of change: Natural increase	Interval components of change: Migration	1980 Population	Interval components of change: Natural increase	Interval components of change: Migration	1985 Population	Interval components of change: Natural increase	Interval components of change: Population	1990 Population
Garfield----	3,200	200	+100	3,400	200	+300	3,900	300	+9,000	13,200	1,300	+3,200	17,700
Kane--------	2,400	100	+1,000	3,600	300	+400	4,200	300	+7,200	11,700	1,200	+2,800	15,600
Total Garfield and Kane--	5,600	300	+1,100	7,000	500	+600	8,100	600	+16,100	24,900	2,500	+5,900	33,300
Beaver and Iron------	16,000	1,400	+1,000	18,400	1,700	+900	21,000	1,600	+1,700	24,300	1,400	+200	25,900
Washington--	13,700	1,200	+2,100	17,000	2,200	+3,900	23,100	2,400	-3,000	22,500	1,600	-700	23,400
Total, Beaver, Iron, Washington----	29,600	2,700	+3,100	35,500	3,900	+4,700	44,100	4,000	-1,300	46,800	3,000	-500	49,300
Total, five county[1]---	35,200	2,900	+4,300	42,400	4,400	+5,300	52,200	4,600	+14,900	71,700	5,500	+5,400	82,600

[1]Detail may not add to totals because of independent rounding.

TABLE VIII-8.--Population at medium and high level scenarios, projected by age group, Garfield and Kane Counties, and remainder of region

[Source: UPED Model Projection, Bureau of Economic and Business Research, University of Utah]

	Medium level				High level			
	1985		1990		1985		1990	
Age group	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page
				Garfield County				
0-4----	1,130	1,150	1,950	1,960	1,670	1,670	3,710	3,710
5-14---	2,560	2,540	3,250	3,260	4,160	4,160	7,030	7,040
15-24---	3,060	3,050	2,940	2,930	5,170	5,170	7,080	7,070
25-44---	4,170	4,170	6,710	6,710	6,780	6,780	13,910	13,910
45-64---	1,340	1,330	1,740	1,740	1,960	1,960	3,410	3,420
65+-----	910	920	1,080	1,090	1,300	1,300	2,030	2,030
Total[1]	13,160	13,160	17,680	17,680	21,040	21,030	37,170	37,180
				Kane County				
0-4----	2,070	1,040	4,070	1,690	1,960	610	4,330	1,240
5-14---	5,100	2,270	6,660	2,920	5,000	1,160	7,980	3,270
15-24---	6,380	2,640	6,290	2,620	6,230	1,180	7,990	3,430
25-44---	8,480	3,820	14,220	5,900	8,260	1,980	16,090	5,410
45-64---	2,260	1,160	3,340	1,570	2,220	740	3,870	1,590
65+-----	1,490	790	1,900	930	1,340	500	2,210	980
Total[1]	25,780	11,720	36,480	15,630	25,120	6,180	42,460	15,910
				Remainder of southern Utah coal EIS region				
0-4----	4,970		4,360		5,120		4,670	
5-14---	9,160		9,760		9,340		10,320	
15-24---	7,000		7,680		7,250		8,370	
25-44---	14,450		15,810		14,820		17,080	
45-64---	5,900		6,060		5,970		6,240	
65+-----	5,300		5,670		5,380		5,810	
Total[1]	46.79		49.34		47.88		52.58	

[1]Details may not add to totals because of independent rounding.

TABLE VIII-9.--Characteristics of age composition, medium and high level scenarios, Garfield and Kane Counties, and remainder of region

[Source: UPED Model Projection, Bureau of Economic and Business Research, University of Utah]

	Medium production level				High production level			
	1985		1990		1985		1990	
	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page	Reside in Utah	Comute from Page	Reside in Utah	Commute from Page
Garfield County								
Percent of population:								
0-15----------	29.5	29.6	31.0	31.1	29.3	29.3	30.6	30.6
65+ ----------	6.9	7.0	6.1	6.2	6.2	6.2	5.5	5.5
Dependency ratio----	.57	.58	.59	.59	.55	.55	.56	.56
Median age----------	24.6	24.6	26.4	26.4	24.3	24.3	25.7	25.7
Kane County								
Percent of population:								
0-15----------	29.4	29.9	31.0	31.1	29.4	30.4	30.7	30.1
65+ ----------	5.8	6.7	5.2	5.9	5.7	8.2	5.2	6.2
Dependency ratio----	.54	.58	.57	.59	.54	.63	.56	.57
Median age----------	24.2	24.7	26.2	26.4	24.2	25.9	25.8	25.1
Remainder of southern Utah coal EIS region								
Percent of population:								
0-15----------	31.7		30.3		31.1		30.4	
65+ ----------	11.3		11.5		11.2		11.1	
Dependency ratio----	.76		.72		.74		.71	
Median age----------	27.5		29.1		27.4		28.5	

TABLE VIII-10.--Housing requirements, medium and high level scenarios, Garfield and Kane Counties, and remainder of the region

[Source: UPED Model Projection, Bureau of Economic and Business Research, University of Utah]

	Medium level				High level			
	1984		1990		1985		1990	
	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page
	Garfield County							
Occupied dwelling units	3,670	3,670	5,080	5,080	5,780	5,780	10,460	10,460
Average household size	3.58	3.58	3.48	3.48	3.64	3.64	3.55	3.55
	Kane County							
Occupied dwelling units	7,030	3,270	10,370	4,490	6,860	1,780	11,960	4,450
Average household size	3.67	3.58	3.52	3.48	3.66	3.46	3.55	3.58
	Remainder of southern Utah coal EIS region							
Occupied dwelling units	13,980		15,020		14,270		15,900	
Average household size	3.35		3.28		3.36		3.31	

The extreme case is that of Kane County. The medium production level would necessitate about 5.7 thousand housing units in 1985. This is 5 1/4 times more than required to meet conditions at the low production level.

For the regional economy as a whole, the projected growth is a much less extraordinary economic experience. Though annual growth rates would be very high for the 1980 to 1985 period, they would be little more than double the regional growth rate projected for 1975 to 1980 (table VIII-11). The real question of impacts associated with coal mining at the medium or high levels concerns the concentration of the resultant population in the remote and very thinly populated subareas of Kane and Garfield Counties. The total magnitude of change in the regional economy is much less an issue.

The economics of Garfield and Kane Counties would be altered significantly if production at the medium level should occur. In Garfield County, employment in mining would be a major addition to the economic base.

Other important economic effects would result from employment of Arizona residents in Kane County mines (tables VIII-12, VIII-13). If Kane County grows rapidly it will become more self-sufficient in higher order services. This could decrease the demand for such services in Garfield County. To a minor degree, therefore, change in the Garfield County economy may be inversely related to the expansion in Kane County.

A more important consideration concerns the distribution of costs of population support. The potential for adverse impacts is increased if population is concentrated in a thinly developed and sparsely settled area. If much of the population impact were to occur in existing, larger communities (Kane County miners to Page, for example) population support might cost less. The sensitivity of the level and distribution of economic activity in Kane County to commuting from Page is shown in table VIII-13. (Mining employment is in terms of jobs in the county even if held by Arizona residents.) There are substantial differences in total jobs, but even greater variations in jobs existing to serve requirements of the local population between the levels of production. The greater the commuting from present population concentrations with absorption capacity, the less the capital requirements of creating new capacity. And, the fewer the in-migrants to small towns and hamlets, the less the adverse impact on such vulnerable groups as the elderly.

The effects of the medium level of population and economic activity on municipal services can be found in the tables in Socioeconomics, chapter IV.

j. Transportation and utilities

At the medium level, transportation impacts would be the same in the Alton-A-WV impact area as described in chapters IV and V.

TABLE VIII-11.--Projected expansion in regional population and employment, medium and high level scenarios

[Source: UPED Model Projection, Bureau of Economic and Business Research, University of Utah]

	1975	Interval growth rate percent/ year	1980	Interval growth rate percent/ year	1985	Interval growth rate percent/ year	1990
Medium level:							
Population------	42,430	4.14	52,190	9.93	85,730	3.77	103,490
Labor force-----	16,040	4.31	19,900	10.67	33,920	4.27	42,460
Jobs (Full and Part time)--	15,700	4.64	19,800	10.98	34,290	4.27	42,460
Proprietor------	3,050	2.70	3,490	5.35	4,560	2.24	5,100
Wage and salary-	12,660	5.07	16,310	12.01	29,730	4.57	37,360
Medium level with commuting from Page:							
Population------	42,430	4.14	52,190	6.34	71,670	2.85	82,640
Labor force-----	16,040	4.31	19,900	6.82	27,980	3.43	33,220
Jobs (Full and Part time)--	15,700	4.64	19,800	8.85	30,820	3.70	37,090
Proprietor------	3,050	2.70	3,490	3.27	4,110	1.45	4,420
Wage and salary-	12,660	5.07	16,310	9.86	26,710	4.03	32,670
High level:							
Population------	42,430	4.14	52,190	11.78	94,040	6.81	132,220
Labor force-----	16,040	4.31	19,900	12.64	37,440	7.39	54,760
Jobs (Full and Part time)--	15,700	4.64	19,800	12.95	37,840	7.39	54,760
Proprietor------	3,050	2.70	3,490	6.54	4,840	4.50	6,060
Wage and salary-	12,660	5.07	16,310	14.09	33,000	7.78	48,690
High level with commuting from Page:							
Population------	42,430	4.14	52,190	7.28	75,100	6.83	105,670
Labor force-----	16,040	4.31	19,900	7.83	29,430	7.58	42,990
Jobs (Full and Part time)--	15,700	4.64	19,800	9.68	32,130	8.00	47,930
Proprietor------	3,050	2.70	3,490	3.89	4,240	4.12	5,210
Wage and salary-	12,660	5.07	16,310	10.73	27,890	8.53	42,720

TABLE VIII-12.--Employment (full- and part-time) and percentage allocation by sector, medium and high level scenarios, 1985 and 1990, Garfield County

[Source: UPED Model Projection, Bureau of Economic and Business Research, University of Utah]

	Medium level				High level			
	1985		1990		1985		1990	
	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page
Agriculture---	280	280	280	280	300	300	330	330
Mining--------	1,270	1,270	1,740	1,740	2,710	2,710	5,040	5,020
Construction--	350	350	400	400	500	500	790	790
Manufacturing-	380	370	490	500	410	380	580	590
TCU[1]----------	230	290	310	380	390	410	710	760
Trade---------	1,380	1,920	1,830	250	2,050	2,340	3,510	4,220
FIRE[2]---------	220	300	310	430	350	400	660	780
Services------	860	1,010	1,210	1,420	1,200	1,280	2,050	2,320
Government----	890	890	1,240	1,250	1,340	1,350	2,480	2,490
Total[3]-----	5,850	6,68	7,810	6,650	9,250	9,660	16,140	17,310
	Percentage allocation							
Agriculture---	4.8	4.2	3.6	3.2	3.2	3.1	2.0	1.9
Mining--------	21.7	19.0	22.2	19.4	29.3	28.1	31.2	29.0
Construction--	5.9	5.2	5.1	4.4	5.4	5.1	4.9	4.6
TCU[1]----------	4.0	4.3	4.0	4.3	4.2	4.2	4.4	4.4
Trade---------	23.6	28.7	23.5	28.4	22.2	24.3	21.8	24.4
FIRE[2]---------	3.7	4.5	4.0	4.8	3.8	4.1	4.1	4.5
Services------	14.7	15.1	15.5	15.9	12.9	13.2	12.7	13.4
Government----	15.2	13.3	15.9	13.9	14.5	14.0	15.4	14.4

[1]Transportation, communication, and utilities.
[2]Finance, insurance, and real estate.
[3]Details may not add to totals because of independent rounding.

TABLE VIII-13.--Employment (full- and part-time) and percentage allocation by sector, medium and high level scenarios, and variations, 1985 and 1990, Kane County

[Source: UPED Model Projection, Bureau of Economic and Business Research, University of Utah]

	Medium production level				High production level			
	1985		1990		1985		1990	
	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page	Reside in Utah	Commute from Page
Agriculture---	220	190	240	190	220	170	260	190
Mining--------	3,350	3,340	4,540	4,530	3,240	3,230	5,600	5,580
Construction--	580	380	740	400	580	300	870	430
Manufacturing-	210	140	290	180	210	110	320	180
TCU[1]----------	580	350	900	560	570	330	1,030	640
Trade---------	2,360	660	3,350	860	2,300	440	3,840	870
FIRE[2]---------	420	120	650	180	410	080	750	190
Services------	1,300	610	1,970	870	1,270	460	2,180	910
Government----	1,550	730	2,360	1,050	1,510	410	2,740	1,060
Total[3]-----	10,570	6,530	15,040	8,810	10,300	5,520	17,590	10,050
	Percentage allocation							
Agriculture---	2.1	2.9	1.6	2.2	2.1	3.2	1.5	1.9
Mining--------	31.7	51.2	30.2	51.4	31.4	58.4	31.9	55.5
Construction--	5.5	5.8	4.9	4.6	5.6	5.4	4.9	4.3
Manufacturing-	2.0	2.2	1.9	2.1	2.0	1.9	1.8	1.8
TCU[1]----------	5.5	5.4	6.0	6.4	5.5	5.9	5.9	6.3
Trade---------	22.3	10.1	22.2	9.7	22.3	7.9	21.9	8.7
FIRE[2]---------	4.0	1.9	4.3	2.0	4.0	1.4	4.3	1.9
Services------	12.3	9.3	13.1	9.8	12.3	8.4	12.4	9.0
Government----	14.7	11.2	15.7	11.9	14.6	7.4	15.6	10.6

[1]Transportation, communication, and utilities.
[2]Finance, insurance, and real estate.
[3]Details may not add to totals because of independent rounding.

Traffic projections (table VIII-14, fig. IV-2) assume that coal would be transported by some other means other than truck. Compared over all 27 selected segments, the traffic level would be about 1.7 times greater than at the projected level. Impacts resulting from traffic increases would occur to a somewhat greater degree than described in chapter IV.

Traffic demands would also require the addition of climbing lanes from the site of the possible new town west to Mt. Carmel Junction and improvements to the intersection of US 89 and U 277 at Glen Canyon City, such as the addition of turning lanes. Traffic would require the addition of two travel lanes to US 89 from the Arizona state line to the possible new town. Depending on the extent to which mine workers reside in the vicinity of Page, similar improvements may be needed in Arizona between the State line and Page. The existing two lane bridge over the Colorado River would become a bottleneck during periods of peak traffic flow. Mines in the Kaiparowits Plateau would generate average daily traffic of 6,200 vehicles, including 750 service trucks. Although this traffic could be accommodated on a modified version of the proposed access road, congestion would be a problem, particularly during shift changes.

A main access road built to state highway standards would be constructed from Glen Canyon City to the mine areas. The State DOT has indicated that the highway would be extended to Escalante, and it was inferred that 10 percent of commuters to the mines would come from Escalante. The State DOT also indicated that, at this level, a road would be desirable between Henrieville and a main access road junction near the Red and Blue mines. This road would be 28 miles in length and, assuming an average right-of-way of 100 feet, would commit 339 acres more than estimated in table VIII-2. Although not included in the traffic computations, it is apparent that such a road would divert at least as many commuters as the route to Escalante, as well as much of the service truck traffic. This may obviate the need for some of the improvements to US 89.

The existing transportation system is inadequate to move 18.8 mty from Kaiparowits Plateau mines. An improved system would be needed. Railroads are being considered (table VIII-3 and fig. I-2) however, steam coal production from the plateau must ultimately reach 30 to 40 mty to make railroad construction feasible (oral communication, Union Pacific Railroad Co.). According to Union Pacific R.R. Co. news releases on December 14, 1978, about 50 mty coal production (steam coal) would be needed to justify railroad construction. Three other proposals for moving coal from Kaiparowits Plateau are coal-slurry pipelines to railheads at Cedar City, Utah; Flagstaff, Ariz.; or Walsenburg, Colo. (fig. I-1, table VIII-4). In comparison with other methods of coal transport, coal-slurry pipelines are not flexible. They are designed to transport a specified volume within a narrow range, from an initial point to an ending one.

Alternative proposals have been presented for bringing in power to the Kaiparowits Plateau from the 230 kV Navajo-Sigurd Utah Power and Light

TABLE VIII-14.--Projected average daily traffic (ADT) levels on selected segments of Utah highways, medium level scenario

Segment[1]	1975 ADT	1980 ADT	1985 ADT	1990 ADT	1990 Trucks
1-------	5,580	7,148	7,498	7,846	1,343
2-------	0	--	--	100	0
3-------	4,660	5,970	6,262	6,553	1,103
4-------	4,940	5,726	6,694	7,098	1,120
5-------	4,000	4,636	5,419	5,747	1,069
6-------	4,275	4,954	6,114	6,611	1,256
7-------	300	325	1,099	1,494	179
8-------	1,390	1,505	3,590	4,737	818
9-------	415	474	1,790	2,466	345
10-------	290	331	1,238	1,678	235
11-------	125	143	604	827	99
12-------	0	--	--	604	0
13-------	1,475	1,719	4,777	6,321	814
14-------	355	415	1,632	2,405	236
15-------	1,650	1,924	5,345	7,073	922
16-------	810	1,090	1,410	1,673	104
17-------	135	121	468	643	30
18-------	20	18	582	608	0
19-------	30	38	129	148	6
20-------	1,590	2,002	5,113	7,025	843
21-------	1,020	1,230	3,282	4,728	671
22-------	890	1,073	3,269	4,801	674
23-------	890	--	--	8,622	1,857
24-------	55	--	--	7,503	842
25A------	0	--	--	5,703	752
26-------	0	--	--	604	0
27-------	20	25	100	120	0

[1]See map, figure IV-2.

transmission line, tapping it in the vicinity of Grosvenor Arch, in Round Valley, or on East Clark Bench southwest of Glen Canyon City. GarKane could also furnish power from a distribution line on East Clark Bench. Firm proposals have not been received. One possibility would be to extend the powerline entirely across the plateau to Escalante, where it would complete a loop with the present distribution line.

Telephone service is not available across the Kaiparowits Plateau, but it is assumed that it would be made available if needed. No firm plans to provide service or additional service have been received. If above-ground telephone lines are used, about 80 miles of right-of-way would be needed on the Kaiparowits Plateau, nearly all probably within the proposed road corridor. Less right-of-way would be required if microwave transmissions are used.

k. Recreation

Projected increases in recreation visits and visitor days by residents of the region at the medium level are shown on tables VIII-15 and VIII-16 along with other scenario levels.

Lands that would be occupied are similar in recreation value, user attractions and recreation use rates (i.e., few or no developed recreation sites, minimal recreation user attractions, and very light (non-impactive) onsite recreation use) to those impacted at the projected level.

Impacts would be: (1) more intensified use of regional recreation attractions listed in tables II-32 and II-33 and as projected in tables IV-20, IV-21, and IV-22; (2) more restrictions and regulations on recreation use and activities (see chapter VI); (3) further reduction in fisherman success and possible hunting success; (4) additional ORV use and resultant impacts; and (5) increased recreation user dissatisfaction with over-crowded conditions on roads and of recreation areas and facilities.

l. Archeology and history

Archeologic and historic values would be benefited or lost depending on the extent to which sites were found and properly evaluated in the process of mine or ancillary facility development. The increased population would increase disturbance of sites and would place even more remote sites under direct pressure resulting in some archeologic and historic values being lost.

m. Esthetics

Impacts to the esthetic resource would be the same as those described in chapters IV and V, but to a greater degree. More urbanization would take place in adjacent communities, and more man-made intrusions would be introduced into the landscape character. The regional area affected by additional production would expand to involve the Escalante, Tropic,

TABLE VIII-15.--Recreation visits (trips) and visitor days use by residents of the region at the medium level

	Scenario		
	Present level	Low level	Medium level
Population of region to support coal production[1]:			
1976----------	48,525	--	--
1985----------	--	62,810	98,326 [4](35,516)
1990----------	--	68,096	113,875 (45,579)
Recreation visits by residents[2]:			
1976----------	444,000	--	--
1985----------	--	574,700	899,700 (325,000)
1990----------	--	623,100	1,042,000 (418,900)
Recreation visitor days by residents[3]:			
1976----------	1,385,300	--	--
1985----------	--	1,793,100	2,807,100 (1,014,000)
1990----------	--	1,944,100	3,251,100 (1,307,000)

[1]Population figures from socioeconomics section.

[2]Average out-of-community but with region recreation trips per household for worst case analysis is 9.15 trips per year.

[3]Visitor days equals 12 hours aggragated by one or more persons. Each out-of-community but within region recreation trip in the worst case averages 3.12 visitor days (37.44 hours).

(Both [2] and [3] are from baseline information calculated from figures in Utah Resident Recreation Travel, 1974, 1975, and 1976, J. D. Hunt, W. H. Becker, M. J. Dalton and S. F. McCool of the Institute for the Study of Outdoor Recreation and Tourism, Utah State University, Logan, Utah 84322.)

[4]Population, recreation visits and recreation visitor days use above the normal increases for 1985 and 1990 as a result of increased coal production are shown in parentheses.

TABLE VIII-16.--Out-of-community outdoor recreation trips by residents of the southern Utah coal region,[1] medium level

Recreation activity	1976		Low (no action) level				Medium level			
			1985		1990		1985		1990	
	Percent of total[3]	Number	Projected total	Increase	Projected total	Increase	Projected total	Increase	Projected total	Increase
Driving for pleasure and sightseeing	21.7	95,500	124,700	29,200	135,200	39,700	195,200	70,500	226,100	90,900
Fishing	15.0	65,800	86,200	20,400	93,500	27,700	135,000	48,800	156,300	62,800
Hiking and back packing	10.6	46,600	60,900	14,300	66,000	19,400	95,400	34,500	110,500	44,500
Water sports (boating, swim, waterskiing, etc.)	9.4	41,500	54,000	12,500	58,600	17,100	84,600	30,600	97,900	39,300
Picnicking	6.9	30,400	39,700	9,300	43,000	12,600	62,100	22,400	71,900	28,900
Skiing	5.7	25,100	32,800	7,700	35,500	10,400	51,300	18,500	59,400	23,900
Spectator sports (watching sporting events, etc.)	4.4	19,300	25,300	6,000	27,400	8,100	39,600	14,300	45,800	18,400
Camping	4.0	17,700	23,000	5,300	24,900	7,200	36,000	13,000	41,700	16,800
4-wheel, motorcycling, ORV use	3.7	16,400	21,300	4,900	23,100	6,700	33,300	12,000	38,600	15,500
Hunting big game	3.2	14,200	18,400	4,200	19,900	5,700	28,800	10,400	33,300	13,400
Golf	3.0	13,000	17,200	4,200	18,700	5,700	27,000	9,800	31,300	12,600
Hunting small game and target shooting	2.1	9,400	12,100	2,700	13,100	3,700	18,900	6,800	21,900	8,800
Winter sports (snowmobiling, ice skating, tubing, etc.)	2.1	9,500	12,100	2,600	13,100	3,600	18,800	6,700	21,900	8,800
Other (rockhounding, gathering resource products, nature study, etc.)[2]	8.2	35,600	47,000	11,400	51,100	15,500	73,700	26,700	85,400	34,300
Totals	100.0	440,000	574,700	134,700	623,100	183,100	899,700	325,000	1,042,000	418,900

[1] Refer to figures I-1 and II-21 for an outline of the southern Utah coal region and the southern Utah coal region Recreation Influence Zone. Text defines differences.

[2] Participation by present population during sample period was less than one-half of one percent in any one activity.

[3] Individuals may or may not have participated in more than one activity, as listed, during each trip. Figures shown are for major purpose of trip and total 100 percent; as an example, trip may have primarily been for fishing and recorded as such however, several other activities may have occurred on the same trip. No time element is involved in this summary sheet.

Based on information from Utah Resident Recreation Travel, 1974, 1975, 1976, Institute for the Study of Outdoor Recreation and Tourism, USU, Logan, Utah, by J. D. Hunt, W. H. Becker, M. J. Dalton and S. F. McCool.

and Panquitch areas in southern Utah. Impacts to these communities and to adjacent land would be the same as described in chapters IV and V.

3. High Level Scenario

Raising Southern Utah's coal production to 46 mty would require Federal action to approve the detailed mining and reclamation plans submitted to USGS for approval (table I-1). It would require submission and approval of mining and relamation plans for the preliminary coal mining proposals involving Federal leases, preference-right-lease applications and State and private land. It would also require the approval of filed and future rights-of-way applications for off-lease ancillary facilities associated with the mines (table VIII-17). The relative locations of the proposed mines at this level are shown on figure I-2.

TABLE VIII-17.--High level scenario, summary of facilities

Facility type	Number proposed	Water requirements acre feet/year	Miles	Acreage requirements Included in project	Disturbed
Water project----	1	--	--	2,943	[1]1,187
Powerplants------	4	46,000	--	14,000	9,000
Mines:					
underground----	15	8,000	--	[2]3,100	3,100
strip----------	4	1,500	--	26,000	26,000
Slurry pipelines-	3	12,400	657	7,900	4,000
Powerlines-------	2	0	100	210	210
Roads----------	2	0	120	720	[1]720
Railroads[3]-------	1	0	270	2,160	[1]2,160
Added community--	1	15,330	--	--	[1]4,104
Total--------		83,230		57,033	50,481

[1]Probably unreclaimed.
[2]Portal areas only. Does not include area subject to subsidence.
[3]Five railroads are preliminary proposed but only one is included here for purposes of analysis.

In addition to the approval of mine and reclamation plans, markets would be necessary. Utah Power and Light and Utah Resources, International, Inc. et al (UPB) have each proposed electric power-generating plants near Escalante, Utah. The Nephi and Axtell powerplants proposed by Utah Power and Light are northwest of the region and are potential markets for Kaiparowits Plateau coal (fig. I-2). A plan for coal-gasification in southern Utah (table VIII-18) has been suggested but possible construction probably would not occur within the timeframe considered in this EIS.

TABLE VIII-18.--Preliminary proposed coal energy conversion plants, high level

	Proponent				
	Mono Power Company, et al.	Utah Power & Light	U. P. B.[1]	Utah Power & Light	Utah Power & Light
Proposal---------	Kaiparowits Gasification Plant	Garfield Power Generating Plant	Power Generating Plant	1,000 MW Axtell Generating Plant	1,000 MW Nephi Power Generating Plant
Map reference:					
Location---------	Kaiparowits Plateau (Nipple Bench)	8 miles south of Escalante in Avley, Utah	4 miles southeast of Escalante on the north side of State Highway 2	1 mile south of Axtell, Utah	10 miles west of Nephi, UT in Dog Valley
Acreage----------		2,000 acres	2,000 acres	2,000 acres	4,000 acres
Mines benefitted-	Kaiparowits Nos. 1-5 Mines	Utah Power & Light mines primarily - other Kaiparowits mines secondarily	Sunoco mines, Red & Blue mines & other Kaiparowits mines secondarily	Utah Power & Light mines at Kaiparowits	Utah Power & Light mines at Kaiparowits
Federal agencies responsible----	BLM - lease EPA FAA US Army Corp of Engineers	BLM - lease NPS	BLM - lease		
Major environmental concerns:					
General comments-	This would necessitate subsequent pipeline(s) construction to carry the gas to market(s)				

[1]U. P. B. = Utah Resources International, Phelps Dodge, and Belco Petroleum Corp.

The movement of large quantities of coal from the Kaiparowits Plateau would require a major transportation system (table VIII-3); only one railroad was included in the cumulative analysis. Preliminary proposed roads ancillary to mining coal are shown on table VIII-19. Analysis of cumulative environmental impact are based on data presented in table VIII-17.

a. Geology, topography, paleontology

Surface disturbances that would result from underground mining at this level are unknown. Subsidence would occur over mine workings, and, in some areas, potential for mine fires would be increased over that at the medium level. Both adverse and beneficial impacts will occur to paleontological resources in approximate proportion to the level of regional development and the area disturbed.

b. Soils

Implementation of mining at the high level would result in much more soil disturbance than at the projected or medium levels. The total disturbed area would be 50,481 acres (table VIII-17). A major factor would be adding two more strip mines, which could disturb as much as 13,700 acres for a total of 26,000 acres. Reclamation success would be difficult to achieve over much of this area, especially where annual precipitation is less than 12 inches as in the Henry Mountain coal field. Wind erosion would be a problem as sandy soils are common.

With the projected increase in population of 144,535 people by 1990 as a result of this production level, 4,104 acres would be needed for community development. Soil impacts would be similar to those discussed under the other alternatives but of greater magnitude, in proportion to the increased acreage of disturbance.

Additional disturbance by railroads, coal-slurry lines, and two possible powerplants would cause soil erosion and reductions in land productivity that cannot be quantified as the locations of most of these activities are unknown.

c. Water

Impacts discussed in chapter IV would be expected to increase in proportion to the increased level of activity. Mining-related activities and subsidence could disrupt saturated sandstones and surface drainage. Although the areas affected would be increased, changes in the hydrologic system of the region would be so small as to be difficult to detect.

d. Air

Particulate impacts from the Alton mine would be the same as those discussed under the projected level. Paving or equivalent stabilization of haul and access roads would essentially eliminate air quality impacts that might result from fugitive dust.

TABLE VIII-19.--Preliminary proposed roads ancillary to mining coal in southern Utah, high level scenario

	Proponent					
	Kane County Commissioners	Utah State Dept. of Highways or Kane-Garfield County Commissioners	Utah State Department of Highways	Utah State Department of Highways	Utah State Department of Highways	Utah State Department Highways
Proposal--------	Road	Road	Road	State Route 276 (study Route)	(study Route 500)	Study Route 506 and State Route 15
Map reference: Location-------- termini and (or) route----	Mono No. 5 mine to Glen Canyon (US 89) via Warm Springs	Escalante to Glen Canyon City (US 89) via Alvey Wash, Collett Canyons and Nipple Creek	Cannonville to Kaiparowits via Cockscomb	Glen Canyon City To Bullfrog Basin Road	State Route 12 East of Escalante down east side of Straight Cliffs to proposed State Route 276	From I-15 near Harrisburg to Kanab via LaVerkin and Rockville
Mileage---------	24 miles	83 miles	40 miles	68 miles	43 miles	58 miles
Acreage---------	125 acres	430 acres	208 acres	355 acres	225 acres	300 acres
Mines benefitted----	Kaiparowits No. 5 5M Corp. mine Hiko Bell mine	Red & Blue mines, Sunoco Energy Development mines, Utah Power & Light mines, Kaiparowits Nos.1-5 mines	Red & Blue mines, Sunoco Energy Development mines, Utah Power & Light mines, Kaiparowits Nos.1-5 mines			
Federal agencies responsible---	BLM-right-of-way NPS	BLM-right-of-way Bureau of Public Roads	BLM-right-of-way Bureau of Public Roads	BLM-right-of-way NPS Bureau of Public Roads	BLM-right-of-way NPS Bureau of Public Roads	BLM right-of-way Bureau of Public Roads
Major environmental concerns---------	Road width and alignment constrained by Park Service Policy on the section crossing Glen Cayon NRA.			Road width and alignment constrained by Park Service Policy on the section crossing Glen Canyon NRA.		
Comments--------	Existing road upgrading proposed.	These roads were included in the initial Kaiparowits submission as proposed State roads. The roads may be initially constructed as county roads and converted to State Highways to State Highways as use increases.		These roads will be of benefit to all of the mines in the Kaiparowits coal field because they will provide better inter-city transportation for residents and service or supply vehicles supporting the communities. They are included in the Utah State Department of Highways Functional Classification and Needs Report 1972-95, adopted June 23, 1972.		

Sulfur Dioxide (SO_2) concentrations would originate at powerplants (table VIII-20). Consistent with the worst case approach, the modeled wind direction maximized impacts either by overlapping plumes from powerplants close to each other or by modeling to predict maximum impact on class I areas. The combination of the Garfield and Escalante powerplants impact Capitol Reef National Park more than the allowable 3-hour SO_2 increment of 25 $\mu g/m^3$ (fig. VIII-1). All class II areas would be impacted by less than the 3-hour, 24-hour, annual average standards and NAAQS.

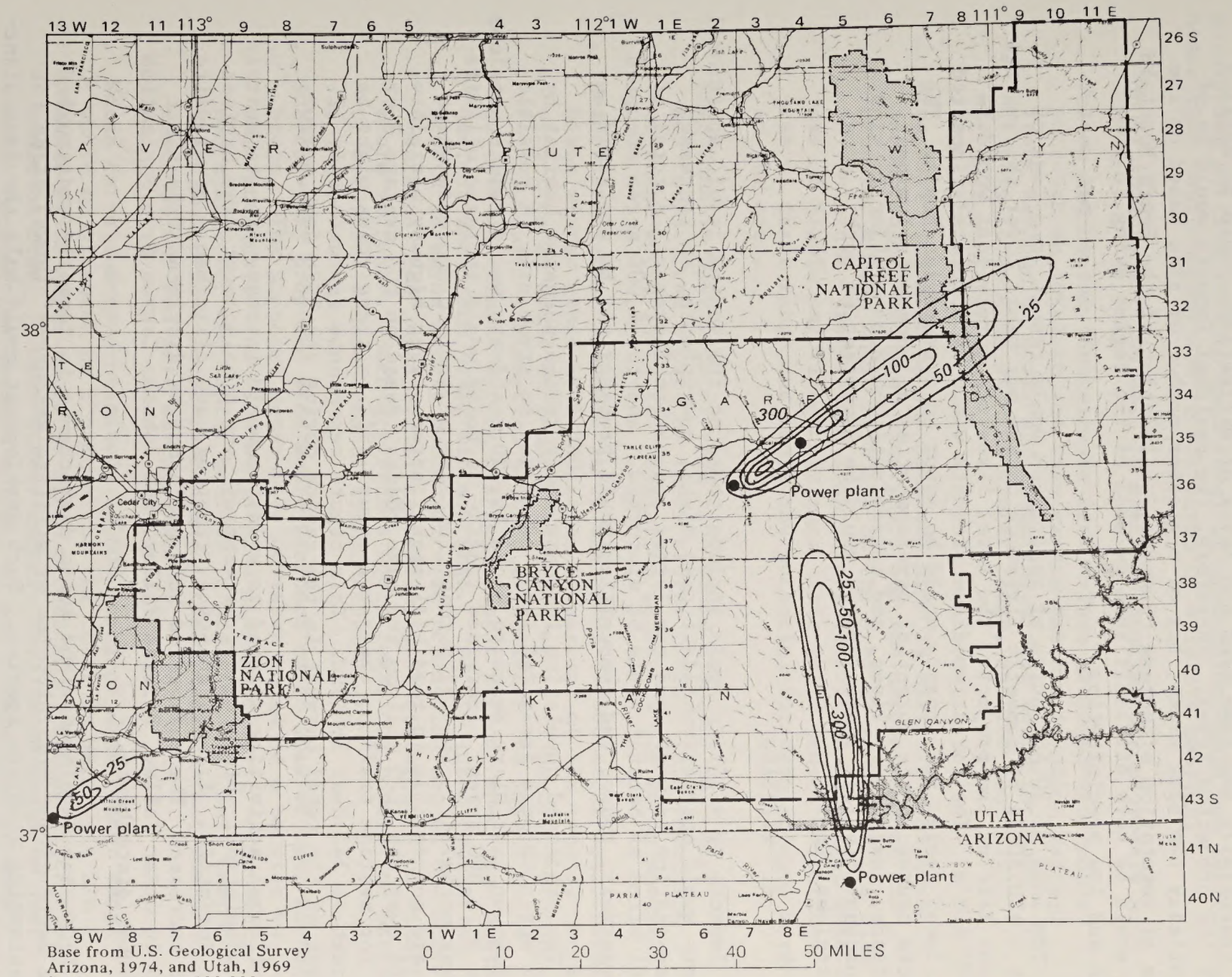
TABLE VIII-20.--Sources by modeling region

Modeling region	Sources		
	Mines	powerplants	Area sources
West slope of Henry Mtns.	Meadowlark Farms		
Escalante area & North Kaiparowits Plateau	Woods Petroleum UP&L and Garfield Sunoco	Escalante Garfield	Escalante
South Kaiparowits Plateau	Red & Blue Kaiparowits Nos. 1-5 Kiko Bell 5 M Corp.	Navajo	
Kolob & Skumpah Terrace, Alton Amphitheater	Alton King Cannel Shakespeare		Alton Glendale Orderville Hatch Henrieville Tropic
Warner Valley		Warner Valley	

NO_2 impacts would be primarily associated with powerplants. The maximum annual average NO_2 concentrations would be 15 $\mu g/m^3$, which is well below the Federal standard of 100 $\mu g/m^3$.

Visibility impacts owing to the Alton mining operations would be the same as described under the proposed action. In the Escalante area and North Kaiparowits Plateau region and the South Kaiparowits Plateau region, visibility would be greatly reduced near unpaved roads during and shortly after periods of heavy traffic.

Population increase would commit the air near cities and towns to some degradation. Significant concentrations would result, possibly exceeding the NAAQS for particulates in the larger urbanized areas.



Base from U.S. Geological Survey
Arizona, 1974, and Utah, 1969
State base maps 1:500,000

FIGURE VIII-1.--Maximum 3-hour SO_2 concentration for the high production level for worst-case meteorology in southern Utah.

e. Vegetation

Essentially the same kind and level of mitigations would be applied as at the projected level. Therefore, the residual impacts would be of essentially the same kinds, but of a greater number or size based on the acres of vegetation affected. However, reclamation of the Henry Mountain area would be more difficult than in most of the region owing to poor soils and low precipitation.

The loss of 50,481 acres of vegetation would result in a loss of about 1,120 AUM's of domestic livestock forage per year. Over the average 30-year life of the projects, the total livestock forage lost would be 33,600 AUM's. The forest/woodland products would be moderately impacted on a local scale, but impacts would be minor on a statewide basis. The impacts caused by the potential development of all conceptual mines, railroads, coal slurry lines, and powerplants would be similar in kind, but unquantifiable. These impacts would be important on both a local and regional basis.

f. Wildlife

Impacts to wildlife would include those at the medium level; additional impacts would accrue from additional mines, powerplants, an increased transportation network, and the larger population increase. A total of 50,481 acres of habitat would be disturbed, and the 6,000 acres occupied by reservoir, roads, and communities would probably not be reclaimed.

The projected population increase would reduce pheasant habitat by 1,139 acres through irrigated lands converted to urban use. A possible new town on East Clark Bench to house 18,000 residents would reduce antelope range by 1,000 acres. Increased traffic on roads would increase wildlife highway mortality. The 192 percent increase of traffic on roads where deer are susceptible to road kill might increase deer highway mortality by 224 over the 1975 kill on the same roads. Based on the average deer kill for average traffic, the total annual kill on these roads might be as great as 342 deer by 1990. This figure represents approximately 12 percent of the total harvest in the region during the 1976 deer season.

Illegal activities related to wildlife would increase proportionately with population. Disturbance, harassment, and displacement from habitat would intensify. Illegal shooting, trapping, and disturbance of wildlife would increase. The endangered bald eagle may be displaced from roost sites in Cedar Valley, Parowan Valley, and Johnson Canyon by urbanization and human disturbance.

Increased development and human disturbance in formerly undisturbed areas would affect Utah Division of Wildlife Resources' (UDWR) plans for transplanting wildlife species. Such development could halt the transplanting of bighorn sheep on areas of the Kaiparowits Plateau, antelope on Panguitch Bench.

The demand for recreational lots would irreversibly decrease wildlife habitat. Based on the present demand in Utah, the increased population attributable to this level of production would own recreational homes that would occupy 230 to 921 acres of wildlife habitat.

Major impacts attributable to specific preliminary proposals are:

- Fulton and Denton (Shakespeare mine)--This proposed mine would encroach on antelope and sage grouse habitat in Johns Valley. Truck haulage of coal, and commuting miners would increase traffic in an area of deer winter range, and the road kill of deer would increase.

- Hiko Bell--The area of the proposed mine is historical bighorn sheep range. No sheep live there now and development of the area for mining would halt use of the area by sheep for the life of the mine. Disturbance from mining activities may limit antelope use of Nipple and Tibbet springs. This would reduce effective use of their range and limit the potential for developing a herd in the area.

- King Cannel--Operation of this mine would displace mule deer and cougar from a part of their winter range. This reduction of range would lower the population potential for these species.

- Meadowlark Farms--Proposed strip mining of 11,360 acres would reduce bison winter range by 6,240 acres (8 percent of the total). Deer winter range would be reduced by 1,000 acres (1 percent of the total), until reclamation becomes effective. The impact would be loss of animals during critical winter periods when snow depths exclude them from other winter range. The projected population growth in Wayne County would increase recreation use on the Henry Mountains, and legal and illegal killing or disturbance of wildlife would increase. Such activities would lower the population potential of wildlife in this area of limited habitat.

- Sunoco--This proposed mine would encroach on an area of deer winter range. The proposed seven-mile conveyor could be a barrier to deer movement. The mine would also disturb cougar, cottontail, mourning dove, and raptor habitat in Right Hand Collett Canyon. There would be a local reduction of these species that would continue for the life of the mine.

- Woods Petroleum--Approximately 13,600 acres of deer winter range would be affected or 2 percent of the total on Herd Unit 51B. About 1,900 acres would be strip mined, and 1,600 acres of that would be critical deer winter range. This range would be lost until reclamation becomes effective, and a reduction in deer population potential would continue until present productivity is restored. The area of the mine would include the home ranges of at least three cougar, and their potential productivity would also be lost or reduced. From 1971 to 1977 this area (herd unit

51B) provided 3.6 percent of the total cougar harvest in the State. Elk are expanding into the area from nearby herds; however, operation of the proposed mine may preclude establishment of an elk herd in this area. Truck haulage of coal on U-12 and traffic increases related to mining would increase deer highway mortality.

The conceptual coal transportation facilities proposed for the region would adversely affect wildlife. Railroads would permanently occupy wildlife habitat at a rate of 18 acres per mile (based on an average 150 foot right-of-way. Many wildlife species would be affected for the life of the railroads. Coal slurry pipelines would occupy wildlife habitat at a rate of 6 acres per mile. Species affected would be small mammals, reptiles and amphibians. Impacts would be temporary, most occurring during construction. Disturbance by maintenance or operating crews may cause abandonment of an area by sensitive species such as cougar, turkey, and raptors. New roads would also encroach on a variety of wildlife habitat. In addition, new roads would bar the movement of some small mammals (Oxley and others, 1974).

Proposed powerplants would adversely affect wildlife habitat for the life of the plants. Transmission lines associated with the powerplants would benefit raptors and other birds by providing hunting perches and nesting sites. Some birds would be killed by collision with the towers or lines. Construction and maintenance roads along powerlines may provide access into formerly undisturbed areas. The result would be reduction of habitat for species requiring remote, undisturbed areas.

g. Fisheries

Resident Utah fishermen in the study area would increase 99 percent over the base-line population while resident Arizona fishermen would increase by 192 percent. Overfishing of trout streams and small reservoirs would increase, extending beyond the southern Utah coal region into much of the Southern Wasatch Plateau and northern Arizona regions. More fishing effort would be shifted away from cold water fishes to warm water varieties as trout waters are overexploited. Increased fishing pressure would be expected at Lake Powell and the increased use of fishing boats would cause lead levels in the water to increase in the marina areas (see chapter II, Fisheries). No additional impacts are expected on the endangered St. George snail beyond those at the projected level (chapter IV).

h. Lands

In addition to the impacts discussed at the lower levels, the following land impacts would occur at the high level. The UPB Generating Station proposal would be located in a potential roadless area contiguous to Phipps-Hollow and approximately 4 miles south of the Escalante River. The Utah Power and Light's southern terminus and Sunoco proposals would be in potential roadless areas between Alvey Wash and Straight Cliffs, near Devil's Garden Outstanding Area (fig. II-21). This area may

require protective regulations to control the secondary impact of additional recreational use.

The proposed Woods Petroleum Corp. mine would be located adjacent to a RARE-II designated roadless area on the Dixie National Forest, No. 4258-Henderson Canyon.

The Escalante Planning Unit, MFP, multiple-use analysis within the planning unit includes the following coal-related impacts associated with Utah Power and Light, Sunoco, UPB, and Woods Petroleum conceptual plans: (1) additional access, drill sites, and mine openings would impact watershed values and established seedings and would require proper location and rehabilitation; (2) the proposed utility corridor must insure watershed protection measures and raptor protection measures; (3) the Utah Power and Light power-generation sites would reduce grazing carrying capacity of the allotment by 750 acres and would remove mule deer winter range; (4) development of the proposed coal operations would result in increased land speculation.

A preliminary proposed railroad to Marysvale from the Kaiparowits Plateau would cross the general region of the upper Paria-Hackberry potential roadless area and Four-Mile Bench potential roadless area and the Forest Service designated RARE-II Table Cliffs roadless area. Potential routes for the conceptual railroad to Cedar City from the Kaiparowits Plateau via East Clark Bench would pass through the NRA and the lower Paria-Hackberry potential roadless area. Land-use regulation to insure protection of fragile and unique areas not classified as wilderness or roadless potential areas are recommended for Eckhart Cliffs and lakes surrounding Alton. The potential routes to Lund from Alton do not cross any potential wilderness or potential roadless areas.

i. Socioeconomics

The high level scenario differs from the projected level in both the kind and magnitude of impacts. Impacts at the high level are of the same nature as those of the medium level but are of greater magnitude in proportion to the larger population involved. General descriptions of impacts common to both the medium and high levels were discussed in the medium level scenario and are not repeated here.

In 1975 the estimated population of Garfield plus Kane County was nearly 7,000. At the high level, over 10,000 workers would be employed in coal mining alone by 1990. This is nearly ten times the coal employment assumed in the projected level. The relative change would be enormous and would affect Garfield County in particular.

Expansion of coal production could result in 2,580 miners residing in the central Garfield County by 1985, and 4,855 by 1990. As the total enumerated population of that part of Garfield County (the Escalante and Tropic Census County Divisions) was only 1,608 in 1970, the potential magnitude of change is apparent.

Projected population, broken down to subareas, is presented in table VIII-21. Table VIII-22 presents subarea projected populations and components of change with commuting from Page, Ariz. Tables VIII-8 through VIII-13, included in the medium level discussion, provide high level scenario information about age groups, age composition, housing requirements, expansion of population and employment, employment by sector in Garfield County, and employment by sector in Kane County.

The effects of the high level of population and economic activity on municipal services can be found in the tables in Socio-economics, chapter IV.

j. Transportation and utilities

Compared over all 27 road segments, traffic would increase 2 1/2 times over the projected level (table VIII-23). Impacts that were described in chapter IV would occur to a much greater degree.

To accommodate these traffic levels, highway improvements would be necessary. The Utah DOT expects that US 89 would have to be upgraded by the addition of two travel lanes from the Arizona State line near Page to State Route 15. Similar improvements would be necessary to US 89 in Arizona between the state line and Page, with somewhat lesser improvements necessary to US 89 between Page and Flagstaff. As with the medium level, the existing two lane bridge over the Colorado River would be a bottleneck during peak periods of traffic flow. The intersection of U-277 and US 89 would also have to be improved to include center islands and turning lanes.

Assuming 2.0 mty are produced from the Henry Mountains area, truck haul may be required over the Notom Road, along the east side of Capitol Reef National Park and partly through it. As this is a proposed strip mine operation, only about 120 employees would be needed to mine the coal, but about 300 would be needed to truck it.

If the proposed IPP powerplant is not built at the Salt Wash site and considering the bottleneck in trying to move heavy trucks through the Capitol Reef National Park, the only feasible haul to railhead would be 106 miles on U-24 through Hanksville to Green River and the Denver & Rio Grande Western Railroad. A market for this coal has not been identified. In general, the traffic capacity of U-24 would not be exceeded, although the mine traffic could conflict with recreation oriented traffic. The State DOT, however, indicates that U-24 is structurally inadequate to handle the truck traffic and would have to be rebuilt.

It is assumed that a small amount of coal would be produced in the vicinity of Tropic, but initially, at least, the production would probably not overload the improved gravel road to the portal.

The proposed Woods Petroleum White Mountain Development would be a combined underground and surface mine with its portal initially on U-12

TABLE VIII-21.--High level scenario, population and components of change, southern Utah counties

[Source: 1970; U.S. Census of Population. Projection years and intervals for counties; UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

County	1970 Population	Interval components of change: Natural increase	Interval components of change: Migration	1975 Population	Interval components of change: Natural increase	Interval components of change: Migration	1980 Population	Interval components of change: Natural increase	Interval components of change: Migration	1985 Population	Interval components of change: Natural increase	Interval components of change: Migration	1990 Population
Garfield------	3,200	200	+100	3,400	200	+300	3,900	300	+16,800	21,000	2,300	13,800	37,200
Kane----------	2,400	100	+1,000	3,600	300	+400	4,200	300	+20,600	25,100	2,800	+14,500	42,500
Total, Garfield and Kane--------	5,600	300	+1,100	7,000	500	+600	8,100	600	+37,400	46,200	5,100	+28,400	79,600
Beaver and Iron--------	1,600	1,400	+1,000	18,400	1,700	+900	21,000	1,600	+2,400	25,000	1,600	+1,500	28,100
Washington----	13,700	1,200	+2,100	17,000	2,200	+3,900	23,100	2,400	-2,600	22,900	1,600	0	24,500
Total, Beaver, Iron Washington--	29,600	2,700	+3,100	35,500	3,900	+4,700	44,100	4,000	+200	47,900	3,200	+1,500	52,600
Total[1]--------	35,200	2,900	+4,300	42,400	4,400	+5,300	52,200	4,600	+37,200	94,000	8,300	+29,900	132,200

[1] Detail may not add to totals because of independent rounding.

TABLE VIII-22.--High level scenario, population and components of change, southern Utah counties; assumes commuting from Page, Arizona

[Source: 1970; U.S. Census of Population. Projection years and intervals for counties; UPED Model Projections, Bureau of Economic and Business Research, University of Utah]

County	1970 Population	Interval components of change: Natural increase	Interval components of change: Migration	1975 Population	Interval components of change: Natural increase	Interval components of change: Migration	1980 Population	Interval components of change: Natural increase	Interval components of change: Migration	1985 Population	Interval components of change: Natural increase	Interval components of change: Migration	1990 Population
Garfield-----	3,200	200	+100	3,400	200	+300	3,900	300	+16,800	21,000	2,300	13,800	37,200
Kane---------	2,400	100	+1,000	3,600	300	+400	4,200	300	+1,600	6,200	500	+9,300	15,900
Total, Garfield and Kane-------	5,600	300	+1,100	7,000	500	+600	8,100	600	+18,500	27,200	2,800	+23,100	53,100
Beaver and Iron-------	1,600	1,400	+1,000	18,400	1,700	+900	21,000	1,600	+2,400	25,000	1,600	+1,500	28,100
Washington---	13,700	1,200	+2,100	17,000	2,200	+3,900	23,100	2,400	-2,600	22,900	1,600	0	24,500
Total, Beaver, Iron Washington--	29,600	2,700	+3,100	35,500	3,900	+4,700	44,100	4,000	-200	47,900	3,200	+1,500	52,600
Total[1]--------	35,200	2,900	+4,300	42,400	4,400	+5,300	52,200	4,600	+18,300	75,100	6,000	+24,600	105,700

[1]Detail may not add to totals because of independent rounding.

TABLE VIII-23.--Projected average daily traffic (ADT) levels on selected segments of Utah highways, high production level (46 mty)

Segment[1]	1975 ADT	1980 ADT	1985 ADT	1990 ADT	1990 Trucks
1----------	5,580	7,148	7,687	8,416	1,440
2----------	0	--	--	100	0
3----------	4,660	5,970	6,420	7,029	1,184
4----------	4,940	5,726	6,943	7,804	1,232
5----------	4,000	4,636	5,621	6,319	1,175
6----------	4,275	4,954	7,788	8,466	1,609
7----------	300	325	2,810	3,797	456
8----------	1,390	1,505	5,474	9,632	1,663
9----------	415	474	--	6,448	987
10----------	290	331	--	3,882	776
11----------	125	143	--	2,232	625
12----------	0	--	--	4,704	697
13----------	1,475	1,719	6,778	11,673	1,503
14----------	355	415	2,626	3,045	298
15----------	1,650	1,924	7,584	13,061	1,702
16----------	810	1,090	1,415	1,874	114
17----------	135	121	468	643	30
18----------	20	18	582	608	0
19----------	30	38	129	154	6
20----------	1,590	2,002	5,058	8,048	974
21----------	1,020	1,230	3,230	5,666	805
22----------	890	1,073	3,214	5,822	818
23----------	890	--	--	10,743	2,305
24----------	55	--	--	8,246	1,016
25A---------	0	--	--	6,446	926
26----------	0	--	--	951	0
27----------	20	--	--	2,000	1,754

[1] See map, figure IV-2.

in Upper Valley Creek, a potentially crowded site. It is unlikely that as much as 5 mty can be taken initially from a portal at this location, but a bottleneck is likely to develop in getting trucks onto and off the highway. In the narrow canyon it may be necessary to build acceleration and deceleration lanes. A possibility exists to truck from Little Valley down the county road paralleling Birch Creek to U-12; however, this is likely to move the bottleneck to the junction of Birch Creek road with U-12. Truck haul would be to a railroad, the most likely possibility being the proposed spur from the Alton-Lund alternative of the UP preliminary plan. (See chapter I.) If the Utah Power and Light proposed railroad were built, a loadout could be built in Little Valley alongside the tracks, eliminating the trucking problem.

For purposes of the traffic analysis, it was assumed that the coal would be trucked over the county road from U-12 to the Red Canyon Branch of UP's conceptual Kaiparowits-Lund line. This would require that this road be upgraded to a configuration similar to the access road for the south Kaiparowits Plateau area mines. Most of the coal to be produced, about 28.5 mty, would come from underground mines on the Kaiparowits Plateau; it could become necessary to construct truckpassing lanes and easy grades across the plateau. As was discussed in connection with the medium level, the State DOT would find a route between Henrieville and the Red and Blue minesites desirable. This would siphon some of the commuter and service truck traffic away from roads in the Escalante area.

Impacts on transportation and utilities would be only an intensification of impacts which would result from development at the projected level. The road would be wider, three lanes in spots, and occupy slightly more area because of the necessity of construction to higher standards, with flatter grades and greater cuts and fills; however, this additional acreage cannot be quantified short of the preliminary design stage. More traffic would use the road, to the detriment of wildlife and to the inconvenience of highway users. The transportation corridor would be wider, because it would carry conveyor belts or off-highway haul roads, higher-voltage powerlines requiring more right-of-way, and the possibility of water pipelines and (or) coal slurry pipelines.

It is likely that any good vehicular access provided to the Kaiparowits Plateau would remain dedicated to that purpose. Following mining, the access provided to the communities in south-central Utah and to the recreational areas would result in continued demand for maintenance of the access route. Because mining operations would be likely to extend beyond 40 years, commitments of rights-of-way to coal conveyors, haul roads, powerlines, and so on are likely also to continue past the lifetimes of the mines under consideration here.

Alternative railroads are being considered to move coal from the Kaiparowits Plateau (fig. I-2, table VIII-3). Movement of coal by rail would most likely be by unit trains. In a strict sense, a unit train is a complete train of dedicated cars operating on a regularly scheduled cycle movement between a single origin and a single destination. A typical coal unit train consists of 100 cars, each capable of carrying

100 tons of coal and four to eight diesel units. Thus, 10,000 tons of coal can be shipped per trip. Shipment of 30 mty would require from eight to nine 100-car unit train round trips daily. The amount of fuel consumed transporting coal by rail from the southern Utah region would be dependent on numerous factors, many of which are presently unknown. The ultimate coal markets, train routing and type of rail carriage (unit train or general freight) would influence the total amount of fuel consumed, estimated to be 10 million gallons of diesel fuel per 100 miles of shipment.

Primary sources of air pollution associated with coal train movements are pollutants emitted as part of the diesel exhaust, and dust blown from uncovered coal cars. The three primary locomotive emissions are carbon monoxide, hydrocarbons, and nitrogen oxides. These pollutants will increase in raw terms (lbs/mile) as the train frequencies increase. Table VIII-24 gives average emissions for the frequency of service in this alternative. This level of pollutant emissions would be insignificant on regional air quality. Other impacts associated with rail operations would include noise, accidents and delay. Rail line operations would create the possibility of highwayrail grade crossing accidents. A 100-car unit train would physically block an intersecting road for approximately 3 1/2 minutes. Warning devices and driver anticipation would further extend the amount of time a particular crossing is closed. In addition to the general inconvenience created by this delay, such blockages could increase response time for emergency vehicles. Unnecessary motor vehicle idling would also be another source of air pollution. Rail service into the region would be new rail line construction and the major points of potential conflicts and delay could be avoided by the construction of grade separations.

TABLE VIII-24.--Locomotive air pollution emissions

Pollutant	Train frequency per hour	Train frequency per day	Locomotive emissions (average lb/mi/hr)
Carbon monoxide (CO)---	1	18	5.6
Hydrocarbons (HC)------	1	18	4.0
Nitrogen oxides (NO_x)--	1	18	15.0

Extra regional (down-line) rail impacts--Impacts resulting from rail operations would not be confined to the region, but would be manifested to some degree wherever the coal shipment goes. The generic impacts discussed previously would pertain to rail movement regardless of routing. While the effect of an individual train would not be significant, the repetition of these small impacts may be significant. The major extraregional implications of the movement of southern Utah coal

would come where these movements are added to lines with already high rail traffic. Presently, the ultimate destinations for most coal produced in the Kaiparowits Plateau at the high level are unknown, making specific point impact analysis outside the region impossible.

k. Recreation

The high level would expand the geographical location for mining coal to include lands on the north end of the Kaiparowits Plateau, the Table Cliffs Plateau, White Mountain and the east side of the Henry Mountains. Consequently the southern coal region RIZ would be expanded to the north and east (fig. II-21).

Impacts similar to those described in chapters IV and V would accrue to recreation sites listed in tables VIII-25 and VIII-26. The majority of these sites now generally receive less use than the sites in the southern portion of the region but would receive substantial increase use (tables VIII-27 and VIII-28).

l. Archeology and history

Archeologic and historic values would be benefited or lost, depending on the extent to which sites were found and properly evaluated in the process of mine or ancillary facility development. The increased population would increase disturbance of sites and even more remote sites would be visited resulting in loss of some archeologic and historic values.

m. Esthetics

Impacts to the esthetic resource would be the same as those described in chapters IV and V, but to a greater degree. More urbanization would take place in adjacent communities, and more manmade intrusions would be introduced into the landscape. The regional area affected by additional production would expand to involve the Escalante, Tropic, and Panquitch areas in southern Utah. Impacts to these communities and to adjacent land would be the same as described in chapters IV and V.

TABLE VIII-25.--Additional developed recreation sites impacted by production of 46 mty

Administering agency or ownership	Developed site name and type	Season of use and length of season	PAOT[1]	1976[2] recreation visits	1976[3] recreation visitor days use	1976[4] use (percent of capacity)	Remarks
Bureau of Land Management:							
Henry Mountains Resource Area	McMilliam Spring campground	--- (120 days)	50	---	200	3	Light use-fair condition.
	Lonesome Beaver campground	--- (120 days)	65	---	400	2	Light use-fair condition.
	Hog Springs campground	1/1 to 12/31(365 days)	30	---	1,100	10	Light use-fair condition.
	Starr Springs campground	--- (240 days)	75	---	8,100	23	Moderate use-good condition.
U.S. Forest Service:							
Fishlake National Forest	Johnson Valley campground	6/1 to 10/15(137 days)	10	3,000	1,500	55	Parking only-day use.
	Gooseberry campground	6/1 to 9/30(122 days)	75	1,800	6,200	34	Minor rehabilitation needed.
	Bowery picnic site	6/1 to 10/15(137 days)	110	4,200	700	5	Light daytime use.
	Mackinaw campground	6/1 to 10/15(137 days)	270	21,600	36,000	49	Heavy use, minor rehabilitation needed.
	Twin Creeks visitor center	6/1 to 10/15(107 days)	20	2,600	500	20	Cood condition.
	Fremont River complex	6/1 to 10/30(152 days)	200	11,200	18,700	31	Needs minor maintenance.
	Elkhorn campground	7/1 to 9/15(77 days)	78	---	3,000	25	Needs some maintenance.
	Sunglow pincic site	5/1 to 11/1(185 days)	57	2,600	2,200	21	Light use-good condition.
	Frying Pan campground	6/1 to 10/15(137 days)	55	1,500	3,800	25	Cood condition.
	Bowery campground	6/1 to 10/15(137 days)	215	15,800	27,100	46	Minor rehabilitation needed.
	Doctor Creek campground	6/1 to 10/15(137 days)	150	7,500	12,400	30	Minor rehabilitation needed.
	Twin Creeks campground	6/1 to 10/15(137 days)	150	10,400	2,600	13	Light use-good condition.
	Doctor Creek picnic area	6/1 to 10/30(152 days)	150	1,800	4,700	21	Moderate use-good condition.
Dixie Nat'l Forest	Singletree campground	5/25 to 9/15(135 days)	200	10,600	6,300	14	Moderate use-good condition.
	Pleasant Creek campground	5/25 to 9/15(135 days)	95	27,200	11,400	53	Heavy use-good condition.
	Oak Creek campground	5/25 to 9/15(135 days)	50	8,400	5,800	51	Some heavy maintenance needed.
National Park Service:							
Clen Canyon Nat'l Recreation Area	Hite marina and campground	1/1 to 12/31(365 days)	30	72,400	---	660	Extreme spring, summer and fall use-fair condition.
	Bullfrog campground and marina	1/1 to 12/31(365 days)	430	121,300	242,600	77	Heavy spring-fall use, good condition.
Capitol Reef Nat'l Park	Capitol Reef campground	1/1 to 12/31(365 days)	265	30,537	35,600	18	Heavy summer use-good condition.
	Capitol Reef picnic site	1/1 to 12/31(365 days)	100	100,000	8,340	23	Heavy summer use-good condition.
	Capitol Reef visitor center	1/1 to 12/31(365 days)	[5]NA	NA	NA	NA	Heavy use-good condition.
Arches Nat'l Park	Devils Carden campground	1/1 to 12/31(365 days)	270	37,900	NA	26	Moderatte use-good condition.
	Devils Carden picnic site	1/1 to 12/31(365 days)	85	NA	NA	NA	Moderate use-good condition.
	Balanced Rock picnic site	1/1 to 12/31(365 days)	15	1,000	NA	18	Light ot moderate use-fair condition.
Canyonlands Nat'l Park	Creen River overlook	1/1 to 12/31(365 days)	NA	NA	NA	NA	Moderate use.
	Crandview Pt. picnic site	1/1 to 12/31(365 days)	30	NA	NA	NA	Light to moderate use-good condition.
	Upheaval Dome picnic site	1/1 to 12/31(365 days)	25	NA	NA	NA	Light to moderate use-good condition.
State of Utah, Division of Parks and Recreation:	Creen River State Rec. Area	1/1 to 12/31(365 days)	250	115,980	use fig.	127	Heavy use-good condition.
	Coblin Valley State Reserve	1/1 to 12/31(365 days)	50	18,020	not calcu-	100	Good condition.
	Deadhorse Point State Park	1/1 to 12/31(365 days)	210	129,230	lated for	295	Cood condition.
	Otter Creek Lake State Beach	6/1 to 11/30(183 days)	180	25,470	State facilities	77	Cood condition.
	Deadhorse Pt. visitor ctr.	1/1 to 12/31(365 days)	([6])	([6])	---	---	Cood condition.
	Deadhorse Interpretative Museum	1/1 to 12/31(365 days)	([6])	([6])	---	---	Cood condition.

[1]Theoretical developed capacity of developed site, expresssed in the number of people the site can accomodate at one time (PAOT).

[2]Recreation visit - one person visiting the site - no time element calculated or involved.

[3]Recreation visitor day use - an aggregate of 12 hours by one or more persons.

[4]Use as a percent of capacity is based on the managed season of use (length of season x PAOT). Well managed sites generally receive between 20 percent and 40 percent use. Beyond 40 percent, sites deteriorate rapidly, require heavy maintenance, and user experience levels diminish from overcrowding (i.e. loss of privacy and solitude, increase in noise, disturbances, etc.).

[5]NA - not available or not applicable.

[6]Included in total for Deadhorse Point State Park.

TABLE VIII-26.--Additional local, regional, and national recreation attractions and use areas impacted by production of 46.0 mty

Administering agency or ownership	Recreation use area or attraction	Recreation visits[1] or visitor days use[2] (where available)	Major recreation user attractions: Scenery	Driving	Camping	Picnicking	Hiking	Hunting	Fishing	Boating	Swimming	ORV use	Nature study	Cultural history	Archeology	Paleontology	Geology	Wildlife	Snowmobiling	Solitude	Photography	Remarks[3]
Bureau of Land Management:	Henry Mountains	Records not kept	*	*	*	*	*	*	*				*	*	*	*			*	*		*	*	Heavy use-local light use-spring and fall.
	Sinbad Country	Records not kept	*	*	*	*	*	*	*				*	*	*	*			*	*		*	*	Moderate use-spring and fall on secondary roads and camping.
	Labrinth Canyon (Green River)	29,000 V	*		*	*	*	*	*	*	*	*	*	*	*	*			*	*		*	*	Heavy use-family float boating.
	San Rafael Reef	Records not kept	*	*	*	*	*	*	*				*	*	*	*			*	*		*	*	Moderate-heavy use-spring and fall-ORV use.
Estimated visits to all public lands in influence zone administered by Bureau of Land Management		400,000 visits																						
U.S. Forest Service:																								
Fishlake National Forest	Fishlake Mountains	570,600 V/D's	*	*	*	*	*	*	*	*	*	*	*	*	*	*			*	*	*	*	*	Heavy use-summer and fall.
Dixie National Forest	Thousand Lake-Boulder Mountain	89,100 V	*	*	*	*	*	*	*	*	*	*	*	*	*	*			*	*	*	*	*	Moderate use.
National Park Service:	Arches National Park	294,800 V	*	*	*	*	*						*	*	*	*			*	*		*	*	Heavy use-spring and fall and increasing.
Canyonlands National Park	Green and Colorado River	7,300 V	*		*	*	*		*	*	*		*	*	*	*			*	*		*	*	Heavy use-float boating.
	The Maze District	3,440 V	*	*	*	*	*						*	*	*	*			*	*		*	*	Light use-poor access.
	Island in the Sky District	21,780 V	*	*	*	*	*						*	*	*	*			*	*		*	*	Moderate use but increasing.
Capitol Reef National Park		469,620 V	*	*	*	*	*						*	*	*	*			*	*		*	*	Heavy use-near capacity in North District.
Glen Canyon National Recreation Area	Bullfrog campground and marina	121,300 V	*	*	*	*	*	*	*	*	*	*	*	*	*	*			*	*		*	*	Extreme use-spring and fall.
	Hite marina and campground	73,400 V	*	*	*	*	*	*	*	*	*	*	*	*	*	*			*	*		*	*	Extreme use-spring-summer-fall. Exceeds carrying capacity by more than 500 percent.
State of Utah, Division of Parks and Recreation:	Goblin Valley State Reserve	18,020 V	*	*	*	*	*	*					*	*	*	*			*	*		*	*	Light use-no developments.
	Deadhorse Point State Park	129,230 V	*	*	*	*	*	*					*	*	*	*			*	*		*	*	Extreme use-near capacity.
	Green River Rec. Area	115,980 V	*		*	*	*		*	*	*												*	Extreme use-above capacity.
	Otter Creek Lake State Rec. Area	25,470 V	*	*	*	*			*	*	*													Heavy use-summer.
Others (mixed, etc.):	Koosharem Reservoir	6,000 V	*		*	*	*	*	*	*			*						*	*			*	Light-moderate use.

[1] V =Visit
[2] V/D = Visitor days use (12-hour period) aggragated by one or more person.
[3] Light use--generally below environmental and designed carrying capacity.
Moderate use--approaching carrying capacity.
Heavy use--at carrying capacity during most of use period, but above carrying capacity on weekends and holidays.
Extreme use--usually above acceptable carrying capacity for major use facilities and environment areas visited during managed or open season.

TABLE VIII-27.--Recreation visits (trips) and visitor days use by residents of the region at the high level

	Coal production level		
	Present level	No action level (0.0 mty)	High level (46.0 mty)
Population of region to support coal production[1]:			
1976	48,525	--	--
1985	--	62,810	102,277[4] (39,417)
1990	--	68,096	144,535 (76,439)
Recreation visits by residents[2]:			
1976	444,000	--	--
1985	--	574,700	935,400 (360,700)
1990	--	623,100	1,322,500 (699,400)
Recreation visitor days by residents[3]:			
1976	1,385,300	--	--
1985	--	1,793,100	2,918,400 (1,125,300)
1990	--	1,944,100	4,126,200 (2,182,100)

[1] Population figures from socioeconomics section.

[2] Average out-of-community but with region recreation trips per household for worst case analysis is 9.15 trips per year.

[3] Visitor days equals 12 hours aggragated by one or more persons. Each out-of-community but within region recreation trip in the worst case averages 3.12 visitor days (37.44 hours).

(Both [2] and [3] are from baseline information calculated from figures in Utah Resident Recreation Travel, 1974, 1975, and 1976, J. D. Hunt, W. H. Becker, M. J. Dalton and S. F. McCool of the Institute for the Study of Outdoor Recreation and Tourism, Utah State University, Logan, Utah 84322.)

[4] Population, recreation visits and recreation visitor days use above the normal increases for 1985 and 1990 as a result of increased coal production are shown in parentheses.

TABLE VIII-28.--Out-of-community outdoor recreation trips by residents of the southern Utah coal region,[1] high level

[Based on information from Utah Resident Recreation Travel, 1974, 1975, 1976, Institute for the Study of Outdoor Recreation and Tourism, USU, Logan, Utah, by J. D. Hunt, W. H. Becker, M. J. Dalton, and S. F. McCool]

Recreation activity	1976		No action level				High level (46.0 mty)			
			1985		1990		1985		1990	
	Percentage of total[3]	Number	Projected total	Increase	Projected total	Increase	Projected total	Increase	Projected total	Increase
Driving for pleasure and sightseeing	21.7	95,500	124,700	29,200	135,200	39,700	203,000	78,300	287,000	151,800
Fishing	15.0	65,800	86,200	20,400	93,500	27,700	140,300	54,100	198,400	104,900
Hiking and back packing	10.6	46,600	60,900	14,300	66,000	19,400	99,200	38,300	140,200	74,200
Water sports (boating, swim, waterskiing etc.)	9.4	41,500	54,000	12,500	58,600	17,100	87,900	29,300	124,300	65,700
Picnicking	6.9	30,400	39,700	9,300	43,000	12,600	64,500	24,800	91,300	48,300
Skiing	5.7	25,100	32,800	7,700	35,500	10,400	53,300	20,500	75,400	39,900
Spectator sports (watching sporting events, etc.)	4.4	19,300	25,300	6,000	27,400	8,100	41,200	15,900	58,200	30,800
Camping	4.0	17,700	23,000	5,300	24,900	7,200	37,400	14,400	52,900	28,000
4-wheel, motorcycling, ORV use	3.7	16,400	21,300	4,900	23,100	6,700	34,600	13,300	48,900	25,800
Hunting big game	3.2	14,200	18,400	4,200	19,900	5,700	30,000	11,600	42,300	22,400
Golf	3.0	13,000	17,200	4,200	18,700	5,700	28,000	10,800	39,700	21,000
Hunting small game and target shooting	2.1	9,400	12,100	2,700	13,100	3,700	19,600	7,500	27,800	14,700
Winter sports (snowmobiling, ice skating, tubing, etc.)	2.1	9,500	12,100	2,600	13,100	3,600	19,700	7,600	27,800	14,700
Other (rockhounding, gathering resource products, nature study, etc.)[2]	8.2	35,600	47,000	11,400	51,100	15,500	76,700	29,700	108,300	57,200
Totals	100.0	440,000	574,700	134,700	623,100	183,100	935,400	360,700	1,322,500	699,400

[1] Refer to figures I-1 and II-21 for an outline of the southern Utah coal region and the southern Utah coal region Recreation Influence Zone. Text defines differences.

[2] Participation by present population during sample period was less than one-half of one percent in any one activity.

[3] Individuals may or may not have participated in more than one activity, as listed, during each trip. Figures shown are for major purpose of trip and total 100 percent; as an example, trip may have primarily been for fishing and recorded as such however, several other activities may have occurred on the same trip. No time element is involved in this summary sheet.

CHAPTER IX

CONSULTATION AND COORDINATION

A. TASK FORCE ORGANIZATION

The statement is a joint U.S. Geological Survey-Bureau of Land Management analysis, with major participation by the Forest Service, Department of Agriculture, and was prepared by a task force under the leadership of the U.S. Geological Survey, Department of the Interior. Other participating agencies were the Bureau of Mines and the Fish and Wildlife Service of the Department of the Interior, and the Interstate Commerce Commission.

The task force office was established in the old Post Office Building, Room 505, 350 South Main Street, Salt Lake City, Utah.

The socioeconomic impact analysis was provided under contract to the U.S. Geological Survey by the Utah Office of the State Planning Coordinator. The climate and air quality analysis was contracted to AeroVironment Inc., Pasadena, Calif.; the regional cumulative historic and archeological impact assessment was done under contract by Wayne T. Van Wagoner & Associates, Inc., Salt Lake City, Utah, and the endangered and threatened plant species evaluation was contracted to Brigham Young University, Provo, Utah.

B. PUBLIC COMMENTS AND RESPONSES

A series of public information meetings were held by the task force, from May 9 to 18, 1977, and potential coal-mining and coal-related activities in southern Utah were described to attendees. The purpose of the meetings was to inform the public of the proposed activities, and to facilitate receipt of their concerns and comments. The public submitted its comments orally and in writing at the meeting, or to the task force office. The public meetings in Utah were held May 9 in Kanab; May 10 in Cedar City; May 11 in Richfield; May 12 in Price; and May 18 in Salt Lake City.

C. CONSULTATION AND COORDINATION IN THE PREPARATION OF THE ENVIRONMENTAL STATEMENT

During preparation of the environmental statement, Federal, State, and local agencies, and representatives of private industry were consulted. Individuals with special expertise relating to the proposed actions provided information and additional data:

- The National Park Service contributed by providing data, reviewing draft documents and joining in field trips and office discussions. The Environmental Protection Agency has cooperated in discussions and has reviewed draft documents during this study.

- Departments of the State of Utah have offered data, advice, and consultation to task force members. Those providing major input to the document include: Division of Oil, Gas and Mining, Division of Water Rights, Division of Water Resources, Division of Utah Geological and Mineral Survey, Division of Parks and Recreation, Division of Wildlife Resources, and Department of Transportation.

- The Utah State Planning Coordinator contracted the socioeconomic portion of the EIS, working with elected and staff officials of local governments and associations of government.

    1) Local government officials and other community leaders participated in the impact assessment by directly providing socioeconomic data and analysis and by alerting members of the task force to potential beneficial or adverse impacts on other topical resources.

    2) Mitigating measures include those desired by local and State government officials.

    3) Where feasible, mitigating measures are suggested for each adverse socioeconomic impact.

- Personnel at the local area and district offices of the Bureau of Land Management in Kanab, Cedar City, Escalante, Hanksville, and Richfield participated in field reviews of the proposed actions, and provided comments on draft texts. Similarly, district and forest personnel from the Dixie National Forest participated in field and early text reviews.

- The Bureau of Land Management and the State of Utah have entered into a cooperative agreement for the protection of cultural resources, which follows:

STATE OF UTAH

Scott M. Matheson, Governor

DEPARTMENT OF
DEVELOPMENT SERVICES

Michael D. Gallivan
Executive Director
104 State Capitol
Salt Lake City, Utah 84114
Telephone: (801) 533-5961

June 23, 1978

Mr. Paul Howard
Bureau of Land Management
University Club Building
136 East South Temple
Salt Lake City, Utah 84111

RE: Central Utah Coal Environmental Statement Cooperative Agreement,
Southern Utah Coal Environmental Statement Cooperative Agreement

Dear Mr. Howard:

The staff has reviewed the memorandums of understanding and concur with this cooperative agreement. I have signed the memorandums, and your proposed means to insure the protection of cultural resources is adequate, so long as it is properly implemented should development occur. However, we reserve the right to continually comment on the quality of techniques used in the environmental impact statements.

If you have any questions or concerns, please contact Wilson G. Martin, Preservation Development Coordinator, 307 West 200 South, Salt Lake City, Utah 84101, Utah State Historical Society, 533-6017.

Sincerely,

Michael D. Gallivan
Executive Director
and
State Historic Preservation Officer

WGM:jr

Cultural Resources Cooperative Agreement Southern Utah Coal Environmental Statement Between The Bureau of Land Management and the State of Utah

I. Purpose

The Bureau of Land Management, hereinafter referred to as the Bureau, is participating, under leadership of the Geological Survey, in preparation of the Southern Utah Region Coal Environmental Statement (Coal ES) under provisions of the National Environmental Policy Act of 1969. The Bureau has determined that cultural resources could be damaged or lost as a result of coal mining proposals at specific sites for which mining plans and applications have been submitted.

The Utah State Historic Preservation Office, hereinafter referred to as the State, is interested in assuring that cultural resources in Utah be protected. The Bureau and the State have consulted and agree as to the measures, outlined in this agreement, which should be undertaken to protect these resources, should authorization be granted to use public lands in Utah administered by The Bureau for the purpose of any of the above mentioned proposed actions. In this agreement, "cultural resources" means data and sites which have archaeological, historical, architectural, or cultural importance and interest. Investigators will be qualified to evaluate these "cultural resources." Qualifications of investigators have been submitted to State Historic Preservation Officer.

II. Authority

This agreement is authorized under the Federal Land Policy and Management Act of 1976 and the National Historic Preservation Act of 1966. It is in accord with Bureau policies and programs. It does not abrogate nor amend any other agreement between the Bureau and the State.

III. Responsibilities and Procedures

The Bureau will comply with 36 CFR 800 in identifying sites which are listed in or eligible for inclusion in the National Register of Historic Places.

A. As part of the planning process and environmental analysis required prior to coal-related management decisions, the Bureau will search for archaeological and historical literature concerning the Southern Utah Coal area. The Bureau has had conducted a stratified random sample survey of one percent of the public lands in the Southern

Utah Coal area. The strata consisted of vegetative zones, and the sample units were quarter sections. The one percent survey provides for an intensive survey of each chosen quarter section, meaning that all cultural resources observable on the surface of that area are recorded.

B. After completing the planning and environmental analysis processes, should the proposed management be implemented, the Bureau will inform project participants of, monitor compliance with, and enforce the following stipulations:

1. Prior to initiation of ground-disturbing activities, literature searches and intensive surveys will be undertaken in all areas which would be disturbed.

2. Wherever possible and feasible, cultural resources will be avoided by construction and related activities. This will be accomplished mainly by rerouting linear facilities, such as roads, fences, and pipelines, and adjusting locations of other facilities.

3. A professional archaeologist may be required to be present when ground-disturbing operations are underway.

4. Subsurface cultural resources that are encountered during any construction will be salvaged if there is no other recourse in such a situation.

C. Wherever it is not possible and feasible to avoid sites that contain cultural resources, the Bureau will consult with the State to determine the most satisfactory means of mitigating damage, as required by 36 CFR 800.

D. The Bureau will provide cultural resources reports, technical reports, and other pertinent material to the State.

E. The State will provide the Bureau with a letter, for use as an exhibit in the Coal ES, to the effect that the procedures herein proposed by the Bureau, if correctly implemented, will satisfy the State's interest.

IV. The attached list identifies the specific actions that the Bureau anticipates will be included in the Coal ES. The list may be brought up-to-date, as necessary, without amending this agreement in any way.

V. Implementation

A. This agreement will become effective on the date of the last signature of this agreement.

B. Either party may request revision or cancellation of this agreement by written notice, not less than 30 days prior to the time when such action is proposed.

C. Any problems resulting from this agreement which cannot be resolved by the Bureau and the State will be referred to the Secretary of the Interior and the Governor of Utah for resolution.

Date

Utah State Director
Bureau of Land Management
Department of the Interior

6/13/78
Date

Utah State Historic
Preservation Officer

Southern

Company and Mine	Specific Proposed Action (applications filed)
El Paso Coal Company Red and Blue mines	Mining and reclamation plan
Utah International, Inc., and Nevada Electric Investment Company Alton mine	Mining and reclamation plan
Mono Power, et al. Kaiparowits Nos. 1-5 mines	Mining and reclamation plan

D. COORDINATION IN THE REVIEW OF THE DRAFT ENVIRONMENTAL STATEMENT

Comments on the draft environmental statement were requested from the following Federal, State, and local agencies. Copies were also sent to proponents, leasees, environmental, and other interest groups for their comments:

Federal agencies:

- Advisory Council on Historic Preservation
- Department of Agriculture
  - Soil Conservation Service
  - USDA Forest Service
- Department of Commerce
- Department of Energy
- Department of Health, Education, and Welfare
- Department of Housing and Urban Development
- Department of the Interior
  - Bureau of Mines
  - Bureau of Reclamation
  - Fish and Wildlife Service
  - Heritage Conservation and Recreation Service
  - National Park Service
  - Office of Surface Mining
- Department of Labor
  - Mining Safety and Health Administration
  - Occupational Safety and Health Administration
- Department of Transportation
- Environmental Protection Agency
- Federal Power Commission
- Interstate Commerce Commission
- Office of Economic Opportunity
- Office of Management and Budget
- Water Resources Council

State agencies:

State of Utah A-95 Clearing House will coordinate comments from all interested State agencies.

- Four Corners Regional Commission

Local agencies:

- Washington County Commission
- Iron County Commission
- Kane County Commission
- Garfield County Commission
- Emery County Commission
- San Juan County Commission
- Sevier County Commission

Wayne County Commission
Utah Association of Counties
Five County Association of Governments
Six County Association of Governments
Southeastern Association of Governments
Utah Association of Counties
Mayors--Utah:

Alton	Henrieville	Parowan
Cannonville	Hurricane	St. George
Cedar City	Kanab	Tropic
Escalante	LaVerkin	Virgin
Glendale	Orderville	Washington

Mayors--Arizona:
Fredonia
Page
Utah League of Cities and Towns

Where copies may be inspected:

Copies of the final environmental statement will be available for public inspection at the locations listed below. Copies may be obtained, as long as supplies last, by writing to the Denver office, or by picking up a copy at the task force office in Salt Lake City.

U.S. Geological Survey:

U.S. Geological Survey
Preparation Branch
Mail Stop 701, Box 25046
Federal Center
Denver, Colorado 80225
(303) 234-3960

Interagency Environmental Task Force on Coal
Room 505, Post Office Building
350 South Main Street
Salt Lake City, Utah 84101
(801) 524-4375

Area Mining Supervisor's Office
8426 Federal Building
125 South State Street
Salt Lake City, Utah 84138
(801) 524-5646

Director's Office, National Center
12201 Sunrise Valley Drive
Reston, Virginia 22092
(703) 860-7411

Regional Manager's Office
7200 W. Alameda Avenue (Villa Italia)
Lakewood, Colorado 80226
(303) 234-2855

Bureau of Land Management:

Office of the State Director
Salt Lake City, Utah 84111
(801) 277-8543

Cedar City District Office
Cedar City, Utah 84720
(801) 586-2401

Vermillion Resource Area Office
Kanab, Utah 84741
(801) 644-2672

Dixie Resource Area Office
St. George, Utah 84770
(801) 673-2463

Paria Resource Area Office
Kanab, Utah 84741
(801) 644-2672

Escalante Resource Area Office
Escalante, Utah 84726
(801) 826-4291

Richfield District Office
Richfield, Utah 84701
(801) 896-5401

Henry Mountain Resource Area Office
Hanksville, Utah 84734

Denver Service Center Library
Building 50, Denver Federal Center
Denver, Colorado 80225
(303) 234-4578

USDA Forest Service:

Supervisor's Office
Dixie National Forest
Cedar City, Utah 84720
(801) 586-2421

Escalante Ranger District
Escalante, Utah 84726
(801) 826-4312

Powell Ranger District
Panquitch, Utah 84759
(801) 676-8815

Libraries:

Utah State University Library
University of Utah Library
Brigham Young University Library
Weber State College Library
Southern Utah State College Library
Dixie College Library
College of Eastern Utah Library
Cedar City Public Library
Iron County Bookmobile
Hurricane City Library
Kanab City Library
Garfield County Bookmobile
Parowan Public Library
Sevier County Bookmobile
Page Public Library
Price Public Library
Northern Arizona University Library
Salt Lake City Public Library
Salt Lake County Public Library

E. PUBLIC COMMENTS AND RESPONSES AFTER DRAFT ENVIRONMENTAL STATEMENT

A total of 800 copies of the draft EIS were sent to Federal, State, and local government agencies, nongovernment organizations, and individuals for their review and comment. Notice of Availability was published in the Wednesday, August 16, 1978, issue of the Federal Register, on page 36333. The notice announced that the USGS invited written comments to be submitted by October 18, 1978; it also included a schedule of formal public hearings that were held at Salt Lake City on September 19, 1978, at Cedar City on September 20, and at Kanab on September 21, 1978. The Federal Register notice also announced that copies of the draft EIS would be made available for public review at five USGS offices, nine BLM offices, three USFS offices, and 19 libraries.

In addition to the Federal Register, publication notices and news releases announcing the hearings and availability of the draft EIS were sent to two wire services, 32 newspapers, 19 radio and TV stations within the regional news media area, and 16 journals and magazines. The Department of the Interior made additional news releases. Prior to September 19, 1978, a public service announcement reminding the public of the scheduled hearings was sent to State and local newspapers.

All comments were carefully reviewed. Comments which presented new data, questioned facts and (or) analyses, and raised questions or issues bearing directly upon the draft EIS received detailed responses or appropriate text changes were made.

F. PUBLIC HEARINGS ON THE DRAFT ENVIRONMENTAL STATEMENT

Public hearings on the draft environmental statement were held in Kanab, Cedar City, and Salt Lake City, as follows:

Date	Time	Location	Attendance	Testifying
September 19, 1978	4:00 p.m.	Salt Lake City	35	6
September 20, 1978	4:00 p.m.	Cedar City	32	7
September 21, 1978	4:00 p.m.	Kanab	36	8
Total----------			103	21

Complete transcripts of the hearings were available for public review at the task force office in Salt Lake City. Copies of the transcript will accompany the EIS to the Environmental Protection Agency for review and, through the decision process, to the Secretary of the Interior.

Copies are also available for public inspection at the U.S. Geological Survey, Directors Office, National Center, 12201 Sunrise Valley Drive, Reston, Virginia, 22092. The full hearing transcripts are not reproduced but are summarized:

- Seven individuals representing Johnson Canyon land owners, proponents of the analyzed actions, or Utah State agencies, orally summarized concerns that were later formally detailed in letters reproduced in this document.

- Seven individuals representing themselves or one of two environmental groups expressed concern over the development and urbanization of the Kaiparowits Plateau and the nearby affected Kane County region, and were concerned by potential changes in lifestyle in the region.

- The remaining three speakers implied that the statement presented a negative attitude toward coal development and that the statement placed a higher value on wildlife than on human life, and questioned the classification of certain wildlife as endangered.

These oral comments were considered carefully in preparation of the final statement. Where identified by the speakers, specific comments were addressed in the final statement by text changes, clarifications, or additions.

G. WRITTEN COMMENTS AND RESPONSES

An index of written comments, reproductions of the comments, and responses as required, follows:

Advisory Council on
Historic Preservation
1522 K Street N.W.
Washington, D.C. 20005

September 7, 1978

Mr. Henry W. Coulter
Acting Director
U.S. Geological Survey
U.S. Department of the Interior
Washington, D. C. 22092

Dear Mr. Coulter:

This is in response to your request of August 14, 1978, for comments on the draft environmental statement for the Development of Coal Resources in Southern Utah.

The Council notes from its review that while cultural resource studies to date indicate no properties included in or known to be eligible for inclusion in the National Register of Historic Places will be affected the possibility exists for previously unknown cultural resources to be identified during project construction and that the U.S. Geological Survey appears to recognize its responsibility pursuant to Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f, as amended, 90 Stat. 1320), should such cultural properties be encountered. Accordingly, we look forward to working with USGS in accordance with the "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800) as appropriate in the future.

Should you have any questions or require additional assistance in this matter, please contact Brit Allan Storey of the Council staff at P. O. Box 25085, Denver, Colorado 80225, or at (303) 234-4946, an FTS number.

Sincerely yours,

Louis S. Wall
Assistant Director, Office of
Review and Compliance, Denver

No response required.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VIII
1860 LINCOLN STREET
DENVER, COLORADO 80295

Ref: 8W-EE

Mr. H. William Menard
Director's Office National
Center
U.S. Geologic Survey
12201 Sunrise Valley Drive
Reston, Virginia 22092

Dear Mr. Menard:

The Region VIII Office of the Environmental Protection Agency has completed its review of the environmental impact statement on the Development of Coal Resources in Southern Utah and submits the following analysis.

EPA is deeply concerned with the significant changes that will be occurring in an area that is outstanding in scenic attractions including Bryce and Zion National Parks and the Glen Canyon National Recreation Area. The report predicts dramatic changes in population, significant deterioration to visibility in Class I areas, destruction of thousands of acres of soil, direct and indirect impacts to vegetation and wildlife resources some of which are on the Endangered and Threatened Species List and reduction of water quality.

1 The Prevention of Significant Deterioration (PSD) of Air Quality Regulations (40 CFR 52.21, as amended, 43 CFR 26388, June 19, 1978 require the application of Best Available Control Technology (BACT) for all sources of fugitive and non-fugitive particulate emission sources at these mines. The mitigating measures sections did not contain adequate discussion of the specific particulate sources and proposed control measures to determine if the BACT requirements of 40 CFR 52.21 will be met. Therefore EPA requests that the Interior Department delay the final EIS until EPA has had an opportunity to complete the PSD permit process.

Deterioration of visibility in Class I areas will have a significant impact to the values for which the National Park System was established. Section 165(d) of the Clean Air Act Amendments charges Federal Land Managers with the affirmative responsibility to protect the air quality related values in Class I areas. Although EPA's PSD regulations exempt fugitive dust from consumption of PSD increments, the National Park Service may consider the impact of all particulate emissions upon Class I air quality related values. EPA would then determine whether there would be a significant impairment of air quality related values in the established Class I areas. Although EPA has not yet promulgated visibility regulations pursuant to section 169 of the Clean Air

1 The entire air quality section is revised and now includes Best Available Control Technology and Best Management Practices requirements. Potential impacts are substantially reduced from those described in the draft EIS. Visual range analysis has also been added to the EIS.

1 Act Amendments of 1977, the reduction of visual range in and near Bryce Canyon National Park by as much as 60% as indicated in the EIS would more than likely be considered significant degradation of visibility. Therefore a PSO permit probably could not be issued to the Alton coal mine operation.

2 The draft EIS did not adequately evaluate water quality impacts to the region. Salinity is a basin-wide water quality concern in the Colorado River Basin. PL 93-320 and Minute 242 of the Treaty with Mexico should be discussed in some detail in the final report. Environmental analyses of the proposed actions in the basin should include determinations of salinity impacts of the proposed actions and potential mitigating measures.

3 The mining plans analyzed in the EIS were not designed to comply with the provisions of the Surface Mining and Reclamation Control Act. Therefore, EPA believes the final EIS should not be published until a complete mining plan complying with regulations promulgated by the Office of Surface Mining is completed and evaluated. This position is consistent with EPA's request to the Department of the Interior's Assistant Secretary for Land and Water Resources that EIS's analyze mining plans that comply with 30CFR700 et. seq.

4 It is our conclusion that development of coal resources in Southern Utah will cause major environmental impacts. According to the procedures EPA has adopted to rate the adequacy of draft environmental impact statements, the draft EIS for the Development of Coal Resources in Southern Utah will be listed in the Federal Register in Category ER-3. This means EPA has serious environmental reservations about the advisability of the proposed action and the document is seriously deficient in informational content. Normally, EPA policy would be to request that this EIS be reissued as a revised or supplemental draft EIS based on the deficiency of information. If BLM will require a revised mining plan from these companies that complies with OSM regulations and can resolve the issues presented herein perhaps BLM could accomplish such actions and immediately proceed to a final EIS. Additional public participation efforts for the final EIS and the program decision option document are also warranted.

We look forward to discussions with your EIS team to resolve the problems presented above and those items listed in our attached detailed comments.

Sincerely yours,

Alan Merson
Regional Administrator

Enclosure

2 See text changes in the Water sections of chapters III and IV. The analysis indicates no measurable adverse impact to salinity of waters of the Colorado River.

3 Compliance with regulations of the Surface Mining and Reclamation Control Act will be required prior to approval of the mining and reclamation plan. As noted in the EIS, the proponents have been advised of this requirement. The following letter addresses this concern:

United States Department of the Interior
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

In Reply Refer To:
1792 (141)

Mr. William D. Dickerson
Acting Director, Office of Federal
Activities (A-104)
Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Dear Mr. Dickerson:

This letter is in response to your concern that in the ongoing coal regional environmental statements (ES) the Department is evaluating mining and reclamation plans that are not in conformance with the Surface Mining Control and Reclamation Act (SMCRA) of 1977 (P.L. 95-87) and the intial regulations, 30 CFR 700 et seq. Your letter of July 6, 1978, raised this concern, as did the Region VIII Administrator's letters of October 17, 1978, commenting on the Final Southwest Wyoming Regional ES, and October 27, 1978, commenting on the Draft Southern Utah Regional ES. We also have received a preliminary draft letter from the Regional VIII Administrator's office concerning the Draft West-Central Colorado Regional Coal ES. However, to-date, we have not received official comments on the Colorado ES.

Detailed Comments
of the
Environmental Protection Agency
on the
Proposed Development of
Southern Utah Coal Resources
Draft Environmental Impact Statement

5 Air Quality Impacts:

Chapter IV of the Regional Analysis report discusses the expected impacts to air quality from coal development. The Prevention of Significant Deterioration (PSD) of Air Quality Regulations (40CFR52-21, as amended, 43FR26388) require the application of Best Available Control Technology (BACT) and Best Management Practices (BMP) for all sources of fugitive and non-fugitive particulate emission sources at the mines. The mitigating measures sections did not contain adequate discussion of the specific particulate sources and proposed control measures to determine if the BACT requirements of 40CFR52-21 will be met. We encourage your office to develop the necessary mitigation measures to control particulate emissions before proceeding further with the proposal.

Our second major concern is with possible violations of the PSD increments in Class I areas in Southern Utah. The report states "The western portion of the Alton lease area was modeled and did not indicate violations of PSD increments at Bryce Canyon National Park. The eastern portions of the Alton lease area is closer to Bryce Canyon and was not modeled. Because of the close proximity (about 3 miles) of the Alton East coal field to Bryce Canyon, it is possible that Class I PSD increments would be violated due to TSP emissions from the eastern portion of the lease area." (page IV-II).

Deterioration of visibility in Class I areas will have a significant impact to the values for which the National Park System was established. Section 165(d) of the Clean Air Act Amendments charges Federal Land Managers with the affirmative responsibility to protect the air quality related values in Class I areas. Although EPA's PSD regulations exempt fugitive dust from consumption of PSD increments it is reasonable to expect the National Park Service to consider the impact of all particulate emissions upon Class I air quality related values. It is therefore our position to defend air quality related values and oppose any action which would cause a significant lowering of these values. As the methods of fugitive

3 After the Department received the Environmental Protection Agency's comments of June 13, 1978, on the Southwest Wyoming Coal Regional ES, the Assistant Secretary for Energy and Minerals discussed this issue with the Region VIII Administrator's Office. The Department recognizes the concerns of EPA. However, we feel that an understanding had been reached that the ongoing regional ES's would proceed with the assessment of the mining and reclamation plans as proposed. Each regional contains a caveat which says that the palns described in the ES will be revised in accordance with the Office of Surface Mining's (OSM) regulations and, when this is done, the mine plans will be reviewed for compliance by the Office of Surface Mining. The caveat also states that prior to approval of a revised plan, an updated environmental assessment will be done. If there have been significant changes in the environmental impacts of the proposed mining operation described in the regional ES from that submitted for approval to OSM, then a determination will be made as to whether a supplemental ES will be required to comply with the National Environmental Policy Act of 1969. This procedure will allow adequate evaluation and public review of mining and reclamation plans that have been brought into compliance with SMRCA.

In the Department's discussion with EPA Region VIII. it was understood that for future ES's that include mining and reclamation plan proposals, the plans would be up-to-date and in conformance with the SMCRA regulations. However, due to the fact that the ongoing regional ES's and the site-specific ES's included in them were well underway when SMCRA became law and the initial regulations were promulgated, the above described procedures would be followed only for these ES's. The Department has very tight time frames for these ES's. You should be aware that depending upon the status of a mining operation, each applicant will have to apply for a permit to mine on Federal lands either 2 months or 8 months after the Federal Lands Program regulations become effective. OSM is presently promulgating these regulations, and their proposed effective date is February 15, 1979.

The plans being analyzed in the regional ES's are being returned to the applicants for revision to include compliance with SMCRA and all other applicable requirements. The plans will not be approved by the Department until they conform to all applicable laws and regulations. In following these procedures, the Department believes that the environmental evaluation will be adequate and that public access to major environmental concerns will be provided. As a standard procedure, a notice is published in the Federal Register when each mining and reclamation plan is in the process of Departmental review. This notice also provides the public an opportunity to review and evaluate the plan.

5 dust control do not reflect best management practices to reduce particulate emissions these mines are considered potentially ineligible for PSD permits under Section 165 of the Clean Air Act as amended. Although EPA has not yet promulgated visibility regulations pursuant to section 169 of the Clean Air Act Amendments of 1977, the reduction of visual range in and near Bryce Canyon National Park by as much as 60% would more than likely be considered significant degradation of visibility. Therefore a PSD permit probably could not be issued to the Alton Coal mine operation.

Members of my staff are in the process of reviewing the detailed document by AeroVironment, Inc., 1977 which discusses air quality in more detail. This information and the Bureau of Land Management report on the environmental analysis of the proposed transportation system should provide us with a more accurate picture of future air quality related impacts. The review of this aspect of the project should not therefore be completed until this other information has been reviewed prior to the completion of the final EIS.

If EPA issues a PSD permit it will specify at a minimum the following measures:

1) Pavement or equivalent chemical stabilization of all haul roads used or in place for more than one year.

2) Treatment with semi-permanent dust supressants of all haul roads used or in place for less than one year and for more than two months.

3) Watering of all other roads in advance of and during use whenever sufficient unstabilized material is present to cause excessive fugitive dust.

4) Reduction of fugitive dust at all coal dump (truck to crusher) locations through use of negative pressure bag house or equivalent methods. Inclusion of conveyor and transfer point covering, and spraying, and the use of coal load out silos.

3 For all future ES's the Department will review mining and reclamation plans that have been submitted to assure they comply with SMCRA before the ES's are started. Site-specific analyses will be based on plans that conform to SMCRA and all other applicable requirements. As with other requirements, the SMCRA regulations will be included as standards of performance and will be part of the proposed plans as they are evaluated.

We feel that these procedures respond to the concerns which EPA has raised. We would welcome discussing these procedures in further detail at your convenience.

Sincerely,

Guy R. Martin

Assistant Secretary for
Land and Water Resources

Identical letter sent to:
Mr. Alan Merson
Regional Administrator
Region VIII
Environmental Protection Agency
1860 Lincoln Street
Denver, Colorado 80295

4 The EIS fully and adequately considers all environmental topics that may be impacted by actions at the projected level. Mining plans must be revised prior to permit approval to mine (see text, part 1, chapter III, and part 2, chapters I of each site specific EIS).

5 See response to comment 1.

6 Water Quality Impacts:

The draft EIS did not adequately evaluate water quality impacts to the region. Salinity is a major basin wide water quality concern in the Colorado River Basin PL 93-320 and Minute 242 of the Treaty with Mexico should be discussed in some detail in the final report. Specifically, all environmental assessments of the proposed actions in the basin should include determinations of salinity impacts of the proposed actions and potential mitigating measures. Salinity impacts could include both loading and concentrating effects resulting from but not limited to the following:

- o Surface disturbance and erosion,
- o Modification of runoff pattern,
- o Interception of ground water,
- o Disposal of ground and/or surface water,
- o Consumptive water uses.

The final EIS should determine the cumulative salinity impacts of the above and discuss opportunities for mitigating adverse salinity impacts. Discussion of alternatives should include consideration of alternatives which would minimize adverse salinity impacts.

In addition we have serious concerns for the numerous impacts to water resources in the area and to the lack of mitigating measures. Such impacts include the long-term alteration of ground water supplies and flow patterns, loss of watering places for livestock and wildlife, unknown effects of pumping from wells for public and industrial water supplies. How will the increased consumption of water affect other entities that depend on the water supplies that will decrease? The report should include an analysis of the major recharge zones in the region. We are also concerned with how mining will affect the recharge characteristics in the area.

7 Energy demands and systems:

The function of this EIS is to provide an overview analysis of potential impacts of regional coal development scenarios; therefore, by excluding the details of the transportation networks and energy system networks (i.e. power plants, transmission lines) you have segmented the analysis and subverted the purpose of the EIS. The impacts that will result from a transportation system as proposed will have a significant

6 All potential water quality impacts were evaluated. Most were insignificant and thus were not discussed at length. A discussion of salinity resulting from public supply and the A-WV project has been added (part 1, chapter IV, Water). The effects of long-term ground-water withdrawals are clarified in chapter IV, Water section. Consumption of water for public supply involves changes in water use and impacts of the changes were and are discussed in part 1, chapter IV, Water and Agriculture sections. Potential loss of water for livestock and wildlife is discussed in the site specific EIS's in part 2. Impacts on ground-water flow and recharge would be insignificant.

7 The Allen-Warner Valley energy system site specific EIS is not completed; however, the significant adverse and beneficial regional and cumulative impacts that might be generated by the A-WV project are considered in enough detail to support a decision on the mining and reclamation plan for the proposed Alton strip mine.

7 impact on the environmental, social and economic future of Southern Utah. We strongly recommend that the Bureau of Land Management environmental analysis (Part 1, page 1-11) on the Allen-Warner Valley Energy System be included under a joint EIS with this proposal.

Construction of the Allen-Warner Valley Energy System, as proposed, would jeopardize the continued existence of the endangered woundfin. (Part I, page V-3) This statement concerning endangered species and others relating to possible violations of air quality standards and proximity to major scenic areas would place the future of the Allen-Warner Valley Energy System in question at this time. Also being considered is the yet to be developed market for the coal. It does not seem reasonable to place the project before the demand. Considering the fragile nature of the area's ecosystem, the significant social impacts and above concerns that will incur as a result of this project, it would seem that stronger justification is warranted at this point.

8 Cultural Impacts:

We are also concerned with the aftermath of coal development. In the regional analysis the report does a commendable job of describing the social impacts of boom-to bust development that may occur, particularly in Kane and Garfield Counties. Admittedly these problems are difficult to analyze but plans must be developed to meet the inevitable problems. Kane and Garfield County communities, which would experience the most immediate effects of expanding coal mining, must be prepared not only for economic changes and problems in providing municipal services, but for other kinds of lasting social and cultural changes as well.

9 We are concerned with the new transportation system proposal discussed in the report; particularly the system in the Kaiparowits plateau region. Disputes involving future road systems through this area (See part 2, page 43) should be resolved prior to approval of a mining plan. Taken one step further, once mining operations are complete, we would hope that all new road systems be reclaimed to their formal character to restore this area to its present condition.

Additional Comments:

10 1. Additional water use on the Kaiparowits Plateau will reduce the springflow and streamflow to Lake Powell 10 percent during the life of the mine. This will result in a lowering of the water level in the reservoir which will draw fish into the water intake pumps and cause a fish kill. Mitigating measures should be included in this report since there are structural means to prevent damage to the fishery.

2. Potential mine discharges should be considered in terms of possible impacts to salinity concentrations in the Colorado River system. In

8 Kane and Garfield County officials contributed to preparation of the EIS and had developed plans to cope with growth caused both by proposed coal development and by unrelated population increases. Their projections indicate that population increase without any coal development would be almost twice as great as that caused by coal development (see text, part 1, chapters II and IV).

9 The State DOT plans to upgrade and maintain an upgraded regional highway system in the event of coal development that warrants upgrading. Local mine access roads probably would be restored, but restoration would follow recommendations of the proper land management authority and would depend on conditions and needs existing 40 or more years from now.

10 Text change; as indicated in the comment, proper design will prevent potential physical hazard to the Lake Powell fishery (chapter III). Use of water for mining on Kaiparawits Plateau will not necessarily impact the water level of Lake Powell, nor was such implied in the DES. Potential mine discharges were considered; infiltration rates are given in part 1, chapter II. Runoff from refuse piles is to be contained and discharged per State and Federal regulations. See also responses to comments 2 and 6.

10 addition, the short and long-term impacts to ground water quality should be addressed. The FES should also give estimates of ground water inflow to the two mines and provide estimates of the quality of runoff from the refuse disposal piles. An NPDES permit under Section 402 of the Clean Water Act will be needed for such discharges. NPDES permits in Utah are issued by the EPA Regional office in Denver.

11 3. The EIS does not satisfy the requirement of the Federal Land Policy and Management Act for roadless area review. According to the Wilderness Inventory Handbook which outlines BLM policy for conducting the wilderness inventory of national resources lands, during the study period and until a Congressional decision concerning wilderness designation is made, an area must be managed to preserve its wilderness character. The final EIS should document the status of roadless area review in the regional study area.

12 4. It should be noted that the inventorying of lands classified as alluvial valley floors requires more than "soil surveys." The Office of Surface Mining (OSM) draft Alluvial Valley Floor Identification Guidance (Federal Register, August 25, 1978) should be referenced.

13 5. Potential impacts to salinity concentrations in the Colorado River system due to point and non-point source discharges from the proposed mining operations should be specifically addressed in the FES. Although the probability for acid mine drainage is very low (as noted in the DES), the potential for elevated total dissolved solids (and trace elements) concentrations in mine related discharges is a distinct possibility. The goals of the Colorado River Salinity Forum (i.e., no discharge of salt where practicable) should be discussed in the FES. It should also be noted that except in special cases, the only parameters controlled by effluent standards for coal mines include pH, total suspended solids, iron, and manganese.

Site Specific Analysis:

Alton Mine

14 1. (page 9) It is EPA's understanding that the mine may involve "steep slope mining" as defined under OSM regulations (30 CFR 716.2). In this case, spoil may not be placed or allowed to remain on the outslope, and spoil (not necessary to achieve approximate original contour) must meet the excess spoil disposal provisions. This concern should be addressed in the FES.

11 BLM has not completed a roadless area review in Utah and has not selected roadless areas; areas that may have roadless potential have been proposed by BLM for further study.

12 The appropriate references have been added.

13 Water used for the A-WV project and for public supply are the only actions which might affect the salinity concentrations in the Colorado River. A summary analysis of the potential has been added in part 1, chapter IV. See also responses to comments 2, 6, and 10.

14 The proponent must meet OSM requirements in a revised mining and reclamation plan prior to receiving permit approval to mine. See response to comment 3.

15 2. (page 11) As noted previously, any discharge of water to natural drainages must consider the goals of the Colorado River Salinity Forum.

16 3. (page 12) How much ground water is expected to enter the mine pits?

17 4. (page 13) The DES states that Utah International, Inc. has not yet developed a specific reclamation plan. The FES should analyze a mining plan which substantially complies with the Surface Mining and Reclamation Act.

18 5. (page 25) Are any data available regarding the leaching characteristics of overburden in the Alton area (i.e., so an assessment of post-mining ground water quality can be made)?

19 6. (page 42) The DES states that "water from springs would not be lost but would be discharged elsewhere in the same watershed." What form might these new discharges take and how might use of this water be affected?

20 7. (page 51) The DES states that twenty-two springs would be destroyed. However, the impact would be minimal because water would still be available. How would it be made "available?"

21 8. (page 24) With regard to the larger valleys of the Alton Coal Field and Sink Valley Wash, the DES states that these are not "alluvial valleys" as defined in the Surface Mining Control and Reclamation Act. It is EPA's opinion that valley areas should be more thoroughly investigated in terms of alluvial valley floor designation (perhaps by means of the OSM draft Alluvial Valley Floor Identification Guidance Document) rather than relying on previous reconnaissance-level identification efforts.

Kaiparowits Nos. 1-5 Mines

22 1. (page 31) With regard to ground water impacts, what is the basis for the statement that "Reasonable enforcement of mitigations should prevent any degradation of water quality?" What "mitigations?" What are the estimates for ground water inflow rates to the mine operations? As noted previously, any expected discharges must consider salinity impacts to the Colorado River System.

15 See responses to comments 2, 6, 10, and 13.

16 Ground-water discharge to springs likely to be destroyed by the Alton mining is 100 to 150 acre-feet per year. This discharge may enter pits or may discharge elsewhere upgradient from the present spring. An estimated total of 6,000 to 10,000 acre-feet of ground water is stored in beds likely to be disrupted by mining. Probably not more than 10,000 acre-feet would drain into pits over the entire mine life, but mining experience would be needed to make an accurate estimate. See part 2, Alton site specific, Water sections in chapters II and III.

17 Text has been changed. The reclamation plan complied with existing regulations and was adequate. See also response to comment 3.

18 Data concerning quality of water in overburden are available and were described in the Alton site specific EIS contained in part 2 (chapter III, Water section).

19 Ground water would discharge initially into or upgradient from the mine pits. Later, because little movement is expected through replaced overburden, ground water would probably discharge upgradient from the pit. No impact is anticipated to long-term use or to chemical quality of ground water.

20 See responses to comments 16, 18, and 19. Existing water rights are protected (see part 1, chapter III, and part 2, chapters I).

21 The text has been altered to show recent changes in administration of SMCRA regulations. The designation of alluvial valleys must be made by the State prior to approval of mining.

22 See chapter I-D (page 15 of the DES, and infiltration rates in paragraph 2, page 22 of the DES). Also, see responses to comments 2, 6 and 10.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
324 25th Street
Ogden, Utah 84401

1950

Director
U.S. Geological Survey
National Center
Mail Stop 108
Reston, Virginia 22093

Dear Sir:

This is in reply to your August 18, 1978, letter requesting comments on the Draft Environmental Statement on Development of Coal Resources in Southern Utah.

Copies of the DES were reviewed by Regional Office Staff Directors and the six National Forests in Utah. Our comments are few; our reviewers have previously read and commented on the pre-draft of the EIS.

Part I - Regional Analysis

1 Page II - 44: The Desert Tortoise and Virginia River Chub are now on the Threatened and Endangered List.

2 Page II - 50: Ashdown Gorge Roadless Area should be included in the last paragraph.

3 Page II - 93: Suggest 8. Esthetics read - "Visual impacts other than those addressed for the site specific proposals in Part II include:"

4 Page II - 94: 4th paragraph, last sentence - "Few people view," etc. How do we know this?

5 Page III - 13: The date for publication of the Draft Paunsaugunt - Sevier LMP and ES has been changed to February 1979.

6 General: Somewhere, the demand for mine timbers, which will undoubtedly come from nearby National Forest lands, should be mentioned as a "secondary impact" on natural resources.

6200-11 (1/69)

1 The desert tortoise in Utah was proposed for listing as endangered in the Federal Register on August 23, 1978. The Virgin River chub was proposed for listing as endangered in the Federal Register on August 24, 1978. They are not yet on the Threatened or Endangered List.

2 Text change.

3 Text change.

4 Text change.

5 Text change.

6 Text change.

Part II - Site Specific Analysis

7 Page 10: The illustrations on page 10 for El Paso and Alton are misplaced.

7 Text change.

8 Page 65: 3. Esthetics - 2nd paragraph Question: What are partial management objectives?

8 Text change.

We appreciate the opportunity to make these minor comments as well as being a part of the team that prepared this thorough analysis.

Leon M. Coleman

P.M. REES
Director, Regional Planning
and Budget

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
4012 Federal Building, 125 South State Street, Salt Lake City, UT 84138

October 19, 1978

Director, U.S. Geological Survey
National Center, Mail Stop 108
Reston, Virginia 22092

Dear Sir:

We have reviewed the draft Regional Environmental Impact Statement on Proposed Coal Development and Associated Activities in Southern Utah. It was sent to the Washington Office of the Soil Conservation Service on August 14, 1978 and has been referred to us for comment.

The points of consideration where SCS has interest or expertise have generally been adequately addressed. Recent rules and regulations governing mining, reclamation and enforcement provide assurance that adequate conservation measures will be applied to disturbed areas to protect the soil and water resource.

1 There is not specific mention of whether any of the farmlands that will be taken out of production are prime farmlands. No specific consideration is given to revegetating farmland that looses its water supply. These lands may become subject to wind and water erosion because of inadequate vegetative cover even though not disturbed by mining operations. Measures should be taken to reestablish native vegetation that can survive without irrigation.

2 There is not mention of contacts or involvement of the Soil Conservation Districts. The impact of 19,500 acres being disturbed by mining and related activities should be made known to local soil and water conservation district supervisors. Supervisors should also be aware that 222 acres of irrigated land will be lost to mining and another 362 acres to urban expansion.

3 Specific impacts on springs and groundwater by mining should be addressed. Loss of water supplies could create serious problems to private landowners.

1 Through consultation with the Assistant Soil Scientist, Soil Conservation Service, Salt Lake City, it was determined that no proposed action would affect prime farmlands. Community growth could affect prime farmlands. Our estimate is that 50 percent of the land converted to community use would be irrigated lands. Additional irrigated lands may be lost as a result of conversion of water use. Because irrigated lands likely to be converted cannot be identified at this time, it is not possible to quantify the potential amount of prime farmlands that may be converted. Some irrigated lands could become subject to wind and water erosion if converted, and action should then be taken to protect these lands, when and if conversion occurs.

2 The Soil Conservation districts are one of the many groups who are provided the opportunity to participate in environmental assessments through the public involvement and review process of the draft and final EIS's.

3 Text in the Alton site specific has been augmented to describe impacts or absence of impacts on springs or ground water.

We appreciate the opportunity of comment on proposed coal development and associated activities.

Sincerely,

George D. McMillan
State Conservationist

cc: R. M. Davis, Administrator, SCS, Washington, D.C. 20013
(5) copies to:
Director, Office of Federal Activities (Mail Code A-104)
Environmental Protection Agency
Rm. 537, West Tower, 401 M Street, S.W.
Washington, D.C. 30460

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION VIII
FEDERAL OFFICE BUILDING
19TH AND STOUT STREETS
DENVER, COLORADO 80294

OFFICE OF THE
PRINCIPAL REGIONAL OFFICIAL

Mr. Henry W. Coulter
Acting Director
U. S. Geological Survey
National Center
Mail Stop 108
Reston, Virginia 22092

Dear Mr. Coulter:

This acknowledges receipt of your draft regional environmental impact statement on proposed coal development and associated activities in Southern Utah.

We believe you have adequately addressed all aspects of the impacts expected to result from the proposed coal development.

Sincerely yours,

Thomas E. Moore, P.E.
Director, ROFEC
Regional Environmental Officer

No response required.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
REGIONAL/AREA OFFICE
EXECUTIVE TOWER - 1405 CURTIS STREET
DENVER, COLORADO 80202

REGION VIII

October 24, 1978

IN REPLY REFER TO:
8SOQ

Mr. Henry W. Coulter
Acting Director
U.S. Geological Survey
National Center, Mail Stop 108
Reston, Virginia 22092

Dear Mr. Coulter:

Thank you for the opportunity to review the draft Environmental Impact Statement (EIS), "Development of Coal Resources in Southern Utah."

Your draft EIS has been reviewed with specific consideration for the areas of responsibility assigned to the Department of Housing and Urban Development (HUD) for review of other agencies' EIS's. These areas focus on a proposal's compatability with local and regional comprehensive planning and impacts on urbanized areas.

The relationship of this undertaking to local and regional planning was not discussed nor did the draft address coordination, if any, between state and local planning officials. Also, although the draft mentions the relatively large number of housing units to be required in the event the proposal is approved, it does not address the adequacy of the local housing industry to provide such needs or possible sites. Finally, some indication of the degree of support or interest in this undertaking by local officials and organizations, as well as public opinion, should be included.

We appreciate the opportunity to review and comment on this draft EIS. If you have any questions regarding these comments, please contact Mr. Walter O. Kelm, Regional Environmental Clearance Officer, at (303) 837-3102 or FTS 327-3102.

Sincerely,

Raymond D. McKinney
Director
Program Planning and Evaluation

AREA OFFICE
Denver, Colorado

The socioeconomic analysis was completed under contract to the USGS by the Office of the State Planning Coordinator. Data and analytical material was received from planning officials in the region's counties. The present local housing industry is inadequate to produce the projected housing unit needs but would be expected to expand sufficiently as demand occurred. Sites for new housing at the level that would be required are believed ample.

United States Department of the Interior
BUREAU OF INDIAN AFFAIRS
PHOENIX AREA OFFICE
P.O. Box 7007
Phoenix, Arizona 85011

IN REPLY REFER TO:
Real Prop. Mgmt.
300.1 - General

October 18, 1978

Memorandum

To: Director, U.S. Geological Survey, National Center,
Mail Stop 108, Reston, Virginia 22092

From: Area Director

Subject: Review of Draft Environmental Impact Statement Concerning
Regional Coal Development in Southern Utah (DES 78/31)

Notice of Negative Response

No response required.

The subject environmental document has been reviewed by this office.

It has been determined that the proposed action will have no significant effect on Indian lands, resources, or other interests.

ASSISTANT Area Director

cc: BIA, Wash. Ofc.
Attn: Code 214

United States Department of the Interior
BUREAU OF MINES
BUILDING 20, DENVER FEDERAL CENTER
DENVER, COLORADO 80225
Intermountain Field Operations Center

Office of
Chief

October 2, 1978

Memorandum

To: W. L. Dare, Chief, Office of Environmental Coordination

From: Chief, Intermountain Field Operations Center

Subject: Review of Draft Environmental Statement: Development of Coal Resources in Southern Utah (DES 78-31)

As requested in your reference slip of August 18, personnel of the Intermountain Field Operations Center have reviewed the subject document.

Our comments on part 1 are as follows.

1 Page v, item 3.D. The figure here for soil disturbance (19,000 acres) should be coordinated with other mentions of this figure in part 1. These include about 19,000 acres on p. IV-4 and 19,500 acres on p. V-1.

1 Text change.

2 Page v, item 3.E. It does not appear that this summary sheet is meant to cite impacts that are insignificant or at least not major. Yet the first two sentences of this item mention impacts (water quality and dissolved solids) which are not identified in other parts of part 1 as significant. Chap. IV (pp. IV-6-7) more or less dismisses these two impacts. They are not discussed further in Chaps. V-VII.

If, however, reason exists for retaining citation of these impacts in the summary sheet, then the verbs in the two sentences probably should be better coordinated. From the discussion in Chap. IV, there does not seem to be sufficient reason to distinguish one impact as a "may" impact and the other as a "would" impact.

2 Text change.

3 Page vi, item I. The figure here for loss of wildlife habitat to urbanization, etc. (2,000 acres) should be coordinated with the other mentions of this figure in part 1. These include 1,000 acres on p. IV-19 and 2,000 acres on pp. V-2 and VII-2. In addition, we note that there is no mention of this figure or impact in Chap. VI and wonder whether this is intentional.

3 Text change.

4 Page vi, Item N. Sufficient attention does not seen to have been drawn here to what appears in Chap. IV (pp. IV-35-36) and Chap. V (p. V-3) analyses to be a potentially devastating impact: housing.

5 Page III-9, item 3. The explanation of the Forest Service's role in land use should be clarified by an explicit mention, at least in the first paragraph, that its jurisdiction applies only to Federal lands administered by the Forest Service.

6 Page V-6, paragraph 2. This whole paragraph seems somewhat out of place in a chapter on unavoidable adverse impacts. The first sentence is unclear. It could be saying that some people will view the impacts as adverse and others as beneficial, in which case it still is waffling over whether it is an unavoidable adverse impact or not. Or, it could be saying that some people will accept the adverse esthetic impact for other reasons (benefits), which seems irrelevant. The second sentence, as now worded, appears to be a suggested mitigation, which would seem to be inappropriate in this chapter.

7 Page VII-2, paragraph 5. The first three sentences need better phrasing. It is not sufficiently clear that two different time frames (short-term and long-term) are being used to discuss irretrievability.

Our comments on the site specific analysis of the Red and Blue mines in part 2 are as follows.

Page 10. The figure on this page should be exchanged for that on page 10 of the site specific analysis of the Alton mine.

8 Page 22, item 9. The language of this mitigating measure needs to be clarified.

9 Page 38, paragraph 1. This introductory paragraph does not indicate, as does a somewhat similar introductory paragraph in Chap. III of the site specific analysis of the Alton mine, that all acreages to follow are "worst-case" figures. Is this the case?

10 Page 38, paragraph 5. This sentence on the undertaking of a paleontological survey doesn't seem to belong here. Chapter I D would appear to be a more appropriate place for it.

4 Impact owing to lack of housing is discussed in detail in chapter IV.

5 Text change.

6 Text change.

7 Text change.

8 Text change.

9 Unless otherwise specified, environmental impact assessments are made on a worst-case basis.

10 Text change.

11 Page 47, paragraph 5. This paragraph does not include mention of the type of adverse impacts of increased traffic cited in Chap. V of the site specific analysis of the Alton mine. It seems that it should.

12 Pages 49-50. This chapter does not mention the same long-term commitment of the air resource to some deterioration because of secondary growth, as does Chap. VI of the site specific analysis of the Alton mine. It seems that it should.

Our comments on the site specific analysis of the Kaiparowits Nos. 1-5 mines in part 2 are as follows.

13 Page 30, paragraph 1. This introductory paragraph does not indicate, as does a somewhat similar introductory paragraph in Chap. III of the site specific analysis of the Alton mine, that all acreages to follow are "worst-case" figures. Is this the case?

14 Page 30, paragraph 5. This sentence on the undertaking of a paleontological survey doesn't seem to belong here. Chap. I D would appear to be a more appropriate place for it.

15 Pages 39-40. This chapter does not contain any discussion of adverse socioeconomic effects, such as mentioned in Chap. V of the site specific analyses of the Red and Blue mines and the Alton mine. It seems that it should.

16 Page 40, paragraph 1. Neither explicitly nor by reference does this paragraph mention the type of adverse impacts of increased traffic cited in Chap. V of the site specific analysis of the Alton mine. It seems that it should.

17 Pages 41-42. This chapter does not mention the same long-term commitment of the air resource to some deterioration because of secondary growth, as does Chap. VI of the site specific analysis of the Alton mine. It seems that it should.

18 This chapter also does not contain the same discussion of socioeconomic short-term uses verses long-term productivity as do Chaps. VI of the site specific analyses of the Red and Blue mines and the Alton mine. It seems that it should.

11 Text change.

12 Text change.

13 See response 9.

14 Text change.

15 Text change.

16 In the absence of firm plans for access roads, impacts are not quantifiable. If coal were transported by slurry line or railroad, road deterioration would be small. Deer and livestock are seldom found along US-89 in this area. Mitigating measures would be required along the new Kaiparowits road as a condition of right-of-way grants. Thus, impacts similar to those for Alton would not occur.

17 Text change.

18 Text change.

19 Page 43. This chapter does not contain the same discussion of the irretrievability of water consumed or used as do Chaps. VII of the site specific analyses of the Red and Blue mines and the Alton mine. It seems that it should.

19 Text change.

Our comments on the site specific analysis of the Alton mine in part 2 are as follows.

20 Page 40, paragraph 2. This sentence on the undertaking of a paleontological survey doesn't seem to belong here. Chap. I D would appear to be a more appropriate place for it.

20 Text change.

21 Page 57, paragraph 7. To be more credible, the last sentence of this paragraph needs a few additional words, such as were given on page 42, to explain why the water of destroyed springs would still be available.

21 Text change.

The statement is being returned as requested.

Joseph B. Smith

Enclosure

cc: S. P. Wimpfen
W. A. McKinney
R. A. Pense

United States Department of the Interior
BUREAU OF RECLAMATION
UPPER COLORADO REGIONAL OFFICE
P.O. BOX 11568
SALT LAKE CITY, UTAH 84147

IN REPLY REFER TO: 151
120.1

Memorandum

To: Task Force Leader, Geological Survey, Room 505, Post Office Building, 350 South Main Street, Salt Lake City, UT 84111

From: Acting Regional Director

Subject: Review of Draft Environmental Statement on Development of Coal Resources in Southern Utah - Part 1 (Regional Analysis) and Part 2 (Site-Specific Analysis)

We have reviewed the above draft environmental statement and have the following comments:

1 1. Identification and quantification of proposed water sources are difficult to ascertain and evaluate. The environmental statement would be improved if there were a specific section discussing where water for each facility would be obtained.

2 2. We feel that heavy pumping of groundwater would have a significant impact on flows in adjacent streams. These flow changes would have a corresponding impact on downstream water users. Impacts should be identified. Specific cases would be Kanab Creek and Johnson Canyon.

3 3. It would seem appropriate to conduct a well drilling and observation program designed to study groundwater movement.

4 4. The potential impacts upon big game migrations and loss of water holes are not sufficiently addressed.

5 5. The sources and amounts of water required for the irrigation of reclaimed lands are not identified.

6 6. The mitigation plan does not mention measures to replace water holes that would be dried up with groundwater pumping. Development of guzzlers may be appropriate.

We appreciate the opportunity to review and comment on this document.

R. W. Wahlen

1 The water source for the mines is described in the proposed action, part 2, chapters I. Water sources for ancillary facilities and communities are not defined so they can be discussed only in a general sense.

2 The text has been augmented to describe the drawdown from pumping water from the Navajo formation at Alton.

3 Such a study is not within the scope of this EIS.

4 Big game migrations are usually initiated by advancing or receding snowlines, and snow fills their water needs. Loss of water on summer or winter range would be a more serious problem, but is not anticipated at the projected level.

5 The amount of irrigation required is currently undetermined but probably would not be significant. Most areas requiring irrigation for reclamation would need water for 2 years to establish natural vegetation.

6 In part 2, under "Legally Enforceable Mitigations," an objective of replacing lost water was established. The company and surface management agency should determine how to reach the objective.

United States Department of the Interior

BUREAU OF RECLAMATION
UPPER COLORADO REGIONAL OFFICE
P.O. BOX 11568
SALT LAKE CITY, UTAH 84147

IN REPLY
REFER TO 460
120.2

Memorandum

To: Director, U.S. Geological Survey
National Center, Mail Stop 108
Reston, VA 22092

From: Regional Director, Salt Lake City, Utah

Subject: Draft Environmental Statement, Development of Coal Resources in Southern Utah - (DES 78-31)

1 The estimated water requirement for the powerplant in Table I-4 on page IV-7 is based on 15 acre-feet per year per megawatt. Although this rate has been used for several years, the average of several powerplants' actual consumption over several years is less than 10 acre-feet per year per megawatt. If the rate of 10 was used for estimating, then the water consumed would be about 28,000 acre-feet per year instead of 41,826 shown on page IV-7. Also, Table I-4 on page I-14 should state that the water required for slurry provides part of the powerplant requirement.

2 Environmental Impact "N" on page VI is not supported by text and does not seem reasonable. We have no other comments.

cc: Commissioner, Attn: 150
Director, Office of Environmental Project Review, Office of the Secretary, Department of the Interior, Washington, D.C. 20240
Regional Director, Attn: 150

1 Estimated water requirement for the powerplants in table I-4 was obtained from the proponent. Discussion on re-use of slurry water in powerplants has been added to tables and the text.

2 Competition for labor and impact to those on fixed incomes are discussed in greater detail in chapters IV and V. Competition for labor is expected because existing area businesses would have to compete with the higher-paying mining sector. Those on fixed incomes could suffer as prices, particularly for housing, increase.

United States Department of the Interior

OFFICE OF SURFACE MINING
Reclamation and Enforcement
WASHINGTON, D.C. 20240

Memorandum

To: Director
U.S. Geological Survey

Thru: Assistant Secretary
Energy and Minerals

From: Director
Office of Surface Mining

Subject: Review of Draft Environmental Statement entitled Development of Coal Resources in Southern Utah

The Office of Surface Mining (OSM) has reviewed the draft environmental impact statement (EIS) entitled Development of Coal Resources in Southern Utah and has the following comments.

The regional analysis (Part 1) adequately discusses the broad impacts that could occur as a result of coal development in the region and has found that there are some potentially significant impacts which cannot be properly assessed at this time. For example, more mine planning information and baseline data are needed to evaluate the effect that surface mining in the East Alton area might have on air quality in Bryce Canyon. OSM concurs that it is sufficient to point out this potential problem, as is done on the regional analysis, and to conclude that air quality standards might be violated because the concerned public is put on notice that different or additional measures will be necessary if the project is allowed to proceed.

While we feel this approach is acceptable for an analysis which assesses the level of activity that may be tolerated in a region, we do not believe it is sufficient for the Site Specific Analysis (Part 2). That analysis should be based on a definite plan of action and should point out specifically where a deviation from the plan will be allowed or required. In our view, this is necessary so that an impact, such as that on air quality in Bryce Canyon, can be properly understood and evaluated by decisionmakers and the concerned public.

No response required.

After the individual mine and reclamation plans described in this EIS are revised to meet requirements of OSM's initial or permanent regulations, as applicable, and other applicable State and Federal laws, OSM will be preparing an environmental assessment (EA) of the potential of the proposed operations to comply with the Surface Mining Control and Reclamation Act of 1977. The significant differences between the environmental impacts of the plans as described in the final EIS and the final plans submitted to OSM will be identified. OSM will use the EA to determine whether each new plan differs from the plan in the final EIS to such an extent that a new site-specific EIS evaluating the mine plan is required.

United States Department of the Interior

HERITAGE CONSERVATION AND RECREATION SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO:
DES-78/31 - G.S.

Memorandum

To: Director, U.S. Geological Survey

From: Director, Heritage Conservation and Recreation Service

Subject: Review of Draft Environmental Statement, Development of Coal Resources in Southern Utah

This is in accordance with your August 14, 1978, memorandum requesting review of the statement noted above.

General Comments - Recreation

1 Both volumes contain several references to the visual impacts which would result from these projects, mainly from land disturbing activities and a decline in the area's air quality. We are especially concerned that the Alton East mine will be visible from Yovimpa Point in Bryce Canyon National Park and other points along the Paunsaugunt Plateau (p. 37, Vol. 2). This problem is compounded by the possibility that the Alton East mine will violate class I PSD standards for Bryce Canyon National Park (p. IV-11, Vol. 1). We do not believe that locating these mines in such close proximity to the park is in the best interest of preserving its scenic and recreational quality. Therefore, we recommend that consideration be given to development of other sites which would not result in adverse visual impacts to Bryce Canyon National Park.

2 Page IV-25, Volume 1 indicates that access roads for the Kaiparowits No. 5 and El Paso Blue Mines will traverse a roadless area, as will the upgraded road between Escalante and the Blue mine. It appears that traffic levels on these roads would threaten the natural quality of Devil's Garden and Escalante Canyon. If alternative routes for these transportation corridors are available, we recommend that they be given consideration in order to preserve to the greatest possible extent the aforementioned natural areas.

3 The route of the proposed Dominguez-Escalante Trail lies near the project area in the southern part of Glen Canyon National Recreation Area and the vicinity of Glen Canyon City. It appears that the proposed improvements to the Pilot Rock Junction-Glen Canyon City jeep trail could intersect the trail corridor. This trail has been proposed for inclusion in the National Trails System. Although there are no

1 During the life of the Alton mine, mining activities viewed from Yovimpa and other points may add or detract from the viewshed, depending upon the viewer. After reclamation, the mined area may enhance the viewshed by adding to the color, lines, and forms. The existing viewshed is not pristine, and would tend to be monotonously pinyon-juniper if it were. Under dust control procedures required by BACT (EPA), the class I PSD standards would not be exceeded in Bryce Canyon National Park. This issue will receive consideration by the Department of the Interior prior to granting a permit to mine.

2 The Page-Escalante road is a county road that bisects a potential roadless area recommended for further study prior to proposed inclusion in the wilderness system. (See text clarification, chapter III.) Before the road is upgraded, an assessment would be made that would be attentive to preserving the integrity of natural and historic areas.

existing statutory restrictions for protection of the trail corridor, we suggest that impacts on the historical integrity of the corridor be considered in further project planning, and that the road be located as far from the corridor as possible in order to minimize these impacts.

3 In addition, the Escalante River from its source to Lake Powell has been identified by the Secretaries of Interior and Agriculture as a potential addition to the National Wild and Scenic Rivers System, pursuant to Section 5(d) of the Wild and Scenic Rivers Act of 1968 (P.L. 90-542). At this time there are no statutory restrictions for protection of the river, and it does not appear that the proposed projects will have any direct impacts on it. However, future project planning, especially further expansion of coal production, should take into account the river's scenic and recreational qualities.

4 Figure II-20 (p. II-85, Vol. 1) shows that new transmission lines will be constructed on several routes. However, the map is not detailed enough to indicate whether any of the proposed lines will cross recreation areas. Numerous recreation areas in Utah have been acquired or developed with matching assistance under the Land and Water Conservation Fund Act of 1965, as amended. Should a proposed transmission line cross a recreation area which has received such assistance, Section 6(f) of the Act would apply. Section 6(f) requires that changes from the recreational use of the land be approved by the Secretary of the Interior. Any request for a change in land use must be initiated through Mr. Gordon E. Harmston, Executive Director, Department of Natural Resources, 438 State Capitol, Salt Lake City, Utah 84114, phone (801) 533-5356.

5 It does not appear that discussions of socioeconomic impacts have given adequate consideration to recreation in area communities which will have to cope with substantial population increases (p. II-97, Vol. 1; p. IV-31, Vol. 1). For example, page II-78, Vol. 1, mentions that several towns are in the process of improving their recreational facilities, but the document does not contain any information on capacity or projected use figures for these facilities. The final environmental statement should contain such information, perhaps in a format similar to Tables II-32 (p. II-86, Vol. 1) and II-33 (p. II-88, Vol. 1).

6 In general, the final statement should be much more responsive to local recreational concerns and should discuss how the adverse impacts of a rapidly increasing population will be mitigated. The attention given to the area's outstanding national recreation and scenic resources is commendable, but does not adequately cover the full range of recreation impacts which can be expected.

3 Such consideration is required by NEPA.

4 Permits must be obtained prior to crossing State or Federal lands. Should the powerline cross a recreation area, and should a change in use be required, the permit process will include obtaining needed clearances from the State of Utah, Department of Natural Resources, before the permit is issued.

5 Table IV-17 provides projected community needs for the three scenarios. This data was provided by local governments and represents their analysis of the city recreation situation. It is a summary table and does not detail the needs.

6 All recreational impacts expected by service representatives and by representatives of other recreation oriented agencies are fully described and quantified in the EIS. Much of the response to recreation impacts will depend on local planning and financial ability. Analysis of these programs is not within the scope of the EIS.

7 We also recommend that the Heritage Conservation and Recreation Service be included in Chapter III, Part C, as the administrative agency for the Land and Water Conservation Fund. The information should reflect the aforementioned requirement for approval of a change in land use in any park receiving assistance from the Fund.

Cultural Resources

8 On the basis of the Regional Analysis (p. II-87 to 93, Vol. 1), consideration of prehistoric resources in the planning for land and resource use in the region is apparently well in hand. The results of the AERC surveys should be useable in individual project planning within the region. It is unfortunate that these results were not applied to the three site specific analyses in Volume 2. Apparently all of the mines will be located in areas of medium site density. (Figure II-22, p. II-90, Vol. 1) The implications and impacts of this should be discussed where appropriate in Volume 2. It is important to protect and preserve cultural resources; therefore, such resources must be a factor in the planning for projects.

Summary Comments

We are extremely concerned that development of these projects, and possible expansion at a later date, will seriously degrade the quality of recreation in southern Utah. The decision to abandon the Kaiparowits Power Plant project was largely due to an interest in preserving the area's scenic and recreational values. It appears that this proposal will involve many of the same types of impacts and that it could start a trend toward wide-ranging resource development that would compromise the scenic and recreational integrity of the area. Therefore, we believe that serious consideration should be given to the No Action Alternative and Low Level Scenario, and that alternative locations for coal development, which would avoid the scenic and recreational impacts associated with the Kaiparowits Plateau, should be thoroughly analyzed.

for Chris Therral Delaporte

7 No such lands are included in any of the actions under consideration.

8 See comment from State Historic Preservation Officer.

United States Department of the Interior

NATIONAL PARK SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO:
L7619(135)

Memorandum

To: Director, Geological Survey

Through: Assistant Secretary for Fish and Wildlife and Parks

From: Director, National Park Service

Subject: Draft Environmental Statement, Development of Coal Resources in Southern Utah (DES 78-31)

The National Park Service has carefully reviewed the subject EIS. The project appears to have potential for adversely affecting several units of the National Park System adjacent to the affected area. Potential effects include (1) reduction of air quality at Bryce Canyon National Park and perhaps Capitol Reef National Park; (2) damage to park resources at Bryce Canyon National Park from blasting; (3) impairment of visitor experiences at Glen Canyon National Recreation Area; and (4) reduction of water quality in tributary streams of the area. Careful monitoring of potentially disruptive activities should be undertaken to facilitate early detection and mitigation of effects. If it cannot presently be assured that adverse impacts to parks will not occur from mining production, coal transportation or its use at powerplants, permits for these activities should contain provisions for curtailing or modifying such operations until effective mitigating measures can be installed.

The following comments on specific sections of the DES are provided for your consideration in preparing the final environmental statement.

Part 1 Regional Analysis:

1. The Summary (page v), Item 2.B. indicates that the projected level of coal development "*** includes the Allen-Warner Valley (AW-V) energy system ***" which, as indicated elsewhere in the DES, is the subject of another environmental statement under preparation by the Bureau of Land Management. The scenario selected as the more viable, i.e. 12 million tons per year (mty) production envisions a delivery of 10.5 mty to the Allen-Warner Valley project, the remainder to be delivered to other markets. This DES does not address in detail the impacts of the Allen-Warner Valley System. However, based on sketchy information presented in this DES, and data gleaned from other sources, we understand that there are serious environmental problems associated with at least the

The draft statement has been revised to clarify the analysis. Except for air quality, the impacts mentioned are not probable, but were stated as unlikely possibilities. Adverse air quality impacts would almost entirely be eliminated by use of BACT regulations required by EPA and the text has been rewritten to reflect these requirements.

The 12 mty scenario is based on feasible coal transportation. The A-WV project contains a detailed proposal for transport of 10.5 mty and minor upgrading of the current road network on the Kaiparowits Plateau would allow movement of 1.5 mty.

Warner Valley portion of the proposed energy development system. In view of the tenuous character of the major market, we question the viability of the 12 mty scenario.

2 2. Although the Kolob coal field is identified as a resource, there is only sporadic discussion of the environmental effects of development within it, and, consequently, we are concluding that none is proposed, and that this DES is not considered to provide support for such development.

3 3. Page I-8, ltem B.2.b: We question this procedure to handle the subject of surface use permits. Bureau of Land Management, Forest Service and the National Park Service, as well as the State, may all be involved.

4 4. Also relating to "Required Authorization," we are aware that current Environmental Protection Agency regulations exempt fugitive dust from control under the total suspended particulate increment of the prevention of significant degradation provisions of the Clean Air Act. The regulation in which that position was taken by the Administrator of the Environmental Protection Agency invited input from the public pertaining to the subject indicating that he would consider reversing that preliminary decision. The Service disagrees with this EPA position. We believe that without adequate control, fugitive dust can become an important factor in the prevention of significant deterioration in pristine air quality areas such as the national parks. Although coal mining is not the sole source of fugitive dust, in this instance it must be considered as a major source. Technology for modeling the transport, dispersion and concentrations of fugitive dust has developed rapidly. We feel strongly that fugitive dust be included as a controlled emission under PSD for Class I areas. If this is done, additional authorization will be required, including the authority to redesignate road corridors where Class Il TSP increments will be exceeded.

5 5. Page 1-11, Item D.2: The road crossing "*** a corner of the Glen Canyon National Recreation Area ***" is about 12 miles long.

6 6. Table I-3: The coal production for 1985 and 1990 at the projected level of development is more than zero.

7 7. Page I-15, Item 12: In Chapter 11 (page 101), it is indicated that recreation visits within the coal region grew at 7.2 percent/year during the period 1966-1976 and it is expected to continue to grow at that rate. This appears to indicate a volume of traffic on the region's roads that increases independently of regional population. The relationship between regional population growth, recreation visits, and traffic volume should be clarified.

8 8. Page I-15, Item 13: There are constraints on unlimited expansion of the existing highway system that could easily frustrate the basic assumption expressed here. Two of these are (1) topographic or other

2 There are no detailed proposals to mine coal from the Kolob coal field.

3 Insofar as the issuance of rights-of-way on public lands, the BLM is the responsible agency. As suggested, BLM will coordinate with USFS or NPS as well as the State.

4 Text change.

5 Text change.

6 Table corrected.

7 Regional traffic volume has increased at a rate independent of population growth.

8 This was considered and discussed with both the Planning and Safety sections of the Utah Deparment of Transportation. The State highways of southern Utah are underloaded (US-89 least so) to the extent that projected levels of traffic can be carried on the existing system with local upgradings as described in the EIS.

engineering considerations, and (2) administrative jurisdictions which recognize other purposes associated with the public use of the roads that would be adversely affected by industrial-commuter traffic.

9. Page II-16: The discussion of water use in Utah is incomplete. The Federal reserved water rights doctrine does, in fact, protect stream flows for the purpose of perpetuating aquatic resources.

9 Text change.

10. Table II-4: The table should indicate the susceptibility of various soil types to wind transport.

10 Discussion of wind erosion is added.

11. Page II-21, next to the last line: Northwest should be northeast.

11 Text change.

12. Figure II-9: There is no evidence of awareness of the existence of air quality monitoring, including records of visibility being generated by personnel and instrumentation at Bryce Canyon, Capitol Reef, and Zion National Parks. These parks also operate official weather stations.

12 Text change; the data points were used and were inadvertently omitted in the draft EIS.

13. Page II-12: Is Johns Valley the sole source of limestone? Use of this source would compound an already difficult traffic problem on U-12 through Bryce Canyon National Park. The Kaiparowits project identified an alternate source on Canaan Peak.

13 Text has been changed to include the Canaan Peak area northeast of Henrieville.

14. Page II-31: What constitutes an adequate data base to determine baseline visibility? We have results of studies conducted by the Lowell Observatory at Bryce Canyon National Park indicating periods when the only impairment to visibility is the molecular composition of the air itself. We have 2 years of data derived from visual observations from various points overlooking much of the coal region recording what could be seen twice each day. These include observations from two Class I areas within the coal region and other areas administered by the National Park Service in its vicinity including three other Class I areas. All the Class I areas involved in the discussion above have been identified by the Secretary of the Interior as having visibility as an important value. Most of these stations have been instrumented in recent months. Certainly there are sufficient data to develop at least a tentative local visual range for the lines of sight monitored.

14 Text change.

15. Page II-28 and Table II-9: Oxidants are traditionally thought of as primarily urban pollutants, but evidence is increasing that ozone occurs in rural areas in unexpectedly high concentrations. The text on page II-28 is consistent with these recent findings in the oil shale areas. The concentration of oxidants measured at the Fremont River station is also surprisingly high, although within National Ambient Air Quality Standards (NAAQS). Is there an explanation for the relatively high ozone concentrations measured at that site?

15 Text change.

16. Page II-36, third paragraph: We doubt that lack of time and shortage of moisture in 1977 has much, if anything, to do with the possible occurrence of endangered plants on lease or facility areas. Coal is

16 Text change. Site specific surveys are required prior to any disturbance, and protection is required if threatened and endangered species are found by the survey.

normally found underground. Plants normally grow on the surface. They do not normally coincide. The important question is unanswered. That is, do they occur on lease or facility areas or areas where urban areas will be developed or recreational activities will take place.

17 17. Page II-45, third paragraph: The words "where applicable" need to be inserted at the end of the first sentence to protect Federal interests.

18 18. Page II-58: The large percentage of employment in Government service is attributed to the concentration of areas administered by the National Park Service. On page II-65 (first paragraph), it is stated that large State and local government employment is the main reason. Which is correct?

19 19. Page II-81: The road through Zion National Park is a park road linking two segments of U-15, not a part of U-15.

20 20. Page II-83: The Notom Road, described as access to the west side of the Henry Mountains, is not shown of Figure II-19. The road is also partially inside Capitol Reef National Park.

21 21. Page II-84: Figure II-21 is not in the report.

22 22. Page II-86 (Table II-32): Capitol Reef National Park is surely within the zone of recreational influence in its entirety. This same comment also applies to Table II-33.

23 23. Page II-1: Each area administered by the National Park Service is established by separate legislation (Presidential Proclamation in the case of national monuments) which provides guidelines for management. The latitude to permit road, utility crossings, etc., in areas administered by the National Park Service is generally precluded by the Agency's organic legislation. In some cases, that latitude is restored by the enabling legislation for individual areas.

24 24. Page III-10, Item 4: In most cases, the body of legislation and management policy precludes the issuance of such permits. In any case, such permits will require close review and strict NEPA compliance.

25 25. Page III-14: There are also management objectives for Zion National Park which would pertain to coal development in the upstream watersheds of in-park water courses and in the Kolob field. We suggest that the environmental impact statement team contact the park staff for inclusion of these in the final environmental statement.

26 26. Page IV-4: In Chapter II, the source of limestone was identified as Johns Valley. We suggested in our earlier comment Canaan Peak as an alternative source. We agree that impacts cannot be quantified until source and volume requirements are known.

17 Text change.

18 Text change. Draft EIS text, on page II-58, describes economics and tourism related to Federal parks. Text on page II-65 describes employment.

19 Text change.

20 Text change.

21 Map is in pocket.

22 Capitol Reef National Park was not included in its entirety (low, projected, medium levels) because the driving time indicates a low potential for an increase in resident and new resident use. The park is included in the high level scenario, as are others. At the high level, access and driving time are the limiting factors that exclude the north part of Capitol Reef and several other recreation areas.

23 The comments are accurate.

24 The comments are accurate.

25 Text change.

26 Text changed to identify Canaan Peak.

27 27. Page IV-9 (Table IV-1): We are uncertain as to whether the Kolob field is being examined in the DES or not. References to it appear sporadically throughout, but it is never clearly analyzed, nor is any proposal made for it. It is included in this table, but for no apparent purpose. Since we have no idea what analysis process was used to produce the projected TSP concentration, we cannot comment on its validity, except to suggest that it is irrelevant.

28 28. Page IV-11: The fifth paragraph demonstrates a dichotomy of opinion over the air quality impacts of the Warner Valley Powerplant. The only one of four studies which minimizes the air quality impacts of the plant, including PSD values not to be exceeded, is the one by Aerovironment which apparently ignores visibility degradation caused by the Warner Valley plant in Zion National Park, a mandatory Class I area where visibility is an important value. At least there is no comment about it attributed to Aerovironment in the DES. Since we cannot be assured that the Warner Valley plant will meet PSD requirements, and the sole market for Alton coal is Allen-Warner Valley, it seems appropriate to describe and evaluate the Alton mine as supplying only the Allen plant (we have yet to discover the facts on emission effects of that plant) and highlight that situation in the summary. For further elaboration on our concerns about air quality impact modeling for the Warner Valley plant, refer to memorandum dated May 5, 1978, from our Assistant to the Regional Director in Utah, forwarded to your Task Force Leader, Interagency Environmental Task Force, Salt Lake City, Utah.

29 29. Page IV-13 (Table IV-2): Same comment as 27.

30 30. Page IV-44: The middle paragraph here ignores the dichotomy of opinion among experts about the degree to which the Warner Valley plant will exceed PSD increments and degrade visibility. Refer to 28 above.

31 31. Page IV-16, second paragraph, second sentence: The DES has presented data pertaining to measured visual range (pages II-28 and 31) exceeding 35 miles. The accuracy of visual range estimations based on estimated pollutant concentrations is questionable.

32 32. Page IV-16, second paragraph, fourth sentence: Does this mean that the coal region near the Alton Mine would experience a 43 percent reduction in visibility resulting from increased TSP caused by mining-related activity? That is the way the sentence reads to us. Is Bryce Canyon National Park "near" the Alton Mine?

33 33. Page IV-24, paragraph three: The water section, page IV-6 indicates some, probably insignificant, increase in sediment movement to the Colorado River. The magnitude of additional sediment loads in the streams nearer the mines should be discussed.

34 34. Pages IV-53-54: The assumption here is that increased population and other mine-related impacts on the town of Page will be within the excess capacity extant in the community. The basis for this conclusion should be indicated.

27 Kolob field is within one of the air quality modeling areas and must be included in the EIS.

28 Text change.

29 See response to comment 27.

30 Text has been clarified. None of the studies to date have indicated the Warner Valley plant would exceed SO_2 limitations.

31 Text change.

32 Text change.

33 Text clarified; no increases have been identified.

34 Text changed and clarified.

35 35. Pages IV-56-57: Although the text on page IV-59 describes an alternative route to the Blue and Kaiparowits Mines, the projected traffic volume (1990 ADT 2,988; Trucks 612) is indicated to be impacting the existing county-maintained road through Glen Canyon National Recreation Area. If the alternate route is constructed, presumably the projected traffic volume would be redirected in its entirety.

36 36. Page IV-60 (Figure IV-5): The figure is misleading in that it overstates the condition of the Smoky Mountain Road and the existing roads in Glen Canyon National Recreation Area.

37 37. Page V-2: Paragraph four again understates substantially the existing visual range. What does "around the impacted areas" mean? If Bryce Canyon National Park (only 3 miles from the eastern end of the Alton lease) is around the impacted area, a reduction in visibility to 17 miles will be almost assuredly unacceptable under the visibility protection regulations regardless of how they are written.

38 38. Page V-3: This section should also indicate that the Warner Valley project will probably exceed PSD increments and adversely affect visibility in Zion National Park.

39 39. Page VII-33 (Table VIII-20): State Route 276 (Study Route 505) is on the same alignment as that of the "*** scenic, low-speed road, ***." referenced in Section 8 of Public Law 92-593. The statute also directs that:

> "In determining the route for this road, special care shall be taken to minimize any adverse environmental impact and said road is not required to meet ordinary secondary road standards as to grade, alignment, and curvature ***."

If the Congress determines that this road is to be constructed, they have the option of designating it to solely recreation traffic. We are compelled to preserve that and all other options for their determination. We cannot, therefore, commit its future use to any form of traffic mix.

40 40. Page VIII-38 (Figure VIII-1): Please note that the figure indicates maximum 3-hour SO_2 concentrations far in excess of PSD Class I increment in Capitol Reef National Park.

41 41. Page VIII-39: The potential disruption of aquatic and riparian ecosystems resulting from the King Cannel project includes the potential for adversely affecting those ecosystems in Zion National Park.

42 42. Pages VIII-44-48: If any of the additional mines considered in this alternative become serious proposals, the effects of hauling on existing roads in or adjacent to national parks would require a much more thorough examination of impacts on park resources and the visiting public.

35 The comment is accurate.

36 Text change.

37 Text change.

38 Text clarified; see comment 30.

39 Text describes the conflict.

40 Text change.

41 Text change. There is no evidence for this impact.

42 The comment is accurate.

Part 2 - Site Specific Analysis El Paso Coal Company - Red and Blue Mines

43 1. Pages 13 and 16: This mining proposal affects use of the existing county-maintained road in Glen Canyon National Recreation Area. We have discussed this at considerable length in preceding comments and refer to them by number: 5, 7, 8, 23, 35, and 39. It is interesting to note that the proponents appear to favor the alternative (outside the national recreation area) route for operation of the much larger Red Mine.

44 2. Page 25: The susceptibility of the various soils to wind transport should be indicated.

45 3. Page 29: We have already commented on the estimated visual range (37 miles) versus measured visual range. Part 1 of the DES reports (page II-31) a measured visual range at Page of 72 miles.

46 4. Page 33: A more complete assessment of socioeconomic impact from this proposal on the town of Page should be provided. As written the text contains only one sentence on this subject.

47 5. Page 34 (Figure 12): This map overstates the conditions of the Smoky Mountain Road and other existing roads in Glen Canyon National Recreation Area.

48 6. Page 35: Check the 6-mile figure for length of proposed haul road in the national recreation area. We think it is more like 12 miles.

49 7. Page 40, fourth paragraph: How many miles are "a few?" Lake Powell is less than 20 miles away, and the national recreation area is virtually adjacent. What happens when existing stream channels become filled with sediment? Do new channels develop requiring relocations of bridges and culverts?

50 8. Pages 40-41: Although visibility impacts are described as greatly reducing visibility in the area of the mine, nothing is said about visibility here.

51 9. Pages 49-50: Degradation of air quality and visibility should appear in this chapter.

52 10. Page 58, Item H: We wonder why the alternative coal haul-commuter route (outside the national recreation area) is not mentioned here.

Kaiparowits Number 1-5 Mines

53 1. Page 2 (Figure 1): Same comment as five above.

54 2. Page 12: We have trouble resolving the statements made in paragraphs three and four relative to the road in the national recreation area and the map (Figure 7) which shows the same alternative route, as mentioned

43 The principal and alternative routes are included in the EIS discussions.

44 Text change.

45 Text change.

46 The text has been revised.

47 Text change.

48 Text change.

49 Text change.

50 Text change; an expanded discussion of air and visibility impacts has been added to this and the regional text.

51 See response to comment 50.

52 The text has been revised.

53 Text change.

54 Text change relating to roads. Water for the Kaiparowits No. 5 mine would come from test wells on the leasehold, not from Lake Powell. Later, Lake Powell water would be used for Nos. 1-5 mines. Text addition made.

earlier to serve the Red Mine. Also refer to comments numbered in (1) above. We also suggest that it be indicated here that permits from the National Park Service would be required for the waterline and related facilities from Lake Powell across lands administered by the national recreation area to the mine.

55 3. Page 23: Visual range again. See comment in Part 2(3) above.

56 4. Page 28: Same comments as Part 2(4).

57 5. Page 31: No mention of increased siltation.

58 6. Page 32: It is interesting to note that the description of air quality impacts, as well as others, is more elaborate in Part 1 for the specific proposals than it is in Part 2. Visibility is described as being greatly reduced in Part 1.

59 7. Page 49, Item G: The inference in the first sentence that the National Park Service is being arbitrarily recalcitrant in refusing to permit the reconstruction of the county-maintained road in Glen Canyon National Recreation Area is inappropriate. Our concerns and the basis for them are well known to the task force, the companies, and the officials of the State of Utah and Kane County, refer again to comment 39 Part 1.

Alton Mine

60 1. Page 13: It is difficult to comment on a draft with the prior knowledge that the proposal being evaluated is already under substantial revision.

61 2. Page 17: We are not aware of any part of this mining proposal that would have the effect of reducing stream flows in the Virgin River. If the stream flow reduction being discussed stems from the Allen-Warner Valley proposal, this statement should be in the environmental statement. If we have missed something and stream flow reduction is anticipated, through Zion National Park, an evaluation of the relationship of the effect and the objectives of the national park should be provided.

62 3. Pages 23-24: Susceptibility of the various soils to wind transport should be indicated.

63 4. Page 30: Same comment as above about estimated visual range.

64 5. Page 34: The DES states that the Virgin River drains part of the mining area. Map (Figure I-2) does not show the proposed mining area in that watershed to any significant extent. Is this an oversight, or does it mean that leases on State land (which are in the watershed) are included in the proposal?

55 Text change.

56 See response to comment 46.

57 Text has been clarified, impact is insignificant.

58 Text change.

59 Text change.

60 A revised mining and reclamation plan or A-WV project proposal will require additional and further assessment.

61 The comment is accurate. The statement was made to indicate an unlikely possibility. Text is revised.

62 Text change.

63 Text change.

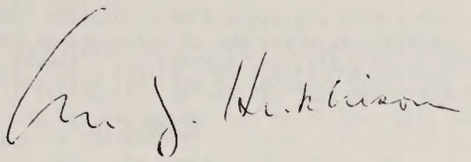
64 Text change. A minor part of the area is in the Virgin River watershed (see the Water section).

65 6. Page 43, Item 3: Same comment about estimated visual range. What does "near" mean? Bryce Canyon National Park is about 3 miles away. Will visibility be degraded in the park? In other places it is said that visibility will be reduced to 17 miles, here it says by 17 miles. Small point with the erroneous visual range of 37 miles, but maybe significant if background visual range was calculated at 80 miles, which is more likely the case.

66 7. Page 59: The overview of mining activities in the east end of the lease area would be a major intrusion from the Yovimpa Point overlook in Bryce Canyon National Park.

67 8. Page 63: The coal itself should probably be considered a resource that is irreversibly and irretrievably committed.

68 9. Page 41, second paragraph: Here the effect of blasting on the rock formations in the park is minimized, yet on page 52, it seems to be considered a real possibility that they will be adversely affected. We need to be absolutely certain that no activity associated with the mine will have that effect. If we cannot be adequately assured, a monitoring system and a GS permit with provisions to stop or modify mine operations if effects occur should be provided.



65 Text change.

66 The overview of mining during the last 5 years in the east end of the lease area would be a major intrusion into a near-natural setting, as viewed from Yovimpa Point in Bryce Canyon National Park. However, after mining and reclamation, the strip-mining area as viewed from Yovimpa Point would appear as an extension of existing cultural modifications in the present landscape character.

67 The intent is to identify those resources that would be impacted by recovery of the resource being developed.

68 Text changed. The mining company will be required to monitor and adjust blasting operations if needed. (See Alton site specific for requirements relative to this situation.)

United States Department of the Interior
FISH AND WILDLIFE SERVICE
AREA OFFICE COLORADO—UTAH
1426 FEDERAL BUILDING
125 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84138

In Reply Refer To (ES) SLC

December 20, 1978

Memorandum

To: Director
U.S. Geological Survey
Reston, Virginia

FROM: Acting Area Manager
Fish and Wildlife Service
Salt Lake City, Utah

SUBJECT: Draft Environmental Statement-Development of Coal Resources in Southern Utah DES 78-31

We were unable to prepare comments on the draft statement during the review period. Although the deadline is past, we submit these comments in event they may still be useful to you in preparing the final statement.

The opportunity to comment is appreciated.

General Comment

1 We were surprised to note the very low rate of recovery predicted for some of the proposed coal leases. For example, as little as 32 percent of in-place coal would be recovered at the Red Mine (Reserve Area A), with the remainder rendered in accessible for future use.

We believe that when leasing coal, or any other nonrenewable resources, belonging to the public, there is an obligation to achieve the highest possible recovery rate. Other things being equal, mining operations achieving higher rates of recovery should disrupt smaller or fewer areas while producing the same amount of coal. This would lessen adverse environmental impacts for the present and leave more coal undisturbed for future use when technology and economics may increase the recovery rate.

We urge that the relationship between varying rates of recovery and cumulative environmental impact be addressed. Any significant difference between alternate sites or mining plans in this respect should be displayed in the statement as a consideration for decision making.

1 The EIS considers the mining and reclamation plans that are proposed on existing leases. Coal recovery is a function of both mine safety and economics (see also letter from Gordon Anderson, response 5). The Secretary may consider several alternatives relative to approval to mine (see chapter VIII in each site specific in part 2).

Specific Comments-Regional Statement

2 IV-7-2 full paragraph:

"Water for mines and possible new communities (table I-4) would likely preempt water presently used for other purposes, mainly agriculture. Such a change in water use would not likely affect Utah's share of Colorado river water or the salinity of the Colorado River."

On the Kaiparowits Plateau there is very little irrigated agriculture from which water could be transferred for project purposes. It is therefore probable that most water consumed by mining and energy related facilities would be water that otherwise would enter the Colorado River.

In the case of the proposed Kaiparowits Project, the Bureau of Reclamation calculated that the estimated depletion of 50,000 acre-feet per year would increase salinity at Imperial Dam by 2.0 milligrams per liter. A 1974 study indicated that each milligram per liter increase in salinity caused an annual damage of $230,000 to agricultural, municipal and industrial users in the Lower Colorado Basin.

Although aquatic habitat for fish and wildlife is probably less sensitive than agriculture and industry to small salinity increases, cumulative increases are of concern.

It seems reasonalbe that downstream impacts similar to those projected for the Kaiparowits project could result from mining and related operations covered in this statement. We realize that water depletions caused by power plants or coal conversion facilities will probably be addressed in separate statements. However, in much of southern Utah, power plants and coal mines are practically inseparable. A power plant is usually the main reason for the coal mine's existence. Therefore, we believe that a general statement of cumulative downstream impacts on water quality would be appropriate.

IV-18-Paragraph 2:

3 "At the end of 3 years, 90 percent of the disturbed areas will be revegetated to a level of useable forage at least as high as before disturbance (BLM, 1975). It is assumed that after 5 years these sites will produce more useable forage than their present low level (Phillips, 1976)."

2 Text has been changed to clarify and further address potential impact on salinity of the Colorado River.

3 There is a distinction between reclamation and restoration. The areas can be reclaimed as indicated in the text. They can never be completely restored. Reclamation to satisfy wildlife needs can be more fully realized by selective placement of rock or rock piles, transplanting local brush and shrubby tree species, and moving surface soils from an area being stripped directly to an area being restored.

We believe this paragraph, though perhaps technically correct, is misleading. It is probably true that some type of vegetation could be re-established on 90 percent of the disturbed areas by the end of three years, given enough irrigation and intensive care. However, complete restoration, including plant succession and re-establishment of microorganisms would take much longer. This is especially true where trees or other woody vegetation are concerned.

3 It is also probably true that after five years the reclaimed sites may produce more useable forage (for certain types of animals) than the present level. However, it is doubtful that this would be true for all animals.

It also should be noted that on many disturbed areas, particularily those related to underground mining, reclamation can not begin until after the end of project operations, an average of about 35 years. From 100 to 200 years would be required to restore a mature stand of juniper or ponderosa pine.

William S. White

U.S. DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
4015 Wilson Boulevard
Arlington, Virginia 22203

Dr. H. William Menard
Director, U. S. Geological Survey
National Center, Mail Stop 108
Reston, Virginia 22092

Dear Dr. Menard:

In response to Dr. Henry W. Coulter's letter of August 14, 1978, we have reviewed the copy you furnished of your two-part draft environmental statement on the development of coal resources in southern Utah.

Our comments are just a few. The statement seems to be totally comprehensive and presents an excellent analysis of possible effects likely to occur with the future development of coal resources in the region. The mining operations, by fully complying with all State, Federal, and local requirements, should not present any problems to us. We would schedule our safety and health inspections accordingly when coal mines become operational in the region.

Thank you for giving us the opportunity to review and comment on your statement.

Sincerely,

Robert B. Lagather
Assistant Secretary for
Mine Safety and Health

No response required.

STATE OF CALIFORNIA—THE RESOURCES AGENCY
EDMUND G. BROWN JR., Governor

COLORADO RIVER BOARD OF CALIFORNIA
107 SOUTH BROADWAY, ROOM 8103
LOS ANGELES, CALIFORNIA 90012
(213) 620-4480

October 18, 1978

Director
U. S. Geological Survey
National Center, Mail Stop 108
Reston, Virginia 22092

Gentlemen:

We have reviewed the Draft Environmental Impact Statement concerning the proposed Development of Coal Resources in Southern Utah (DES 78-31) which was transmitted to the Environmental Protection Agency on August 11, 1978. The Colorado River Board is primarily interested in the impact on salinity of the river as a result of development of the coal resources in southern Utah and the use of that coal at the proposed Allen-Warner Valley electric power generation plants. Specific changes that we have concluded should be made in Part I of the report are as follows:

1 Table I-4 on page I-14

Water requirement in table for "mines" and "added community" should be reconciled with quantities shown for the specific sites in Part 2 of report.

2 Page I-15 or I-16

An additional basic assumption should be added to the list on the pages cited that would incorporate the following policy adopted by the Colorado River Basin Salinity Control Forum: "The objective for industrial discharges shall be a no-salt return policy wherever practicable." This policy has been followed at other recently-constructed powerplants in the Colorado River Basin.

3 Page IV-7, third full paragraph

This paragraph should be expanded to cover the downstream effects on salinity resulting from the total water usage described in this paragraph, particularly below Hoover Dam and at Imperial Dam. Also, the effects that the water usage described will have on the authorized Las Vegas Wash Salinity Control Project should be estimated. Please include estimates of salt tonnage added or removed from the Colorado River.

1 The water quantities for mines have been reconciled. The water quantities for "added community" are also reconciled, but include the A-WV project.

2 The A-WV proposal follows the policy cited in the comment. The subject will be described in greater detail in the A-WV site specific being prepared by BLM.

3 Text change; operation of the project would reduce the salinity of the Colorado River downstream of Las Vegas Wash.

Chapter V

A paragraph should be added describing the impact on the salinity of Colorado River water below Hoover Dam and at Imperial Dam resulting from the proposed development.

We appreciate the opportunity to comment on this draft environmental statement.

Sincerely yours,

M. B. Holburt

MYRON B. HOLBURT
Chief Engineer

STATE OF UTAH
Scott M. Matheson, Governor
DEPARTMENT OF
DEVELOPMENT SERVICES
J. Phillip Keene III
Executive Director
104 State Capitol
Salt Lake City, Utah 84114
Telephone: (801) 533-5961

November 6, 1978

Director, U. S. Geological Survey
National Center, Mail Stop 108
Reston, Virginia 22092

RE: Draft Environmental Statement Central Coal, Utah

Gentlemen:

The staff has reviewed this project and feel that the draft EIS meets the requirements as per 106 review so long as the attached memorandum of agreement is completely adhered to.

However, we would like to caution the environmental team concerning the use of predicitality statements based on 1% Class 2 surveys. We feel this is inappropriate as a sample and an unacceptable predicitive sample base.

The example in the draft on page IV-68, first paragraph, is like this.

If you have any questions or concerns, please contact Wilson G. Martin, Preservation Development Coordinator, Utah State Historical Society, 307 West 200 South, Salt Lake City, Utah 84101.

Sincerely,

J. Phillip Keene III
Executive Director
and
State Historic Preservation Officer

WGM:jr

Enclosure

The cooperative agreement between the BLM and the State of Utah for protection of cultural resources has been added to the text in chapter IX, part 1.

state of utah

DIVISION OF WILDLIFE RESOURCES

DOUGLAS F. DAY
Director

1596 West North Temple/Salt Lake City, Utah 84116/801-533-9333

October 11, 1978

Mr. Milo Barney, Chairman
Environmental Coordinating Committee
400 Empire Building
231 East 400 South
Salt Lake City, Utah 84138

Dear Milo:

We have reviewed the Draft Environmental Statement Development of Coal Resources in Southern Utah, Part 1, Regional Analysis, and Part 2, Site Specific Analysis. Generally, wildlife resources and impacts to both populations and habitat have been well assessed; however, the following comments should be considered and incorporated as appropriate in the final draft.

Part 1, Regional Analysis

1 On page II-14, Table II-3, the column "General Land Use" should list wildlife for every soil group because some species of wildlife inhabit everyone of the land forms listed.

2 On page II-38, Table II-12, under "Remarks," we assume the number of acres of summer and winter range for mule deer will be included. Also, elk are known to inhabit the Henry Mountains. The big game distribution map (Figure II-14) on page II-42 has properly shown elk distribution on the Henry Mountains.

3 In Chapter II, page 40, it is generally accepted that a low point in the downward trend of the deer population on herd unit 52 has been reached and numbers of deer are now beginning to increase.

4 It is well documented that desert bighorns inhabited both sides (east and west) of the Colorado River and adjacent mountains prior to development of Lake Powell. Present natural occurrence (at low density) west of the Colorado River has been documented. It is probable that the present low density west of the Colorado River is more attributable to past intensive grazing by domestic sheep than to the barrier effect of the lake, although the latter is a factor.

5 It should be pointed out that the Henry Mountain bison herd is the only free-roaming, hunted herd in the United States. As a result it is an important national resource as well as a valuable state resource.

1 Text change.

2 Text change.

3 The text statement is a general one applying to the entire region. Some units may be leveling off or increasing, but long-term trends have not been established.

4 The distribution is described in chapter II (Wildlife).

5 Text change.

6 In Chapter II, page 43, it is no longer generally accepted that the bald eagle's "usual diet" is fish. Spencer (1976), in a study of wintering bald eagles in the United States, showed their diets and habits to be quite varied and different from what was considered the usual diet of fish in the past. Waterfowl are an important source of prey for bald eagles during winter periods.

7 Peregrine falcon eyries were located during 1977 along Lake Powell in the extreme eastern portion of the region.

8 In Chapter II, page 44, include that bobcat trapping in Utah has been closed for two years. Trapping of bobcats in the future will be restricted.

9 In Chapter II, page 45, first paragraph, second sentence, change 40 varieties to 40 species.

10 In Chapter II, page 95, the future environment of the Henry Mountains without the proposed action, with regard to wildlife and interaction with man, will not be significantly different than it is today. Examination of Table II-36 (page II-96) shows that the Garfield County population (which could most readily utilize the Henry Mountains) will only increase from 3,200 people in 1970 to 5,000 people by 1990. This is a relatively small numerical increase compared to the potential increase with development (1,800 compared to 2,900).

11 A transplant of desert bighorn sheep onto the Little Rockies has been approved and may be initiated during 1978. A cougar-deer study for the Henry Mountains has also been funded and will be initiated in 1978.

12 If coal leasing or coal development of preferential leasing rights does not take place on the Henry Mountains, development of recreational home sites and facilities and uranium mining would remain the most serious potential conflicts between man and wildlife.

13 In Chapter III, page 12, add Division of Wildlife Resources, this Division administers all wildlife now or hereafter within Utah, not held in private ownership legally acquired, as property of the State of Utah. The Division of Wildlife Resources is charged with the duty to protect, propagate, manage, conserve and distribute protected wildlife throughout the State.

14 In Chapter IV, page 19, apprehended wildlife violations in the Henry Mountain area (including north end of Lake Powell) have increased 231 percent from 1972 through 1977 (26 to 86). About 70 percent of the violations result in losses to wildlife populations.

15 On page IV-23, it is stated that changing water from agricultural to domestic use will probably cause a shift to higher upstream diversions on high-water-quality streams (trout streams). This would severely degrade the few existing stream trout fisheries.

6 Text change. Spencer's (1976) study is of wintering bald eagles away from summer habitat and usual heavy utilization of fish. Waterfowl are not a significant food item for eagles in desert areas away from water.

7 The task force personnel are aware of the localities; to prevent disturbance of active peregrine falcon eyries, specific locations are not given.

8 Text change.

9 Text change.

10 The impact will depend on location of the new populations and on control of access to the Henry Mountains. Much of the increase owing to coal development may be located more distantly from the Henry Mountains than the increase owing to normal population growth.

11 Several planned transplants and studies could be identified; however, the statement is intended to be general and to apply regionally.

12 See response 10.

13 Text change.

14 Existing conditions, including violations, are described in chapter II.

15 Text change; normally, diversion points would not change because of the legal implications attendant on changed diversion points.

Part 2, Site Specific Analysis

Red and Blue Mines

16 On page 18, No. 9, it states reseeding for reclamation purposes will be in early spring or midsummer and be native species. Experience has shown that late fall seeding (October and November) is far more successful than spring or summer seeding. We strongly urge that seeding take place in late fall. Supplemental irrigation should be strongly considered if natural precipitation is inadequate to promote revegetation.

17 On page 22, No. 11, the fences mentioned should not exceed 42 inches total height.

18 On page 47, Wildlife and fisheries, loss of watering places for wildlife due to elimination of springs and seeps via subsidence need not be unavoidable if artificial rain water catchments are constructed as a form of mitigation. Developments of springs and seeps for consumptive uses can provide sufficient water at the source to preserve associated riparian micro-habitat for wildlife.

Alton Strip Mine

19 Substantial direct habitat losses will occur as a result of strip mining. There is a small sage grouse population located around Skutumpah, and we believe increased activity in the area will further reduce or eliminate this population. Mule deer are limited. The area is generally winter range and does not presently support a large wintering herd of deer; however, contour trenches will have a detrimental effect on the mule deer in the area as well as all other wildlife species.

20 On page 34, 7. FISHERIES, there is no mention of DWR stream classification for East Fork Virgin River (Classes IV, V and VI), Kanab Creek (Class IV), or Virgin River (Class V). However, the general appraisal of fishery values is correct.

21 There should be presented in text the stream population estimates, where known, and natural propagation values. Probable limiting factors presently limiting fisheries should be discussed.

There is virtually no discussion of aquatic macroinvertebrate communities. These communities generally reflect aquatic environmental conditions and should be discussed in this section and in the "impact" sections. The report should include estimates on present angler use on stream sections and DWR estimates of maximum use capacities. This would permit more useful analysis of impact of added angler use on existing fisheries.

22 On page 47, 6. FISHERIES, if Kanab Creek is rerouted, its fishery will be lost. The text simply states that we would not lose downstream fisheries if rerouting does not cross drainage boundaries.

16 This refers to a company statement. Proper seeding procedures will be determined by the surface management agency. Irrigation will be required as necessary (see part 1, chapter I, section D).

17 Fence design appropriate to wildlife using the area would be specified by the surface management agency.

18 The surface management agency may stipulate replacement of wildlife water as a condition of mine plan approval.

19 The increased activity will affect the small sage grouse population. Utah Division of Wildlife Resources publications (referenced in text) classify most of the lease area as deer summer range. Countour trenches are not proposed.

20 The Division of Wildlife Resources stream classification system was not used because it is weighted to give highest values to trout and their habitat and does not recognize values for endangered fishes or their habitat. The system used expands upon the DWR system.

21 The value of population estimates and natural propogation values is recognized; however, this information was not available when working up the data with the regional fish biologist. The same situation applies to the macro-invertebrate data.

22 The Kanab Creek game fishery is 3 miles upstream from the proposed Alton mine and would not be affected by mining. No fishery exists in Kanab Creek below the proposed Alton mine.

23 On page 57, D. WATER, springs yielding 100-150 acre-feet per year will be used to partially satisfy a total mining need of 900 acre-feet per year. Where is the balance needed coming from?

24 The report states that the impact of spring tapping will be minimal "because water would still be available." This is not necessarily true. The location, amount, and quality of water still available would determine overall impact in the area both from the standpoint of the fishery and related riparian wildlife habitat.

25 On page 61, G. FISHERIES, this section incompletely and poorly addresses long-term impacts of reduced streamflow on aquatic habitat and fish production in the Virgin River. No discussions of flow-related impacts are included for Paria and East Fork Virgin rivers and Kanab Creek.

Impacts of streamflow depletion on trout habitat are well known and documented in recent literature. Methods for habitat evaluation and impact assessment are known and are used by DWR. The report should address probable post-project streamflows, as computed from estimated consumptive diversions and return flows, and then perform at least limited hydraulic predictions and correlate with fish habitat availability. Impacts on trout should at least be addressed for East Fork Virgin River and Kanab Creek. Impacts due to streamflow depletions in main Virgin River would be more difficult to relate to woundfin and Virgin River spinedace, but more definitive statements should be made.

Increased stream sediments could have severe long-term impacts on the fishery and would adversely impact trout reproduction and macroinvertebrate habitat in the east fork of the Virgin River and Kanab Creek.

We appreciate the opportunity to review and comment on these proposals. If we can be of further assistance, please contact us accordingly.

Sincerely

Douglas F. Day
Director

23 Text has been clarified; see chapter III, Water section.

24 Stream flow is discussed in the Water section. Flows of the Paria, East Fork Virgin River, Kanab Creek, and Virgin River would not be affected.

25 Sediment concentration would not increase in the streamflow.

Scott M. Matheson
Governor

Kent Briggs
State Planning Coordinator

STATE OF UTAH
Office of the
STATE PLANNING COORDINATOR
118 State Capitol
Salt Lake City, Utah 84114
(801) 533-5246

October 18, 1978

Director
U.S. Geological Survey
National Center
Mail Stop 108
Reston, Virginia 22092

Dear Sir:

The Utah State Environmental Coordinating Committee has reviewed the draft environmental impact statement concerning regional coal development in Southern Utah. The Committee offers the following comments for your consideration.

1 The document fails to address interbasin impacts of resource transfers. To the extent that coal development in southern Utah provides energy to California, the impacts of development are transferrred from the point of use. This alters water demand, population growth, and regional development. The extraterritorial issue is not discussed. We feel that this major issue deserves careful attention, and the regional coal environmental statement is the proper place for such analysis.

2 Discussion of cultural and socio-economic impacts is inadequate. The statement provides only surface analysis and does not deal with the boomtown problems encountered in western energy areas. The mechanisms for dealing with boomtown growth and the current level of planning could be more fully detailed.

3 The air quality discussion does not reflect current thinking of the Environmental Protection Agency concerning natural dust and particulate standards. The statement may overstate air quality conflicts. In addition, the statement does not adequately address the upcoming NO_x standards and conflicts that may be forthcoming with southern Utah coal development.

4 Recent analysis has disclosed high levels of heavy metal accumulation in the fish of Lake Powell. This issue has been raised before regarding southern Utah coal development since Utah coal has relatively high concentrations of these trace minerals. The regional statement should include a full examination of this problem and discuss causes and solutions.

1 The market for coal production from the Kaiparowits Plateau mines is not known; therefore, the potential impacts at consumption points cannot be identified or quantified. Power from the A-WV project is proposed to supplant existing supplies and to provide power for anticipated normal growth in the projected market area; thus, the impact would be relatively insignificant. This impact would be described in the site specific EIS being completed by BLM.

2 The discussion of cultural and socioeconomic impacts is generally sufficient to evaluate the proposed action. The socioeconomic analysis has been expanded to be responsive to more specific comments and criticisms.

3 Text change.

4 The proposed actions would not directly add to the heavy metal accumulation in fish of Lake Powell. A population increase in the region indirectly might cause such an increase in heavy metal accumulation, dependent on regulation of Lake Powell boating. Population growth associated with coal development at the projected level would be substantially less than that expected through normal growth.

The remaining comments refer to specific pages in the draft statement.

5 Page II-65

Reference to the farm sector's role being less important to the region's economy than it is nationally must be based on the diminishing number of farm workers. Because of the relatively small labor force and the regions narrow economic base, the farm sector provides even greater input to the region's economy than it does nationally.

Discussion of lower regional net earnings (versus national) should mention typical agricultural effects of producing and consuming ones own product--thereby circumventing the market and allowing lower net earnings to sustain higher standards of life.

Page II-70

6 On page II-70 the report reverses its stand on the farm sector and states it's very important to the region. The statement that farms contribution to total personal income in Kane and Garfield Counties are negligible should be explained in terms of the argument above; that is, production for owner consumption or livestock feed supports a significant contribution even if it is hard to measure.

References to high and varied rates of unemployment in the region (especially Kane and Garfield) should mention the recreation effects of providing services to seasonal patrons. This industry (which is significant throughout the region) draws heavily on secondary wage earners that enter and drop out of the labor force more readily than any other sector. This is especially true in farm areas.

7 Page II-84 - Figure II-21 does not exist.

8 Page II-98 - Reference to U-15 should be changed to U-9.

9 Page II-99 - Reference to map figure IV-2 is inconsistent with Table II-38.

10 Page II-101 - Reference to I-10 should be changed to I-15.

Thank you for this review opportunity.

Sincerely,

Kent Briggs

Kent Briggs
State Planning Coordinator

KB/jl

5 The farm sector's role plays a greater part in the region's economy than it does in the State or national economy. Text has been clarified.

6 The effects of producing and consuming one's own product is a consideration in determining "income less than poverty level;" see table II-30 (DES).

7 See comment 5.

8 This discussion is included in the first paragraph in the unemployment and poverty level section.

9 See map pocket in part 1.

10 Text change.

El Paso COAL COMPANY

P. O. BOX 1492
EL PASO, TEXAS 79978
PHONE: 915-543-2600

S. F. SHERWOOD VICE PRESIDENT

October 16, 1978

Director
U. S. Geological Survey
National Center
Mail Stop 108
Reston, Virginia 22092

Gentlemen:

Re: Draft Environmental Statement
Development of Coal Resources
in Southern Utah, INT DES 78-31,
August 16, 1978

In response to your Notice of Availability of the captioned document, which appeared in the Federal Register of August 16, 1978, 43 Fed. Reg. 36333, El Paso Coal Company forwards the attached comments for your consideration.

On August 31, 1976, the U. S. Geological Survey advised federal lessees of the Department of the Interior's ("Interior") intention to prepare an environmental impact statement ("EIS") on coal development in southern Utah. This notice stated that lessees desiring to have their project considered in the EIS on a site-specific basis had to submit mining and reclamation plans no later than November 8, 1976. El Paso Coal Company (at that time El Paso Energy Resources Company) submitted a detailed mining and reclamation plan on November 5, 1976. The plan consisted of two mines -- a Red Mine sized for 6.25 million tons per year of run-of-mine coal and a Blue Mine sized for 0.5 million tons per year of run-of-mine coal. On November 30, 1977, the U. S. Geological Survey advised El Paso Coal Company ("El Paso") that the mining and reclamation plan submitted was adequate for site-specific coverage.

1 After reviewing the draft EIS, El Paso is concerned that the projected production scenario for the Red Mine in the regional portion of the EIS (Part 1) is not the likely production level. The document shows no production from the Red Mine in 1985. In El Paso's mining and reclamation plan, planned production schedules for both the Red and Blue Mines were shown. These schedules showed the proposed tonnage to be mined per project year. The initial project year was defined as beginning with field construction activities. Since the production projections discussed in Part 1, Regional Analysis, of the draft EIS are based on project approvals by 1980, field construction activities could start

1 The projected scenario does not preclude production from the proposed Red mine by 1985, but assumes a maximum potential production from the Kaiparowits Plateau based on a truck haul and requiring only upgrading of the present road system.

during 1980 and, therefore, the 1985 planned production from the Red Mine would be 3.1 million tons. The omission of addressing coal production from the Red Mine during 1985 also apparently fails to consider the diligent development requirements contained in the Federal Coal Leasing Amendments Act of 1975 and Interior's regulations. Assuming the
1 Secretary were to grant the maximum five-year extension permitted and assuming there were no credits for administrative delays, El Paso would have to produce one-fortieth of the reserves comprising the Red Mine Area by no later than 1991. Because of the size of the Red Mine, reaching this production level could not occur in one year; in fact, it is likely that production would have to occur during 1985. Therefore, the draft EIS needs to be revised to reflect production from the Red Mine during 1985 and, accordingly, to discuss the impacts from this particular mine. The attached specific comments provide our production estimates for these years and indicate where the data should be inserted in the EIS.

2 The other major area of general comment involves the impact of the Office of Surface Mining ("OSM") interim regulations and proposed permanent regulations on the mining and reclamation plans addressed as site-specific. While El Paso concurs with the U. S. Geological Survey's position that the OSM regulations are considered as mitigation measures and must be complied with, the document inaccurately states that the plans have been returned to the operators for revisions to comply with the regulations. The plans themselves should not be physically returned, even though the operators have been advised to revise their plans to comply with the noted OSM regulations. However, the mining and reclamation plans do not need to be revised before the completion of the EIS. In support of this position, reference is made to Interior's recent draft EIS on the Permanent Regulatory Program Implementing Section 501(b) of the Surface Mining Control and Reclamation Act of 1977. Of particular significance is Section I A.2 (page BI-2) which discusses the role of the U. S. Geological Survey and states in part:

> "Although the requirements imposed by USGS in the previous Part 211 regulations may not have been precisely the same as those required by the proposed permanent program regulations, USGS did require contemporaneous reclamation, elimination of highwalls and return to approximate original contour, removal and replacement of topsoil, control of acid of toxic drainage through diversion or treatment, disposal of waste in an approved manner, publication of blasting schedules, establishment of permanent vegetative cover on disturbed lands, and prohibited surfacing of roads with acid or toxic producing materials and the construction of roads in stream beds."

2 Text change.

Thus, most of the mitigation requirements of the OSM regulations have already been included in the mining and reclamation plans assessed in the draft EIS.

The attached specific comments also suggest appropriate revisions to the text to reflect the role OSM will play and the lack of impact on the environment from the OSM regulations.

3 After a review of the OSM interim regulations and further exploratory drilling during the intervening two-year period since the plan was submitted, El Paso has determined that it is necessary to relocate the Blue Mine portal to an area north of the previously proposed site. This new location is shown on the enclosed map, which should be substituted for the maps in Pocket Nos. 30 and 31 of the plan. Correspondingly, except for the topsoil storage area and angling the surface facilities area, the other items on the map have been relocated. Consequently, the acres disturbed by the Blue Mine surface facilities has increased from 39 to 51. The breakdown of the areas disturbed is contained in the revised Table VII-1 of El Paso's mining and reclamation plan which is also enclosed herewith.

As noted, besides these general comments, attached are El Paso's specific comments pertaining to Part 1 and the site-specific portions of Part 2 covering El Paso's mining and reclamation plan.

El Paso appreciates the opportunity to comment on this draft EIS.

Respectfully submitted,

S. F. Sherwood

Enclosures (2)

3 Modification of the mining plan is to be submitted to the USGS Area Mining Supervisor and will be processed in accordance with laws, regulations, and procedures in effect at the time of submittal.

PART 1

SOUTHERN UTAH REGIONAL DRAFT
ENVIRONMENTAL IMPACT STATEMENT (DEIS)

CHAPTER I

4 Page vi, Section 3 of the Summary, Item G.

In the "Summary of Environmental Impacts by 1990" it is alleged that, "Dust could reduce the visual range to less than 3 miles around the Blue and Kaiparowits No. 5 mines . . . ." That is an overstatement of the impact described in the body of the report. On page IV-8, last paragraph, in a discussion of the air quality expected in the area of those mines, it is more accurately stated that, "The increased dust concentrations are highly localized and decrease to insignificance within 5 miles of the mine sites." Also, in Part 2, page 41, line 2, the statement is made "It [the fugitive dust] would dissipate rapidly with distance from the road."

4 Text change. See responses to EPA comments.

5 Page I-3, 4th Full Paragraph, Line 4.

Delete "central" and in lieu thereof insert "southern".

5 Text change.

6 Page I-3, 4th Full Paragraph, Line 5.

Change "will" to "may". Although some actions will require further environmental assessment, not every action in association with the proposed projects discussed in this EIS will require additional environmental assessment. A proposal may be coal-related yet have such a readily discernable minimal effect on the environment that no further environmental assessment would be required prior to issuing a negative statement. Furthermore, the action proposed may not constitute major federal action thereby not requiring any additional environmental assessment. Therefore, the suggested change should be made otherwise the present language could be construed that an inflexible commitment has been made to subject any coal-related proposal, no matter how insignificant the action is, to further environmental assessment.

6 According to NEPA regulations, a proposed action must have an environmental assessment if it is new or if it alters an existing action on Federal lands, or on any other lands where Federal funds are involved. Depending on the magnitude of the impacts, the result of the assessment may be a negative declaration, an environmental analysis report, or an environmental statement.

7 Page I-3, End of 5th Full Paragraph.

Since this paragraph discusses coal leasing policy issues and defers any discussion to the new programmatic coal leasing EIS that the Department of the Interior is preparing, a reference to the timing of the programmatic EIS would be appropriate.

7 A Draft Coal Management Program EIS was filed with EPA on December 15, 1978.

8 Page I-4, Table I-1.

The projected level implies that the only amount of coal likely to be mined from El Paso's leases is that from the Blue Mine. Such a projection apparently fails to take into account the ten-year diligent

8 Refer to comments 1 and 87.

development requirements imposed on federal coal lessees by the Department of the Interior regulations promulgated to implement the Federal Coal Leasing Amendments Act of 1975. The mining and reclamation plan submitted by El Paso represents two plans covering both the Red Mine and the Blue Mine, with the Red Mine scheduled to attain a yearly production of 6.25 million tons. In order to meet diligent development requirements, even assuming the maximum five-year extension to the ten-year diligent development period is granted by the Secretary of the Interior, coal production from the Red Mine would have to be 6.25 million tons per year by no later than 1991. Therefore, the projected level scenario column of Table I-1 should be revised to show that El Paso Coal Company will be producing 6.75 million tons per year by 1990.

9 In addition, the area in acres shown within Table I-1 would be more accurately addressed if the heading above the two columns read "Total Acres Under Lease" as the lease acres are in excess of those proposed for the Red and Blue Mines.

10 Page I-5, Line 2.

With reference to the choice of the year 1990 for production projections, the word "arbitrarily" should be deleted, as the explanation given shows that the date was not chosen arbitrarily.

11 Page I-5, Section 5, Paragraph 1, Item No. 1.

At the start of item no. 1, delete "Future changes" and in lieu thereof insert "Substantial revisions" and at the end of the item delete "." and insert "which result in significantly increased impacts to the environment." As written, the language implies that any future changes to an approved mining and reclamation plan may involve major environmental review. This should be clarified to indicate that this provision only refers to substantial changes or revisions in the mining and reclamation plan which would have a significant effect on the environment.

12 Page I-5, Section 5, Paragraph 1, Item No. 2.

Delete item no. 2 as written and in lieu thereof insert:

> "Future applications for rights-of-way permits for major transportation systems or for systems which would significantly disturb the environment or for coal lease applications which meet short-term standards would have to be reviewed."

Not all requests for rights-of-way permits would require major environmental review. Some rights-of-way may be of short distance or result in insignificant environmental disturbance, thereby not requiring the preparation of an EIS (which is implied by the use of the term "major environmental review"). Therefore, the sentence should be revised as suggested.

9 Text change. See table I-1.

10 Text change.

11 See response to comment 6.

12 See response to comment 6.

13 Page I-5, Section 5, Paragraph 1, Item No. 3.

Delete item no. 3 in its entirety. As written, the language implies that the review and/or renewal of a mining permit issued pursuant to the Surface Mining Control and Reclamation Act of 1977 would require the preparation of an EIS or environmental assessment prior to such action being taken. However, the Act in no way implies that an EIS must be prepared prior to the renewal of a mining permit; rather, if certain criteria are met, not to include the preparation of an EIS, the renewal of the permit is automatic. To require and do otherwise would result in making the financing of most coal mining operations impossible.

14 Page I-6, Table I-2.

The 1985 projected coal production shown for the Blue and Red Mines are misleading and incorrect. On page I-5 it states the "1985 and 1990 projections are based on project approvals by 1980." Based on this, the 1985 production schedule for the Blue and Red Mines should be shown at a projected production level of .5 and 3.1 million tons per year, respectively. These projected production levels correspond with those submitted in El Paso's Mining and Reclamation Plan on page II-59.

15 Page I-7, 1st Full Paragraph, Line 5.

Change "are" to "were".

16 Page I-7, Section B.1, 1st Paragraph, Lines 10-11.

Revise the last sentence of the paragraph as follows:

> "However, it is not anticipated that revisions to mine and reclamation plans to comply with these regulations will result in any greater impacts to the environment than discussed in this statement, especially since the applicable initial regulations are considered as required and legally enforceable Federal mitigating measures."

The purpose of an EIS is to discuss impacts to the environment. The initial OSM regulatory program, as well as the permanent regulatory program when promulgated, do not substantially increase any impacts to the environment; rather, if anything, they reduce the potential impacts that mining operations will have on the environment.

17 Page I-7, Section B.1, 2d Paragraph.

Delete the second paragraph in its entirety and in lieu thereof insert:

> "As a result of the promulgation of the Office of Surface Mining's initial regulatory program pursuant to the Surface Mining Control and Reclamation Act of 1977, the lessees who have submitted mining and reclamation plans have been advised that the previously submitted mining and reclamation plans must be revised to conform with

13 See response to comment 6.

14 Text change.

15 Text change.

16 OSM will evaluate revised plans to analyze potential additional or reduced environmental impact.

17 Text change.

17 the applicable initial regulations. After the revisions to the mining and reclamation plans have been submitted to the Office of Surface Mining, they will be reviewed and evaluated by the Office of Surface Mining and the U. S. Geological Survey to determine compliance with the requirements of federal regulations located at 30 C.F.R. Part 211 and 30 C.F.R. Part 700. The mining and reclamation plans will not be approved until they conform with all applicable regulations or demonstrate how the requirements of all applicable regulations will be met."

As written, the paragraph states that the mining and reclamation plans previously submitted have been returned to the operator for further revision. This is not correct and misleads the reader. The operators only have been notified that it is necessary to revise the previously submitted mining and reclamation plans to conform with the new OSM regulations. In most instances, it should not be necessary to redo the entire mining and reclamation plan; rather, it will be necessary only to revise certain portions of the plan to reflect the changes in the regulations.

18 Page I-7, Section B.1, Last Paragraph.

Delete the last paragraph as written and in lieu thereof insert the following paragraph:

"Although no formal land use applications for facilities associated with the coal mining operations proposed in the mining and reclamation plans have been submitted, some associated land uses have been identified by the lessees and their impacts are included in the discussion of impacts herein."

As written, the paragraph indicates that no associated land uses have been identified, an implication which is not accurate. Some land uses have been proposed.

19 Page I-8, Section B.2.a.

In light of the revisions to 30 C.F.R. Part 211 promulgated August 22, 1978, this paragraph should be deleted in its entirety and in lieu thereof inserted the following paragraph:

"The Regional Director of OSM, in consultation with the Area Mining Supervisor of GS, shall review the mining and reclamation plan and make a recommendation as to approval or disapproval. The Assistant Secretary of the Interior for Energy and Minerals must approve the mining and reclamation plan prior to any commencement of mining operations by the company."

This revision conforms with the changes made to 30 C.F.R. Part 211.

18 This section discusses the specific proposed actions and the applications received. This paragraph is a negative declaration on land use or right-of-way applications. In subsequent text the receipt of preliminary proposals for the ancillary facilities is acknowledged (see chapter I, section C, item 3, DES).

19 Text change.

20 Page I-8, Section B.2.b, Line 3.

Delete "GS" and in lieu thereof insert "Assistant Secretary for Energy and Minerals". This change is consistent with the preceeding comment and the revisions recently made to 30 C.F.R. Part 211.

21 Page I-8, Section B.2.b, Line 4.

In the discussion of required BLM approvals, in the last sentence after "responsible for" insert "certain water drilling permits". This sentence would then indicate that BLM is also responsible for granting certain water drilling permits.

22 Page I-8, Section 2.c.

To the discussion of required state approvals, add the following sentence: "The approval of the Utah State Engineer will be required if it is decided to pursue appropriation of any available waters within his jurisdiction."

23 Page I-8, Section C.2.a.1, Lines 4-5.

Delete the last sentence of the paragraph in its entirety. As written, the sentence provides: "Projected production by 1985 is dependent upon projects being approved by 1980." This statement is not necessarily true, especially with respect to El Paso's Blue Mine. Therefore, this sentence should be deleted.

24 Page I-9, Section D.2, 1st Paragraph, Lines 1, 5, and 7.

In the first line, change "12 mty" to 18.25 mty". In line 5 after "The" change "1.5" to "7.25" and in line 7 after "(table I-2)" insert ", the Red Mine (6.25 mty)." As previously noted, because of diligent development requirements, production from the Red Mine must achieve 1/40th of the reserves no later than 1991 (assuming the granting of the maximum five-year extension; otherwise this production must be achieved by 1986). Therefore, there will have to be coal being produced from the Red Mine no later than 1990 and likely by 1985 in order to meet the diligent development requirements. The numbers suggested reflect the addition of 6.25 mty from the Red Mine.

25 Page I-10, Table I-3.

It is suggested that "<1" be used in projecting the coal production for the low level scenario, as the low level is so defined on page I-9 under D.1.

The coal production projections shown in Table I-3 should be adjusted to reflect those changes suggested for Table I-2 on page I-6.

20 Text change.

21 Authority: BLM would grant a temporary use permit for drill sites but the State of Utah would grant the permit allowing actual capture and use of ground water. Then BLM would have to grant a right-of-way for surface area required for lifting and transporting the water on public land.

22 If one of the proposals contained a specific proposal for a water development it would be appropriate to include the approval of the Utah State Engineer on water allocation. The actions considered in this statement do not include specific water developments. See chapter III, Institutional Relationships, State of Utah.

23 Assumption regarding the time schedule of coal development is one of the bases of the projected scenario.

24 See response to comment 1.

25 Text change. See response to comment 1.

In the "projected level" line, the "0" under the 1985 and 1990 columns should be deleted and filled in as follows: In the 1985 column insert "9.1" and in the 1990 column insert "18.25". These changes are consistent with previous comments discussing production from the Red Mine.

26 Page I-14, Table I-4.

El Paso's Red Mine is not included in this table. In fact, the Red Mine is not mentioned in the text of Part 1, but is included in various tables in later chapters (Tables VII-3, VII-4, VII-5, VII-6, and VII-7). As previously noted, the Red Mine should be covered in the projected project levels.

27 Page I-15, Item 4.

The reference supporting this statement should be cited.

28 Page I-15, Item 5.

This may not be a valid assumption if temporary housing is involved.

29 Page I-15, Item 6.

In the description of mining methods, after "consistent with" insert "miner safety,". One of the primary considerations with respect to coal recovery is health and safety requirements designed to protect miners.

CHAPTER II

30 Page II-1, Section A.1, 3rd Paragraph.

The description of wind information should relate actual data to stations in Figure II-9, page II-22.

31 Pages II-2, II-3 and II-4, Figures II-1, II-2 and II-3.

It would be helpful if the units depicted on the figures were described in the title or in a legend.

32 Page II-21, Section 4, 3rd Paragraph, Last Sentence.

Delete "mining" and in lieu thereof insert "mixing."

33 Pages II-21 and 22, Section 4, 4th Paragraph and Figure II-9.

An explanation is needed to identify the meaning of the numbers illustrated in Figure II-9.

26 See response to comment 1.

27 Real Estate Corporation of America, 1975, pages 1-3.

28 Although urban land potentially could be converted to agricultural land, this generally does not happen. City and county zoning, and land economics make this change difficult.

29 Text change.

30 The wind information on page II-1 is regional in nature, very general, and supported by the monitoring stations shown on figure II-9. A more detailed description of the wind would not benefit the assessment.

31 Text change.

32 Text change.

33 Text change.

34 Page II-23, Figure II-10.

It is suggested that a legend be added to the figure so that the reader can determine which arrows are daytime and which arrows are nighttime drainage air flow.

35 Page II-28, Next to Last Paragraph, Line 3.

Delete "adsorption" and in lieu thereof insert "absorption."

36 Pages II-31 Through 36, Section 5.

The discussion of vegetation types should include an assessment of the relative abundance of the eleven types. Because productivity range for the entire area (page II-31) is provided, perhaps productivity values can be included for each vegetation type.

The discussion of the vegetation types should include intermittent water courses whose vegetation does not have sufficient water to be included in the Stream-Side type.

37 Page II-36, 3rd Paragraph.

This paragraph should either be deleted entirely or reworded to delete the phrase "because of lack of time".

38 Page II-36, Section 6.

With respect to the wildlife section, the species of greatest human interest and the rare or unique wildlife species may not be the most important for ecosystem function. At least some idea of the species characteristic of each vegetation type would be desirable, especially for the types potentially most extensively impacted. i.e. pinyon-juniper woodland and sagebrush-grassland.

39 Page II-43, 2d Paragraph.

This paragraph is too general. The last sentence could be appended to the first paragraph on page II-40; the rest should be deleted.

40 Page II-44, Last Two Paragraphs.

These paragraphs belong in the impacts section.

41 Page II-55, Table II-16.

This table is misleading in that it states that 225 cattle used the Blue Mine lease and adjacent area. The Blue Mine lease area is only 1,280 acres, and would not support 225 cattle for 4-1/2 months. This would equal a year-long stocking rate of 15 acres per animal unit, a result which is inconsistent with the approximately 147 acres per AUM in the Kaiparowits area. The term "adjacent area" obviously needs to be defined.

34 Text change.

35 Text change.

36 Figure II-11 (in pocket) portrays the relative abundance of the vegetative types more clearly than an acreage figure constrained by the coal region boundaries. Productivity values for individual vegetative types are not available.

At this broad level of classification, many subtypes like the intermittent streamside subtypes are not identified. Portraying or describing the subtypes was not needed in assessing the environmental impacts.

37 Text change.

38 Vegetation and wildlife are coordinated in tables II-12 and II-13.

39 The paragraph is general, because the impact would potentially affect less than 1 percent of the population.

40 Text change.

41 This table shows the actual use by cattle on and adjacent to the lease areas and is not limited to the area that the mine would disturb. Text is clarified.

42 Page II-80, Last Paragraph.

Presumably the schools named in this paragraph are in the Garfield County School District. If so, this should be noted in the paragraph.

43 Page II-82, Figure II-19.

It is suggested that a legend describing the solid triangles and numbers be added to the figure for clarity.

44 Page II-87, Section 7, 1st Paragraph.

At the end of the first paragraph, add: "Further studies and mitigation measures will be undertaken when and as required by the National Historic Preservation Act of 1966 and the Archaeological Data Preservation Act of 1974."

45 Page II-89.

In the title of Table II-34, it is suggested that the word "archaeological be inserted between the words "Class II" and "Site Totals."

46 Page II-90, Figure II-22.

The title in this figure should indicate "Archaeological Site Density..."

47 Page II-94, Section C.1, 1st Paragraph.

If 23,400 is the correct figure for population growth in the absence of coal development, this could be stated more clearly.

CHAPTER III

48 Page III-1, 6th Paragraph, Line 2.

After "(USFS)," delete "and" and after "(USGS)" insert ", the Office of Surface Mining Reclamation and Enforcement ("OSM")." This change is consistent with the previous changes noted with regard to the recent revisions made to 30 C.F.R. Part 211.

49 Page III-2, Line 1.

After "Part 211 (5/76)" insert ", and as amended (8/78,". Again, these revisions are consistent with the recent revisions to 30 C.F.R. Part 211.

50 Page III-4, 2d Full Paragraph.

EPA has already promulgated its PSD Regulations. Furthermore, these regulations provide some exemptions with respect to fugitive dust in connection with mining operations.

42 Text change.

43 Text change.

44 The suggested addition is legally required mitigation and is adequately treated in chapter III.

45 Text change.

46 Text change.

47 Text change.

48 Text change.

49 Text change.

50 Text change.

51 Page III-6, 2d Paragraph, Line 1.

After "rights-of-way" delete "will be approved" and in lieu thereof insert "construction activities may commence". It is not necessary that mining and reclamation plan approvals and right-of-way permit issuances be held up until all archaeological clearances have been obtained. It is possible to approve a mining and reclamation plan prior to obtaining an archaeological clearance. Similarly, right-of-way permit applications could be approved prior to obtaining archaeological clearance. Therefore, the language should be modified to reflect this possibility.

52 Page III-7, Section 8, 2d Paragraph, Line 4.

Either delete, " . . . to enter into a coordination process", or insert the necessary words to make the meaning clear.

53 Page III-8, Section C.1, Line 3.

After "Director, USGS" delete "." and insert "and the Director, OSM.". Again, this change is necessitated by the recent revisions to 30 C.F.R. Part 211.

54 Pages III-8 and III-9, Section C.2, 1st Paragraph.

This paragraph should be reviewed and revised, if necessary, to reflect any changes in the noted BLM and USGS relationship and to determine if it is necessary to insert a reference to OSM. In addition, revisions to this paragraph on Page III-9, lines 3, 4 and 10, are necessary to reflect the recent changes in 30 C.F.R. Part 211.

55 Page III-9, Section C.3, 3rd Paragraph.

This paragraph should be reviewed to determine if it is still accurate in light of the recent revisions to 30 C.F.R. Part 211.

56 Page III-10, Section C.4, Line 2.

As written, the document indicates that a National Park Service special land use permit is required for improving the existing County or State road. This statement is not entirely correct as it is likely that such a permit would not be required for improving an existing County and State road if the improvements were to stay within the existing right-of-way.

In addition, the National Park Service responsibilities discussion could be expanded.

51 Text change.

52 Text change.

53 Text change.

54 Text change.

55 Text change.

56 Text change.

57 Page IV-1, 5th Paragraph.

The estimated 3,000 acres which could be affected by subsidence have been overstated for the projected level of coal production discussed in Chapter IV. The 3,000 acres which could be affected by subsidence probably refers to a medium or high level production estimate, in which case the reference to 3,000 acres should be discussed in Chapter VIII and not in Chapter IV.

58 Page IV-7, Section 3, 2d Paragraph.

The air emissions and impacts should also cover the production expected from the Red Mine by 1990.

59 Page IV-7, 3rd Full Paragraph.

Pumping of the aquifer should be qualified as is recovery; namely: "long term."

60 Page IV-8.

The analysis of PSD increments and the fugitive dust contributions is not appropriate because most of the fugitive dust is due to resuspension from unpaved roads. The PSD rules explicitly exempt from impact analyses those emissions which are "shown to be fugitive dust." [Section 52.21(k)(5)]

61 Page IV-8, Last Paragraph.

The maximum 24-hour incremental impact is said to be 65 ug/m_3; Table IV-1 on page IV-9 indicates that it is 70 ug/m_3; Figure IV-1 on page IV-10 indicates that the maximum is 38 ug/m_3. These inconsistencies should be eliminated and the correct figure inserted.

62 Page IV-16, Section 4.

If the locations of facilities and forage potential of vegetation types is known, a more accurate estimate of forage production lost should be prepared than what is given on this page.

63 Pages IV-16 Through 19, Section 4.

With respect to the vegetation section, several general comments are provided. When the disturbed pinyon-juniper lands are revegetated, they will not instantly become pinyon-juniper lands again. As the next section notes, succession to a pinyon-juniper woodland will take "possibly as much as 100 years." In the meantime, a shrub-grassland will exist.

57 Over the full life of the mines, 3,000 acres or more could be affected by subsidence. This equates to about 480 acres for the Blue mine and 2,500 for Kaiparowits No. 5 mine.

58 Full production from the Red mine is not included in the projected scenario. See response to comment 1.

59 Text change.

60 Text change.

61 Text change.

62 The locations of the mine facilities are known. The location of expanded communities and ancillary facilities is not known. The magnitude of the impact could not be accurately determined.

63 Text and comment are correct.

64 Page IV-18, 1st Paragraph, Lines 5-7.

Delete: "Irrigation will be required on all sites receiving less than 10 inches of precipation per year (National Academy of Sciences, 1974)." and in lieu thereof insert: "It is possible that irrigation may be necessary to achieve successful revegetation." The National Academy of Sciences study was general in nature and not site specific to this portion of Utah. Under the Surface Mining Control and Reclamation Act, the operator is required to reclaim the land to a level at least equal in production to that existing prior to mining operations. Therefore, if irrigation is necessary to obtain this result, the operator will have to do so; however, it should not be presented as a flat conclusion. In addition, the discussion of the procedures for revegetation and restoration should be expanded.

65 Page IV-22, Table IV-4.

With respect to the Blue Mine, on the acres affected line delete "40" and in lieu thereof insert "51".

66 Page IV-25, Section B.1(1), Line 3.

After "improving" delete "a jeep trail" and in lieu thereof insert "an existing road". This section inaccurately portrays the existing road as a "jeep trail". The existing road is a county road, forming a part of the Kane County highway system, and has been maintained by the County with mechanical equipment. In fact, this particular road has previously been used by trucks hauling coal. Because the road is a county road and has been mechanically maintained, it should not be classified as or inferred to be a trail; rather, it should be characterized as a road especially since it meets the definition of a road contained in the proposed BLM wilderness review procedures. Furthermore, the use of the term "road" will also clarify any misconceptions or attempts to classify the area as "roadless".

67 Page IV-25, Section 7, 1st Paragraph, Lines 2-3.

The phrase, ". . . listed as continuing proposed for threatened or endangered species listing," could be simplified to read ". . . proposed for federal threatened or endangered status." This comment also applies where similar phrases are used when the snails are discussed in later chapters.

68 Pages IV-26 and 27, Section 2, 1st Paragraph, and Table IV-5.

Table II-16 lists 7,690 AUM's of actual use on and adjacent to three mines (Alton, Blue and Mono.) Table IV-5 lists only 44-82 AUM's to be lost on the same three leases due to mining. On page IV-26, the paragraph is misleading in that the forage required for 1,915 AUM's over a

64 Text change.

65 See response to comment 3.

66 Text change.

67 Text change.

68 Text change.

30-year period is incorrectly converted to the equivalent of the forage required by 160 animal units for 1 year, when actually it is equivalent to the forage required by 160 cows for 30 years or 5.3 cows for one year.

69 Page IV, Table IV-5.

The life of the Blue Mine is shown to be 30 years. It should be changed to correspond with the number shown in Table I-2.

70 Page IV-28, Section 3, 1st Paragraph, 1st Sentence.

The figure given for mining employment by 1990 (in the text and Table IV-6) conflicts with the number given in the impact section of Part 2, page 42, "Site Specific Analysis of the Proposed Red and Blue Mines, Kane County, Utah."

71 Page IV-28, Section 3, 2d Paragraph.

Tourism might also be listed as a separate and important basic economic activity in the region.

72 Page IV-56, Table IV-20.

It is suggested that a legend describing the solid triangle and numbers be added to the figure for clarity.

73 Page IV-58.

On this page, several of the paragraphs discuss truck haulage of coal south of Kaiparowits across Glen Canyon Bridge into Arizona. It should be noted that the coal could also be trucked west to Cedar City.

74 Page IV-58, 4th Full Paragraph.

It is suggested that the segment of road discussed in this paragraph be more clearly defined as to its location.

75 Page IV-58, Last Paragraph.

The draft states: "The County has the authority only to maintain this part of the road in its present configuration; it cannot be improved without National Park Service approval." What is the source of this statement? The type and the width of the road could be dependent upon the size of the right-of-way that the County possesses, which width may be larger than the present road since the road existed prior to the creation of the NRA. As written, the document implies that the National Park Service has made a final decision with regard to the width of the right-of-way and the type of road that will be allowed there. In addition, the paragraph goes on to state that the road would not be able

69 Text change.

70 The number in the text and in table IV-6 is the total work force for the Blue and Kaiparowits No. 5 mines. The number given in part II - Red and Blue mines - is the work force of those mines.

71 The effect of tourism is not measured separately, but is included in trade and services.

72 The figure and table showing traffic count are complementary and are not intended to be used separately.

73 Text change.

74 Text change.

75 The text is correct. Explanation of the NPS position is given in chapter II, and the discussion in chapter IV conforms to that position. The road has carried some ten thousand tons of coal traffic, taken out over a period of months. Bringing out 1.5 million tons per year, 12 months out of the year, would be quite different. The road would be inadequate in its present state for the projected coal truck and commuter traffic.

to accommodate projected coal traffic. However, as previously noted, coal trucks have used the road in the past. In fact, on the next page in the second paragraph, the document states: "Although the present highway system can accommodate the projected traffic, increased traffic would decrease the present level efficiency." In light of these inconsistencies and the other comments, this paragraph should be revised.

76 Page IV-61, 1st Paragraph, Line 5.

The reference to Figure IV-5 regarding proposed power lines is inappropriate and should be deleted as the figure shows alternative access routes and not powerline routes.

77 Page IV-61, 1st Paragraph, Lines 6-8.

How can surface disturbance be less (44 acres) if an access road is included, than if an existing road is used (90 acres)?

78 Page IV-64, 3rd Paragraph, Line 1.

After "from" insert "possible". There is no indication that the mine plant sites are currently used for recreation purposes; therefore, these sites would only eliminate possible recreation use.

79 Page IV-64, Section 6.

Figure II-27, referring to site density, could not be found.

CHAPTER V

80 Page V-1, 1st Paragraph.

The basis for using 3,000 acres for subsidence damage is not explained. The Blue Mine will affect only 480 acres (Part 2, page 38, 2nd paragraph). The only other mine included in this figure is Kaiparowits No. 5, and no value for subsidence damage was found for it.

81 Page V-1, 3rd Paragraph.

The value of 19,500 acres of disturbed land includes the Allen-Warner Valley Energy System (AWVES). Sometimes the AWVES is included in discussions of adverse effects, etc., and frequently it is excluded. This creates confusion and hinders continuity.

This paragraph states that soil movement would equal 6,000 cubic yards per acre per year. This is incorrect. 19,500 acres x 10 cubic yards per acre loss rate x 30 years = approximately 6 million cubic yards per acre over 30 years. Therefore, soil loss per year could not equal 6,000 cubic yards.

76 Text change.

77 Text change.

78 Text change.

79 Text change.

80 The stated acreage includes the Blue mine and Kaiparowits No. 5 mine. See response to comment 57.

81 The A-WV and soil movement analysis has been clarified in the text.

82 Page V-2, 4th Paragraph.

It is not an unavoidable impact because the roads can be watered or otherwise treated to suppress dust. It is an overstatement, in any case. See comment for page vi, under 3. Summary of Environmental Impacts by 1990:, Item G. Also in Part 2, page 41, line 2, the following statement is made: "It [the fugitive dust] would dissipate rapidly with distance from the road."

82 Text change.

83 Page V-2, 5th Paragraph, Line 4.

The total AUM's affected should be "1,920" instead of "4,920". However, even this revised total is misleading since not all 9,400 acres will be unavailable for grazing during the entire 30-year period. Especially with regard to the surface mine near Alton, only a portion of the acreage will be mined at any one time and other portions will be reclaimed and put back into production for grazing. This comment also applies to Page VII-1, 7th Paragraph and Page VIII-11.

83 Text change.

84 Page V-2, Last Paragraph.

The reference to a permanent loss of 2000 acres is inconsistent with the 1000 acre figure contained on page IV-19.

84 Text change.

CHAPTER VI

85 Page VI-1, 2d Paragraph.

The same comment noted on page IV-1 regarding the 3,000 acres to be affected by subsidence also applies to this paragraph.

85 See response to comments 57 and 80.

CHAPTER VII

86 Page VII-1, 2d Paragraph.

The same comment noted on page IV-1 regarding the 3,000 acres to be affected by subsidence again applies.

86 See response to comments 57 and 80.

CHAPTER VIII

87 Page VIII-1, 2d Paragraph, Lines 6-9.

The text states that the Secretary ". . . is considering actions [under the EIS] within his authority that will allow Federal coal to be available when needed and in environmentally acceptable conditions to meet

87 Diligence is primarily dependent on proponent actions and market demand for coal and is not an issue within the scope of this EIS. The EIS does evaluate potential environmental impacts and alternatives under various market demand scenarios. It is a question of: "If a given production level is achieved, what are the impacts?" DOI is not proposing a given level of production.

market demands . . ." There is no mention that this possible lack of action will influence lessees "due diligence" burden. The Secretary should be considering what actions he can take to permit the Federal requirment of due diligence to be implemented. The implication is that he is considering whether to take action rather than what action.

88 Page VIII-2, 4th Paragraph.

Insert an item no. 4 as follows:

> "4. The Federal government may have to compensate lease holders for their interest in the leases."

Should the Department of the Interior not approve mine and reclamation plans submitted by the lessees, resulting in the leases being terminated for failing to meet diligent development requirements, it is possible that the lessees would have to be compensated for their interest resulting from their holding the leases.

89 Page VIII-6, Table VIII-3.

With respect to the acreage requirement line, based on El Paso's calculations, the following revisions should be made: In the first column (Union Pacific railroad to Cedar City) delete "2,160" and in lieu thereof insert "2,558"; in the third column (Denver and Rio Grande Railroad to Marysvale), delete "832" and in lieu thereof insert "1,260"; and in the fourth column (Santa Fe Railroad to Flagstaff), delete "1,488" and in lieu thereof insert "2,255".

90 Page VIII-7, Table VIII-4.

In the first line of the middle three columns, delete "El Paso Energy Resources Co." and in lieu thereof insert "El Paso Coal Co.".

91 Page VIII-11, Section f.

Delete ". . . and Fisheries" from this title since the very next section is entitled "Fisheries."

92 Page VIII-13, 2d Full Paragraph.

Delete the second paragraph in its entirety. This paragraph states in part:

> "The accumulation of coal fines, trace elements, heavy metals, salts, and industrial wastes in storage ponds and disposal areas would create a potential for degradation of aquatic habitat in Lake Powell. Such pollutants could be released from spills, calamitous storms, or faulty design of disposal areas . . ."

88 No law permits such compensation at the present time.

89 Text change.

90 Text change.

91 Text change.

92 Text change.

These sentences appear to be in conflict with the water impacts paragraph (Paragraph 2.C on Page VIII-5) which states:

> "Impacts on water resources at the mine areas would be very minor, and would involve less than 1% of the region. Changes in the chemical quality of water flowing to the Colorado River would be inperceptible."

93 Page VIII-13, Section h., Last Line through First Line of Page VIII-14.

Delete the sentence starting at the bottom of the page and continuing onto the next page. The sentence states: "Proposed transportation routes have not been specifically designated but will probably cross this potential roadless area [Fifty-Mile]." This sentence does not conform to the route locations presented on Figure I-2 which shows all detailed and preliminary transportation routes to lie outside the Fifty-Mile-Mountain roadless area.

94 Page VIII-14, Lines 1-3.

The first sentence on the page states: "Archaeologic values in the area are considered important, and Fifty-Mile-Mountain is being considered for inclusion in the National Historic Register." With respect to the reference to Fifty-Mile-Mountain, the EIS should be more specific and identify the reasons for such consideration for inclusion in the National Register of Historic Places. Furthermore, it should be clarified if Fifty-Mile-Mountain meets the regulatory threshold criteria making it eligible for inclusion in the National Register. If not, this portion of the sentence should be deleted.

95 Page VIII-24, Section j., 2d Paragraph, Line 3.

There is a reference to a verbal communication with Union Pacific Railroad Company indicating that coal production on Kaiparowits Plateau must ultimately reach 30 to 40 million tons per year to make railroad construction feasible. Is this figure the lowest tonnages necessary to make it feasible or is it just one case assuming certain variables? These figures should be further verified with the Union Pacific Railroad. This same comment also applies to Page VIII-49, 4th Paragraph.

96 Page VIII-24, Section j., 4th and 6th Paragraphs, Line 2.

In both paragraphs there is a reference to a proposed new town. El Paso has not proposed a new town in its mining and reclation plan. Unless a new town has been proposed by Mono Power Company et al. or others, reference should only be to a possible town.

97 Page VIII-26, 2d Paragraph, Line 4.

The statement is made that 18.88 million tons coal per year could not justify the cost of railroad construction. This tonnage, if considered

93 Text change.

94 The statement is factual. Determination of the possible inclusion is not within the scope of this EIS.

95 Mr. Crant Flenker of the Union Pacific Realroad Co., and John Olsen of Morrison-Knudsen Co., Inc., indicated that 30 to 40 million tons per year was the minimum steam coal transport necessary to pay out the cost of building the railroad. UP news releases of December 13-14, 1978, indicate that 50 mty (steam coal) production would be needed to justify the cost of a railroad.

96 Text change.

97 See response to comment 95.

initial tonnage movements, would probably justify a railroad. In addition, this change would not contradict the previously noted tonnage statement on Page VIII-24 because the 30-40 million tons per year figure (assuming it is correct) refers to an ultimate tonnage movement assuming certain undefined factors. The last sentence of this paragraph should either be deleted or revised to reflect the comments herein.

98 Page VIII-31, Table VIII-18.

This table contains one additional coal slurry pipeline compared to the base case (Table I-4). However, the total slurry lines proposed is five (two by A-WV power plants and three by El Paso). When comparing the base case and the high production case, the additional pipeline is 474 miles long which indicates that it is El Paso's proposed line to Walsenburg. No information is presented to indicate how this particular pipeline was selected. Also, the water requirements for the Walsenburg pipeline are overstated by 440 acre feet/year (the figures should be 3,676 instead of 4,116). Although, acreage requirements were given in the table, El Paso did not provide any acreage numbers in its submittal. No indication is given as to how these numbers were derived.

99 Page VIII-32, Table VIII-19.

The entire first column of the table referring to El Paso Energy Resources Company and a proposed coal gasification plant should be deleted. El Paso is not proposing any coal gasification project in the Kaiparowits Plateau area.

100 Page VIII-41, 2nd Paragraph, Line 2.

The statement is made that coal slurry pipelines would occupy a wildlife habitat at a rate of 6 acres per mile. No reference or method of calculating this figure has been provided.

101 Chapter VIII, (General Comment).

The destruction of vegetation and the subsequent loss of AUM's over the 30-year lifetime of the mine should be linear for all levels of production. The removal of 22,005 acres of vegetation equals the loss of 4,500 AUM's over 30 years for the medium production level scenario (page VIII-11). The removal of 50,481 acres of vegetation for the high production level scenario would cause the loss of 10,000 AUM's over 30 years (page VIII-37). However, the loss of 9,457 acres at the projected level of production is said to cause the loss of 1,915 AUM's of grazing capacity (page VII-1, 7th paragraph; assuming the 4,920 AUM's from page V-2, 5th paragraph is a typographical error), and does not fit the linear trend. Regression analysis estimates the AUM's lost if 9,457 acres were disturbed to be 6,372 AUM's.

98 Chapter VIII does not contain a detailed discussion of any of the nebulous pipeline routings. The Walsenberg route is mentioned in the site specific EIS. Water requirements were based on 50 percent by volume. Right-of-way requirements are shown in table VIII-4, which contains the most detailed presentation of all pipeline proposals.

99 Text change.

100 The estimate of 6 acres per mile is based on a 50 foot disturbed width for pipelines.

101 Destruction of vegetation and loss of AUM's does not project linearly because of differences in vegetative productivity and interim reclamation.

Pocket Map, Figure I-2.

102 The references to El Paso Energy Resources Company should be changed to El Paso Coal Company.

102 Text change.

PART 2

COMMENTS TO DRAFT SOUTHERN UTAH REGIONAL
ENVIRONMENTAL IMPACT STATEMENT (DEIS)

SITE SPECIFIC ANALYSIS OF THE
PROPOSED RED AND BLUE MINES

103 Page vii.

The title of Chapter II is "Description of the Existing Environment."

104 Page 2, Table 1.

The Table shows that the following areas will be disturbed:

Red Mine - 870
Blue Mine - 33
903 Acres

The numbers should be revised as follows:

Red Mine - 919
Blue Mine - 51
970 Acres

105 Page 2, Table 1, Footnote 1.

Footnote 1 to this table should be rewritten as follows: "Preliminary plans may require further environmental assessment before being approved." As written, the footnote implies that all actions in the specified category will require further environmental assessment and cannot be approved based on this EIS. However, this statement is not necessarily true, especially with respect to water wells for and the access road to the Blue Mine.

106 Page 5, 1st Paragraph.

This paragraph should be revised to reflect the location of the facilities shown on the Blue Mine facilities map enclosed with these comments.

107 Page 5, 2nd Paragraph, Lines 1-2.

The first sentence should be revised to refer to 4 parallel headings on 80 foot centers, as shown on the enclosed map.

103 Text change.

104 See response to comment 65.

105 See response to comment 6.

106 See response to comment 65.

107 See response to comment 65.

108 Page 5, 5th Paragraph, Last Line.

The reference to a "channel division and new channel . . . " is probably only a misspelling of "diversion".

109 Page 10, Figure 6.

Figure 6, a sketch showing a typical dragline strip-mining operation, has definitely been mislocated. Obviously, this figure should have been inserted in the site specific portion pertaining to the Alton Surface Mine. Inserted in lieu of present Figure 6 should be the map showing the Red Mine surface facilities which is shown as Figure 6 on page 10 of the Alton site specific portion of the draft EIS.

110 Page 11, Figure 7.

In the second line of the text under the figure, delete "25-foot circular" and insert in lieu thereof "24-foot diameter". This revision is consistent with the text contained in the last paragraph on Page 5. Similarly, the same revision should be made to Figure 8 on Page 12.

111 Page 14, Figure 9.

Item 2 of the notes contained on the right hand side of Figure 9 should be ± 15 inches rather than ± 15 feet of topsoil cover.

112 Page 16, Third Full Paragraph, Lines 3-4.

The statement concerning the water source for a coal slurry line should be qualified to read: "It is anticipated that the source of water for any slurry line (estimated to be 3,676 acre-feet annually) would come from Lake Powell." This revision would be consistent with the text contained at page A-114 of the Red Mine Transportation Appendix. Furthermore, since it is also possible the water could come from another source, any statement should not be of such a nature as to represent a final conclusion that the only source of water is Lake Powell.

113 Page 16, 4th Paragraph.

The document implies that an environmental assessment would have to be prepared prior to the approval of a water well for the Blue Mine. Since the amount of water involved is only 10 acre feet per year, there is a question if any further environmental assessment would be required prior to approval. This comment also holds true with respect to the drilling seven (7) wells for the Red Mine. Therefore, the water paragraphs should be removed from this particular portion of the document.

114 Page 19, Section D.

The purpose of this section is not clear. Some of the so called enforceable mitgating measures are not required under 30 C.F.R. Part

108 Text change.

109 Text change.

110 Text change.

111 Text change.

112 Text change.

113 Correct, see response to comment 6.

114 Conveying the idea that the listed mitigations were required under 30 C.F.R. Part 715 was not intended. The revised mitigation measures will be required by the appropriate regulatory authority. See part 1, chapter III.

715. Examples of the mitigating measures not required in 30 C.F.R. Part 715 are:

5. Disposal ponds, etc., will be fenced or covered to keep out livestock and wildlife.

8. Irrigation will be required, as determined by proper state or federal authorities.

10. Access and haul roads will be paved prior to development of the Red Mine.

11. Fences will be approved for wildlife areas by state or federal authorities.

Of course, some of these noted items may be required by other federal regulations. Therefore, this Section should be revised.

115 Page 19, 2d Paragraph, Lines 1-3.

115 Text change.

The first sentence of the paragraph should be revised as follows:

"El Paso is in the process of revising its mining and reclamation plan to meet the new OSM Regulations; however, the revisions are not expected to increase the impacts described in this Site Specific Analysis as the regulations are designed to decrease the impacts from mining."

As written, the statement indicates that El Paso's mining and reclamation plan will be returned to the operator to revise it. However, the only request has been a notice to the operators to revise their mine plans to comply with the OSM regulations. El Paso's previously submitted mining and reclamation plan has not been returned. The suggested revision more correctly states what has transpired and what further steps El Paso must take.

116 Page 19, 2d Paragraph, Item No. 1.

116 Text change.

The first sentence should be revised as follows: "The proposed developments fall under the provisions of the Surface Mining Control and Reclamation Act of 1977 (PL 95-87) and the Department of the Interior Regulations promulgated pursuant thereto." As written, the sentence indicates that the Department of the Interior passed the Surface Mining Control and Reclamation Act.

117 Page 22, Item No. 8.

117 Text change.

Item no. 8 should be deleted in its entirety and substituted in lieu thereof the following: "Supplemental irrigation to reestablish vegetation will be used as necessary." Past reclamation efforts have not required supplemental irrigation. Since the Act and the regulations

promulgated pursuant thereto require the lessee/operator to reclaim and revegetate the land, the lessee/operator will take whatever steps, to include supplemental irrigation, necessary to effectuate reclamation. Therefore, there is no need to dictate a specific rate of irrigation which could result in consuming unnecessary amounts of water.

118 Page 22, Item No. 9.

After "hard-surfacing" insert ", using dust suppressants,". Dust suppressants represent an alternative to paving or using water to suppress dust.

119 Page 24, Section A.2.b, Line 1.

The text refers to a dip of 1° to 3° S.W. In El Paso's plan, (Page II-79) the dip mentioned is 3°.

120 Page 28, 2d Paragraph, Last Line.

The text refers to an average annual runoff of 640 acre feet. This figure conflicts with the 300 acre feet figure submitted by El Paso in its plan.

121 Page 29, Section 4, 1st Paragraph, Line 8.

The reference to Table II-11 should be to Table II-7.

122 Page 32, Section B.1, 1st Paragraph, Line 2.

At the start of the second sentence, delete "The project" and in lieu thereof insert "The total area under lease by El Paso".

123 Page 32, Section 2, 1st Paragraph.

A grazing capacity total of 30 AUM's for the Red and Blue Mine facilities, areas, and access roads is ambiguous. The lease is 40,546 acres, but the area to be disturbed is less than 1,000 acres. This statement needs clarification.

124 Page 37, Item 6.

The discussion of archaeology and history appears to be accurate as far as it goes, but it would be helpful to add the following: "A further discussion of the archaeological and historical resources of the lease and surrounding area may be found in Part 1, the Regional Analysis, at II-87 *et seq*. Additional information will be obtained when and as necessary under the National Historic Preservation Act of 1966 and the Historical and Archaeological Data Preservation Act of 1974."

118 Text change.

119 The text is correct as stated.

120 Average annual runoff of 640 acre-feet was estimated from streamflow records and runoff maps of Utah.

121 Text change.

122 Text change.

123 Text change.

124 As the comment indicates, the area that would be disturbed must be surveyed in detail prior to disturbance. Additional discussion would not aid impact analysis.

125 Page 38, 1st Paragraph, 1st Sentence.

Delete "rather than the preliminary proposal of the mine plans and". The mining plans are the proposed actions.

126 Page 39, 4th Paragraph.

Erosion rates of 1.0 to 3.0 cubic yards per acre per year given here do not agree with the rate of 10 cubic yards per acre per year given in Part 1, page IV-5, second paragraph. The formula used to obtain the value of 10 cubic yards includes a slope factor of 60%. However, slopes on reclaimed areas will not be greater than 50%.

127 Page 41, Section 4, 2d Paragraph.

This paragraph states that four plant species (two endangered and two threatened), which were not listed, will have to be surveyed for. However, the baseline (page 30, under 5. VEGETATION, 2d and 3rd paragraphs) states that these plants were surveyed for and none were found. This conflict needs to be resolved.

128 Page 42, Section 2, 1st Paragraph, 1st Sentence, Line 2.

The source of the population figures should be identified.

Gradual influx and expansion of population within the project area can be absorbed without major disruption and significant deterioration to the existing community life. Proper planning and mitigation by industry and local and county governmental entities can lessen many of the "several significant impacts" as discussed in this section.

129 Page 42, Last Paragraph.

This paragraph suggests that payroll for the Red and Blue mines would amount to more than 4,000 people (total annual payroll of $56 million, average annual salary of $12,000 to $15,000). Table 1, on page 2, shows total personnel requirements for these mines of 1970 people. On page IV-28 of Part 1, mining employment in 1990 is given as 1,040. The latter figure is for the Blue, Kaiparowits No. 5, and Alton mines; the Red mine is assumed not to be in production. Therefore, these figures need to be revised to reflect only the payroll of El Paso's employees and the source of the figures.

130 Page 43, 1st Line.

Change "28" to "29".

131 Page 43, Section 3, 4th Paragraph, Last Sentence.

This ambiguous sentence should either be omitted or restated as follows:

> "Impacts that result from this construction and use could be significant."

125 Text has been changed. The preliminary proposals are transportation and other coal related proposals for which land use applications have not been filed.

126 The estimate of increased soil erosion rates of 1.0 to 3.0 cubic yards per acre per year is for erosion by water action prior to reclamation. The 10 cubic yard per acre per year rate includes also erosion by wind. Predictions were made for slopes which are steeper than 50 percent because most of the erosion would occur prior to reclamation.

127 As stated in section D of chapter I, a site specific survey will still be necessary.

128 These population estimates were based on a procedure explained in Rapid Growth from Energy Projects, Ideas for State and Local Action, Department of Housing and Urban Development, 1976.

129 The manpower and total population figures are based on 15 tons of coal mined per man shift or 290 total work force per mty coal production. The production in part 1 is based on different mines. See response to comment 1.

130 Depending on the location and extent of road improvement, road mileages from Glen Canyon City would be 26-29 miles. A compromise figure of 28 miles was used for analysis.

131 The impacts owing to transport of 6.8 mty of coal would be significant but cannot be quantified until a detailed plan and route is chosen.

132 Page 44, Section 5, 3rd Paragraph, Line 7.

Gradual influx and expansion of population would enable parks and recreation officials to cope with predicted increases in use.

133 Page 47, 2d Line.

Change "25" to "35".

134 Page 50, 2d Paragraph.

The discussion of Short-Term Use versus Long-Term Productivity would benefit by referencing the corresponding discussion in Chapter VI of Part 1, Regional Analysis.

135 Page 51, 2d Paragraph, 1st Line.

Change "K_2" to "K_1".

136 Page 53, Section A, 4th Paragraph.

This paragraph recognizes that a lessee would lose its investment and lease if the Secretary took no action; however, on Page 54, under Section B (defer action), the same result is not recognized, even though it would occur because of the lack of needed lead time and because of the ten-year diligent development requirement.

137 Page 53, Section A, 5th Paragraph.

The fifth paragraph of the discussion of the "no action" alternative should be expanded to read: "The State of Utah will probably lose the revenue from State Lands since mining on State land is not economically feasible unless adjoining Federal lands also are mined."

138 Page 56, Section 3, Lines 5-7.

As written, the sentence states: "To date, the Administration has not requested such action, and the Congress has not initiated or considered such legislation; the possibility thereof is thus conjectural at best." It should be revised as follows: "To date, the Administration has not requested such action; however, Congress is currently considering various forms of such legislation." Recently, bills authorizing this procedure, as well as lease exchanges and compensation to lessees, have passed appropriate Senate and House Committees.

132 Chapter V of the site specific analysis for the Red and Blue mines specifically addresses this problem.

133 Text has been changed.

134 The recreation discussion in part 1 concerns a larger and more widely distributed population than that created only by the Red and Blue mines. Therefore, the discussion of short-term use versus long-term productivity does not apply directly to the Red and Blue mines.

135 Text change.

136 Text change.

137 Text change.

138 The comment is accurate; however, the new congress may or may not have a similar bill under consideration. Such a law may or may not be inacted. Analysis of speculative laws is not within the scope of the EIS.

NEVADA POWER COMPANY
FOURTH STREET AND STEWART AVENUE
P.O. BOX 230 • LAS VEGAS, NEVADA • 89151

October 13, 1978

Director
U. S. Geological Survey
National Center
Mail Stop 108
Reston, Virginia 22092

Dear Sir:

Attached are detailed comments on the environmental impact statement draft for development of coal resources in Southern Utah. These comments are submitted by Nevada Power Company as Project Manager for the Allen Warner Valley Energy System.

Comments specifically directed to the Alton Coal Field will be prepared and submitted by Utah Internnational, Inc. Washington County Water Conservancy District of the State of Utah will submit comments regarding the Warner Valley Water Project.

Sincerely,

John W. Arlidge
Manager, Special Projects

/so

Enclosure

cc: Mr. Paul Howard - BLM Utah
Ms. Ruth A. Frear - Sierra Club
Mr. Gordon Anderson - Friends of the Earth

Development of Coal Resources
In Southern Utah
Part 2 Site Specific Analysis Alton Mine
Draft Environmental Statement
Comments
by
Nevada Power Company
and
Allen Warner Valley Energy System Participants

1 Page 1 - Nevada Electric Company should read "Nevada Electric Investment Company".

2 Page 47, Section 6 Fisheries, third paragraph - States "impacts on fisheries in the Virgin River system from slurrying to the proposed power plants ..." implies some adverse impact on the River due to the slurry pipeline. No foundation was established for such a statement. To the contrary, all studies indicate the pipeline will have no impact on the fisheries in the River. Thus, the implication that slurrying will have an adverse impact should be removed.

1 Text change.

2 Text change. An accidental pipeline break probably would present the only hazard to the fisheries. If the low flow of the Virgin River were reduced by conversion of the flow to public, industrial, or irrigation supply, the fisheries would risk an adverse impact. Such a reduction is not currently proposed.

Development of Coal Resources
In Southern Utah
Part 1 Regional Analysis
Draft Environmental Statement
Comments
by
Nevada Power Company
and
Allen Warner Valley Energy System Participants

3 Page I-4, Table I - Reference to Nevada Power Company should be reference to Nevada Electric Investment Company. The holder of the Alton West Coal leases is NEIC; therefore all references (pages I-6, IV-3, etc.) to Alton West leases should refer to NEIC.

4 Page I-11, paragraph E - Incorrectly identifies participants in the Energy System. The Energy System components have been grouped together only for the purpose of the Bureau of Land Management Impact Statement. The components and participants in each component are:

Alton Mine - Utah International and Nevada Electric Investment Company. Relationship not defined

Alton Pipeline - Work to date has been done by Nevada Power; ultimate owner or operator is not known.

Warner Valley Station - St. George, Nevada Power, Pacific Gas and Electric and Southern California Edison anticipate participation in the plant. Participants as tenants-in-common is the probable relationship.

Harry Allen Station - Nevada Power Company, Pacific Gas and Electric and Southern California Edison anticipate participation in the plant. Regardless of initial ownership, Nevada Power will ultimately receive 100 percent of the plant output. Relationships among the participants are not defined at this time.

Warner Valley Reservoir - Washington County Water Conservancy District. Water project is not a part of the Energy System.

5 Page I-11, paragraph 1 - Leases in the Alton Coal Field are held by Nevada Electric Investment Company, not Nevada Power Company.

6 Page I-11, paragraph 2 - The pipeline to Warner Valley Station will be 70 miles long and the pipeline to Allen Station will be 183 miles long.

7 Page I-13, paragraph 5 - A complete transmission line proposal has been submitted. However, the exact routing of transmission lines between El Dorado and Southern California will be submitted in the near future. References to McCullough Substation should read "El Dorado Substation".

8 Page I-14, Table I-4 and Page IV-7, paragraph 3 - Water requirements are incor-

3 Text change.

4 Text change.

5 Text change.

6 Text change.

7 Text change.

8 Text change.

rect for power plants and slurry pipelines. The average annual water use for both Allen and Warner Valley Stations is 32,500. For the coal slurry pipeline, the use rate will be 5,400 to 7,800 acre feet per year.

9 Pages I-26,27, Table II-7 and II-8 - Period of observation for Warner Valley is longer than indicated. Reports for additional periods of observation have been submitted to the Bureau of Land Management and through the BLM to USGS.

10 Page IV-7, third paragraph - There is no project called the Allen Warner Valley water project. This probably refers to the Washington County Water Conservancy District project from which the Warner Valley Station will have the right to purchase up to 10,000 acre feet.

The last part of the third paragraph; "... loss by Nevada ... of Colorado River Water credit ... dewatering of the Las Vegas Wash" are impacts of the Las Vegas Wash Pollution Abatement Project. These impacts were addressed in the Environmental Protection Agency's Final Impact Statement for the Pollution Abatement Project.

11 Page IV-11, fifth paragraph - The draft states that the ERT, EPA and Stearns-Roger reports on Warner Valley Station air quality indicate PSD violations and reduced visibility at Zion National Park. Dispersion modeling by Stearns-Roger indicate no violations of either PSD class II or class I areas. Revised modeling by ERT, using the correct SO_2 emission rate for the Warner Valley Station, also indicate no violations of PSD class II or I standards. Although the results of EPA's modeling have not been released by BIM for review, it is our understanding that conclusions by Don Henderson of EPA Region VIII also indicate no violations. To date, we have seen no report or indication that visibility in Zion National Park will be reduced because of the Warner Valley Station.

12 Page IV-19, 21, 23 and 25, Sections on Wildlife Fisheries and Invertebrates and on Page V-3 and in Section VIII - Numerous remarks within the draft statement indicate possible adverse impacts caused by increased populations within Washington, Iron and Beaver Counties associated with the Allen Warner Valley Energy System. Examples are the possible reduction of snail habitat (pages IV-25 and V-3) and displacement of bald and golden eagles due to urbanization in Parowan and Cedar Valleys (page IV-21). However, comparison of population charts within the Statement (Table II-36 and IV-7) with and without the proposed development indicate negligible increases in population in the three counties. The text of the statement, our own studies and the studies of the Five Counties Association of Government agree with that finding. The only effect the Energy System will have on the populations of those communities will be Washington County reaching the anticipated 1985 population level by 1980. After that, both population tables are the same. Thus, we believe that comments on "boom towns", reduction of species, etc. in the three counties should be removed.

13 Page IV-23, second paragraph - States, "Major identified impacts include: disturbance of 9,588 acres of habitat; loss or disturbance of rare species such as the spotted bat, Gila monster, desert tortoise, and desert bighorn sheep; disturbance of nesting raptors in Warner Valley and along the Hurricane Cliffs; possible elimination of the endangered Vegas Valley leopard frog; and a long-term lowering of wildlife productivity. Beneficial impacts would be creation of resting and feeding areas for waterfowl and shorebirds, and an increase of pheasant habitat on irrigated cropland in Washington County." The statements of

9 Text change.

10 Text change.

11 Text change.

12 Coal and powerplant development in the projected scenario would cause population increases in Washington and Iron Counties. The potential impacts on wildlife, fisheries, and invertebrates could occur. Because projected growth in Iron County is negligible, reference to urbanization impacts on eagles in Parowan and Cedar Valley has been deleted.

13 The draft text was based on an initial assessment of the situation. Subsequent evaluation indicates a text change is appropriate.

loss or disturbance and possible elimination of wildlife and species are completely incorrect. The project has been designed and scheduled to hold to a minimum, if not to entirely eliminate, any disturbance of the spotted bat, Gila monster, and desert bighorn. In over three years of work by State, federal, and consulting biologists, no nesting raptors have been found along the Hurricane Cliffs or in Warner Valley.

The endangered Vegas Valley Leopard Frog does not appear within or near any component boundary of the Energy System. Several remarks within the draft statement attempt to tie possible impacts of the Las Vegas Wash pollution abatement project to the Allen Warner Valley Energy System (pages IV-7 and IV-23). The pollution abatement project has a final impact statement prepared by the Environmental Protection Agency and has been funded by that Agency and is under construction and will operate with or without the construction of the Energy System. The purchase of sewage effluent for the Allen Station cooling requirement from the pollution abatement project will not change the pollution abatement project nor its impacts on the Las Vegas Wash. Thus, any impacts on the Las Vegas Wash or species within the Wash should be removed from this statement.

As to the long term lowering of wildlife productivity, elsewhere in the statement it is stated that the total loss over the life of the project of approximately 2,000 AUMs. A very small reduction in AUMs over such a large area. Also, the surface mine reclamation is sited as enhancing the habitat for large wildlife.

These inaccuracies should be eliminated.

14 Pages IV-25 and V-3 - The April 3, 1978; Regional Director, Fish and Wildlife Service opinion was quoted in part. If the remainder of the opinion was quoted or available to the reader, the reader would find:

> a) "We recognize the project would have a beneficial impact during low flow months ... this would, in all probability, improve conditions for Woundfin ..."
>
> b) "If these flow recommendations can be maintained at Hurricane Gaging Station ... adverse impacts on the Woundfin can be eliminated".

The total opinion should be made available to the reader and impact analysis should be based on the whole opinion. Again we point out that the Washington County Water Conservancy District project is not part of the Energy System.

15 Page IV-44 - Text at top of page is not continuous to previous text.

16 Page IV-55, Section 4, third paragraph - States, "No major improvements are planned ... to provide access to the Warner Valley Power plant site." Major road improvements will be accomplished to the site for the purpose of hauling heavy equipment and employee safety. Details of the road improvements have been submitted to the Bureau of Land Management. The statement of no major improvements and the resulting impact analysis should be removed from the draft.

17 Page V-2, second paragraph - States, "Ground-water use in Warner Valley could decrease yield of springs and wells ...". The only suggestion of ground water

14 The quote presented is accurate and the text has been revised.

15 The text is intended to be continuous and is in context.

16 Text change.

17 Text change.

use in Warner Valley was an alternative for domestic water at the plant site. The alternative was stated because of the request of the Bureau of Land Management to provide alternative systems for "all" aspects of the Energy System. The Warner Valley proposal states that the two gallon per minute domestic water supply will be obtained from Station make-up water purchased from the Washington County Water Conservancy District. Thus, comments on decreased yield of springs and wells should be eliminated.

18 Page VIII-9, VIII-10 and VIII-36 - No units are given for the quantities stated. Also, on VIII-9 Warner Valley should be moved to column for power plants.

18 Text change.

UTAH INTERNATIONAL INC.
550 CALIFORNIA STREET · SAN FRANCISCO, CALIFORNIA 94104
CABLE ADDRESS: UTAHINTL · (415) 981-1515

17 October 1978

Mr. H. William Menard
Director, U. S. Geological Survey
National Center, Mail Stop 108
Reston, Virginia 22092

Dear Mr. Menard:

Attached are written comments on the Draft Environmental Statement, Development of Coal Resources in Southern Utah Part 1, Regional Analysis and Part 2, Site Specific Analysis.

We recognize the very difficult task of preparing documents such as these and for the most part feel that your agency has done a credible job under some very difficult circumstances.

Our comments address the areas we feel require additional attention or correction.

We trust the project team will correct the deficiencies noted and produce a final statement that will allow the concerned agencies to make an informed and timely decision on the development of these resources.

Sincerely,

J. LeRoy Balzer, Ph.D.
Director, Environmental Quality Dept.

JLB:rb
Attachments

GENERAL COMMENTS

It is very difficult from reading this report to accurately determine the impacts on the region that could result from coal development. There are four basic areas that contribute to this problem. They are:

1. The inclusion of the Allen-Warner Valley Power System in the regional analysis makes it very difficult for the reader to either separate and identify the impacts of coal development alone, or put the combined impacts into perspective. This is further complicated when the authors include the power system, or portions of the system, then refer in general terms to impacts of the system, advising the reader that details of these impacts are discussed in the Allen-Warner Valley site specific EIS (BLM). The referencing of the other document is not a problem, it's the inconsistent way in which the power system is included or excluded. It would seem more logical to have described the Allen-Warner Valley Power System in the Proposed Actions as the ultimate user of the coal but not include it in the Impacts Section and the reader informed that a draft EIS is being prepared on the system by BLM.

1 The A-WV system is part of the coal and energy development program for southern Utah; the cumulative impacts of the system therefore are included in part 1.

2. Both documents suffer from a serious lack of consistency in a number of areas.

Often the description of the environment does not relate well with the statements made in the impact section. For example, Part I, Page II-47, contains a lengthy discussion of Lake Powell including a correlation between lead content in the gills of three fish species and outboard motor use on the lake. From this discussion a reader would assume a potential impact on Lake Powell. In the impact section, Part I, Page IV-6, is a discussion of dissolved solids and sediment movement where the author states, "this increase would have little effect locally and would probably be imperceptible in flows to the Colorado River" and "However, increased sediment movement to the Colorado River would be insignificant ---- Paria River." This is followed by a sentence on Page IV-24 that states, "Although mining would cause no increase in sediment concentrations (Water Section), fish habitat that would probably be impacted by sediment would be Wahweap and Warm Creek bays in Lake Powell and the East Fork of the Virgin River." Three statements that essentially say there will be no impact do not warrant the lengthy discussion of Lake Powell in the description of the environment. This only misleads and confuses the reader.

2 The EIS must contain analyses of both direct impacts owing to the coal mines and secondary impacts owing to a population increase.

3 In many cases individual authors of the report chose not to review or incorporate material or data from associated disciplines. This leads to confusion and misunderstanding on the readers part. For example in the vegetation section table IV-3, the author describes the types of vegetation that will be disturbed and does not indicate that any ponderosa pine type will be affected. In the wildlife section page IV-23, the author states, "Loss of mature ponderosa pine trees from strip mining in the Alton area will eliminate roosting and nesting sites for raptors." This kind of inconsistency leaves the reader with some serious doubts about the validity and accuracy of the assumed impacts described in both sections. The report has far too many examples of these kinds of mistakes that greatly detract from its credibility.

4 There are serious problems with the consistency of numbers used in the report. Part I lists a series of assumptions that most authors chose to ignore, and numbers and values developed by one author were almost never consistent with numbers and values used by other authors. The one very evident example of this was the population increase in the region as the result of coal development. This population projection was quoted nine times in Part I and ranged from "small" to "large influx of people", and 8,336 to 23,400. When the assumed water use of one-acre foot for four persons and community development at the rate of 18 persons per acre were applied to population figures used in the report, the resultant water use or acres disturbed did not agree with those stated as impacts.

These inconsistencies must be resolved in the final report. The reader is left with the impression that either team members did not communicate, or disagreed and did not resolve the differences prior to printing.

5 In too many areas of the report, impacts are assumed without data to support the assumption. There are also a number of discussions where the author presents data in a manner that leads the reader to assume a greater impact than would actually exist. For example, the paragraph in Part 2, Page 51 that discusses the premature razing of topographic features in Bryce Canyon National assumes the potential impact, cites a worst-case analysis in very ambiguous terms, but never tells the reader the findings of this worst-case analysis. From the way this paragraph is presented, a reader would assume there is a potential impact and the worst-case analysis confirmed this fact.

6 In another example, the author of the recreation sections develops a baseline described as the Southern Utah Coal

3 The reviewer misunderstands the use of vegetation type which is defined as a mapable extent of a dominant vegetation type; individual or small groups of ponderosa pine trees not covering enough area to qualify as a separate mapable type occur within other types just as other species can occur in the ponderosa pine type.

4 The numbers throughout the text have been reconciled.

5 The text has been clarified to indicate that premature razing of rock formations in Bryce Canyon by mining activities should not occur.

6 All recreation use areas within the RIZ are included in the assessment. Areas that would not be significantly impacted are described only in chapter II. Such areas may lack recreation attractions, or are lightly used for recreation, or have user capacity to accomodate projected increase in use.

Region Recreation Influence Zone or RIZ. This presumably is an inventory of the recreational facilities available within the region and the bases upon which impacts of increased use would be evaluated. The author then removes from this inventory areas that "have the user carrying capacity to accomodate projected increases of use without impairment of resource or individual user values." The RIZ thus includes only those areas that are already heavily impacted. The logic and value of this kind of evaluation is difficult to determine except that it provides the desired results of the author.

7 Probably the most serious problem in accurately determining the impacts in these reports is the way in which individual biases are reflected in the material presented. In reading the report it is not difficult to tell what an individual author's feelings are related to mining and power generation.

8 In Part 2, Alton Mine, the Virgin River and the endangered woundfin are discussed seven times including one statement to the effect that, "No reduction in flow owing to strip-mining activity is anticipated in the East Fork Virgin River, Kanab River, or the Paria River." The other six statements describe the potential impacts and yet no data can be found in either document to substantiate these impacts. This is an obvious attempt to bias the reader.

9 The author of the esthetics section (Part 2, Page 39) is not comfortable with the BLM regional classification of the scenic quality of the mine site as "common" and "minimal" so they are upgraded in the report. These classifications were developed so that resources management decisions and their effect on scenic quality could be evaluated without biases.

10 In the fisheries impact section the author tried very hard to impact Lake Powell but had problems developing supporting data so made a statement that added nothing to the report. "Although mining would cause no increase in sediment concentrations (Water section), fish habitat that would probably be impacted by sediment would be Wahweap and Warm Creek bays in Lake Powell and the East Fork of the Virgin River."

7 An effort has been made to reduce lack of objectivity caused by individual bias.

8 Text change.

9 The impression was not intended. The BLM regional classification of scenic quality was used in the EIS assessment.

10 Text change. See John Spaulding, Kaiser Engineer's letter, comment 35.

Comment Number

11 1. Page V, Para. 3.A. "Land surface on 17,149 acres would be disturbed --- acres."
Para. 3.D. "Soils on 19,000 acres would be disturbed --- development."
Comment: Although it is difficult to determine from the report it appears that 19,150 acres will be disturbed. Change both paragraphs to reflect this number.

12 2. Page VI, Para. 3.I. "and about 2,000 acres would be permanently lost to --- roads."
Comment: This is in conflict with other statements in the report that indicate about 1,000 acres would be permanently lost. Change this sentence to read 1,000 acres.

13 3. Page VI. Para. 3.J. "About one half the regional increase in population, from 46,500 in 1970 to 66,950, would be concentrated in Kane and Garfield counties."
Comment: This statement is incorrect, misleading, and in conflict with other statements in the report. It implies that coal development will increase the population in the region by 20,450 persons and one half (10,225) will be concentrated in the two counties. Change this statement to read, "Of the approximately 8,400 new residences in the region, as the result of coal development, 8,100 could reside in Kane and Garfield counties."

14 4. Page VI, Para. 3.K. "The increased population would require about 565 acre-feet of water annually for domestic and public supply purposes."
Comment: It is difficult to determine the source of this number from the report. If the assumption of one acre-foot (326,000 gallons) for four persons is correct, then this figure should read 2,100 acre-feet (8,400 -:- 4 = 2,100). A more realistic consumption would be 100 gallons per person per day which would indicate an annual acre-foot consumption of 940.

$$\left(\frac{8{,}400 \text{ people} \times 100 \text{ gal} \times 365}{326{,}000 \text{ gal}} = 940 \text{ acre-feet}\right).$$

11 Text change.

12 Text change.

13 Text change.

14 Text change.

Comment Number

Change this statement to read "The increased population as the result of coal development would require about 940 acre-feet of water annually for domestic and public supply purposes.

5. Page I-14, Table I-4. Basic analysis data and assumptions

Comment: This table includes figures that are incorrect and in conflict with other statements in the report. They are:

15 1) Water requirement acre-feet per year.

a) Strip mines. The table indicates 1,416 acre-feet per year while the site specific indicates 900 with 160 for mining and 740 for domestic needs in the community.

b) Added community. The table indicates 1660 acre-feet per year while the summary indicates 565 and the assumptions (Page I-15) would show a need of 2,400 acre-feet per year.

The assumptions on Page I-15 for water demands state "Annual water use will be at the rate of one acre-foot (326,000 gallons) for four people; --- use." This is more than twice the 100 gallons per person per day normally used in estimating domestic consumption (see comment 4). Change the table to read strip mining 160 acre-feet per year, and added community 940 acre-feet per year.

16 2) Acreage requirements

a) Added Community. The report states (as an assumption) that community development will be at the rate of 18 people per acre and there will be 8,400 new people in the region.

This does not equate to the 362 used in the Table. Change to read 967 acres (8,400 people -:- 18 = 466.67).

17 6. Page I-15, Para. 1. Change to read "Annual water use will be at the rate of 100 gallons per person per day."

15 Text change.

16 Text change.

17 Text change. One acre-foot of water per 5 people equates to 180 gallons per person per day.

Comment Number

18 6a. Page II-21. AIR
Comment: The meteorological discussion presented appears to be adequate, although inclusion of meteorological data collected by Utah International at the Alton coal field would have made the analysis more site specific for that field.

The total suspended particulate (TSP) data presented shows violations of 24-hour primary and secondary National Ambient Air Quality Standards (NAAQS). The stations recording extremely high 24-hour concentrations had low annual geometric means, implying that the high concentrations were the result of natural causes (i.e., wind blown dust). Given recent EPA policy regarding fugitive dust, the DEIS should study the high concentrations measured to determine if they can be attributed to fugitive dust or industrial sources.

18 Text change.

19 7. Page II-31, Para. 3. "Vegetative production also ranges from 200 lbs/acre to 1,500 lbs/acre, dry weight."
Comment: This is much too high and in conflict with other statements in the report. The greatest portion of the vegetation that will be disturbed is in the Pinyon-Juniper type (77%) with an annual forage production that, in good years, will not exceed 50 lbs. per acre. Change to read "Vegetative production also ranges from no forage production to 1,500 lbs/acre, dry weight with most of the disturbed type (Pinyon-Juniper 77%) less than 50 lbs/acre, dry weight."

19 Text change.

20 8. Page II-40, Para. 2. "Deer populations have trended downward in recent years, but studies by UDWR indicate that range conditions are good and that the range could support more deer."
Comment: More recent studies indicate this downward trend has reversed.

20 Text change.

21 Text change.

21 9. Page II-44, Para. 7. "The direct loss of wildlife from illegal shooting, highway mortality, and other activities would increase. Rare or unique species in small numbers may be eliminated."
Comment: This is an assumed impact without much basis in fact and is found in the description of the

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existing environment, not in the impact section. If there is supporting data, place in the impact section.

22 10. Page II-47, Para. 1, 2 & 3. The total discussion of Lake Powell is not germane to the report. The assumption that "it should continue to provide fishing near the current level for the projected 1990 population of southern Utah provided coal is not developed" is an assumption without basis in fact.

Comment: This statement assumes a major impact on the fishery which the report fails to substantiate. The impacts are assumed to be from two sources; fishing pressure and degradation of water quality. The facts are:

1) Degradation of Water Quality. The report discusses in detail the potential sources of pollution from mining, but when they are quantified and described in their relationship to Lake Powell, the impact does not warrant this detailed discussion of the lake. For example, Page IV-6, Para. 4. states "However, increased sediment movement to the Colorado River would be insignificant (less than 0.2 of 1 percent) because the source area (the spoil piles) at any given time would be extremely small compared to the total contributory areas of Kanab Creek or the Paria River, " and Page IV-6, Para. 4. the author states "The concentration of dissolved solids in runoff from the mined area may increase as much as 10 percent, based on data from Black Mesa, Arizona (Verma, 1977); this increase would have little effect locally and would probably be imperceptible in flows to the Colorado River because the mined area is less than one-half of one percent of the total watershed involved."

2) Fishing Pressure. The report implies the increased population in the region as the result of coal development will reduce Lake Powell from its current "capacity to provide excellent warm water fishing." The facts simply stated are:

a) Lake Powell was fished in 1977 by 245,440 fishermen.

b) The increased population as the result of coal development will be 8,400 people.

22 See response to comment 2. It is germane because Lake Powell would be impacted under each of the scenarios. The reviewer assumes incorrectly that secondary impacts would not be significant.

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c) If 31 peracent (as the report states) of these people were fishermen and they fished the lake three times during the year, the fishing pressure on Lake Powell would increase by about three tenths of one percent.

d) Fishing pressure without coal development increased by over 19 percent between 1976 and 1977.

For better balance between the description of the existing environment and impacts, and to impacts in more realistic terms, this total discussion of Lake Powell should be removed from the report.

23 11. Page II-47, Para. 6. "The Virgin River is of critical fishery value because it is the only stream supporting a population of the endangered woundfin (Plagopterus Argentissimus)".

Comment: Public comment during the hearings questioned the accuracy of the statement "it is the only stream". This fact should be investigated further if the statement is to remain in the report.

24 12. Page II-50, Para. 6. "The USDA Forest Service RARE II study has identified two roadless areas on the Dixie National Forest within the Southern Coal Regional Boundary namely, Henderson Canyon area (#4-258), and Box Death Hollow (#4-259). The management direction for these areas is to maintain their wilderness character until a decision is made in the study regarding their future management."

Comment: The management direction is not to maintain their wilderness character but rather to maintain their roadless character and the study is to determine if they have, in fact, wilderness character. Change to read, "The management objective is to maintain their roadless character until a decision is made in the study regarding their suitability for inclusion in the wilderness system.

25 13. Page II-62, Table II-19....Population of the United States, Utah and the Southwestern Counties by age distribution (Percentage breakdown 1970)

Comment: This table should be corrected or taken out of the report. There are mathematical errors that

23 Text change. La Verkin Creek was not included in the draft because it is entirely outside the southern Utah coal region boundary.

24 Text change.

25 Text change.

Comment Number

detract from its value and make other numbers in this section suspect. For instance the total southwestern population is stated as 36,224 while Table II-17 states the 1970 southwestern population as 35,224. Yet adding all the age groups in the region together total 34,656. Also, the percentage by age group figures are incorrect.

26 14. Page II-84, Para. 6 & 7. Both of these paragraphs are rather puzzling. If interpreted correctly they state that the RIZ includes the recreation resources of the region that could be impacted as a result of mining 12 MTY of coal. Then it removes from the list of recreation resources in the RIZ those areas that:

1) "Lack recreation attractions and are lightly used for recreation."

2) "Have the user carrying capacity to accomodate projected increases of use without impairment of resources or individual user values."

3) "Possess significant recreation attractions but generally lack enough developed facilities or have administrative restraints on types of use."

The only assumption a reader can make from this is that the total impact from increased recreation use will be on those areas that do not have the capacity to accomodate projected increases and those areas with the capacity will be ignored in evaluating the regional impact. This is totally illogical.

This complete section needs to be rewritten and presented in a more logical manner.

27 15. Page II-91, Para. 6, Page II-93, Para. 1 & 2. These paragraphs tell the reader little or nothing about the archaeology and history of the region. These three paragraphs could be removed without detracting from the completeness of the report.

28 16. Page II-94, Para. 6. "Population is expected to increase due to normal growth in the region without coal

26 Refer to response to comment 6. There areas would not be significantly impacted.

27 These paragraphs describe a part of the current situation.

28 Text change.

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development. Growth of 23,400 people from 1975 to 1990 is anticipated resulting in community enlargement on approximately 900 acres."

Comment: Table II-36 indicates a 1975 population for the region of 42,400 (although Table II-7 indicates 43,506) and projects a 1990 population of 58,600. Therefore, the population increase for the period should be 16,200. Using the assumption that 18 new residences will occupy one acre, 16,200 population increase will need 900 acres. Change the paragraph to the correct population figures.

29 17. Page II-95, Para 6. "Regional population increased over time in the absence of coal mining would be small (Table II-36)."

Comment: This statement implies that the population increase in the region will be caused primarily by coal development. If this statement is fact, then the regional population increase with coal development will be small. Without coal development the population will increase between 1975 and 1990 in the region by 16,200 people. With coal development the population will increase by 24,500. This is an additional 8,400 people as the result of coal development. To put this statement into proper perspective, it should read, "Of the total population increase for the region of 24,600 (at the projected level of 12 mty) between 1975 and 1990, 66 percent or 16,200 would occur regardless of coal development.

30 18. Page II-96, Table II-36.

Comment: The title of this table should indicate the fact that it is projected population increases within the region without coal development. The author compares this table with Table IV-7, so the titles should indicate the basis of comparison - Without Coal Development and With Coal Development.

31 19. Page II-101, Para. 5. "Without coal development, the following changes will occur to the recreation resources within the RIZ:

a) Acute shortages in developed recreation sites for camping and picnicking.

29 Text change. Population in the absence of coal development (table II-36) would increase 38 percent from 1975 to 1990. With coal development (table IV-7) it would increase 58 percent during the same period. One-third of the increase with coal development is attributed to coal.

30 Text change.

31 Refer to response to comment 6.

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b) Additional conflicts will occur between different user groups and the same dispersed areas."

Comment: As the RIZ does not include areas that "have the user carrying capacity to accommodate projected increases of use without impairment of resources or individual user values" (see Page II-84, Para. 84.), how can these statements be true? To properly evaluate the impact of a change on a specific resource, the total resource needs to be considered, not just that portion that is already being heavily used.

32 20. Page IV-I, Para. 2. "At the projected level --- 19,500 acres will be disturbed (Table I-4),"
Comment: Table I-4 totals 19,045 acres disturbed. Comment number 5 increases the total to 19,150 acres. Change statement to show 19,150 acres.

33 21. Page IV-1, Para. 3.1.
Comment: Highwalls will be 150 feet high, not 160 feet.

34 22. Page IV-4, Para. 6. "Total projected acreage of soil disturbance is about 9,095 acres from developing the 3 mines at the projected production level --- and 362 acres from necessary associated community development."
Comment: Include in this sentence the statement that 8,300 acres of this disturbance will be temporary and reclaimed following mining. Change 362 acres to 467 acres.

35 23. Page IV-7, Para. 4. This whole paragraph is very confusing to the reader. It provides a whole series of numbers related to water requirements for the Allen-Warner Valley Power and Water projects then references the BLM study for sources. This is followed by a discussion of pumping from the Navajo Sandstone inferring that much larger volumes will be pumped than are actually planned.
Comment: This whole paragraph should be taken out of the report and replaced with the following paragraphs that more accurately describe the impacts.

Estimated water requirements at the level of coal

32 Text change.
33 Text change.
34 Text change.
35 Text change.

Comment Number

development including the Allen-Warner Valley Energy System would be 42,519 acre-feet per year. Facilities, their estimated annual consumption and proposed sources are as follows:

FACITLITY	ACRE-FEET/ YEAR	SOURCE
Underground Mines	80	Ground Water
Strip Mine	193	Ground Water
Power Plants		
Henry Allen Station	27,208	Sewage Effluent-Las Vegas
Warner Valley Station	5,243	Washington County Water Concervency District
Slurry Lines	7,800	Ground Water
Coal Processing Plant	1,055	Ground Water
Added Communities	940	Ground Water
Total	42,519	

Of the total water requirements of 42,519 acre-feet per year, 27,208 acre-feet per year will be treated sewage effluent from the city of Las Vegas and will have no impact on the Southern Utah region. The remaining 15,311 acre-feet per year will come from new sources. Approximately 5,243 acre-feet per year will be purchased from the Washington County Water Concervency District and 10,068 acre-feet per year from regional ground water sources. Impacts of water purchases from the Washington County Water Convervency District are discussed in the Allen-Warner site specific EIS (BLM).

"Proposed ground water withdrawal in the region will be 9,048 acre-feet per year from the Navajo Sandstone in the Alton area, 80 acre-feet per year from an unknown source on the Kaiparowits Plateau, and 940 acre-feet per year from sources within Kane and Garfield Counties."

"Withdrawal of 80 acre-feet per year from ground water sources on the Kaiparowits Pateau will have almost no impact on the resources of the region."

"As most of the population increase, due to coal development, will reside in Kane and Garfield

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Counties, it can be assumed that the most of the 940 acre-feet required for these new residents will come from underground sources in the two counties. Impacts from this withdrawal cannot be assessed without first knowing where these people will reside within the counties."

36[24]. Page IV, Para. 4. "Pumping from the Navajo Sandstone in the Alton area would cause water-level declines (written comm., BLM, 1977). As water levels lower, yields of wells and springs that tap the Navajo Sandstone would be decreased or dried up."

Comment: The author concedes that there is not data to isolate impacts on specific wells or springs. In the absence of such data, to state that springs would dry up as a result of pumping, is pure speculation. It can be assumed that pumping would cause some water-level decline. To imply that this decline will affect wells and springs that tap the Navajo without knowing the water holding and conducting properties of the local Navajo Sandstones factors that control the areal extent of the water level decline, is misleading. Further, the effect of pumping on any springs depends on the type of spring (contact, conduit, or fissure) and its source. It is doubtful that springs in the Alton area get water from the Navajo Sandstone but rather from the overlying formation at the contact of the impermeable bed (Goode, H. D., 1964). It is also doubtful that pumping would have any effect on these springs because the lithology indicates the presence of non-water-bearing formation between the Navajo Sandstone and the overlying water-bearing formation.

The proposed withdrawal from the Navajo Sandstone is estimated at approximately 9,000 acre-feet per year. The estimated annual recharge of the Navajo Sandstone from the outcrop area alone is 30,000 to 60,000 acre-feet (Goode, H. D., 1966). This would indicate that extraction of 9,000 acre-feet per year of water from the formation would be approximately one-third to one-sixth of the annual recharge from just one source, the outcrop, and would not cause any descernable effect on the water resources of the area.

To more properly describe the impact, the following statement should be placed in this section - "Pumping from the Navajo Sandstone in the Alton area would cause water-level declines in areas adjacent to the

36 Text change.

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well field. The effect of this water level decline on adjacent wells is difficult to determine with the data available. The best available information (Goode, H. D., 1964 & 1966) indicates that the withdrawal of approximately 9,000 acre-feet per year from the Navajo Sandstone in the Alton area will have no appreciable affect on wells that currently tap this source. As the springs in the Alton area do not use the Navajo Sandstone as a source, pumping from the formation will not effect these springs. Springs within the region that do tap the formation are of a sufficient distance away from the well field that pumping will have no impact on their flows. As the pumping will be at a rate one-third to one-sixth of the estimated recharge, the decline will be on a local cyclic basis and no long-term or continued decline in the water is expected.

37[25]. Page IV-7, Section 3. AIR

The emission inventory appears to overestimate particulate emissions from surface coal mining operations. The largest source of particulates, traffic on dirt haul roads, is assumed to be only 50% controlled by watering. New EPA regulations implementing Prevention of Significant Deterioration (PSD) require Best Available Control Technology (BACT) to be applied on all souces of fugitive dust at a mine. BACT for haul roads will undoubtedly require more stringent requirements for haul road dust control than watering. Most likely the application of chemical dust suppressants (as opposed to paving) will be required. The application of dust suppressants has been estimated to control 90% of dust emissions by EPA. If this correct control measure were applied to the estimated emissions of the Alton coal mine, it would reduce the estimated emissions of 5,772 tons/year by more than half, to 2,414 tons/year.

The regional and site-specific study results, in Parts I and II respectively, are not clear. While the approach taken by Aerovironment seemed to be logical, the report presented results that were contradictory. For example, the discussion on Page IV-8, of Part I claims that the regional impact

37 Text change.

Comment Number

of the Alton mine would be less than the 24 hour PSD Class II increment and the 24-hour NAAQS. The discussion on page 43 of Part II increment would be violated near the mine. The report should treat particulates on a site-specific basis only, particulates impacts from mining generally impact areas near the source. The regional analysis is a more reasonable approach for the SO_2 study.

A serious error of the air quality analysis presented in the report is the failure to exclude fugitive dust sources from the impact analysis. The EPA regulations implementing PSD state that all sources that can be shown to be fugitive dust can be excluded from such impact analyses due to a number of reasons. Included in EPA's definition of fugitive dust would be dragline operation, wind erosion, and unpaved road traffic. If fugitive dust emissions were excluded from the Alton coal mine emission inventory, emissions to be included in the modeling analysis would be reduced from 5,772 ton/year to 652 ton/year. The conclusions drawn from the analysis would change commensurately.

38[26]. Page IV-14, Para. 7. The report presents an extremely misleading analysis of visibility impacts. The report states that a goal of the Clean Air Act Ammendments of 1977 is "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas." The analysis presented does little to help the reader determine if the proposed project will affect the attainment of this goal.

38 Text change.

The impact analysis estimated a background visual range of 35 miles (60 km) using empirical formulae based on light scattering coefficients and a mass particulate concentration of 20 ug/m^3. Actual measurements of visual range presented in the existing environment section show visual range in the area ranged from 40 to 72 miles. In addition, integrating nephelometer measurements made at the proposed Alton coal mine site show average visual range measurements to be 70 miles (112 km). This large discrepancy raises questions regarding the accuracy of the formulae used.

Reductions in visual range were estimated using

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worst-case particulate concentrations predicted to occur at or near the actual mining area as imput to the empirical formulae. This technique is analagovs to predicting visibility reductions as perceived by an observer standing in the middle of the mining operation during worst-case meteological conditions. It gives no indication of the effect on visibility at nearby Class I areas.

A significant proportion of the particulate mass concentration predicted at or near the mine is made up of large particles that have not yet settled out. The formulae used assume a constant size distribution of the type normally attributed to suspended particulates. The size distribution of the worst-case particulate concentration used in the formulae certainly is not representative of truly suspended particulates.

The analysis also neglects to consider significant diurnal variations in visibility. Measurements of visual range taken at the Alton site show that maximum visual range occurs during late morning and afternoon hours, while minimum visual range occurs at night. The analysis uses predicted particulate concentrations averaged over 24 hours which averages out all the variability between daytime and nighttime visibility. This method implicitly assumes that nighttime visibility is just as important as daytime visibility. Given the fact that the methodology used in the impact analysis would predict higher particulate concentrations at night than during the day, the visual range reductions are overestimated for daytime conditions.

The report should present a visibility analysis that addresses the stated goals -- protecting visibility in Class I areas. For example, in the case of the Alton coal lease area, the report should consider the impact on visibility perceived by an observer looking out from Yovimpa Point, in the southern portion of Bryce Canyon National Park. Such an analysis, if done correctly, would admittedly be much more sophisticated than the one presented in the report. However, the present analysis misses the intent of the Clean Air Act Amendments completely.

Comment Number

39 27. Page IV-16, Para. 3
Comment: This paragraph, like many others, ignors the numbers and assumptions developed in the beginning of the report to describe impacts. Also the numbers presented do not agree with numbers developed in other portions of the report. Table I-4 -- Basic analysis data and assumption, page I-14 should be the numbers used throughout the report but individual authors have chosen to make their own calculations and assumptions which only confuse the reader. Specific changes that should be made in this paragraph are as follows:

"A total of approximately 11,388 acres of vegetation will be removed over the life of the project." (The coal processing plant is not "in areas distant from the mine projects and the regional boundaries", but will be located in the Bald Knoll area - see project description. Also the added community acreage does not agree with assumptions page I-15, Para. 4.). "Of this 11,388 acres, a maximum 4,888 acres will be disturbed at one time and approximately 1,067 will be permanently lost to community development and roads."

39 Text change.

40 28. Page IV-16, Para. 3. "Some vegetation would be damaged by urban development and the large influx of people. The exact area impacted, however, cannot be measured."
Comment: This statement does little to help the reader evaluate the potential impact. "Some vegetation", and "large influx of people" are statements that can be very misleading. As the statement says essentially nothing, it should be made specific or removed from the report.

40 Text change.

41 29. Page IV-16, Para. 4. This paragraph should be in the existing environment section. It adds nothing to the impact section of the report.

41 The paragraph aids in quantifying the potential loss owing to mining.

42 30. Page IV-27, Table IV-3. Acre of impact by vegetative type.
Comment: Add the coal processing plant to the ancillary facilities and indicate the percentage of disturbed type as it relates to the total acreage for the region.

42 The coal processing plant is part of the A-WV Energy System and will be assessed in the site specific EIS being prepared by BLM.

Comment Number

43[31]. Page IV-19, Para. 1. "The total wildlife habitat that would be occupied, disturbed, or otherwise altered by coal mining at the projected level of production is 9,457 acres. Of this amount, 222 acres of wildlife habitat is irrigated crop land, which may be lost owing to change of water use from agricultural to industrial and domestic."

Comment: This statement does not put the impact into perspective. There are variations in the value of wildlife habitat depending on how it is used, its areal extent and degree of use. Most of the vegetation type impacted is Pinyon-Juniper (6,420 acres or 77 percent of the total vegetative impact), a type that is certainly not in limited supply or over used. From a regional standpoint the removal of 6,420 acres of Pinyon-Juniper would reduce the type by less than four thousands of one percent. In reclamation this type will be converted to species that could have more value as wildlife habitat. These are the kinds of facts that should be in the report.

44[32]. Page IV-19, Para. 1. "The remaining area, although reclaimed over 5 to possibly as much as 100 years, may be altered so that some former wildlife inhabitants may find it unsuitable. Consequently, some species would have a permanent loss of habitat."

Comment: These two sentences do little to help the reader evaluate the impact. Where are the facts? There are sufficient data available to present this proposed impact in a form that would place it in perspective. The vegetation section gives the acres disturbed by type and total by type for the region. It is not difficult to determine which species utilize which type for some part of their life history and how much it is utilized. With this information the author could have presented some facts, not assumptions such as "may be altered", "some former wildlife inhabitants may find it unsuitable" and "some species"---

45[33]. Page IV-19, Para. 2. "The demand for recreational lots and cabins would increase. Most such sites would be in "desirable" areas on private lands in forested mountain areas. Occupation of these lands and the consequent disturbance would cause an additional loss or abandonment of habitat. A minimum of 100

43 This is an introductory paragraph to subsequent paragraphs.

44 Refer to response to comment 43. Reclamation will occur. The vegetation on the reclaimed land is not known because the final detailed reclamation plan is not complete. Therefore, the wildlife impacts can not be accurately predicted for all species affected. A revised mining and reclamation plan which must be submitted by Utah International Inc. to OSM may be required to treat this issue in detail.

45 Text change.

Comment Number

recreation homes, occupying from 25 to 100 acres of land, would be demanded. Most such sites would probably be within the boundaries of the region but, lacking data on location, the impact cannot be further quantified."

Comment: The whole subject of recreational lots and cabins is out of proportion with other potential impacts. It is very doubtful that the population increase from coal development would result in "a minimum of 100 recreation homes". This assumes that approximately one out of every twenty-four new families in the area would desire or could afford a second home. This is a much higher ratio than is found in more affluent and urban areas where second mountain homes are in greater demand and affordable by a larger percentage of the population. This whole subject should be removed from the report, or if left in, should be substantiated with some facts.

46[34]. Page IV-19, Para. 3. "Studies in Idaho and New Mexico suggest that the illegal harvest of some game species may exceed the legal harvest (Vilkitis, 1968, Pursley, 1977)."

Comment: The impact of illegal hunting is realistic, although supporting statements are somewhat misleading. It is not uncommon for illegal harvest to exceed legal harvest regardless of increases in population. Remove the last sentence from this paragraph.

47[35]. Page IV-19, Para. 4. "Approximately 30 percent of the total impacts on wildlife resulting from increased population by 1990 would be attributable to developing the Alton, Blue and Kaiparowits No. 5 mines and the Allen-Warner Valley power project."

Comment: This paragraph should be expanded to put the impacts into persepective or removed. As it is presently, it says nothing that will add to the understanding of the impacts. Does this mean that all the impacts in this section are 70 percent greater or 70 percent less than stated?

48[36]. Page IV-21, Para. 2. "Cumulative impacts on deer, from mining would include loss of habitat from occupation by structures or other facilities and displacement from habitat or reduced use from disturbance. The

46 Illegal hunting will increase with increase in population, thus illegal harvest may increase further over legal harvest.

47 Text change.

48 Reduction of underused deer range may not reduce present population; however, it could reduce the total carrying capacity and limit population to something less than the current potential.

Comment Number

acreage that would be affected is shown on Table IV-4. Data are not available on deer numbers, forage production or potential carrying capacity; therefore, the number of animals that would be affected cannot be quantified. The impacts to deer would continue for the life of the mines or until facilities are removed and areas reclaimed."

Comment: The impact described in this paragraph assumes that there is a direct ratio between reduction in certain habitats and loss of population. This is not always the case, particularly when the range is underused. Page II-40, Para. 2. states "studies by UDWR indicate that range conditions are good and the range could support more deer". From this statement it could be assumed that the reduction in habitat will possibly have no affect on the current deer population as the results of habitat reduction. In the long term the conversion of 6,380 acres of Pinyon-Juniper to a more desirable habitat (early spring grasses for instance) would allow for a greater increase in the population than is now possible with the current range condition. The whole subject of habitat loss needs to be better described. The value of habitats (summer versus winter range, etc.) needs to be discussed along with the impacts on given population rather than the broad assumptions presented here.

49[37]. Page IV-21, Para. 2. "Elk range in the Cedar Mountain-Kolob area would be reduced by summer homes. The amount of range that would be lost cannot be quantified, however."

Comment: The whole subject of summer homes should be removed from the report. Even if the total proposed summer home development were to take place (which is doubtful) and they were all built in the Cedar Mountain-Kolob area (which is also doubtful), the elk range would be reduced by 100 acres. This is hardly an impact worthy of discussion in this report and detracts from the credibility of the report. Particularly when the amount and location of habitat can't be identified.

49 Text change.

50[38]. Page IV-21, Para. 3.

Comment: These acreage figures are incorrect. (See comment number 27)

50 Text change.

Comment Number

51 39. Page IV-22, Table IV-4.
Comment: Include acreage for coal processing plant.

52 40. Page IV-23, Para. 1. "Loss of mature ponderosa pine trees from strip mining in the Alton area would eliminate roosting and nesting sites for raptors."
Comment: Table IV-3 acres of impact by vegetative type, does not indicate that any ponderosa pine type will be impacted by the project, which is, in fact, true. So what is the basis of a statement such as this?

53 41. Page IV-24, Para. 3. "Although mining would cause no increase in sediment concentrations (water section), fish habitat that would probably be impacted by sediment would be Wahweap and Warm Creek bays in Lake Powell and the East Fork of the Virgin River."
Comment: If mining would cause no increase in sediment concentratons, how can the fish habitat be impacted by sediment in Wahweap and Warm Creek bays in Lake Powell and the East Fork of the Virgin River? This statement makes no sense at all and should be taken out of the report.

54 42. Page IV-24, Para. 4. "No appreciable amount of chemical analysis has been done in the southern Utah coal region to predict impacts; however, fish habitat in Lake Powell and perhaps the Virgin River system would possibly be affected by trace element contamination from mining coal at the projected level."
Comment: As in comment 41, this statement makes no sense and is in conflict with information presented in other areas of the report. Page IV-6, Para. 4. states "The concentration of dissoved solids in runoff from the mined area may increase as much as 10 percent, based on data from Black Mesa, Arizona (Verma, 1977); this increase would have little effect locally and would probably be imperceptable in flows to the Colorado River because the mined area is less than one-half of one percent of the total watershed involved." Disturbance in the Virgin Creek watershed will be something less than forty acres. From these facts it's difficult to determine the bases used by the author to make the assumptons in comment 41 and 42. Both statements should be taken out of the report.

51 This is included in the A-WV acreage figure. See comment 42.

52 See response to comment 3.

53 Mining as proposed would have no effect on Lake Powell. Associated activities, community development, and recreational activities at the increased population might increase sediment concentrations which might then affect Lake Powell and the East Fork of the Virgin River.

54 Text change.

Comment Number

55[43]. Page IV-24, Para. 5. "Increased population associated with increased coal production would increase the demand for fish resources. In 1975 about 31 percent of all Utahan's fished, and about 15,000 were residents of the coal region (USFWS 1977). At the projected coal production level, resident Utah fishermen would increase by 11 percent to around 20,000 and resident Arizona fishermen would increase by 20 percent or to about 3,500 in the area adjacent to the coal region by 1900 (see Recreation)."

Comment: From this paragraph the reader would assume that as the result of coal development, the resident fishermen population in the region would increase by 5,600 (20,000 - 15,000 + (1.20 x 3,500) and that 67 percent of the new residents would fish. This is incorrect and misleading. The population increase from coal development is projected to be 8,400. If 31 percent of all Utahan's fished (as the report states), a more realistic increase in resident fishermen population in the region would be 2,604 .31 x 8,400 = 2,604). As paragraph six of this same page is based on the above assumption, these impacts should be reviewed and revised accordingly.

55 Text change.

56[44]. Page IV-32, Table IV-7. Population and components of change (thousands of persons).

Comment: Although the socioeconomic section is very detailed and thorough, there is no clear and concise statement that tells the reader what population changes will occur without coal development and with coal development. As the author suggests, comparing Table IV-7 with Table II-36 shows population increases. This can be confusing, which is evident by the wide range of population projections used by other authors of the report. Only the wildlife section came close to the actual population increase from mining. There was also confusion between migration without coal development and migration with coal development. Table II-36 and IV-7 should be combined and a summary made so that the reader can quickly see these population changes.

56 Future environment (no action) is in chapter II, and assessment of changes under the various scenarios is in chapters IV and VIII.

57[45]. Page IV-62, Table IV-21. Recreation visits (trips) and visitor days use; by residents of the region at the projected level.

Comment: The basic population figures used for this

57 Population figures (table IV-21) are based on the RIZ which includes the Arizona strip. Population figures on table II-36 and IV-21 include nothing out of Utah.

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projection do not agree with the socioeconomics section of the report, although the author footnoted them as such. Table IV-21 shows no action level (0.0mty) 1985 population at 62,810 and the 1990 population at 68,096. Figures in Table II-36 and Table IV-11 in the socioeconomic section for "Low Level" show a 1985 population of 54,620 and a 1990 population of 58,620. The 1976 population of 48,525 is a fourteen percent increase over the 1975 population indicated in the socioeconomic section. As this number is used to develop the 9.15 trips per year used in the analysis, it should be correct. It is not so much a question of incorrect numbers as one of the credibility of the assumptions made in the text using these numbers. This Table should be revised with correct numbers, and a column that indicates percentage of increased use attributed to population increases without coal development and with coal development.

58[46]. Page IV-64, Para. 1. "Present levels (1976) of recreation use --- capacities."
Comment: This paragraph does not agree with Page II-87, Para. 1. If the RIZ had included all recreation sites, this statement would not have appeared in the report. (See comment number 14).

59[47]. Page IV-64, Para. 2.
Comment: This paragraph needs to be put into perspective. The author has elected to ignore a number of important factors. The problem with the lack of outdoor recreation facilities is not something unique to the region. Developing coal will not change the magnitude of this impact. It has occurred and will continue to occur regardless of the action taken. Recreation visits and visitor day use by residents will increase 58 percent by 1990. Of this 58 percent, 40 percent will occur without coal development. If the author had included the non-resident visitor in these calculations, the contribution by coal development to the increased use would be less than one-tenth of one percent. As the RIZ includes four National Forests, four National Parks, two National Monuments and one National Recreation Area, this would have been a more realistic evaluation.

58 Chapter II discussion indicates 25 sites are overused, 10 sites are approaching optimum use, and only 6 sites are underused. The statement in chapter IV is correct.

59 Future impacts with development need to be considered in the light of future impacts without development to gain a perspective of their magnitude. Also the information on tables should be considered with the text to gain a full perspective.

Comment Number

60 48. Page IV-64, Para. 3.
Comment: This paragraph presents a somewhat different picture than described on Page II-87, Para. 2. The Alton area is not a "recreation area that fishermen, backpackers, etc., would find desirable". This statement should be removed or made more specific.

61 50. Page V-1, Para. 3. Change "soils on 19,500 acres" to 19,150 acres. (See comment no. 20)

62 51. Page V-1, Para. 4.
Comment: There needs to be better substantiation of this impact and its relationship to increases in population. It reads much like an assumption made from a bias of the author.

63 52. Page V-2, Para. 1. (See comment number 24)

64 53. Page V-2, Para. 4. (See comment number 25)

65 54. Page V-2, Para. 5. (See comment number 27)

66 55. Page V-2, Para. 6. (See comment number 2 and 31)

67 56. Page V-2, Para. 3. (See comment number 3)

68 57. Page VI-1, Para. 6. (See comment number 25)

69 58. Page VII-1, Para. 8. (See comment number 23)

70 59. Page VII-2, Para. 7. "Increased visits and levels of use of the regional recreation resource would be irreversible. The opportunity to participate in recreation at present experience levels (i.e., relatively unrestricted or unregulated and in some places, uncrowded) would be irretrievable. In addition, vandalism, ORV use, or use above acceptable carrying capacities that results in the destruction of irreplaceable or irrepairable resources, such

60 Areas adjacent to the mines have recreation attractions, are used for recreation, and recreation use would be altered on these areas by mining and related activities.

61 Text change.

62 Damage caused by recreation use and ORV's is well documented. Quantification of ORV damage is impossible because an unknown part of the mine related population will have ORV's and use areas are not known.

63 Text is correct as written.

64 Text change.

65 Text change.

66 Text change.

67 Text change.

68 Text change.

69 Text change.

70 The assumption is correct. Missing is that the developed recreation facilities are generally used to capacity and undeveloped recreation areas receive little or no use. The latter is the uncrowded area.

Comment
Number

as archeological sites, historical sites, soils, wildlife habitat, or the esthetic resource would be irretreivable."

Comment: This paragraph is misleading. The reader would assume that outdoor recreation in the region is unrestricted, unregulated, and in some places, uncrowded and that development of coal will change this condition. This is not how the RIZ is described in other parts of the report. The author should be more consistant between chapters.

SPECIFIC COMMENTS - PART 2, ALTON MINE.

Comment Number

71 60. Page 1, Para. 1. "The leases are held by UII and Nevada Electric Co. Company (NEI) (Table 1, Figure 3)."
Comment: Change Nevada Electric Co. Company (NEI) to Nevada Electric Investment Co. (NEICO) wherever Nevada Electric Co. is referred to in the report.

71 Text change.

72 61. Page 1, Para. 1. "The coal will be transported by truck to a proposed preparation plant located mostly on leased state land near Bald Knoll (Figure 1,4).
Comment: Change to read "located mostly on privately owned land".

72 Text change.

73 62. Page 1, Para. 3.
Comment: Minable should be mineable.

73 Noted.

74 63. Page 6, Table 1. Summary of data in mining plan.
Comment: Change water requirements to 193 acre-feet per year.

74 The submitted mining and reclamation plan stated 100 gpm, which is approximately 160 acre-feet per year.

75 64. Page 8, Table 2. Proposed schedule of coal development from the Alton mine.
Comment: Alton East and Alton West are reversed under "Raw coal mined".

75 Text change.

76 65. Page 9, Para. 1.
Comment: Adopted should be adapted and working should be worked.

76 Text change.

77 66. Page 10, Fig. 6.
Comment: Not a part of Alton mine.

77 Text change.

78 67. Page 12, Para. 4. (See comment number 23)

78 Text change.

79 68. Page 13, Para. 2. "UII has not yet developed a specific reclamation plan."
Comment: From the statement above a reader would assume that UII has not made an effort to develop a reclamation plan, which is not the case. UII submitted

79 Text change.

Comment Number

an outline of planned reclamation along with a description of mining to USGS in September 1976. This was in conformance with the existing requirements of 30 DFR 211. Subsequent changes in regulations may necessitate modifications to the proposed plan, and these will be presented at the appropriate time. Reclamation research for the Alton Mine has been on-going since 1974, and UII is jointly participating in field studies at the site with the USGS.

80[69]. Page 15. D. LEGALLY ENFORCEABLE MITIGATING MEASURES
Comment: There are a number of mitigating measures in this section that are of questionable value and are too premature to be called "legally enforceable mitigating measures". The specific reclamation plan should designate such things as "depth of ripping" and "pounds of seed per acre" and not some "legally enforceable mitigation measure" promulgated before the more definitive needs of reclamation are known.

80 The measures listed are legally enforceable and are recommended as mitigations. Analysis in chapters III-VII considers impact remaining after use of these and company suggested mitigations.

81[70]. Page 17, Para. 3. "Because reduction of streamflow in the Virgin River -- PL 93-205, Endangered Species Act of 1973".
Comment: From the volume of information about the Virgin River and the endangered woundfin presented in the report, the reader would have to assume the potential of a significant impact on the habitat as the result of mining. Later the report addresses the relationship properly. Part 2, Chapter III states "No reduction in flow owing to strip mining activity is anticipated in the East Fork Virgin River, Kanab Creek, or the Paria River. The mining operation is designed to avoid impedance of surface flow and reduce sediment transport." In addition, the same chapter states "No increase in sediment load is expected in the East Fork Virgin River."

A logical question is, if there is not reduction in flows or increase in sediment load, why the detailed discussion of the Virgin River and endangered woundfin in the site specific analysis, Alton mine?

The facts simply stated are:

The Alton lease area occupies approximately 120 acres of the Virgin River watershed and surface

81 Text change.

Comment Number

disturbance could occur on a small fraction of this area. This is hardly a potential impact worthy of the detailed discussion of the mine in Part 2.

Pumping from the Navajo Sandstone Formation in the Alton area will have no impact on the Virgin River. Only three springs are reported to be coming out of Navajo Sandstone where the flow is intercepted by the East Fork Virgin River. They respectively yield 1 pint/min., less than 1 quart/min., and 3 gal/min. Their distance from the well area makes it highly unlikely that they will be affected by pumping. In addition, the estimated annual recharge in this area from just the outcrop area alone is 30,000 to 60,000 acre-feet; three to six times the proposed annual volume of 10,000 acre-feet per year to be pumped from the formation.

As it is apparent, mining and pumping in the Alton area will have no discernable effect on the Virgin River, this statement along with other lengthly discussions related to the River, be removed from the report and replaced with a statement that presents facts - not assumptions.

82[71]. Page 17, Para. 4. "Several measures will be required to protect delicate topographic features and visitor experience levels -- Bryce Canyon National Park."
Comment: There is no supporting data that even remotely indicates this as a potential impact so why propose a rather detailed "legally enforceable mitigation measure" on something that is pure speculation? Remove from the report. (See comment number 83)

83[72]. Page 21, Fig. 8. Generalized stratigraphic section of Alton coal field.
Comment: This is not a stratigraphic section of the Alton coal field but rather for southern Utah. In the Alton coal field area, the upper most formation is mostly Tropic Shale with some Straight Cliff Sandstone. This could be misleading. Change the figure title or the figure.

84[73]. Page 25, Para. 2. "The analytical data did not indicate trace elements in amounts potentially toxic to native plants. Soils developed from shale of groups 2 and

82 The impact potential exists.

83 The stratigraphic section applies to the general Alton coal field area, not just the proposed Alton mine.

84 The information included in the EIS came from the group referenced in the comment. If significant changes occur they should be included in the mandatory refinements of the Alton mining and reclamation plan when submitted to OSM.

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4 will have high runoff, shallow moisture penetration, high erosion hazards, and problems with root penetration and erosion would be expected."
Comment: This information should be updated with the forthcoming report from the cooperative study being done by UII and the Rocky Mountain Forest and Range Experiment Station.

8574. Page 27, Para. 5. "The average discharge of the East Fork of the Virgin River is (USGS, 1977, P. 258)."
Comment: The continued discussion of the Virgin River is misleading. (See comment number 63)

8675. Page 29, Para. 4. AIR
Comment: (See comment number 25 and 16)

8776. Page 34, Para. 4. "The East Fork Virgin River has brown and rainbow trout. Fish population in the Virgin River is limited by the low flows which cause changes in water quality and reduce space for aquatic life."
Comment: This statement implies a substantial impact on the Virgin River from mining in the Alton area which is misleading. The complete paragraph should be removed. (See comment number 63)

8877. Page 37, Para. 5. "The Alton East mine area does not make up a part of the recreation resource of the south rim of the Paunsaugunt Plateau.
Comment: The Alton East mine area is not part of the recreation resource but rather part of the viewshed from the Paunsaugunt Plateau. Change "recreation resource" to "viewshed".

8978. Page 37, 6. ESTHETICS
Comment: The discussions of strip mining on the views from Yovimpa Point are inconsistant, vague and somewhat overstated. The author apparently had problems bringing this impact into proper perspective as the impact was seldom described the same as to degree or magnitude. Unfortunately, the reader does not get an illustration until Figure 13 in Part 2 and the photograph presented here is somewhat misleading.

In addition to Figure 13, the author has either

85 Most of the population associated with the Alton mine will live in the East Fork of the Virgin River drainage, and may impact the river.

86 Text change.

87 See response to comment 85.

88 Text is clear, recreation viewshed is a recreation resource.

89 While it is occurring and visible, mining would impact the Yovimpa viewshed. After reclamation, the mined area would be an extension of the existing modifications to the natural landscape and would add to the variety of color, line, and form. This may enhance the Yovimpa viewshed. Esthetic judgement is subjective and the reader must draw his own conclusions as to adverse or beneficial impact.

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failed to mention or has touched on very lightly, four critical factors related to this impact.

They are:

1. Although the landscape from Yovimpa Point appears natural, much of the variety, color and texture is found in the vegetative patterns, which for the most part are the results of man's activities. (Conversion of Pinyon-Juniper to grass, grazing, etc.)

2. The actual time period of the mining impact is relatively short; possibly five years.

3. The magnitude of the area disturbed within the viewshed from Yovimpa Point is relatively small. (Unfortunately, Figure 13 distorts this fact.)

4. The reclamation program following mining will return the character of the view to very near its original configuration.

The two primary elements of the visual landscape from Yovimpa Point are landform and vegetative patterns. Strip mining and reclamation will temporarily alter both elements for a short time. In the long term, any changes in landform will not be descernable from Yovimpa Point and changes in the vegetative patterns will be similar to those that have been taking place over the last century.

Figure 13, in Part 2, should be removed from the final report and replaced by a more accurate graphic presentation of the area disturbed. Specifically, one that truly depicts the visual image from the Point and includes the total viewshed and not just that portion where mining will take place. Secondly, wherever the visual impact of strip mining is discussed in the report, the statement should be made that the impact is temporary and short-term.

90 78. Page 41, Para. 6. "The proposed action would --- needs in communities."
Comment: (See comment number 23)

91 79. Page 43, 3. AIR
Comment: (See comment number 25 and 26)

90 The water requirements are based on data in the current mine plan.

91 Text change.

Comment Number

92 80. Page 43, Para. 1.
Comment: Acreages shown here should agree with Table IV-3 for the Alton mine.

93 81. Page 45, Para. 8. "Mule deer would be displaced from as much as 8,300 acres of summer range (3.1 percent of the total on this herd unit) and major browse areas would be significantly reduced if reclamation were not successful. ---- The direct loss of deer to vehicle strikes would be expected to increase because of increased traffic."
Comment: This whole discussion of the impact needs better perspective. It is difficult to equate the loss of 512 acres of Pinyon-Juniper with a reduction in the herd potential by 26 deer. By the term "population potential", the reader would have to assume the habitat is not being used now at the 0.1 per acre rate but at something less. The relative value of Pinyon-Juniper as a habitat and its relationship to population fluctuations needs to be included in this discussion. The reader might be puzzled by the fact that major efforts in the west to convert Pinyon-Juniper to other vegetative types have been to improve wildlife habitat and then find, as the report states, the loss of ten acres of Pinyon-Juniper reduces the deer population by one deer.

94 82. Page 47, Para. 5.
Comment: If the project will not reduce flows in the Virgin River, as the report states, (Page 41, Para. 7) why is this statement in the report? Remove from the report.

95 83. Page 51, Para. 5. "Premature razing of rock pinnacles --- undertaken."
Comment: There are a number of statements such as this inferring that ground virbrations and air blasts resulting from blasting operations in the Alton strip mine could prematurely raze delicate topographic features in Zion National Park. Although the reader is left with this impression, the report does not develop any facts to support the assumption.

For example, the subject is first brought to the attention of the reader in Part 2 in a discussion of "Several measures that will be required to protect

92 Text change.

93 In the west, major efforts had been made to convert pinyon-juniper to other vegetative types for cattle and sheep use. Studies show that unless islands of pinyon-juniper are left, deer use is reduced. At Alton, the amount of this impact depends on reclamation.

94 See response to comment 85.

95 The Fogelson study indicated that, using normal mining techniques, the razing of rock pinnacles and spires will not occur. The potential exists. See response to comment 82.

Comment
Number

delicate topographic feates ----". Again, Part 2 states that "Rock formations within the south district of Bryce Canyon National Park could be prematurely razed from ground vibrations and air blast if blast charge size were excessive or sequence poorly timed." This is followed by paragraph 5 above that totally confuses the reader. Again --- "Premature razing of rock pinnacles --- could result from excessive air blast and vibrations if preventative measures are not undertaken." Following this statement in the same paragraph is a discussion of a worst-case analysis indicating that air blast and vibrations would be below 136 decibels and 2 inches per second particle velocity recorded at the closest distance (2.6 miles) between the blasting operations and the National Park boundary. Although the paragraph goes on to state that the nearest topographic features are a minimum of 4.8 miles away - this is the end of any discussion related to the worst-cas analysis. The reader, to this point in the report, has been exposed to three statements regarding the premature razing of delicate topographic features and when hard facts are presented for the first time, they say essentially nothing. The reader would have to assume that 136 decibels and 2 inches per second particle velocity are somehow related to razing topographic features. Also, to support the original assumption, the worst-case analysis had confirmed this potential. The reader is further confused by the statement that the worst-case analysis indicated that air blast and vibrations would be below these figures.

The reader then finds the final discussion on the subject which states simply that "Blasting of overburden and coal in the mine is not expected to create any adverse effect to topographic formations in Bryce Canyon National Park as shown by the Company and Bureau of Mines Analysis (VII 1976, Fogelson, D. E. 1977).

Any person attempting to make an informed decision on this subject will get little help from the material presented.

The facts are that although damage depends upon many variables, it is generally found that plaster cracks or slopes begin ravelling at a particle velocity of approximately 2 inches per second, and slope

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failure can occur at apprroximately 25 inches per second.

Using a typical blast design for coal mining of this nature and calculating the particle velocity, indicates a worst-case example of the blast effect on Bryce Canyon, three miles away, to be 0.048 inches per second.

Assuming that the figure 2 inches particle velocity is a level not to be exceeded, the proposed blast effect is less than this maximum by a factor exceeding 41 or stated another way, the particle velocity would have to be 41 times greater than anticipated to have any effect on the topographic features in the park.

The subject should be introduced in the report as a concern of the agencies followed by a complete description of the worst-case analysis. The conclusions should be based on that analysis rather than the assumptions reported in the draft.

84. Page 57, CHAPTER V: ADVERSE IMPACTS THAT CANNOT BE AVOIDED; CHAPTER VI: SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY; CHAPTER VII: IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURSE.

Comment: CHAPTER V.

96 D. WATER. Revise water use figures.

97 E. AIR. Change to conform to revisions in text and comments 25 and 26.

98 H. FISHERIES. Report states there will be no impact on Virgin River, so remove this statement. (See comment number 63)

Comment: CHAPER VI.

99 G. FISHERIES. Discussion of reduced flow in the Virgin River is in direct conflict with other portions of the report. Remove this statement.

Comment: CHAPTER VII.

100 C. WATER. Revise water use figures.

96 See response to comment 90.

97 Text change.

98 See response to comment 85.

99 See response to comment 85.

100 See response to comment 90.

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8 December 1978

Mr. Edward Davidson
U. S. Geological Summary
Suite 505
350 South Main Street
Salt Lake City, Utah 84101

Dear Mr. Davidson:

Enclosed is a copy of the computer visual perspective of the Alton Coal mine as viewed from Yovimpa Point in Bryce Canyon National Park. This is the final product of the visual study we discussed during my recent visit to your office.

The perspective was developed through a four step process. First, the contours or landforms were digitized and formed the basis for the computer analysis. From this basic data the computer developed a three dimensional model of the landform and a two dimensional map that identified those portions of the landscape that are visable from Yovimpa Point. A map of the actual area that could be disturbed by mining was then superimposed over the two dimensional map and the areas that could be disturbed by mining and can be viewed from Yovimpa Point were identified. In the final step the areas that could be disturbed and can be viewed from the Point were plotted on the three dimensional model. (The darkly shaded areas on the perspective)

For a better visual perspective of the landform the three dimensional model is a view above and back from Yovimpa Point and the vertical relief has been exaggerated 1.55 times. The areas that could be disturbed and seen are as they would be viewed from Yovimpa Point. Although the perspective is not an exact portrayal of the visual impact from Yovimpa Point, it is a more accurate description than shown in the Draft Environmental Statement and is in fact a "worst case" because of the exaggerated relief.

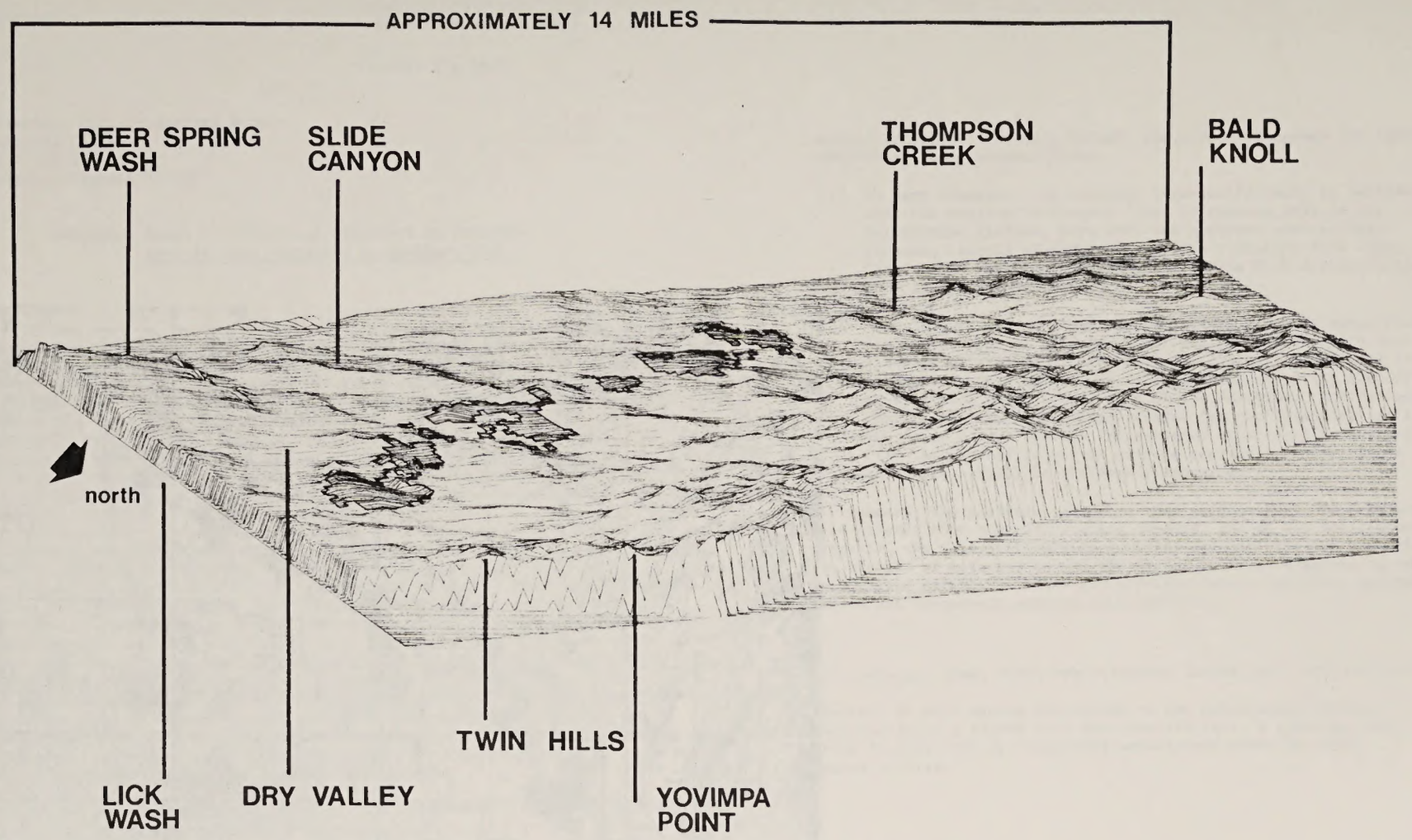
No response required.

With the enclosed perspective and specific comments previously submitted related to this impact, the authors of the final report should have the necessary data to more properly describe the visual impact of mining on the visitor experience from Yovimpa Point.

Sincerely,

J. LeRoy Balzer, Ph.D.
Director, Environmental Quality Dept.

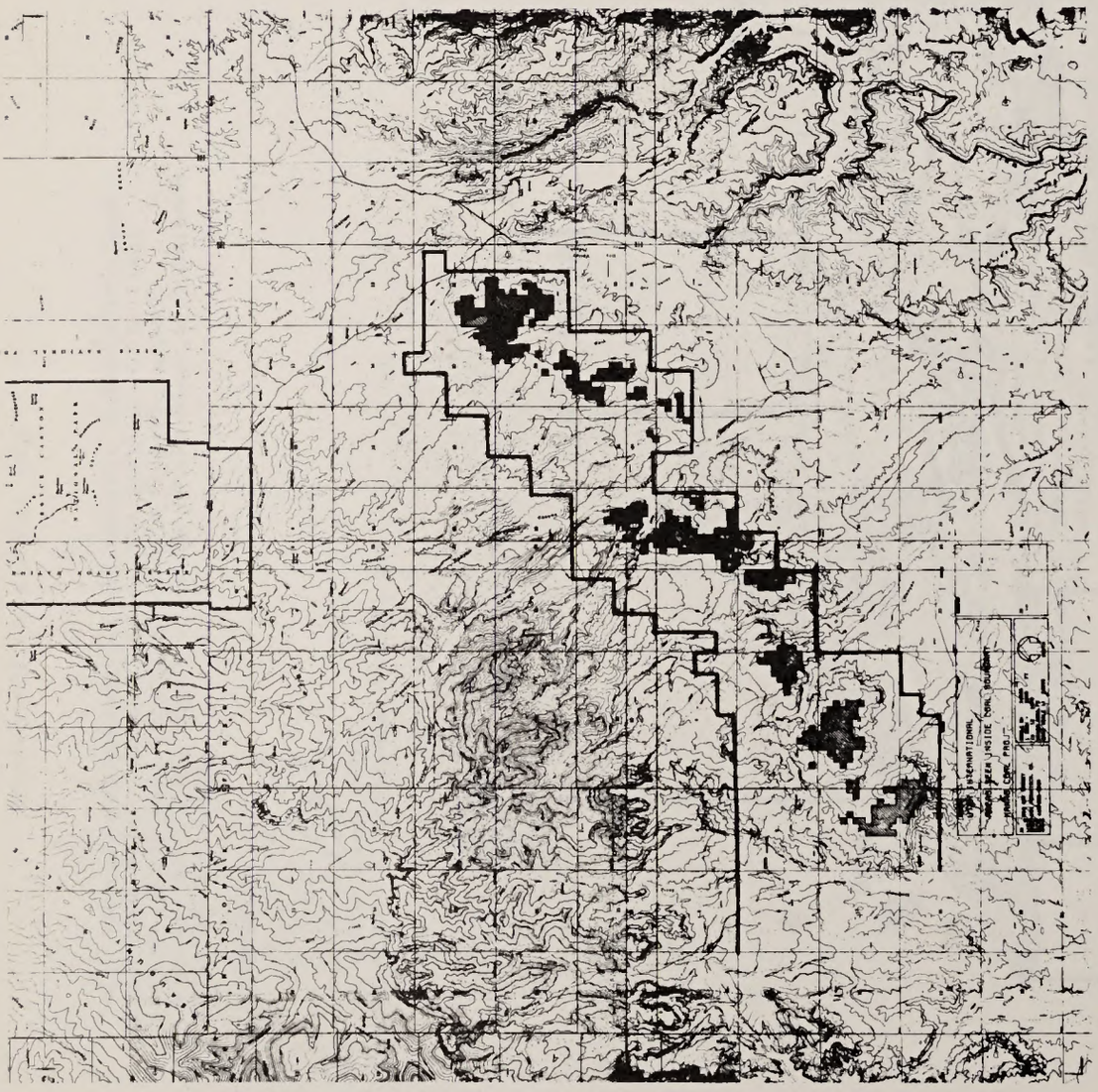
JLB:rb



VISUAL PERSPECTIVE
Alton Coal Mine

AREAS THAT WILL BE DISTURBED BY MINING AND CAN BE SEEN FROM YOVIMPA POINT.

FIGURE 1 A



KAISER ENGINEERS

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October 17, 1978

Director, U.S. Geological Survey
National Center
Mailstop 108
Reston, Virginia 22092

Subject: Draft Environmental Statement on Development of Coal Resources in Southern Utah

Gentlemen:

Kaiser Engineers has been asked by Resources Company, New Albion Resources Company, and Mono Power Company, holders of Federal Coal Leases on the Kaiparowits Plateau to comment on the Draft Environmental Statement for Development of Coal Resources in Southern Utah. Kaiser Engineers prepared the mining and reclamation plan for the Kaiparowits Coal Project and initially submitted this plan to the U.S. Geological Survey in 1975. It was resubmitted with certain changes, including the incorporation of Mine No. 5 as a production facility, in late 1976 to the Federal Interagency Task Force on Coal. We attach to this letter a detailed list of comments on specific statements in Parts 1 and 2.

1 In general we believe that the Site Specific Analysis (Part 2) prepared for the Kaiparowits Coal Project was relatively objective and observed the intent of the Kaiparowits Mining and Reclamation Plan. There are, however, three areas where erroneous base figures and general assumptions have resulted in substantially greater derivative effect and potential environmental impact than are anticipated to be the case. The first area is in mine capacity. Though the design capacity of the facility is one million tons per year, the annual scheduled production is 750,000 tons. Overdesign is a technique used to provide a margin of excess plant capacity that can be called upon to achieve annual scheduled production if operations are temporarily disrupted, as they can be by a variety of factors. Utilization of design capacity instead of scheduled capacity for forecasting environmental impact overstates the case by 33 percent.

2 The second area is in the use of an average productivity figure to derive the number of employees, the size of population increase related to mine activities, and the resultant projection of socioeconomic impact. The task force estimated the Mine No. 5 employees at 280; Kaiser Engineers' estimate is 108. The reason for this substantially lower rate is that this particular mine area is conducive to high productivity.

General response: In this letter, the reviewers convey two impressions that should be discussed first.

(1) In many comments, the reviewer incorrectly seems to believe that the regional statement (part 1) relates only to the Kaiparowits Plateau, even only the southern part of the plateau, instead of the entire region extending from Cedar City to the Henry Mountains, and from the Utah-Arizona State line to the Fremont River.

(2) The reviewer is concerned by the lack of economic comparison. The annual wage of the coal miner can be compared with that of a cowboy or farm hand. However, the financial sacrifice to live in southern Utah instead of in a bustling community like Price or Salt Lake City is only part of the equation. A different quality of life is knowingly traded for the financial sacrifice. The value of the present recreational experience in southern Utah, as opposed to use of crowded recreational facilities elsewhere, cannot be accurately measured.

In summary, the analysis indicates that socioeconomic impacts potentially are greater than any site-related impacts, and of the socioeconomic impacts, the most difficult to quantify and describe are the effect on quality of life and on the ability of local governments to cope with rapid growth. A seemingly straight-forward economic analysis would not adequately address such impacts.

1 The proposed plan, which was analyzed, called for 1 mty production.

2 Because no coal mining experience in the Kaiparowits Plateau substantiates a higher tons per manshift rate, a rate was used that is supported by comparable underground mines in other parts of Utah.

3 The third and last general area which should be corrected is the inconsistent treatment of the Kane County road from U.S. Highway 89 across GCNRA and up Missing Canyon to the Kaiparowits Plateau. In some places it is accurately referred to as an existing county road; in others it is referred to as a jeep trail; and in some cases it is implied that the road does not exist and is only proposed. In our detailed comments which follow we have pointed out that with regular maintenance, the county road is passable most of the year by all vehicles, including coal haulage trucks. We have also submitted to the task force a detailed explanation of the legal status of the road and the reasons for the coal owners to believe that the road may continue to be used for commercial traffic, including coal haulage.

4 Our view of the Regional Analysis (Part 1) is more critical. It appears to have been written in a different tenor than the site specific analysis. This draft environmental statement reads as if its purpose is to condemn the proposed projects, even though we believe that this purpose does not fairly represent the attitude of the U.S. Geological Survey. It may be that the GS was trapped by the nature of the task and by the contribution by other government agencies inherently opposed to such projects.

The report makes no attempt to explain the benefits from mining the coal, particularly the three proposed projects covered in Part 2. It does make brief references to new jobs and payrolls but overbalances these benefits with the socioeconomic factors which are subjectively negative. The report tends to downplay the economic, political and social benefits of the projects and emphasize the possible losses of paleontological resources. It does not go into our dependence on foreign oil, the national policy to develop coal, the impact on balance of payments, the great benefits to the depressed economy of Southern Utah, the opportunities offered to young people, the production of needed energy, and the fact that this region of Utah holds great coal deposits closest to the metropolises of the Pacific Southwest.

The report assumes worst situations and builds arguments upon these assumptions. Examples: soil erosion amounting to 6 million tons in 20 years; reduction of visibility possibly to 3 miles; no intelligent approach to community planning and financing; no control over ORV, poachers and vandals, and unproved loss of wild life.

Computer printouts result in figures of spurious exactitude - Example: Highway Segment 1 will carry an average of 1332 trucks every day in 1990; the population of Panguitch will be 1987 in the year 1990 if no action is taken on coal, and vegetative productivity would be lost from 9457 acres for an average of 30 years.

3 Text change. A small part of the road is in the State highway system, and the road is termed a county road because the county holds existing rights-of-way.

4 See general statement. Use of worst-case analysis is specified and current problems of land management must be projected and considered in the analysis.

This draft statement is ponderous and a powerful handicap to mining, transporting and utilizing coal in the Southern Utah region. Though some portions are factual and carefully written, it inadvertently emphasizes and re-emphasizes the extremely difficult problems facing an investor-owned organization trying to mine coal from the public lands. The number of agencies involved is formidable without considering the hundreds of regulations and special requirements which must be met.

We recognize the time and effort which went into the preparation of this document and sincerely urge the writers of the policy document to extract the real issues and recommend the approval of the submitted mining and reclamation plans, with those mitigating measures which are reasonable to planned economic development of a valuable natural resource.

Very truly yours,

John D. Spaulding
Project Manager

JDS:sdp
attachment
cc: Ed Davidson, Interagency Task Force

COMMENTS

ON

DRAFT ENVIRONMENTAL IMPACT STATEMENT

DEVELOPMENT OF COAL RESOURCES IN SOUTHERN UTAH

PART 1

REGIONAL ANALYSIS

Page v 3. Summary of Environmental Impacts by 1990

5 D. "Soils on 19,000 A disturbed.
On-site erosion rates could increase by average of 10/cy/A/Yr."

190,000 cy/yr or
3,800,000 cy in 20 yrs or
@ 120#/cf or 1.6t/cy
= 6,080,00- tons

As an increase in erosion rate this is highly improbable because laws require erosion control.

6 E. "Water quality may be lowered" (or may not be lowered). Total dissolved solids would increase (not necessarily if impounding is used).
Decrease yield of springs and wells (possibly, but probably only on the mining property).

7 F. "Air quality would be lowered" (TSP). (Not necessarily true. Sprinkling and oiling might reduce suspended particulates.)

Page vi G. "Dust could reduce visual range to less than 3 miles around Blue and Kaiparowits No. 5 Mines." (All kinds of things could happen, but won't. It's ridiculous to think of a reduction to 3 miles.)

8 H. The small economic loss in grazing land should be compared with the great economic gain from coal mining, and should not be left as a hanging implication.

9 I. "About 11,000 acres of wildlife habitat would be lost for the duration of the project." (First, wildlife is scarce because this is tough country. Second, Utah has 54,346,240 acres, so the average lost would be 0.02%.)

5 Erosion calculations are for exposed soils. The calculation presented by the reviewer is inaccurate. The entire area disturbed would not have exposed soils for the life of the project.

6 Text change.

7 Text change.

8 The loss of grazing use is a statement of fact not intended as a comparative unit. Increased wages are discussed in the socioeconomic section.

9 The comment is accurate.

Page vi (cont.)

10 J. Population increase of 20,450 people would have to be handled by planning. About half the increase would take place in Kane and Garfield counties, tripling present population. The Kaiparowits Project plan calls for handling this kind of increase in a manner which should prove successful.

11 L. Yes, cropland would suffer if the water came from existing agricultural use, but it would not come from such use on the Kaiparowits Plateau.

12 M. Regarding "social conflicts," it is also possible that an influx of new people, many with skills, talents and cosmopolitan backgrounds, will stimulate "current" life in Southern Utah and improve the society.

N. Yes, competition for labor will enter the scene. This could be healthy. People on fixed income already suffer from an inflation. These coal projects could open new opportunities for many persons now on fixed incomes.

O. With proper planning and use of funds, the quality of municipal and local services should improve, not decline.

13 P. Yes, roads require land, but 530 acres for 115 miles of road is insignificant in this country.

Summary of Environmental Impacts by 1990

14 Items M, N, and O discuss adverse changes in quality of life. No balance is shown so as to indicate that an influx of workers may enhance life style by introducing new concepts and new ideas. In addition, the population influx could improve conditions for those whose income is limited by lack of job opportunity, and increased goods and services. There is no recognition made of improvements in communication that would result from the addition of 115 miles of roads.

Page I-3 Par. 2

Chapter I: Description of Proposed Actions

15 Major analyses in the report are based on 12 mty by 1990, which is "dependent on Federal approval of mining and reclamation plans on existing Federal leases." The Secretary of the Interior is not proposing a production level; instead, "he is considering appropriate actions to insure that Federal coal is available under environmentally acceptable conditions and as needed to meet market demands and the energy needs of the nation." This is an extraordinary statement with three implications:

1. The Secretary is supplanting the market.

2. The market for coal may not be related to the nation's energy needs.

3. Private enterprise cannot plan on this basis for inherently long-lead-time mining and power projects.

10 The socioeconomic section discusses this impact.

11 At the projected level public water supply for Kaiparowits miners probably would be supplied by the Page, Arizona system. However, the bulk of the population increase is in the Alton mine-Allen-Warner Valley Energy system area where crop land would be involved. See general statement.

12 The comments are accurate. Adverse impacts might not occur. However, they are possible and are discussed in detail in chapter IV.

13 Text has been changed. New roads are of significance to transportation, wildlife, and recreation use.

14 Chapter IV contains detailed discussions of changes anticipated in employment and employment opportunities, income and economic conditions. The potential beneficial impacts are described.

15 The implications presented by the reviewer are not intended. The Secretary is conducting a legally mandated review of pending mining and reclamation plans.

Page I-3
Par. 5

Uncertainty is reinforced by another statement: "Additionally, any future coal-related action on Federal lands in central Utah beyond those proposed and analyzed in this statement will require additional environmental assessment prior to granting of permits."

Page I-5
Par. 4

Still further uncertainty is added by Section 5: "Future National Environmental Policy Act (NEPA) Review Points." This includes DOE coal production rates and diligence requirements on Federal leases.

Page I-7
Par. 5

At this time, the mining and reclamation plan submitted for the Kaiparowits project for Mines 1 through 5 has not been returned to be revised so as to meet applicable new regulations. It is anticipated, however, that the mining and reclamation plan will be modified so as to meet the applicable requirements.

Chapter II: Description of the Existing Environment

A. Natural Environment

1. Climate

16 Pages II-2, 3, 4

Figures on these pages should indicate whether the temperatures are in Centigrade or Fahrenheit.

16 Text change.

17 Page II-11
Par. 1

2. Land

"The best quality coal in the region is found in the Kaiparowits Plateau field." Nevertheless, Table II-1 shows sulfur on Smoky Mountain at 0.75%, whereas Kaiser Engineers' summary shows 0.6%.

17 Our source is Doelling and Graham, 1972, and represents an area larger than that explored by Kaiser Engineers.

Comparison on dry basis:

	USGS[1] ES	Kaiser Engineers 100-200 Series	Kaiser Engineers 300 Series
Volatile Matter	42.44	42.13	42.07
Fixed Carbon	48.70	47.78	48.53
Ash	8.59	10.09	9.35
Sulfur	0.75	0.59	0.62
Btu/lb.	12,401	12,400	12,536

[1]Smoky Mountain

18 Page II-9 Table II-2 On any basis, the Kaiparowits field dominates the Southern Utah reserves, showing measured reserves 70% of total and gross resources and reserves 76% of all Southern Utah fields, and possibly even higher. Kaiparowits reserves and resources are shown in the range of 15.2 to 20.6 billion tons. This emphasizes the importance of solving the problem of how to mine the Kaiparowits coal.

19 Page II-11 Par. 5 "Methane and other combustible gases are present locally, in unknown concentrations, in some coal beds and overburden rocks at the region." This statement is misleading as a whole and sharply misleading on the Southern Kaiparowits. No such gases are noticeable on the surface by any ordinary means; even drilling into the multiple seams revealed little methane as a mining problem on the Southern Kaiparowits.

20 Page II-44 Par. 7 6. Wildlife

The conclusion is that development would result in increased "direct loss of wildlife from illegal shooting, highway mortality and other activities." No indication of possible corrective measures is made.

21 Page II-47 Par. 3 The statement that "Lake Powell's sportfishery will continue to provide fishing near the current level" with the proviso that "coal is not developed" has no basis in the reference material, is a tertiary implication, and does not belong in the statement.

B. Cultural Environment

22 Page II-54 3. Coal Mining Methods

This section is noteworthy for omitting any reference to reclamation techniques.

23 Page II-56 -II-81 4. Socioeconomics

Garfield County's 1970 per capital personal income ($2397) was 60.4% of U.S. average. Kane County's is the lowest in the region being considered.

Population growth has been slow and natural increase stayed slightly ahead of out migration. The young people are leaving and the percent of old people is high. These figures cover the twenty years, 1950-1970.

Government employees comprise one-fourth of the employed people in Kane and Garfield counties, about an eighth are in farming (declining), and the rest mostly in trade and services. It is interesting to note that in 1973-76, federal, state and local government provide the following percentage of total earnings: Garfield County, 37.2%; Kane County, 36.4%.

18 The mine plans are concerned with only a part of the Kaiparowits Plateau coal reserves.

19 The proposed Kaiparowits Nos. 1-5 mine area did not encounter much methane; others encountered limited amounts. Whether or not methane occurs in quantities sufficient to be hazardous or to cause impacts is unknown, but methane is present.

20 Text change.

21 Text change.

22 The comment is accurate. Reclamation techniques are discussed and on a site specific basis in part 2.

23 Chapter II defines the existing situation. The potential positive and negative impacts of coal development are discussed in chapter IV.

Unemployment rates in Kane and Garfield counties jump around:

Year	U.S.	Utah	Garfield	Kane
1960	5.6	4.8	14.6	6.0
1970	4.9	6.1	21.3	15.3
1976	7.7	5.2	12.3	6.0

Public assistance is provided to 22.8% of the families in Garfield County and 17.4% in Kane County.

The statistics submitted verify the knowledge that Garfield and Kane Counties are financially poor and are losing their young people because of lack of opportunities.

Nowhere in this chapter does this report explain the economic and other benefits of sizeable coal mining enterprises which would alleviate these negative economic factors.

8. Esthetics

24 Page II-94 Par. 3

The reference to existing community developments and habitation as "manmade intrusions" carries a connotation somewhat in variance with the high values placed upon past human habitations by the paleological treatment of artifacts in this region. At what point do "manmade intrusions" become historical sites or valuable paleological sources of human history?

C. Future Environment Without the Proposed Federal Action

2. Cultural Environment

25 Page II-101

Identified changes which will occur to the recreation resource within the RIZ are all negative in nature. The entire tone of these changes assumes shortage in recreational sites, conflicts with different user groups, lowering of fishing access, damage from ORV use, increased lingering and vandalism, increased deterioration of vegetation and soils, diminished opportunity for solitude, additional problems for water rights and utilities and more vandalism of archaeological and historical sites. Mention is not made of benefits which accrue to the people who have had an opportunity to use the recreation resources.

Chapter III - Planning and Environmental Control

26 Page III-1 - III-15

This chapter identifies the legislative basis for controls, but does not identify the redundant and contradictory controls which may result. A more concise identification of specific areas of responsibility and a precise delineation of authority would be helpful.

24 According to law, man-made intrusions start to have historical significance after they have been in place for 50 years.

25 Mention is not made of the benefits to people who use recreation resources because it is not relevant to this study. People will recreate wherever they live and gain these benefits. There is no evidence that recreation resources of the RIZ provide these benefits to any greater degree than recreation resources in other areas.

26 Chapter III identifies the major legislative basis and management authorities. Part 2 contains more detail.

Chapter IV: Impact Analysis

A. Natural Environment

1. Land

27 Page IV-1 Par. 6

This paragraph describes the possibility of maximum subsidence from the extraction of coal by underground methods. The last sentence of this paragraph states that the "surface area subject to subsidence would range from 90 to about 130 percent of the area of the mine workings." This is a misleading statement in that the Kaiparowits mine and reclamation plan calls for a combination of room and pillar mining, a method which yields a lower total extraction of the resources yet minimizes subsidence problems; and longwall mining, a method with high extraction ratios and greater subsidence. There is a trade-off between high extraction rates and high subsidence rates. If the mining plans are altered in the future under the authority of the Regional Mining Supervisor to increase utilization of longwall methods of coal extraction, the recovery ratio will increase and there will be a larger area subject to subsidence. We object to the hypothecation of circumstances which have no been submitted in the formal mining and reclamation plan, and to the utilization of the worst case in every instance -- i.e., citing a low recovery ratio and a high subsidence when in fact each tends to be mutually exclusive of the other.

The exact acreage to be affected by subsidence is questionable, but it is true that subsidence will take place. Two factors must be considered: (1) The land is not presently being used in any way which will be affected by subsidence, and (2) natural forces have caused, and will continue to cause enormous rock slides on the rim of the plateau, leaving huge blocks of rock isolated as monuments on the Tropic Flats.

Page IV-2 Par. 1

The discussion of surface expression of subsidence should be specific as to sites. The statement that "some fractures, however, may be as much as 3 feet wide, 950 feet deep and, where the surface is soilfree sandstone, a few hundred feet long" is misleading when applied to the region as a whole.

Page IV-2 Par. 4

This paragraph implies that mine-stress releases could induce earthquakes up to a 4.9 Richter. This is totally unfounded when stated out of context. It should be explained in more detail in conjunction with the magnitude of localized mine-stress releases, their area of influence and the rate of diminishment.

28 Page IV-2 Par. 5

Threats to "paleontological resources" (fossils) are exaggerated.

27 The EIS statements on the potential extent and nature of subsidence are accurate. The range, possible controls, and potential adverse impacts of subsidence are described.

28 The magnitude of the impact cannot be measured.

Page IV-3 Par. 1 **29**

The discussion of recovery problems on the Kaiparowits is a reasonable discussion. New technology can be applied, we hope, to improve recovery through better mining equipment and methods, proper sequencing of extraction and perhaps ultimate recovery by in-situ or other methods. This is a problem in most underground coal mining, and we can reasonably expect some new recovery techniques in the next 20 years.

Page IV-4 Par. 1 **30**

Methane exhalation from mining operations should be un-noticeable in the Mono area of the Kaiparowits.

Page IV-4 Par. 2

As mentioned before, the stated increase in erosion rates is excessive: 10 yds/acre/year. Severe duststorms are common on the southern Kaiparowits Plateau, and it can be expected that slightly less erosion will take place with mining operations because of controls over dust by structures, watering, oiling, etc.

2. Water

Page IV-7 Par. 3 **31**

The statement that water for mines and possible new communities (Table I-4) would likely preempt water presently used for other purposes, mainly agriculture. Is not the water for mines and communities presently unallocated, and would have little impact on the water available for agriculture?

3. Air

Page IV-8 **32**

The discussion of the maximum 24-hour incremental impact of dust from roads states that the increased dust concentration would be insignificant beyond 5 miles of the mine site is not consistent with the Figure IV-1, which conveys the impression of a much larger impacted area.

The impacts on air by the Kaiparowits mining activities are highly theoretical. Dust from roads seems to be the main culprit, but roads will be watered or oiled. An incremental impact of 65 ug/m^3 is far too high.

Page IV-8 Par. 5

No basis has been stated for the conditions under which 65 ug per m^3 has been established. The testing methods are not explicit. It is suspected that this figure is related to uncontrolled, unwatered roads. Some mention has been made of paving, which may appear to be an attractive solution under some conditions, but maintenance of a well-engineered, watered gravel road is superior to asphalt paving under the usage conditions which will exist in this area. Given a suitable road watering program, the TSP concentrations quoted are meaningless.

29 The comment is accurate, and the analysis considered the possibility of increased recovery.

30 See response to comment 19 regarding methane.

The discussion of soils and erosion in part 1 is general, because of the varied conditions in the region, and should not be considered in relation to the Kaiparowits alone. Specific erosion rates are discussed in part 2.

31 All water in the State of Utah and Utah's entitlement to Colorado River water is either filed for or allocated, according to the State engineer. Water for mines or community use would require an adjustment in existing allocations. Most allocations in Southern Utah are for agriculture.

32 Text change. The impression was not intended. The entire air quality analysis is rewritten to take into account recently required EPA regulations. Bryce Canyon National Park is of concern because the park is near the proposed Alton mine.

Fortunately, the report states that the Kaiparowits "expected incremental 24 hour TSP impact for the proposed coal development at 12 mty would be less than the 10 mg/m^3 standard at Zion and Capitol Reef National Parks." Why no comment here on Bryce Canyon? It is equally distant from the site.

Page IV-16 Par. 2

The previous comments apply to this statement as well; the TSP projections are meaningless without further explanation of testing techniques.

4. Vegetation

33 Page IV-16 Par. 3

Identifying 9400 acres of vegetation as being removed over the life of the proposed coal project ignores the mining and reclamation plan requirements which call for revegetation and reclamation as an ongoing mining operation function. The statement should be modified to exclude the land that has been reclaimed usually within five years of mining.

Page IV-18 Par. 6

Surveys for and enforcement of The Endangered Species Act of 1973 threaten future operations and are indeterminate in effects today.

5. Wildlife

34

The statement is made that reclaimed areas over 5 to possibly as many as 100 years may be so altered that some form of wildlife inhabitants may find it unsuitable. Since the reclamation requires that the land be brought back to its original or higher purpose, it may equally be true that the reclamation may improve the environment and even enhance wildlife. There is a reasonable probability that this would occur because of the necessity to upgrade the mined land.

Total wildlife habitat identified as disturbed is 9,457 acres. Figure II-9 identifies an air basin of 17 and a half million acres. The affected area of 0.05% of the area in question. While not all of this land is available for the wildlife, the same applies to the area to be dedicated to projects.

6. Fisheries

35 Page IV-24 Par. 3

The discussion of non-point pollution in this paragraph is absurd. After stating non-point pollution will come mainly from surface runoff and non-explicit "deleterious products" and "suggests" that they may be injurious to fish, the paragraph concludes that mining causes no increase in sediment concentrations.

B. Cultural Environment and Land Use

36 Page IV-25 Par. 5

1. Lands

The second sentence states "transportation options include

33 Whether or not land would be reclaimed is not relevant to the total acreage that would be disturbed. The schedule of reclamation is described in chapter IV, and in part 2.

34 Positive impacts to wildlife after reclamation are discussed in chapter IV. The restoration of lands to a "higher purpose" may adversely impact some wildlife species while benefiting others.

35 Text change.

36 Text change.

improving a jeep trail near Pilot Rock Junction, which crosses the NRA and extends to Glen Canyon City." The utilization of the term "jeep trail" is entirely subjective in that this is a recognized, dedicated county road. It is travelled in conventional two-wheel drive sedans. There has been a substantial amount of traffic over this road, including 15-ton coal haulage trucks. The fact that weather conditions occasionally preclude any traffic on the road, and only four-wheel drive traffic until such time as the road maintenance crews have repaired the washouts, does not make this a jeep trail.

2. Agriculture, Range, and Timber

Page IV-26 Par. 8 — 37

A comparison of minor agricultural losses against the values produced by mining would show startling contrast. Generalities, not economics, pervade this section as in many other sections.

37 The agricultural losses generally are classed as not significant on a regional basis. See chapter IV.

Page IV-28 Par. 1 — 38

The assumption is made that 565 acre feet required annually for culinary purposes in 1990 for increased population might be obtained by purchasing existing agricultural water rights. It may also be available from unappropriated or non-used water resources.

38 See response to comment 31.

39 3. Socioeconomics

d. Sources of Revenue

Page IV-44 Par. 5 — A

Funding plans developed for the new town at East Clark Bench are ignored in the discussions.

39
A The new town was proposed and analyzed as part of the Kaiparowits Power Project. It was not proposed in the Kaiparowits Nos. 1-5 mining and reclamation plans. A borrowing of conclusions therefore was not attempted. Moreover, financial conclusions are not available.

Page IV-47 Table IV-17 — B

Table IV-17 identifies projected community needs at various production levels for activities such as solid waste disposal, improved airport, fire department, water system, etc. It is not clear whether the projected population expansion and business opportunities identify the people who would be required to perform the above services, nor does it indicate whether revenues would be accruing to the communities for the performance of the identified services during this period of time. Since municipal expenditures will be funded through bonds to be repaid at a later date by the people using the facilities, care should be taken to be sure that the revenues for the identified systems are returned to the economy of the affected five county area.

B Employment effects of increasing government employment have been captured in the socioeconomic analysis (see table IV-12). On timing of revenues, see item d, page IV-44 (draft statement).

4. Finance

Page IV-53-4 — C

The discussions of finance are postulated in a negative way, proposing that any development would be a net drain on the local economy. This totally ignores financing structures for new communities which have been proposed by the coal owners. In addition, no mention is made of the provisions

C Text change. Given the general nature of the discussion in part 1, and the analysis there of scenario levels rather than specific sites or mining operations, it is somewhat speculative to correlate impacts with specific mines or locations.

39

in the Coal Leasing Amendments Act of 1975 which rebates 50 percent of the royalties collected to the state. Though it is widely recognized in the State of Utah that a substantial portion of these royalties will be made available to the coal development areas, Federal agencies fail to recognize this circumstance, stating instead the most negative, dismal scenario possible.

e. Out-of-State Areas with Impact Potential

Page IV-53 Par. 6 **D** The conclusion to be derived from this section is that Page, Arizona could handle 3000 to 4000 increase in population (to 10,000 total) without strain.

E No comment is made on the political implications of Utah mine-related people living and trading just across the border in Arizona. We believe the Utah Governor's Office will oppose vigorously the development of such a situation.

40

4. Transportation and Utilities

Page IV-58 Par. 3 **A** The mention of a paved, asphalt highway with a 100-foot wide right-of-way is purely hypothetical at this point. If the task force anticipates a requirement of such a paved road, the statements on TSP based upon unpaved, unwatered roads should be corrected.

Page IV-58 Par. 6 int **B** The discussion of the county road from U.S. Highway 89 to the Kaiparowits Plateau is unnecessarily confused with the intentions of the National Park Service to establish a "scenic, low-speed road" as mentioned in the enabling legislation for GCNRA. The existing county road predates GCNRA and is available for use by all commercial traffic. It is the responsibility of Kane County and the State of Utah to maintain this road in a state amenable to the traffic which uses it. The subsequent enabling legislation for GCNRA and establishment of the "low-speed scenic road" has no bearing on the pre-existing rights of commercial traffic or the rights of Kane County and the State of Utah to maintain this portion of the road system.

Page IV-59 Par. 1 **C** The discussion of an alternative route of access to the Kaiparowits Plateau which would not cross GCNRA fails to mention that this road is not in existence, as opposed to the existing county, which is in existence and is designed to serve all traffic, including commercial, to the Kaiparowits Plateau; this usage predating GCNRA.

Page IV-59 Par. 3 **D** The statement that increased cost of maintenance might be in "some degree" offset by increased taxes is a totally subjective statement without any basis in the references. No study has been made of the cost of maintenance vs. the increased revenues. An equally subjective statement is that the increased taxes would more than offset any required maintenance or improvement costs.

39

D Text change.

E As stated in response 39A above, a new town was not the subject of this EIS. However, if a new town were proposed, a more detailed analysis would be required--at which time coordination and consultation with the governor's office would take place.

40

A Text change. EPA requires Best Available Control Technology and Best Management Practices, which will require paving or equivalent stabilization.

B Text has been clarified.

C Text changed and clarified.

D Source of transportation data is the Utah DOT.

6. Archaeology and History

41 Page IV-64 Par. 4

The increased population as a result of coal development would give more people an opportunity to view the archaeological and historical sites. This enhanced usage would result in a greater appreciation for the past.

Chapter V: Unavoidable Adverse Impacts

42 Page V-1

This chapter is a tale of woe. Most of the items have already been commented upon. The chapter lacks totally a sense of proportion, and it depends upon theoretical projections of doubtful validity.

The identification not only of real impacts but also of hypothetical adverse impacts is not balanced by discussing the positive impacts which would accrue from the project.

43 Page V-1 Par. 1

The first sentence is incorrect. Sixty-five million tons of coal would not be lost; rather they would not be utilized under present technology. The area affected by subsidence seems excessively large, and is postulated on a worst case basis. This should be so indicated. Note previous detailed comments on subsidence and recovery.

44 Page V-2 Par. 3

Lowered visibility due to TSP is not an unavoidable adverse impact. Note the detailed statements which have been made on TSP.

45 Page V-2 Par. 6

The number of acres lost to an individual animal species, 723 acres of deer winter range, 9457 acres of cottontail range, 450 acres of pheasant habitat, 2000 acres of sage grouse habitat, 350 acres of summer turkey range, should be qualified by indicating how many total acres are available to these animals.

46 Page V-3 Par. 7

"Temporary unavoidable financial pressure on local government will result from rapid growth." This does not necessarily follow well-planned community development with sound financial backing as that proposed by the coal owners. The new community on East Clark Bench avoids the stereotyped problems of boom town growth and financing. As a result, this is not an "unavoidable adverse impact." It is an avoidable impact, and is rapidly becoming a matter of course for all responsible resource developments.

Chapter VI - Short-Term Use Vs. Long-Term Effects

47

This section should discuss the positive impacts that the project would have to the benefit of people, especially those who will benefit from the use and availability of the coal. This is not done. It would appear appropriate that Chapter VI discuss the positive long-term effects and short-term effects to the same degree that adverse effects have been identified. Balance is not achieved in the environmental impact statement unless the positive benefits are also described in detail.

41 The response to comment 25 applies here.

42 See general statement.

43 Text change.

44 Text change.

45 Where possible the percent of habitat that would be affected is stated.

46 A new town was not proposed in the mining and reclamation plans. An adequately planned new town can provide for the timely availability of housing and services and it is thus an important mitigating measure. The reviewers statement pertains only to provision of a new town and not to impacts on existing communities. In no way can the impacts of mining, occurring in widely dispersed locations, be confined to a single new town.

47 Positive impacts have been identified to the extent that they can be identified.

Chapter VII: Irreversible and Irretrievable Commitments

This is another negative list that presents nothing new. Still greater coal development is not considered. Much of the data are theoretical but expressed in numbers with apparent accuracy -- for instance, "vegetative productivity would be lost from 9.457 acres for 30 years." The list appears to have been developed by obstructionists, and the list does not give credit to all kinds of preventive and remedial actions. There is no sense of proportion.

Page VII-1 Par. 2 **48** The statement, "Minor, but unquantifiable, subsidence" is the only accurate statement in this paragraph.

49 We do not believe that the proposed coal mining and related developments will irreversibly commit the region to more urbanized, industrialized environment. The time scale used is too short. History shows that when man leaves the area, wildlife habitat return and occupy it.

Page VII-2 Par. 8 **50** Increased visits and levels of the use of the regional recreation resource are not irreversible actions but rather utilization actions. It seems inappropriate that, on one hand the statement talks about the use of the land for recreation, and then denies the use of land for recreation as being an irreversible action.

Page VII-3 Par. 2 **51** The concept that the natural landscape would be irretrievable during the life of the facility, mining remnants and residues is inconsistent. It is being applied to a different land use. Irretrievable would indicate that no possible reversal can occur.

Chapter VIII - Alternatives

Page VIII-1 **52** Failure to discuss alternative sources of energy and energy conservation in the development of coal in other regions of the United States, along with impact of this project, defeats the purpose of the environmental impact statement. Positive alternatives versus environmental impacts are not made.

B. Production Level Scenarios

2. Medium Production Scenario

53 Discussion of the Medium Production Level Scenario should also include an estimate of the probability of medium production occurring.

Page VIII-4 Par. 5

a. Geology, Topography, Paleontology - Fifth Paragraph

54 The statement that more than 36,000 acres of Kaiparowits would be disturbed by subsidence is not consistent with Table VIII-2, which shows far less acreage involved in underground mining.

48 See response to comment 27.

49 The three coal mines of the projected scenario would have about a 30 year life, but the Kaiparowits and Alton fields could produce for many more years. Given enough time, wildlife may return.

50 Because population growth is assumed to be irreversible, impacts on recreation facilities are also irreversible.

51 Being irretrievable for the life of the mine does not preclude reclamation and some form of restoration after mining ceases; a reversal can occur.

52 Alternative energy sources are not within the scope of this EIS.

53 The probability cannot be determined because of the need for a major transportation system.

54 Text clarified.

d. Air

Page VIII-11 Par. 2 — 55 The previous comments on TSP are applied to this paragraph.

f. Wildlife and Fisheries

56 This scenario suggests that people habitat replaces wildlife habitat, and human beings run rampant over the wilderness, resulting in death and disturbance to wildlife. This section assumes that people cannot cope with the activities of people. It is a strange commentary on how rigorously mining can be controlled in detail, but poaching, snowmobiles, ORV's, etc. will be permitted to damage the countryside and its wildlife; hence the natural inference that the project is bad.

Page VIII-18 Par. 2 — 57 The previous comments on subsidence apply to this paragraph.

Page VIII-13 Par. 3 — 58 The wording of this paragraph implies that this scenario is expected, when, in fact, the submitted mining and reclamation plan specifically precludes such possibilities.

59 Socioeconomics

Page VIII-14 Par. 1 — A A relative change in adding 61,000 people to the area over a fifteen-year period, 1975 to 1990, may be significant, but not enormous, as charged in the first paragraph.

Page VIII-17 Par. 1 — B The statement that a population growing at an average rate of 36 percent per year cannot be absorbed and serviced at contemporary standards, while true, does not add that contemporary standards would not be applicable if such change in growth rate occurred.

C In discussing the high production level alternative (29.5 million tons per year) it should be noted that the impacts are for activities generating over one billion dollars per year in revenues for the coal produced. The accompanying changes should be compared against the revenues generated.

High Production Level Scenario (46 mty)

Page VIII-29 — 60 A coal gasification plant is mentioned "probably beyond the time frame of this analysis." Table VIII-19 identifies a Kaiparowits gasification plant proposed by El Paso Energy Resources Co. on Fourmile Bench, but makes no mention of the gasification plant proposed by Mono-New Albion-Resources. This plant is briefly mentioned in Part 2 on Mines 1-5.

55 Text change.

56 The loss of habitat owing to urbanization and industralization is well documented. Present wildlife laws and law enforcement have failed to prevent adverse impacts to wildlife, and the trend indicates illegal activities will continue to increase. The adverse impacts attributable to population increase in the region would occur with population growth resulting from any cause.

57 See response to comment 54.

58 The mining and reclamation plans do not preclude such possibilities.

59 A Growth at this level constitutes an enormous impact to southern Utah.

B Contemporary service standards in small rural communities in southern Utah are generally lower than would be acceptable in urban areas and are even at times below legal standards. Rather than minimizing the problem, as the reviewer wishes to imply, the reverse is true.

C Government revenue estimates are not significant unless directly compared to government costs in providing services. The reviewer does not identify the source and manner by which the 1 billion dollar figure was derived, nor does he state to whom or what level of government such revenues would accrue. See responses to comments 39 and 46.

60 Text change.

Page VIII-33
Table VIII-20

61 The heading of this chart, "Preliminary proposed roads ancillary to mining coal in southern Utah, high production level," implies that the county road from U.S. Highway 89 to the Kaiparowits Plateau is proposed. It is not a proposed road. It is an existing, dedicated county road, portions of which have been in use for decades predating GCNRA.

Page VIII-34
Par. 7

62 The previous comments on TSP are applicable here.

61 Text change.

62 Text change.

COMMENTS

ON

DRAFT ENVIRONMENTAL IMPACT STATEMENT

DEVELOPMENT OF COAL RESOURCES IN SOUTHERN UTAH

PART 2

SITE SPECIFIC ANALYSIS

MONO POWER - ET AL.

Chapter I - Description of the Proposed Action

A. INTRODUCTION

Page 2
Figure 1

63 In Figure 1, the "Central Facilities" location for the Kaiparowits Nos. 1-5 mines is unclear, and appears to be erroneously shown as off the leasehold to the northwest, whereas in reality they would be slightly west of the middle of the leasehold.

63 The central facilities site location is plotted as per Kaiser Engineers' Drawing No. 10-102-C.

B. PROPOSED ACTION

Page 4
Table 1

64 A The figure of 3,190 personnel in the mine operation is erroneous. The maximum of personnel considered was 2,393 (indicated in the Kaiparowits Master Plan Study on page VI-9, the Kaiparowits Mining and Reclamation Plan to the U.S.G.S. on page III-7, and later in the Interim Report, Table II-1, page II-14). The addition of Mine 5 as an operating mine would not increase personnel because no production increase would be anticipated; instead, production and personnel would be spread over five mines instead of four operating mines and one "training" mine as originally conceived.

64 A Work force estimates for Utah coal mines are based on 15 tons per manshift, or 290 people to produce 1 million tons of coal per year. See response to comment 2.

B The figure of 290 personnel indicated in the No. 5 mine operation is in error. Only 108 persons (22 salaried and 86 hourly) were projected as the manpower requirement for this operation (study data compiled on February 14, 1978). Accordingly, the total figure shown as 3,480 is wrong.

B See response to comment 64A.

C Ancillary Facility for Kaiparowits No. 5 should read "County road upgrade for Mine No. 5 U.S. Highway 89 near Glen Canyon City".

C See responses to comments 3 and 36.

Page 5
Table 2

64 D It is not apparent as to where the reduction in acreage devoted to tailings ponds came from. It was not planned to reduce the size of the tailings ponds by virtue of opening the No. 5 mine, although it is conceiveable and highly possible that less tonnage, and thereby less need for coal cleaning, would be required at the central coal cleaning plant while No. 5 mine is producing (assuming that the total tonnage would be 12 million tons of raw coal production from all five mines). This slight reduction of 23 Acs. is hardly noticable when considering the provision of 550 Acs. for the main clean plant facility.

Page 6
Par. 2

E The scheduled production from Mine No. 5 is 750,000 annual tons. Design capacity is one million tons per year. The reason that mine facilities are overdesigned in terms of scheduled production is to compensate for normal interruptions in production, enabling temporary excess production to achieve annual scheduled production. For brief periods during the year the mine may operate at its maximum design capacity. Projections are valid only when based on scheduled capacity not design capacity.

Page 6
Par. 4

F The statement is made that "the present plan utilizes a series of conveyors to replace the original single master conveyor...." Although the location of the raw coal collecting conveyors running overland was changed somewhat in the refinement of the engineering design of the facilities, no basic change was made in either size or location of these conveyors as originally planned, starting from Mine No. 1 and ending at the raw coal storage area adjacent to the coal preparation plant.

Page 6
Par. 5

G A reduction in the proposed tailings ponds from 573 to 550 Acs.is implied (related to Table 2). The Kaiparowits Master Plan Study (page V-64), the Kaiparowits Mining and Reclamation Plan to the U.S.G.S. (page II-23) dated July 1975 and the proposed changes to the Mining and Reclamation Plan in letter of February 24, 1977, to Mr. Jackson W. Moffitt, Area Mining Supervisor, make no reference to 550 Ac. tailings ponds, but rather refer to 573 Acs. as the size of the proposed ponds.

Page 12
Par. 2

H Kaiser Engineers' estimate of the work force at Mine No. 5 is 108 people for a scheduled production of 750,000 annual tons. Obviously the productivity would be in excess of the quoted 15 tons per man-shift. Averages such as had been used by the task force can be misleading when applied to a specific property. As much of the data and conclusions in the impact statement are predicated on employee levels, the base figure should be accurate. In this case the task force figure of 290 miners and support people is in excess by a

64 D The 1975 mining and reclamation plan, page II-3, describes a 550 acre tailings pond and a 23 acre clear water pond. Revisions to the mining plan, dated February 24, 1977, state in the attachment, "The tailings and clear water ponds will be located in three sites, totaling 550 acres, southwest * * * as shown on Drawing No. 10-102-C."

E See response to comment 1.

F Text change.

G Table II-1, page II-3, of the 1975 mining and reclamation plan is in disagreement with the text on page II-23. Environmental analysis was based on table II-1 and on the February 24, 1977, mining plan revision as quoted in response to comment 64D above.

H See response to comment 64A above.

64 factor of 3. As a result all impacts should be scaled down by the same. The No. 5 mine was designed to produce coal efficiently using the latest technology, which would require a minimal work force. Only 22 salaried and 86 hourly personnel would be required for this particular operation. The mine would be operating in a very thick seam where double bench operations would be used. Personnel working at Mine No. 5 would not be in addition to those originally planned for Mines 1-4, but simply would replace persons from these four mines.

Page 12 Par. 3 **I** We suggest that the term marginal be used instead of inadequate when referring to the Smokey Mountain and Missing Canyon County roads. Substantial tonnages of coal have been moved over the Missing Canyon road and will continue to. Such movement indicates existing adequacy. It is recognized that the roads could be improved to facilitate flow of traffic, improve safety, and mitigate against environmental impact.

Page 12 Par. 4 **J** The term "proposed haul road" is not accurate in that it is not proposed and it is not considered solely a haul road. We suggest the term "County road" be utilized as the appropriate descriptor as that is the existing classification. Historically, the entire road has been used by commercial traffic for many years, and coal has been hauled over that specific segment. The comment that coal haul traffic is an unresolved dispute implies that coal cannot be hauled without some approval. No evidence has been presented nor action taken by any jurisdiction to preclude movement of coal or any other normal commercial traffic over the existing county road. As a result, the right to utilize a county road for commercial traffic is not in dispute.

Page 15 Par. 3 **65** D. Legally Enforceable Mitigating Measures

"The mining and reclamation plans cannot be approved until they conform to all applicable requirements" including new regulations.

It is interesting to note that regulations and requirements will mitigate environmental damage which is presumed to take place in Part 1. Examples:

Subsidence monitoring and inspection

Roads will be paved or sprinkled

Lands, plants and wildlife (including endangered species) must be protected in a variety of ways.

64 **I** Considering the existing road bed condition, and the recreational traffic across the NRA segment, the road is inadequate for both coal haul and commuter traffic.

J Coal traffic is free to use the Smoky Mountain-Missing Canyon road as it exists, although without upgrading it is inadequate to transport the projected tonnage of 1.5 mty. NPS approval would be required for any realinement within the NRA, and BLM approval would be required for any upgrading or realinement across other Federal lands on the route. Should the road segment within the NRA be realined and upgraded as part of the Glen Canyon City-Bullfrog Basin road, commercial use would be in conflict with intended use.

65 Legally enforceable mitigations are intended to mitigate mining-induced environmental impacts, but are not considered to be totally effective. Part 1 describes cumulative impacts after mitigation.

Water is protected

Conservation of resources will be an objective

Protection of paleontological, archeological and historic features.

This inconsistency should be corrected so that corrective measures are included in the same context as possible environmental damage.

Chapter II - Description of the Existing Environment

A. NATURAL ENVIRONMENT

1. Climate

Page 18 Par. 2 **66** The figure of 8 inches per year of precipitation is mentioned. In Kaiser Engineers' writing, 10 inches of average annual precipitation is always used.

66 The precipitation map (Utah State Engineer Office and others, 1961) that was used indicates that annual average precipitation is 8 inches. If Kaiser Engineers have long-term records to support 10 inches, a change would be appropriate.

2. Land

a. Land Surface

Page 18 Par. 3 **67** The proposed No. 5 mine entry is listed as "about 300 feet below the proposed plateau sites of the other four entries." The No. 5 mine is actually 530 feet below the plateau, with the portals of Mines 1 through 4, 115 feet lower than elevation on the plateau.

In this same section, the "steep rocky canyon" between the proposed sites of Nos. 2 and 3 mines is a "major limitation to construction." It is acknowledged that a conveyor bridge, perhaps 250 feet long or thereabouts, would have to be constructed across the 100-foot-deep canyon at the point. However, this construction would not be construed as a "major limitation to construction" as stated. Kaiser Engineers is fully competent to design and construct such a structure, which would only be a minor portion of the total surface facilities planned.

67 Text change.

Page 20 Par. 1 **68** The statement that "Revegetation potential is low on all these soils..." does not take into account the success which has been achieved in the reclamation and revegetation of the drill sites on the leasehold. These reclamation efforts have proved so successful that it is difficult to determine drill hole locations withiout a map and on-site markers.

68 A low revegetation potential does not mean that the area cannot be revegetated. It is a relative rating based on soil and climatic conditions.

c. Land Surface

Page 20 Par. 2 — 69 This is geologically incorrect: "Mine 4, the coal preparation plant, waste dump, and tailings ponds would be in an area that ranges from the clayey soils on the Tropic Shale to loamy and sandy soils over sandstone." The Tropic Shale lies far below the surface at this point and the reference is incorrect.

69 Text change.

B. CULTURAL ENVIRONMENT AND LAND USE

1. Lands

Page 27 Par. 6 — 70 A The last sentence should be revised to indicate the status of the 12 graded roads, eliminating the implication that these are defacto roads when in fact, two are dedicated county roads.

70 A The very fact that roads are graded is an indication that someone is maintaining them. Whether dedicated or not, the roads are there and are available for public traffic, which is the point of the paragraph.

4. Transportation

Page 28 Par. 5 — B It is acknowledged that older maps show the Missing Canyon Road as a "jeep trail". To clarify the connotations of jeep trail an objective treatment of this subject would state that this road is generally passable by conventional two-wheel drive vehicles except during the rainy season, immediately after wash outs. It has been used historically by all classes of vehicles and trucks to supply exploration operations on the leasehold. In addition it has been utilized by coal haulage trucks of up to 15 ton capacity to haul coal. The continuing attempts to classify this road as a jeep trail are misleading.

B Text change.

5. Recreation and Esthetics

Page 28 Par. 7 — 71 Reference is made to the area where Smokey Mountain road crosses lands within the Glen Canyon NRA as being "heavily used by recreationists." Seldom have project workers ever seen any other person in this area other than those few individuals engaged in some way with the coal mine exploration program on the Kaiparowits Plateau; certainly the area is not heavily used by recreationists.

71 Text change.

Chapter III - Environmental Impacts

A. NATURAL ENVIRONMENT

1. Land

b. Geology and Minerals

Page 30 Par. 4 — 72 "Geologic hazards would be created by subsidence tension cracks and by not leaving adequate support where adits

72 The text describes the potential. These factors should be considered irrespective of mining engineering practices.

enter canyon walls..... and in areas of shallow overburden under canyon rims and floors." Except for subsidence cracks, which may not be consequential, this statement assumes poor mining engineering practices. In the design of the portal location, as well as all other underground mine workings, care was exercised to provide suitable support so that no roof failures would result in the mine workings or at the portal areas. Indeed, such an occurrence would spell failure for the mine, so that only recognized and proven mine layouts were suggested for this area. At the portal approximately 60 percent of the coal would be left in pillars which would not be mined during the life of the mine.

All mining plans submitted have provisions for protection of canyon walls and more than adequate support at points where adits enter canyon walls. The purpose of the mining and reclamation plan is to show that operators understand the hazards which might be encountered and design in appropriate safeguards.

Page 30
Par. 5

73 The need for a paleontological survey was suggested. Inasmuch as the disturbed areas (for construction of mine slopes, shafts, surface facilities and overland belt conveyors) lie on the Plateau where weathered bed rocks protrude to the surface or are covered with thin layers of clay soil, there is little likelihood that fossils of any significance would be located. Moreover, if there were any items of paleontological interest in these relatively small areas of impact, it is quite reasonable that the same geological formations would exist over the remainder of the plateau area in an undisturbed condition.

Page 31
Par. 3

74 All statements relating to erosion rates during times of initial overburden removal and construction should be described within the context of the given sentence as temporary. As an example the second sentence should read "the erosion rates would temporarily cause increased erosion rates...." The soil disturbed in the construction and operation of the mines would consist mainly in the solid refuse area and the tailings ponds. Each of these two types of disposal areas would impact 573 Acs. Wind erosion of either the coarse refuse or the tailings ponds produced in the wet cleaning of coal could not be rightly considered in the same category as "exposed soil" referred to in the section on soils. Furthermore, the 573 Acs. for the refuse disposal area and the like sized area for the tailings ponds would not be disturbed all at once, but only as required, with restoration by revegetation immediately following completion of dumping in the given area. Therefore, the 50 tons per acre per year wind erosion rate would appear very high for an overall average.

73 Text change.

74 The text does describe the temporary increase in erosion. Reference to the increased erosion rates is for the period of soil exposure. When the surface is protected by vegetation, surfacing, or structures, the increased erosion rates would no longer occur.

Page 31
Par. 4

75 The successful reclamation of drill sites in this area without irrigation and mulch indicate that this is an inaccurate statement.

3. Air

Page 32
Par. 1

76 Again in the discussion of air quality, paved roads are not mentioned, although dust control is called 50% effective from watering or chemical treatment. Dust from roads is repeatedly overemphasized and overstated.

Page 32
Par. 2

The dust control factor of 50 percent attributable to water treatment is too low by several orders of magnitude. Proper watering schedules and or chemical dust control measures can reduce total suspended particles occuring as a result of the vehicular traffic by 90 percent or more of the uncontrolled count.

5. Wildlife and Fisheries

Page 32
Par. 6

77 A The statement that coal mining operations would cause a potential loss of surface water should be balanced by the fact that catchments to prevent runoff of surface waters may increase the year round supply of water to wildlife.

Page 33
Par. 2

Same comment as previous paragraph.

Page 33
Par. 4

B This paragraph assumes non-enforcement of game laws.

Page 33
Par. 7

78 Water intake structures are designed to minimize hazards to fish under worst case conditions. As a result, even at low reservoir levels where the maximum probability would exist for fish impingement on the screens, the design is such as to minimize fish mortality. Of those fish that would be exposed to the hazard, only an extremely small proportion of the total fish population are of a size to incur damage. As a result, the overall effects of a water intake structure on the total fish population would be statistically unmeasurable.

B. CULTURAL ENVIRONMENTAL AND LAND USE

2. Socioeconomics

Page 34
Par. 1

79 A Minimum attention is paid to increased payrolls, taxes, etc; maximum attention to all manner of social problems. No attention is given to a new town.

B The previous projections for new residents to be accomodated by the mines at full production, including the staff of the

75 Text change.

76 Text change. See response to comment 40.

77A No plans for water catchments are described in the mining and reclamation plans submitted by Kaiser Enginners, Inc. To offset wildlife water losses, replacement of wildlife water sources may be required by the regulatory agency.

B This paragraph does not assume non-enforcement of game laws. Records in Utah and other neighboring states show that in boom areas, illegal game kills are increasing at a far greater rate than the population increases, even with increased enforcement.

78 Text change.

79 A Text change. Please note that a new town is not part of the Kaiparowits Nos. 1-5 mine proposal. Implications of a new town versus no new town in relation to potential southern Utah regional population problems are discussed in part 1 of this statement.

B New population was computed by a formula that equates to 6.12 times the work force; assumptions are:

(1) 80 percent of the work force has a family of 3.8 people, 20 percent are single.

(2) Support people = 1.5 times the work force

(3) Support people are composed of 40 percent with a family of 3.8 people, 40 percent single, and 20 percent existing population.

If N = number in work force

Then total = $.8N(3.8) + .2N + .4(1.5)(3.8)N + .4(1.5)N = 6.12N$

the generating station, was approximately 15,500, fifteen years after the start of construction. As the current mining and reclamation plan does not include projections for the additional 500 power generating station workers, these figures should be down-graded about 20 percent to

80 approximately 11,000. In any event, the task force estimate of 21,000 to 22,000 is about 30 percent higher than previous projections. This same correction in numbers should be applied to the section on RECREATION and ESTHETICS where the 21,000-22,000 figures appear again. The 40-60 percent who would "probably live in mobil homes" is double the figures which are provided in the community development studies which were submitted to the task force.

3. Transportation

Page 34 Par. 3

81 The estimates of vehicles made by the task force are substantially higher than the company estimates of the vehicular traffic, particularly for Mine No. 5. In the case of Mine No. 5 haulage trucks would account for 124 round trips per day regardless of the destination. With a work force of approximately 100 people, the number of worker round trips would be approximately 50. Service vehicles would be a maximum of 8 with a total round trip number of less than 200 for Mine No. 5. This is a contrast with the 680 vehicles per day cited by the task force for Mine No. 5. These comments also apply to Table 3.

Page 34 Par. 4

The one million ton per year figure should be reduced to 750,000 tons per year for the reasons stated previously.

4. Recreation and Esthetics

Page 36 Par. 2

82 The population cited here of 21 to 22,000 people is in error. Please see previous comments on population.

Chapter V - Adverse Effects that Cannot be Avoided

Page 39 Par. 3

83 The sentence reads "Unavoidable destruction, disturbance, and removal of possible paleontological resources...." should be modified to include the word possible as shown above. This is consistent with the acknowledgement that it is unknown if and in what quantities paleontological resources exists.

Page 39 Par. 4

84 As it has been before mentioned, comments referring to increased erosion during the construction phase should be explicitly stated within the context that they are temporarily increased. As a result the following changes should be

80 See response to comment 79.

81 Text change.

82 See response to comment 79.

83 Paleontologic resources occur in the area (see Kaiparowits final EIS).

84 See response to comment 74. Erosion would increase during exposure which may or may not be temporary. Erosion would decrease as surface protection is provided.

made: Sentence 3 "Temporarily increased erosion during exposure...."; Sentence 4 "Temporarily increased wind erosion potentials....."

85 Page 40 Par. 3

This statement is inaccurate by stating that mine traffic would conflict with recreational traffic and recreation users seeking "solitude, unconfined and backcountry recreation experience". That portion of the road subject to travel by commercial vehicles and the general public is acknowledged in the statement as having little recreation potential, and in fact is used lightly by the general public and then only as a route of access to varied pursuits.

The emission of "industrial odors" from a coal mine is most unproblematical. Coal mines just don't emit odors like pulp mills. Exhaust emissions from vehicles going to and from the mines would be no more, and probably less, than what would be expected for normal vehicular traffic. Such an effect could not be construed to conflict with the recreational use of the area. Likewise, noise would not significantly affect the recreational use of the area, because no significant noise, like that experienced in steel and heavy industry, would be detected at the mines and surface facilities. Coal mines don't create noise, and the environmental impact statement should not have suggested otherwise, but should have positively stated the absence of noise.

86 Chapter VI - Short Term Use Versus Long Term Productivity
Page 41

The statements on potential subsidence should be made in the context of the mining methods used. The mining and reclamation plan calls for a mix of room and pillar and of long wall mining methods. Though some subsidence may take place, the surface evidence would be minimal and in most cases difficult to detect without precise measuring methods.

Page 41 Par. 1

It is unequivocally stated that "subsidence-related geologic hazards would permanently alter the land surface above mined-out areas..." Experience from locations where pillar extraction mining is commonly practiced with ensuing lowering of the surface indicates that within a very short period of time there remains little or no indication of the surface impact created by the underground mining. Mining under the Kaiparowits Plateau should be no different; accordingly, the statement should have been made that "subsidence...may temporarily or permanently alter in some cases the land surface above mined-out areas,..." (underlining supplied to emphasize suggested changes).

87 Page 41 Par. 2

It is a matter of conjecture whether or not there would be any gain in knowledge of paleontological resources due to surveys or exposure of mining excavation, especially in the surface area. Underground, there may be some gain in knowledge from mining, but it is unlikely.

85 Though the recreation road use is generally light, it does occur on all roads and is greater in the vicinity of the NRA. Industrial traffic such as large haul trucks will conflict with recreational vehicles or recreationists seeking solitude. Coal mines in and of themselves may not emit odors, and if underground, noise or dust. However, transportation of coal by truck, train, or other conveyances does create noise, odor, and dust.

86 The discussion is treated in part 1. The submitted mining and reclamation plan does not provide sufficient information to calculate subsidence.

87 The comment is accurate.

Page 41
Par. 4

88 The statement that 78,000 acre-feet would be discharged as sewage does not take into account the data submitted to the task force on plans for sewage treatment within the new community. Treatment would generate an effluent at Level D and would be discharged through land applications for beneficial use to the community. It should not be implied that sewage would be discharged.

Page 41
Par. 6

89 To balance the statement on the encroachment upon wildlife by mining activities, it is quite likely that wildlife may become more abundant in those areas close to the refuse disposal areas where restoration of land takes place. In many cases it has been found that land restored after mining is better grazing land than the initial land before mining impacted it, and thus the land supports wildlife better.

Chapter VII - Irreversible and Irretrievable Commitments of Resources

90 Objection is made to the entire tenor of Chapter VII. It is a subjective extrapolation of previous assumptions, many of them erroneous suggesting that any development, regardless of design, planning and adherance to statutes and regulations, will result in irreversible environmental damage. This simply is not true.

Page 43
Par. 1

91 At a 50 percent recovery, which is acceptable for planning, the coal recovery would be 529,129,000, say 530 million tons. Leaving in place a like quantity of coal for adequate roof support is, by innuendo, bad for the Kaiparowits resource. No reference is made to this recovery as being acceptable and the usual for the coal mining industry; rather it is suggested as negative, with the point that methods should be developed to recover this additional 50 percent.

Page 43
Par. 2

92 As for the "uninventoried and unexposed fossil localities" being lost or disturbed, certainly these same fossil localities will never be known if mining is not pursued, for it is inconceivable that society is willing to excavate to a depth required at Kaiparowits just to investigate or inventory fossils common to many coal seams being mined.

Page 43
Par. 6

93 In regard to the possible loss of wildlife killed by vehicle strikes, etc., the extent of such losses should be no greater than what is experienced in other areas, and would possibly be less than many other places, because of the remoteness of the area with far less vehicular traffic than what would be expected on roads interconnecting population centers. This likelihood is not presented, leaving a negative comment stand.

88 The implication in the draft text was unintended; State laws require treatment of raw sewage. A new town is not proposed in the mining and reclamation plan.

89 The text paragraph is accurate as written. It is not likely wildlife would become more abundant near the refuse disposal area during the mine life, or in the short term.

The principal game animal on the Kaiparowits Plateau is mule deer; mule deer are browsers rather than grazers. Revegetation to satisfy grazing animals would not be beneficial to mule deer or to other species in this area, as suggested in the comment.

90 As the reviewer recognizes, the chapter is based on analysis contained in chapter IV.

91 Under current mining techniques, about 50 percent of the minable coal is nonrecoverable.

92 The text as written is accurate.

93 The extent of losses should be no greater than that experienced in other similar areas. Vehicle wildlife strikes are a function of miles of roads and vehicle speed. Remoteness of an area and lower traffic levels may in fact contribute to a higher road mortality per mile than mortality on heavily traveled roads. On heavily traveled roads, constant traffic may deter some of the more wary species from crossing or approaching the road.

Page 43
Par. 9

94 As for "cultural resources" in the area, certainly with all the investigations made prior to and during the exploratory drilling on the Kaiparowits Plateau, any "cultural resources" should be known. In the absence of such, the EIS should have so stated that none have been recorded, or the comment should have been eliminated entirely. As it now stands, there is an innuendo of possible destruction of a valued cultural site.

Chapter VIII - Alternatives

95 These basically negative alternatives are a suitable conclusion to the draft environmental statement.

No reference is made to Public Law 91-631, passed December 31, 1970, "An Act to establish a national mining and minerals policy."

It reads in part:

"Congress declares it is the continuing policy of the Federal Government in the national interest to foster and encourage private enterprise" to

1. Develop economically sound and stable mining industries

2. Foster "orderly and economic development" of domestic mining industries

3. Foster research

4. Study and develop better methods to lessen adverse impact on the physical environment"

The Act includes "all minerals and mineral fuels."

Development is apparently totally under the control of the Federal Government, even though private enterprise must take the risks, invest the capital, produce the coal, meet the market situation, pay taxes and royalties, and, with hope, even squeeze a profit.

B. DEFER ACTION

Page 45
Par. 3

96 In discussing the recovery of thicker coal beds with advanced technology, there is an implication that there is

94 Abundant archeologic sites are in the lease ares. See chapter II.

95 The policy expressed in Public Law 91-631 will certainly be one of the considerations in a Department of the Interior decision.

96 Text change.

a delay in mining would substantially improve the recovery. This, in fact, may be the case over time. But there is no need to delay development as improved technology will be utilized as it develops during the life of the mining operation.

C. PREVENT FURTHER DEVELOPMENT ON EXISTING LEASES

4. 97 Reject the mining and reclamation plans

Page 47
Par. 4

The last sentence should read as follows: "Although a water-line route from Lake Power...., and adequate water and power are not currently available for the total mining complex, Mine No. 5 is self-sufficient.

E. APPROVE THE MINE PLAN AFTER MODIFICATION

Page 48
Par. 3

98 The suggestion of constructing Lone Rock Canyon Highway does not mention that this is strictly a proposed route. It does not currently exist as a county road, has no right-of-way, source of funding, or specific plans for construction. The Missing Canyon Road does exist and can currently be used. Conflicts between recreation and mine traffic within GCNRA, if such potential for conflict exists, could also be avoided by utilizing the existing county road for commerical traffic and to continue the plans for the "low-speed scenic route", separate from the current alignment along an alignment more amenable to the purposes of recreational traffic. This alternative should be seriously considered as it could satisfy all parties whose interests are as stated. Obviously if the reason for objecting the use of the existing county road for increased commercial traffic is merely a means to forestall development, then this would not be an acceptable alternative to those parties opposing development.

F. ALLOW DEVELOPMENT OF SELECTED AREAS NOW UNDER LEASE

Page 48
Par. 4

99 The development of selected areas now under lease does not appear to be feasible nor would it ameliorate any of the minor environmental impacts. We completely concur with the final sentence in this section which states that "such a practice would result in leaving substantial isolated blocks of coal that would not be economically recoverable."

G. TASK FORCE PROPOSED ALTERNATIVE

100 It is the intent of the coal owners to develop the entire leasehold, but in the absence of a specific current use for the total planned annual production of 12 million tons,

97 Text change.

98 The Lone Rock Canyon road does exist; a group touring the Kaiparowits sites was taken over it in 1975. It is in poor condition and is not passable in all weather. It was not intended that the Lone Rock Canyon road be used without upgrading; the Utah State Highway Department (now UDOT) has preliminary alinement and design for the State highway quality road following the same general route (Kaiparowits EIS). The conflict of road use through the Glen Canyon NRA exists (see response to comment 3).

99 The comment is accurate.

100 The EIS does not preclude development as proposed.

the task force proposed alternative is a pragmatic start to development of the reserve. It should be approved without delay. It should not, however, be misinterpreted that commitment to the development of Mine No. 5 detracts from the plans to ultimately develop the entire reserve.

Page 49 Par. 6 **101** In discussing air quality impacts, this paragraph should be rephrased to state that the air quality impact could be reduced substantially through dust control programs.

Page 49 Par. 7 **102** The proposed additional new residents added to the communities is stated in the EIS on page 49 as 850 to 900. Inasmuch as this figure is presumed to be based on the total labor projected for Mine No. 5, which was incorrectly stated earlier in the EIS, this increase in community growth is overstated.

Page 50 Par. 3 **103** Kaiser Engineers uses a consumption factor of 400 gallons per day per resident. Thus the total added community water consumption incurred because of Mine No. 5 employment would be 201,600 gallons per day, or 225.8 acre-feet per year. The EIS states on page 49 a consumption figure of 350 acre-feet per year. Sewage discharge using Kaiser Engineers' figures would then be 112.9 acre-feet instead of the 175 acre-feet indicated in the EIS.

Chapter IX - Consultation and Coordination with others

104 On page 51, corrections in the spelling of names should be made as follows:

C. B. Tillson, Jr.
Kaiser Engineers, Inc.

101 Text change.

102 See responses to comments 79 and 80.

103 Text change. The EIS uses a ratio of 1 acre-foot of water to supply 5 people; this is equivalent to 180 gallons per capita day. The totals were in error and have been changed.

104 Text change.

Development of Coal Resources in Southern Utah

Comments Prepared for the U. S. Geological Survey
by Robert H. Hassell; Orem, Utah

I have just finished resding the draft environmental statement on the development of coal resources in southern Utah, and I am pleased to be able to offer these comments on your analysis. It is certainly fitting that the first of the USGS regional analyses should cover southern Utah, which has been the focus of so much debate over the production of energy and the use of our natural resources. This is the setting not only of large and valuable coal reserves but of scenery unequaled anywhere in the world, of air still clean enough to breathe without being a health hazard, of vistas extending for over seventy miles, and of a hardy, loving people whose recent ancestors carved s home from a harsh land and who today maintain a style of life and community which is totally unique. This is no ordinary place, and in moving the accouterments of heavy industry here we should move slowly and be sure not only of what we are doing but of the probable effects tomorrow of our actions today.

In general I am pleased with what you have done in the draft ElS. For quite some time other conservationists and I have asked what projects like these, which are of the same type and which are scheduled to impact a given area at the same time, should have their impacts evaluated both collectively and individually, and 1 am very pleased to see that our cries have been heard. After all, one coal mine by itself need have only a small impact, but several mines clustered together can have a huge effect on the air, land, water, and society. This is the first EIS that I have seen which attempts to evaluate collective impacts, and 1 think we should consider it a success.

Part I - Regional Analysis

1 think 1 understand why you chose to base your analysis on a projected 12 mty of coal production, but I am still somewhat confused over the status of the lease applications you discuss in the 29.3 mty alternative in chapter VIIl. Not terribly long ago 1 was given several briefings on the progress of applications for new coal leases in the region covered by this analysis, and you have mentioned a number of these in chapter VIl, beginning on page 39. You 12 mty snalysis chooses to evaluate the effects only on leases currently in hand, but what of these others? Your final

1 The 29.3 and 12 mty production levels are based on detailed mining and reclamation plans on existing leases. The 29.3 is the sum of the production proposed in the detailed mining plans. The 12 mty is the projected production level and is the maximum amount that could be transported over upgraded existing and formally proposed transportation systems. The 46 mty level includes production from Federal lands under lease application.

EIS should at least mention the status of the other detsiled mining plans which have been submitted, and what the probable future of the lease applications is. As it stands now, one scarcely knows what is standing between the 12 mty and the 29.3 mty scenarios.

2 On page II-31 you make the statement, "At the present time there is an inadequate data base with which to determine baseline visibility in Class I areas in southern Utah." It would seem to me that if existing data is inadequate to evaluate an impact then we should set out to get the data we need if it is possible to do so. In the case of visibility it would seem to be a simple task to pick a few high points within the region and simply do daily visibility measurements using selected landmarks within the region and its environs. We cannot fulfill the obligations that NEPA imposes on us to evaluate an impact on visibility if we have no idea of the resource to be impacted. I would think that the USGS is well within its legal rights and moral obligations in postponing any action on the approval of mining plans until an adequate data base on visibility is assembled and until the EPA has promulgated its NAAQS on this resource.

3 On page II-34 you mention the plants associated as groundcover with Ponderosa Pine and you left out the dominant shrub of this zone - Manzanita. In southern Utah the Manzanita is always associated with Ponderosa. At Bryce Canyon, Zion Canyon, and Caanan Mountain the Manzanita literally covers the ground between trees, often growing when no other shrub can survive. The Manzanita is also a good barometer of environmental change, and it certainly deserves mention here.

4 In your list of RARE II roadless areas (page II-50) identified by the Forest Service you left out the Ashdown Gorge area adjacent to Cedar Breaks National Monument. The area was identified in RARE I for wilderness study and it has the same status in the current roadless area survey. There are also several areas on the Paunsaugunt - Sevier Planning Unit of the Dixie National Forest that you have neglected, among them Mt. Dutton and Adams Head - Casto Bluff, which are also part of the Rare II process. The land use plan on the Paunsaugunt - Sevier has not been completed, so all roadless areas identified furing RARE I are automatically part of RARE II study areas.

5 You have done a commendable job in evaluating and analyzing the socioeconomic condition of the impact area (pages II-56 - II-84). I haven't seen a better analysis anywhere, but there are some difficulties.

2 Text change and data added.

3 Text change.

4 Text change.

5 The growth rate as shown on table II-17 is measured as a percent increase or decrease from a base year: -1.2 indicates a minus 1.2 percent growth. Table II-28 shows that farm earnings from Garfield County for 1975 are -1.2 percent. This means that farms operated at a loss.

For example, the tables in this section are virtually unreadable. In table II-17 (page II-59) we find that the annual growth rate of population, 1950-70, in Beaver County is -1.2. -1.2 what? I have the same problem with table II-28, (How can the farm income in Garfield County be -1.2%?) and with table II-36. I certainly hope that if these tables are used in the final EIS they are either put into a better format or explained.

6 There is one aspect of the socio-economic condition of this area which nowhere is properly evaluated, and that concerns the very unique social structure of southern Utah, particularly Kane and Garfield Counties. When Brigham Young sent out the pioneer settlement missionaries from the Salt Lake Valley he had very definite ideas on how the new towns his settlers would found would both look and function. Contrary to the settlement patterns of the American Mid-West, the communities were to be located very near to the farms, with the farmers living in the communities - not on their land. This is one reason why there are so many small communities scattered about these two southern Utah counties, each seemingly unable to function as an economic unit. The social and educational life of each community was to be centered on the church, which provided schooling, recreation, youth activities, a social hierarchy, and an identifiable political system, as well as worship. In large urban centers like Cedar City and St. George the structure is today not easily identifiable, but in Panguitch, Hatch, Tropic, Escalante, Cannonville, Henrieville, and Orderville the communities function today just about as Brigham Young intended. There are the usual public facilities, like schools, courts, and government, but these have been made to fit within the original structure and have not replaced it. Living there, as I was privileged to do for a number of years, was like turning back the clock, and leaving there produced a culture shock I will not easily get over. The people who live in places like Alton or Orderville stay because they cherish the particular life style these places afford. It is a style of life which is very fragile, and any significant influx of outsiders will tear its fabric to shreds. I am not suggesting that we as a people should deliberately choose to preserve these communities as a living museum-piece, and perhaps these people alone should be able to determine their future without the "assistance" of those of us who live in crowded places far away from this paradise. However, we should not allow ourselves the luxury of believing that the area can be industrialized and still not

6 The potential disruption accompanying social change is described in chapters IV and V. The potential impact is identified but cannot be accurately quantified.

change. There is simply NO WAY that the level of development contemplated by this EIS can be accomdated without making the region something very different than it is. Your EIS does not do justice to this truth, and in this is its major failing.

7 Your analysis of impacts on water supplies are quite good as far as it goes. I like your continuing emphasis that new uses for water in this arid region will come at the expense of old uses, a sobering thought when one considers that it means eventually turning back to the desert the green fields won at so much cost. One thing you have neglected to mention is the consumptive use of water from the Navajo aquifer to fuel the coal slurry pipelines to run from Alton to Warner Valley and Las Vegas. Now, I realize that this is not intended to be an EIS on the Allen-Warner Valley energy system, but certainly one would think that the coal slurry system, since it relates directly to the mining and transport of the coal, should be evaluated in so far as it impacts the mine site. Clearly the water for the slurry will have to come from the Skutumpah Bench region, and the consumption of this water should be evaluated in the EIS.

8 Your section on air (pages IV-6 to IV-16) is very well done. I could actually understand it, and I think you analysis is right on the mark. I have trouble believing, however, that Mono Power and El Paso Coal will truck all that coal over roads which lie on formations which make them completely impassable when wet and which can be dustbins when dry. Certainly for the sake of realism your analysis should assume that a major upgrading the Kaiparowits and Skutumpah road systems will be necessary to accomodate the movement of personel and coal. I have tried to drive the Kaiparowits and Skutumpah roads in wet weather with 4-wheel drive, always with disastrous results, so I know that these roads are not commercially serviceable in their present condition. Hence, I think that the effects on air quality from the Kaiparowits mines will likely be much less than your analysis indicates. The cost of putting the area roads in proper condition will, however, be a considerable extra cost to the state and counties.

9 Your section on Cultural Environment and Land Use (pages IV-25 to IV-66) is excellent as far as it goes. I have the same problem here, however, with your tables. I have no idea what table IV-7 is trying to tell me, and tables IV-9, IV-10, IV-13, IV-14, IV-15 also present difficulties. I really appreciate that statement on page IV-50 that taxes colleced by the normal means seldom meet the costs of population

7 Text change.

8 Text change. BACT requirements of EPA would eliminate nearly all adverse air quality impacts.

9 Tables present extensive information concisely. They should be interpreted by reading accompanying narratives. Your assertions were identified and are described in chapter IV.

impact, a fact to which every boom town in Alaska and Wyoming can attest. Your analysis needs to be amplified, however, to point out the real toll in human misery which often comes in the wake of boom conditions. The wages paid to coal workers will be substantially above what is considered the norm for the area, and while this will be fine for those who find jobs in the mines, it spells real trouble for operators of local businesses and farms who will now find themselves competing for labor in a market substantially inflated overnight. Rents will escalate, prices will soar, and the family business, conerstone of the local economy today, will find itself driven to the wall by competition from chain stores and discount marts.

10 Crime, which is today a minor annoyance in Alton, Panguitch, and Orderville, will suddenly become a major concern. The local residents today seldom have to lock their homes once the tourist rush subsides, and the sudden realization that their new neighbors are not all "just plain folks" will come as a shock. The local school districts will suddenly find the need for vastly enlarged facilities without the wherewithal to build them unless, of course, the State of Utah totally overhauls its current method of school finance - an unlikely event at best. The local governments of the area are totally unequipped to cope with the situation the EIS describes, and my experience with them indicates that they have scant realization of what this all means. Politically the area is in for a reverse polarity, with those used to being in control suddenly finding themselves on the outside, and today's majority will suddenly be a minority.

Part II - Site Specific Analysis
El Paso Red and Blue Mines

11 You have done an excellent job here, and I have no real suggestions for additions or improvements. I am very appreciative of the section on Alternatives. Your explanations of the very limited range of choices open to the Secretary in dealing with the mining plans is forthright, clear, and well-written. I had a vague idea previous to reading the EIS that our options as defined by law were somewhat limited, but I had little idea how limited. In view of the statement on page 41 that fugitive dust from coal hauling on unpaved roads would exceed Class II air quality standards I would suggest that the Secretary only approve the mining plan upon condition that haul roads be treated in a manner

10 See chapters II and IV. On school financing, see chapter IV. Mechanisms for intergovernmental revenue transfers would be required to cope adequately with rapid growth (see chapter IV). See also response 39 to letter from John D. Spaulding (Kaiser Engineers).

11 See response to comment 8.

sufficient to keep the dust below Class II TSP standards. In view of the impossibility of using an existing track through the Glen Canyon NRA without substantial reworking (something I strongly oppose), I suggest a further stipulation that the alternative route routside the NRA, as described in page IV-59 (part 1), be constructed and used for coal hauling. The costs of constructing this route could be a subject for negotiation between the State of Utah and the coal companies, but it should be emphasized in the approval of the mining plan that under no circumstances will upgrading of the Glen Canyon City - Sit Down Bench road be permitted. From the information given in the EIS I believe that the Secretary would be perfectly within the legal framework of his office in attaching these stipulations to the mining plan approval.

Kaiparowits Nos. 1-5 Mines

12 I am a bit confused about exactly what the federal govenment is proposing to do here. Clearly, Mono Power Company is proposing to develop five mines on the Kaiparowits Plateau, from which it hopes for an eventual production of 12 mty. However, the EIS evaluates the impact for only the No. 5 mine (I-3, part 1). In the section on Alternative (page 49) we find a Task Force proposed alternative for approval of only the No. 5 mine, but from page 44 it is clear that a "No Action" alternative for the mining plans on mines 1-4 is not within the Secretary's authority. Hence, I find myself very confused on the issue of this particular proposal. In the final EIS you need to spell out what kind of a mining plan you are proposing to approve and the basis for your choice. If Mono Power is willing to accept defered status on mines 1-4 this is fine, but that should be spelled out in your plan. If you approve the mining plan on all five mines then you have a whole new ball gave in part 1.

Other than that, I can only repeat my comments on the El Paso Mine respecting road access. This will be especially critical if El Paso Red, Blue, and Kaiparowits 1-5 all go into production. Hence, I suggest that no mining plan for the Mono Power properties be approved without the stipulation that there be no upgrading of roads within the Glen Canyon NRA for coal hauling purposes and that an alternative be developed outside the NRA surfaced enought to keep TSP levels below the Class II maximum levels. I can see no other alternative without violating the law.

12 See response to comment 1. Approval of the Kaiparowits No. 5 mining plan could be given independently of approval of plans for mines Nos. 1-4. Similarly, the Blue mine could be approved independently of the Red mine.

Alton Mine

Of all the mines proposed in the draft EIS the Alton Mine is the one with the most severe impacts. This is because it is the largest (10.5 mty), is a surface (strip) mine as contrasted with the underground mines proposed for the other projects, and lies at its closest only three miles from a national park (Bryce Canyon). It is fitting, therefore, that we spend most of our time in analyzing this project, in considering its impacts and how to mitigate them, and the alternatives. In achieving these goals I
13 find that your EIS comes ahort of the high standard expected. First respecting reclamation: Federal law provides that unless there is a high expectation for success at revegetation no strip mining is to be permitted. Your analysis state such a high probability for success at reclamation (page IV-4, IV-18, page 60), but you give no evidence for you optomism. In working with the BLM - Kanab District on the Land Use Plan for this area I was told catagocally that before any strip mine permits were issued for the Skutumpah Bench on-site experiments in revegetation would be conducted to demonstrate the feasibility of reclamation. As far as I know no such experiments have been conducted, and the project proponents have not even submitted a reclamation plan (page 13). Hence, the basis for your flamboyant optomism on the probability of succesa seems a bit ephemeral. Rainfall is not the only criterion of successful revegetation. Also involved are topsoil depths, composition of sub-soils and underlying rock strata, degree of slope, handling of soils and their relpacement, and the pH of surface water and soils. Your EIS evaluates none of these things and yet confidently predicts easy revegetation without even a plan for such. Clearly, Federal law demands more, and proposing approval of a mining plan before enough information is available leaves your proposed action open to a lawsuit. It seems to me a bit ironic that the USGS, knowing the scrutinty to which this EIS will be subjected by conservationists, would leave such a large, gaping hole in its analysis. The law is quite specific - the burden of proof lies with the project proponents and those proposing project approval, not on skeptics or opponents. Before the final EIS is published site-specific experiments on reclamation potential should be conducted and the procedures and results included in the document. By experiments I do not mean the type conducted on experimental spoil piles for oil shale sites in western Colorado, which proved only that hydroponic gardening

13 Two different reclamation plots (part 1, chapter IV) at the Alton minesites show success in revegetation, as do coal strip-mine areas throughout the Northern Plains and southwestern States. The Alton environment does not contain any condition that would present a serious reclamation problem.

is possible in any medium, but genuine experiments which depend substantially on natural nutrients and normal moisture.

14 Your analysis on air quality is quite badly deficient. On page IV-11 we are told that "it is possible that Class I PSD standards would be violated" at Bryce Canyon National Park. Question: Why do we have a draft EIS published BEFORE such significant data is available, at least as a model? The purpose of an EIS is to evaluate good hard data prior to undertaking a federal action significantly effecting the environment. Yet you have gone to press with an EIS which lacks one of its most important components - probable effect on one of America's most beautiful national parks. Before any mining plan can be approved we must be reasonably sure that Class I air quality at Bryce Canyon will be maintained, that the soon-to-be-promolgated PSD visibility regulations at Bryce Canyon will be met, and that reclamation will be possible. Your EIS lacks vital information on all of these points, and on two of them, visibility and air quality, it gives a poor outlook on the possibility of their maintainance as required by law. In view of this why do we even consider granting permission for an action which in all probability will violate the law?

15 Page 48 (Socioeconomics) makes some quite outlandish statements which I doubt can be verified either on the bssis of past experience or current trends. It states that while this project alone will increase Kane County's population by 3,750, the impact will not be major. On page II-96 we find that Kane County's 1990 population will be 5,100, compared to 3,600 today. The authors of the page 48 statement seem to feel that this increase of 1500 people will be part of the 3,750 likely to result from the project. However, what seems much more likely is that these 3,750 will be over and above the natural increase in population which is expected without the project. Your table on page IV-32 seems to agree with me, since it projects a 1990 population in Kane County of 12,100, or about 240% of the county's projected population if the mines do not go into production. Not satisfied with this bit of statistical nonsense, the authors then wade in way over their collective head by stating (also on page 48) that "the majority of the employees and their families would be former residents and/or share a similar lifestyle as the established residents." How does one manage to arrive at these conclusions? One only has to look at the cultural mix of the only county in Utah currently dominated by coal mining, Carbon, to realize how really ridiculous those assertions are. It also is in total contradiction with the analysis given in the first two paragraphs of page V-4. It is just this kind of "pie

14 Text change; data and analysis updated.

15 The population projection to 1990 shown in chapter II of part 1 represents natural growth; the population growth in chapter IV additionally includes growth attributed to the projected scenario. Population figures in the Alton site specific (part 2) relate only to the mine and do not include other facets of the A-WV energy system or the developments on the Kaiparowits Plateau. However, the possibility of social conflict as a result of new residents and returning residents who have lived under different conditions and have a somewhat different lifestyle, is identified. See response 6.

in the sky" nonsense which the laws of reason should allow us to avoid. The laws of mathematics tell us that one cannot increase the population of Kane County 250% in 15 years by using only residents or former residents. This kind of stuff in an EIS is just what is not needed. This document should deal in hard facts. There are a number of communities in Montana and Wyoming where strip mines have been a recent occurance, and which could be used for comparison purposes. The Kaiparowits EIS did a good job of projecting the future problems of southern Utah communities from the experience of similar communities elsewhere, and perhaps we need some of that sort of thing here.

16 Now we turn to the section on alternatives. You seem to have considered every feasible alternative but the one that Federal environmental laws may force you to make. I am refering to the fact that the few facts your EIS gives on the basic issues involved makes it seem very probable that while the Western half of the lease will be able to meet the Class I standards for TSP and visibility at Bryce Canyon National Park, the eastern section probably will not. Hence, according to Section E, page 69 (failure to comply with existing laws) the Secretary would be well within his authority to restrict development on the existing lease to the western section only. Since this section contains most of the coal (64%) in the field it would seem economically feasible to mine only this section, and it would seem to be the only legal way the mining plan
17 can be approved at all. This would also save Bryce Canyon National Park from having one of its finest overlooks hopelessly scared and disfigured. I would suggest in your final EIS that you evaluate this as a feasible alternative along with the others you have chosen.

Eratta in the EIS

page I-12, line 30. "alinement" should be alignment.

page II-19, line 37. "Hatchberry" should be Hackberry

page IV-7, line 17. "Allen-Warner Valley water project" should be Allen - Warner Valley energy project.

page IV-53, line 8. "SPU" should read WPU.

page 10 (El Paso) should be interchanged with page 10 (Alton)

page 22 (Mono Power), lines 19, 20, 21."mg/I" should read mg/L.

page 52 (Alton), line 4 "extreme south rim." There is no such thing on the Paunsaugunt Plateau. The entire south rim is a single line of vertical cliffs of Wasatch Formation limestone dropping straight to the Skutumpah Bench. The phrase here indicating more than one rim should be replaced simply with "south rim."

16 Additional analysis indicates PSD incremental limitations would be met for both Alton East and Alton West. The analysis did indicate a small impact to visibility at Bryce Canyon National Park. Currently, EPA has not promulgated standards for visibility.

17 A temporary change in the visual quality from Yovimpa Point would exist during and for as long as 5 years after mining. After reclamation, the mined area would would appear as an extension of existing modifications (railing pinyon-juniper, planting to grass, etc.). These modifications in form, color, texture, and line break up the monotonous midground and would improve the vista for most viewers.

September 30, 1978

Environmental Task Force on Coal
Room 505
Post Office Building
350 South Main Street
Salt Lake City, Utah 84101

Gentlemen:

I have carefully read your EIS on coal development in southern Utah as it applies to wildlife. Two figures you present are questionable:

1 In II.C.1. you mention normal population growth will consume 900 acres by 1990. In IV.5 you cite 1,000 acres to be permanently lost to mining, roads, recreation hones, and urbanized areas. There is only a 100-acre difference.

2 Secondly, in II.A.6. you cite 328 species of birds in the impact areas. There are only 298 birds known in the entire state of Utah.

I present these only to show that I feel such discrepancies in figures discredit other statistical data you present. I am opposed to any disturbance of the areas in question, but I find your EIS lets me down when I'm searching for data to back my arguments.

Sincerely,

Anne J. Keene
Wildlife Committee Chairperson
Utah Audubon Society

314 - K - Street
S.L.C., Utah 84103

1 The disturbed acreage listed in chapter IV is additive to the acreage disturbed by normal population growth (chapter II).

2 The number for bird species found in the area is taken from a Bureau of Land Management publication "Birds - Cedar City BLM District" which was compiled with assistance from the Utah Audubon Society, University of Utah, and the Utah Division of Wildlife Resources.

P.O. Box 924
Kanab, Utah 84741
September 30, 1978

H. William Menard, Director
U.S. Geological Survey
National Center, Mail Stop 108
Reston, Virginia 22092

Dear Mr. Menard:

Enclosed is a petition relating to the proposed coal mining in Kane County, Utah, and specifically to the Alton Coal Mine plan. This petition was presented in the Public Hearing which was held in Kanab on September 21, 1978, by Mr. Jet Mackelprang.

The petitioners' request that this petition be addressed in the final Environmental Impact Statement, and also in compliance with Sec. 507 (b) (11) of the Surface Mining Control and Reclamation Act of 1977 (Public Law 95-87) that the permit for mining shall not be approved until the determination is made of the probable hydrologic consequences of the mining and reclamation operations on the quantity and quality of water presently owned and used for domestic and agricultural purposes by the residents and property owners in Johnson Canyon.

Very truly yours,

Caroline Lippincott

Caroline Lippincott
for the Johnson Canyon
residents and property
owners

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

OFFICE OF THE DIRECTOR

In Reply Refer To:
EGS-220438-MS108

Ms. Caroline Lippincott
P.O. Box 924
Kanab, Utah 84741

Dear Ms. Lippincott:

We have received your letter of September 30, 1978, and the petition enclosed therewith, and your letter of October 2, 1978. Please be assured that the concerns expressed by your letters and the petition will be carefully considered in our preparation of the final environmental statement on coal development in southern Utah.

Also be assured that the evaluation of impacts contained in the draft statement are, as we state therein, based on mining and reclamation plans that may not fully conform to the requirements of the Surface Mining Control and Reclamation Act. In many cases the plans are deficient in the area of the rigorous hydrologic requirements of the new Act, and in these cases, bringing the plans into full conformance with the Act will mean substantial reduction of impact or total preclusion of some of the impacts described. In any event, I feel certain that no pending plan will be approved by the Department of the Interior if it does not conform to the Act.

Thank you, and the other petitioners, for informing us of your concerns in this matter.

Sincerely yours,

Acting Director

cc: General Files, MS114/Reston
Dir. Chron MS114
Chief, EIAP MS760
Stewart MS108

EGS:DO:HGStewart:ga:10/11/78:860-7493

September 18, 1978

Director, U.S. Geological Survey
108 National Center
Reston, Va 22092

1 The undersigned do herewith petition that mining between the Severe and Paunsaguant Faults in Kane County, Utah, not be approved or permitted until study assures that there will be no disruption or degradation of the culinary and agricultural water supplies to the residents and property owners of Johnson Canyon.

The petitioners' believe that the surface mining as proposed will remove, disturb, and bisect millions of tons of watershed and aquifer strata which is the major source and supply of surface and underground water for all the culinary and agricultural water in Johnson Canyon. The impact of the disturbance and removal of the water shed cover and the underlying aquifer on the overall existing water systems has not been adequately studied, determined, and enunciated.

The Johnson Wash heads in this area, and additional silting will cause backgrading, resulting in deterioration and decrease in the water flow.

Additional study and consideration also needs to address the impact of the removal of a great quantity of water from the Dakota and Navajo Sandstone strata for coal slurry purposes on the existing water supplies and uses in Johnson Canyon.

Leon S Appicott
Carma Appicott
P.O. Box 924, Kanab, Ut

R.A. Von Hake

J. C. Mackelprang

Charles Cooper

Ralph Bunting

Eugene H. Hinton

John K. Lillie

Cozy C. Powell

Jet Mackelprang

Betty Jo Greene

Ervin Little PO Box 1058, KANAB

Vaughn H. Judd

Clarice Mackelprang

Carlyle A Hulet

Norma L Hulet

1 Substantive text changes have been made to hydrologic sections in the Alton site specific EIS (part 2) to better describe potential adverse and lack of adverse impacts on water.

P.O. Box 924
Kanab, Ut 84741
October 2, 1978

H. William Menard, Director
U.S. Geological Survey
National Center, Mail Stop 108
Reston, Virginia 22092

Dear Mr. Menard:

In addition to the testimony relating to the draft Environmental Impact Study on proposed coal mining in Southern Utah which was presented in the Public Hearing in Kanab on September 21, 1978, I request that the following points be addressed:

1 (1). The study concludes that existing highways, with minor improvements will accommodate present and predicted increased traffic. The conclusion is based on "averaging" present traffic, and "the historic relationship between population and traffic". In fact, present traffic is very heavy in summer, due to the impact of tourist cars and recreational vehicles, and trucks delivering supplies to restaurants, stores, motels, service stations, marinas, etc. to serve the vacationers. It is very light in winter months. Whatever the historic relationship between population and traffic, it has little, if any, significance in predicting traffic in Kane County. Increased tourism needs to be predicted on other data, and the seasonal peaks of traffic on highways and roads, and within communities need to be considered.
The nature of existing highways (undivided two lane, with two direction movement) and present accident rates should also be considered. Also, the County road to the site of the proposed Alton mining area is primarily a narrow dirt road which is closed in winter months. A more accurate projection of road needs, costs, and financing needs to be made, along with their impact on the environment. (Reference, P I-15, 12 EIS).

2 (2) In predicting total mining development and its impact in the area, consideration needs to be given to the liklihood of development of uranium mining in nearby Northern Arizona near Fredonia, where rich deposits have reportedly been discovered. Fredonia is only seven miles from Kanab and is isolated from any other sizable communities. It is a hamlet of a few hundred population which will be impacted by the proposed coal mining as much as will Kanab. (Ref. P 1-13 F).

3 (3). The economic impact of all tax supported services and public buildings and facilities required by the expanded population needs to be assessed. Their effect on the local tax rates and property value appraisals, and the ability of present residents to pay the increased taxes while maintaining their economic self reliance need to be fully addressed. This is especially important considering the

1 Recreational traffic is growing faster than the national population. The population in Kane County would grow much faster than the national population. However, the data available on traffic flow on existing highways within the southern Utah region do not differentiate between local and recreation traffic, even though out-of-state automobiles (not light trucks or recreational vehicles) are counted. In effect, the assumption (see chapter I) tends to overestimate recreational traffic, especially at the middle and upper level scenarios. See response to National Park Service letter, comment 7.

The roads in southern Utah are generally under-utilized. Increasing traffic levels several times could cause user inconvenience but, with some road improvement (see chapter IV), the roads would be capable of accomodating the traffic. Accidents would increase as the traffic increases but accident rates would not change.

The county road to the Alton mine would need upgrading as described in the Alton mine site specific (part 2). Estimating costs of road upgrading implies a degree of design not within the scope of this EIS. Financing of road construction and other necessary public services also is treated generally (see Socioeconomics sections). Under Utah law, industries may prepay State taxes in order to obtain needed services (such as roads).

2 Uranium mining may occur in the vicinity of Fredonia; the old Hacks Canyon mine, near the junction of Hacks Canyon and Kanab Creek, in Arizona, may be reopened to produce uranium ore. Production and the work force are expected to be low. Any potential impacts would be minor. Text has been added that describes potential coal mining-related impacts on Fredonia.

3 A discussion of municipal services is in chapters II and IV. To assess "present residents' ability to pay the increased taxes while maintaining their economic self-reliance," would require determination of whether or not taxes would in fact increase, as well as consideration of ability to pay. Both would require primary research efforts quite beyond the scope of the EIS. It should be enough to alert the government decision makers to the problem by noting, as the reviewer does, that rapid growth may force communities to raise taxes and fees for municipal services, thus potentially damaging those persons who gain no direct and personal benefit from coal mining. It is usually asserted, though, that expanded economic activity can indirectly benefit even these people, so objective assessment would require a search for net effects.

population studies indicate a high proportion of old and very young. The study also anticipates that much of the increased population will live in house trailers which require heavy density services but which will not provide additional property taxes in proportion to the amount of services needed.

The changes in environment as they affect people should be given equal consideration as their effect on other animals and plants.

Sincerely,

Caroline Lippincott

FRIENDS OF THE EARTH
124 SPEAR SAN FRANCISCO CALIFORNIA 94105
(415) 495-4770

Moab, Utah
Oct. 18, 1978

Director
United States Geological Survey
12201 Sunrise Valley Drive
Reston, Virginia 22092

Dear Sir:

The following comments on The Development of Coal Resources in Southern Utah Environmental Statement released by the U.S.G.S. are submitted on behalf of Friends of the Earth, a national conservation organization dedicated to the preservation, restoration, and rational use of the Earth.

1 Our organization notes this particular environmental statement, in and of itself, is insufficient to serve as a decision-making document for any of the proposals reviewed for the reasons listed below,and recommend the document be rejected.

1. The Southern Utah Coal Regional ES predates the release of the Federal Coal Leasing Programmatic Environmental Statement scheduled for release on November 28th,1978 by the Department of Interior.

2. The ES predates the approval of the Office of Surface Mining Regulations now under consideration by the Department of the Interior. The detailed mining plans reviewed in the Environmental Statement fail to meet the criteria of the O.S.M. interim regulations adopted December 13th, 1977. In addition, the detailed mining plans reviewed in the statement do not meet the criteria of the U.S.G.S. regulations adopted August 21st, 1978.

3. The 12.0 mty coal mining scenario representing the detailed mining plans submitted to date and chosen by the task force for "detailed" examination within the ES has been recognized by all the individuals involved as an obviously arbitrary selection. This 12.0 mty scenario cannot realistically be considered reflective of the actual proposals of industry for development of the Kaiparowits Plateau. The 46.0 mty scenario, a much more realistic appraisal of the level of development currently planned for the Southern Utah Coal Region by industry should have been treated as the scenario deserving the more detailed examination within the document.

4. The ES is useless and irelevant as a planning document for other Federal and State agencies concerned with the proposed development of the Southern Utah Coal Region because of its existence within the vacuum created by the arbitrary nature of the scenario reviewed therein.

5. Much of the information, observations, and conclusions contained within the document are of such a vague, subjective or incorrect nature as to be essentially meaningless. Some of the more glaring examples include:

1 Chapter I defines the scope of this EIS. The document recognizes that prior to approval, mining and reclamation plans must be revised to comply with recently enacted laws and regulations. The projected scenario used for impact analysis is a possible development based on market, economics, access, and other relevant factors. The draft Coal Management Program EIS was filed with EPA on December 15, 1978.

II-56 2 "..There are no strip mines in the region." Actually, the only coal strip mine in the state of Utah, operated by the Dirty Devil Mining Company is located near Factory Butte, within the Henry Mountains Coal Field and in the Southern Utah Coal Region.

II-84 3 ".. the Southern Utah Coal Region Recreation Influence Zone or RIZ, where primary and secondary impacts would accrue to the recreation resource as a result of mining 12 mty of coal. The RIZ is based on recreation use within the region. Travel times from communities to recreation areas within the region range from less than 1 to as much as 3 hours. Areas within 2 hours travel time not included within the RIZ either lack recreation attractions and are lightly used for recreation, or have the user carrying capacity to accommodate projected increases of use without imrairment of resource or individual user values. Areas within the RIZ that would require more than 2 hours travel time possess significant recreation attractions but generally lack enough developed facilities or have administrative restraints on types of use."

The selection of driving time as a limit to the geographical extent of impacts to regional recreational resources from coal mining developments is a highly subjective and arbitrary decision. Recreational resources are more than just those areas accessible by car and developed for automotive access and convenience. In effect, the entire Colorado Plateau Province should be considered to be the minimum geographical entity for consideration for such a designation.

II-94 4 "Scenic quality or variety is common (tyrical) to much of that found throughout the general area. Lake Powell and Glen Canyon Dam, however, are considered to be outstanding visual attractions. In both cases, activities of man dominate the landscape character (dam is manmade and has created an artificial lake). Few people view these manmade intrusions as offensive or as detracting from the landscape character of the area."

This incredible statement obviously can only be interpreted as a complete misrepresentation of the scenic visual characteristic found throughout the Southern Utah Region, including the Kaiparowits Plateau. To assume the Glen Canyon Dam is an outstanding visual attraction and viewed by only a few people as offensive is a totally unsubstantiated and biased judgement by the author of this section and should be removed from the final version of the ES.

IV-2 5 "The major impact on coal would be non-recovery of about 50 percent of the coal in underground mines." The 50 percent recovery rate assumed by the proponents and echoed in the ES is highly optimistic considering the formidible problems posed by the coal seams of the Kaiparowits coal reserves to present room and pillar mining techniques. The Utah Geological and Mineralogical Survey estimates that between 33% and 50% of the total coal resources of the Kaiparowits Plateau would be mineable. The Lake Powell Research Project, Kaiparowits Handbook on Coal Resources noted "Because newer, more efficient mining machines are also less discriminatory much of the coal must be cleaned before use, and an average of 20% of the mine output in such cases is discarded as refuse. Thus only about 20% of the Kaiparowits Plateau total coal resources can be considered now as fully recoverable."

2 The strip mine near Factory Butte is not within the boundaries of the southern Utah coal regional EIS covered by this analysis. The work force, transportation, and other impacts associated with this mine would affect the central Utah coal region.

3 Driving time is the only valid limit to the geographic extent of the Regional Recreation Zone. Two hours median travel time was assumed for several reasons: 1) user identification and origin can be made more accurately; 2) local population, when they have short periods (2 days or fewer) for recreation, will usually travel not more than 2 hours one way; 3) once a resident has left the 2-hour travel zone, his identity, especially as it relates to impacts, is not easily discernible from impacts created by other travelers.

4 In 1977, more than 2,127,000 people visited the Glen Canyon National Recreation Area. Much (750,000 people) involved stopping at, photographing, and touring the dam. Use in 1978 is expected to reach 3,000,000 visits. This indicates a strong visual attraction for many visitors, but does not deny the existence of those who may not find the dam visually pleasing.

The Bureau of Land Management does not keep recreation use figures for that part of the Kaiparowits Plateau being evaluated in the southern Utah coal EIS. However, the number of visits to the plateau that they project does not equate to the visits to other scenic attractions in southern Utah. This indicates that, although the plateau has some limited attraction, it is well below average for the region. The esthetic analysis of the region is based on a systematic edited and audited inventory and evaluation (Roy Mann Associates, Inc., 1977).

It is recognized that esthetic viewpoints do conflict and that esthetic judgement is highly subjective. The evaluation adequately reflects this situation.

5 The estimated 50 percent coal recovery rate considers only those coal beds that can be mined under existing safety, economic, and technologic constraints. Overall recovery of the total coal resource could be much less than 50 percent. In such places, coal that must be left is contained mainly in beds too thin to mine or in beds that are so close to mine workings that mining would be unsafe. Where they occur, conditions such as these are described in the site specific EIS (part 2). A washing plant would increase coal recovery because with use of a washing plant, mining can be much less selective. The refuse from the washing plant is not coal but consists almost entirely of waste rock.

6 IV-4 "The amount of lime dust used in underground mining ..is insignificant, and impact relative to additional limestone quarrying and truck haulage cannot be quantified until a source is selected."

However, a 40 mty Kaiparowits Coal Mining scenario utilizing 25,000 tons of lime dust is not an insignificant amount. The fact that a definite limestone source has yet to be identified for any production level underlines the incomplete nature of the document in evaluating the associated impacts of coal mining in the region.

7 VIII-24 "At the medium production level, ...The remaining 18.8 mty would come from the south end of the Kaiparowits Plateau. It has been estimated that coal production off the plateau must ultimately reach 30 to 40 mty to make railroad construction feasible."

This statement underlines the total arbitrary nature of the 29.3 mty medium production level. It can be assumed 18.8 mty production of coal from the Kaiparowits Plateau would not be truck-hauled to the nearest railhead, yet the statement assumes a scenario below the minimum threshhold level required for construction of the railway system could somehow be achieved. Such a scenario is obviously not possible except for a short interim period of time prior to reaching the minimum 30-40 mty Kaiparowits coal export level and obviously does not warrant consideration within the ES.

8 Vol.II,B,pl. "The Mono Power Co.,et al mines would be developed as coal markets become available; the company proposes, however, to place the Kaiparowits No.5 mine into production as soon as possible. The participants have no sales contract for any of the coal and have no positive plans to supply spot market coal."

This statement clearly underlines the fact that this Environmental Statement cannot be considered to be an adequate decision making document. Without any indication of the need for this coal, or viable markets for this coal, alternatives to supply such needs or markets cannot be evaluated to any degree, as required.

9 Vol.II,C,pl3 "Utah International,Inc. has not yet developed a specific reclamation plan."

Why, then, is the U.S.G.S. evaluating the UII proposal in a site-specific analysis in detail in the first place?

10 Vol.II,C,p30 "Meteorological observations from Bryce Canyon National Park show a 40 mile visual range in daytime..."

Considering the visual range is defined as "the distance a person can see", we find it very hard to believe the visual range from the observation points at Bryce Canyon National Park show a 40 mile range. For example, Navajo Mountain, 70 miles from Bryce is easily visible virtually at all times from several of the Park's overlooks. Depending on the effect of the Navajo Power Plant's emissions other, more distant features in excess of 100 miles are also easily visible from the overlooks at Bryce Canyon National Park. 40 miles is a mid-range view from these overlooks.

6 Sources of limestone are not identified; analysis of this problem would be considered at the medium and high level scenarios.

7 As described in chapter I of part 1, the medium level scenario considers the sum of all detailed proposals. It is not based on an economic analysis of coal market or feasible transportation. As indicated in part 1, the Union Pacific Railroad Company has indicated that 50 mty of coal production would be necessary to support the cost of their proposed railroad into the southern Utah coal region.

8 The Kaiparowits No. 5 mining and reclamation plan is complete as submitted. The impact analysis in part 2 would allow a decision regarding approval to mine. The programatic EIS evaluates coal production alternatives on a broader basis (see response to comment 1).

9 Utah International's mining and reclamation plan was submitted to USGS under 30 CFR 211 of May 1976, with sufficient information for evaluation. For each mining sequence and prior to mining, the company will develop a specific reclamation plan that complies with the mandatory mitigations included in the EIS (part 2) and in laws and regulations that may be promulgated in the future.

10 Text change.

Our organization hopes these and the many other inadequacies too numerous to list in these comments will be rectified within the final ES. However, we note the statement will not qualify as an acceptable decision-making document until the criteria outlined in points 1 through 4 above are fully met.

Friends of the Earth will submit a Coal Policy Statement for the State of Utah upon review of the forthcoming Central Utah Coal Regional ES, Federal Coal Leasing Programmatic ES, O.S.M. Regulations and other relavant documents at a future date which we hope will be considered by the Department of the Interior.

We hope these comments will be considered in the planning process for the management of the Federal Coal Reserves of the State of Utah and would like to request their inclusion within the final Southern Utah Coal Regional Environmental Statement.

Friends of the Earth would also like to compliment Edward Davidson and the members of the Coal Task Force for their performance in preparing the statement, which we believe was commendable under the circumstances.

Sincerely yours,

Gordon Anderson

Gordon Anderson
Colorado Plateau Representative
Friends of the Earth
P.O.Box 820, Moab,Utah 84532

cc:
Secretary of Interior
Utah Coal Task Force
EPA
NPS
Conservation Organizations

447 North Pugsley St.
Salt Lake City, Utah 84103
Oct. 15, 1978

Director
U.S. Geological Survey
National Center
Mail Stop 108
Reston, Virginia 22092

Dear Sir,

The Utah Audubon Society has received the draft environmental statement concerning regional coal development in Southern Utah.

1 We oppose the development of these coal reserves for the following reasons:

-The market for this coal has not been adequately defined, and if overseas markets are under consideration, we oppose this as not being in the national interest.

-We do not feel it is responsible management to extract this coal, as proposed, in a manner that would leave upwards of 60% in the ground in an unrecoverable condition. This waste cannot be tolerated if realistic planning is made for the long-term interests of our nation.

-Alternatives to coal development have not yet been given serious consideration, and we believe they must be before coal development, with its myriad adverse impacts, commences. These alternatives would include extensive energy conservation, and reliance on solar, wind, and biomass energy, particularly for heating needs. Electrical needs, it should be noted, constitute less than 10% of the national energy budget, and this would be the main form of power likely to be produced from the coal.

-The complex and massive socio-economic impacts listed in the Draft Environmental Statement do not seem justifiable except under an extreme and proven demand situation.

2 -There is scant data on non-game wildlife, and this needs to be given much more consideration than has been given.

3 -The reclaimation issue has not been adequately dealt with. For example, we would cite the pinyon pine-juniper associations which take up to a hundred years or more to put in balance. This cannot possibly be done in the time frame suggested in the report.

-Total impacts on air quality alone would make the proposed developments illegal. We are against any downgrading of air quality in this nationally valued area.

If more coal is proven necessary at this time, we advocate further reliance on existing coal fields rather than development of coal reserves in the environmentally sensitive Kaiparowits region.

1 The letter is appreciated, and the reviewer's comments will be considered prior to a decision by the Department of the Interior on the proposed actions.

2 Non-game wildlife were given much consideration but, as the reviewer observes, scant data is available. Impacts were assessed to the level of available data and no significant impacts were identified.

3 The state of reclamation technology has advanced and successful reclamation is anticipated. A 100 percent cover of pinyon pine does not provide the most optimum habitat for either wildlife or other uses.

Thank you for your interest.

Sincerely,

Daniel Geery

Daniel Geery
Conservation Chairperson,
Utah Audubon Society

Kanab, UT
Oct. 15, 1978

H. William Menard
Director, U.S. Geological Survey
National Center, Mail Stop 108
Reston, Virginia 22092

Dear Mr. Williams,

I attended the meeting held in Kanab, Kane Co., UT, Sept. 21, 1978, on the Alton coal project. One of the gentlemen from the project co. made the statement "the water would be used from the Navajo sand formation and would damage no other river or stream etc."

Just where does every well, spring or stream come from but from the Navajo sand formation?

The water table last year (1977) dropped one foot from where it started a year ago. During the pumping season in Johnson Canyon it dropped 4'9" (four feet, nine inches). This year so far it has dropped 4'3" (four feet, three inches) but it was a foot lower to begin with. (That would be 5'3".) What will happen when pumping begins day in day out, year in year out, with out a resting piriod in the winter time?

It would not take long until the entire country would be completely with out water.

No water no vegetation, no vegetation no wild life including humans.

We need the energy, so mine the coal but leave the water alone, build the plant there; or harness the tides and keep both power and water where the population is. Leave a little beauty and life where it is for all to enjoy.

Thank you,

Mrs. R. K. Scribner
PO Box 24
Kanab, UT 84742
Resident of Johnson Canyon
Kane Co., Utah

(copy)

In the Alton area, most springs and wells draw from near-surface sandstone beds. Pumping water from the Navajo Sandstone would not affect these aquifers. Text has been added to show the expected drawdown in the Navajo aquifer at Alton and elsewhere as a result of establishing and operating a new well field at Alton. The nearest existing well that taps the Navajo Sandstone is 10 miles from the proposed A-WV Alton well field. After 30 years of pumping, the long-term drawdown in lower Johnson Canyon would be 1 foot at a point 10 miles from the Alton wells and would not be perceptible much beyond the 10-mile point.

Brigham Young University

Geology Department

September 29, 1978

Dr. H. William Menard, Director
U.S. Geolooical Survey
National Center, Mail Stop 103
Reston, Virginia 22092

Dear Dr. Menard:

I have recently gone over the Environmental Statement report concerning the development of coal resources in southern Utah. While many environmental aspects were well treated, I was very disappointed to see that paleontology was essentially ignored. Existing and proposed federal legislation, the latter currently being processed, are serving to protect paleontological resources throughout the country. It therefore would be most beneficial (and least expensive) to consider how best to treat fossils on federal lands which will be used in coal development in Utah well before any coal extraction is undertaken. Currently a few vertebrate paleontologists including myself are on a Government Liason Committee working with Mr. Charles McKinney who is the manager of the Federal Antiquities Program. We are establishing guidelines for the protection of fossils and how best to preserve this resource. Any of us on this committee (a list of members is included) would be glad to offer assistance in helping you to develop policy concerning fossils, or in other ways that we might help. An enlargement of this committee includes a variety of paleontologists who also would be available to offer needed assistance.

I cannot stress too strongly the need to consider the fossil resources before leasing lands for developments of various sorts. Enclosed is a copy of a letter I sent to Mr. George Turcott relating to this matter as well as ones relating to correspondence with U.S. Congressmen. Also enclosed is a statement from a report sponsored by the N.S.F. which provides information on the importance of fossils.

Sincerely,

Wade E. Miller

Dr. Wade E. Miller
Professor of Geology

WEM:pl

Enclosures

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

OFFICE OF THE DIRECTOR

In Reply Refer To:
EGS-Mail Stop 108

October 10, 1978

Dr. Wade E. Miller
Professor of Geology
Geology Department
Brigham Young University
Provo, Utah 84602

Dear Dr. Miller:

Director Menard has ask me to respond to your letter of September 29, 1978, concerning protection of our paleontological resources. The discussion of this matter in our regional coal environmental statement on southern Utah, and many others now in preparation by the Department of the Interior, will all treat the matter uniformly, if not extensively.

Our rationale in this matter comes from the present incomplete state of preparation to meet some, if not all, of your concerns. The Geological Survey has been working with the Bureau of Land Management for a year or more to develop reasonable and feasible evaluative and protective procedures and requirements to be followed in mineral development on public lands under the control of that Bureau.

We think it possible that proposed requirements and procedures now being drafted will be published and made available for public comment within the next few months. Beyond that, we are uncertain of any plans by the Bureau of Land Management for other types of consultation on their proposal at this time. By a copy of this letter, I am forwarding a copy of your letter to Director Gregg so that he may be aware of your kind offer of assistance.

Sincerely yours,

JRB

J. R. Balsley
Assistant Director--Land Resources

Copy to: Director, Bureau of Land Management

cc: General Files, MS114/Reston/ Dir. Chron/ Stuart Hughes, BLM
Chief, EIAP/ Chief, CD, (630)/ Charles Repenning, USGS
MS104/ MS108:HGStewart:ga:10/10/78:860-7493

Mr. Edward Davidson
Interagency Task Force on Coal
350 South Main St.
Room 505
Salt Lake City, Utah 84101

J. Keith Rigby Jr.
Box 6770
Albuquerque, New Mexico 87107

Dear Mr. Davidson:

I recently met one of the Southern Utah Regional Coal ES team members in Flagstaff, Arizona at which time we had some rather pointed discussions about the quality of the document as it appeared in draft form. I recieved a copy of the document at that time and was informed that the comment period was to close in the middle of October. I hope that this letter reaches you in time.

I am enclosing a copy of the Star Lake-Bisti Regional Coal ES with this mailing for your inspection. Much of the criticism of the Southern Utah ES may be simply noted in the comparison of the two documents. I am also enclosing a copy of a letter from Secretary Andrus to the New Mexico Congressional Deligation. This letter should be used as documentation for the direction that the Department will take in the near future for paleontological resource management. For additional information I would strongly suggest you contact the Washington Office of the Bureau of Land Management (Mr. Stewart Houghes, FTS 343-5994) for the status of several critical documents relating to paleontological resource management. These documents include: draft regulations and draft manual for paleontological resource management, a position document prepared by the Bureau of Land Management addressing paleontological resource management and several instruction memoranda (some of which have already been prepared and forwarded to field offices) relating to paleontological resource management and specifically to inclusion of paleontological resource sections of environmental statements.

1 I am indeed sensitive to the problems associated with the preparation of an environmental statement such as yours. However, the total lack of paleontological data and impact assessment overwhelms me. I recall talking to you several times by phone during the fall and late summer of 1977 in which I tried to allert you to the necessity of including paleontological data and impact assessment in your ES. Suite has been filed on a coal related ES on the Navajo Reservation in New Mexico claiming inadequacy of the statement; one facet of which in the total lack of impact assessment on paleontological resources.

2 I do not understand why logic has not prevailed in this matter. Obviously the draft document has passed at least several reviews. I do not understand why the gross inconsistency exists in review between our two statements and what appears to be a gross deliberate action not to include impact analysis for paleontological resources in environmental statements. I view this as an extremely dangerous course of action.

It is acknowledged that the author, a paleontologist employed by BLM in the State of New Mexico and a contributor to the paleontology sections of the Star Lake-Bisti Regional Coal EIS, is concerned about paleontologic resources. It is not clear if he is commenting as an individual or as an authorized representative of the BLM. The letter infers that the paleontologic sections in the Star Lake-Bisti Regional ES will be the model for future BLM statements, which may or may not be accurate. See also response to letter from Wade E. Miller.

1 Chapter II of the statement acknowledges the presence of fossil material throughout southern Utah. A more detailed description could have been written that listed known fossils in each strata, and a map could have been prepared that showed where concentrations of fossil material are known. This would have provided information for illegal collection to the detriment of science. Also, it could tend to emphasize protection of areas where fossil material is known, resulting in losses of significant material which may occur elsewhere.

The description is held to a level of significance needed by a decisionmaker to make a decision regarding the proposed actions. Additional material in the EIS would be extraneous to the information necessary to found an intelligent and careful decision. Typically, bulky and extraneous material such as the writer suggests be added serves only to obfuscate the data and impact assessment necessary and relevant to a wise decision.

2 Chapter IV succintly identifies impacts that could occur if paleontologic resources are not protected.

3 I realize the difficulty you may have encountered in obtaining the additional funding it would have required to conduct even a second-rate inventory in the time frame in which you had to opperate. This,however, does not excuse the fact that in my observations no protective or mitigative measures appear in the draft ES for paleontological resources. I happen to know that you had professional paleontological consultation avenues open through the Paleontology and Stratigraphy Branch of the U. S. G. S. Why were not these people used to include some minimal protective measures in the draft environmental statement?

I do not want these comments to appear as the typical "crank" letter so often recieved but I am gravely concerned about the protection of the paleontological resources which may experience irreparable damage due to actions you address in the draft ES. The general quality of the document seems to be high. However, the total neglect or near total neglect of data and impacts associated with paleontological resources also appears to be one of gross negligence and oversight which I find difficult to overlook in light of our past conversations.

Sincerely,

Dr. J. Keith Rigby Jr.

3 Chapter III of part 1, and chapter I, section D, of each site specific analysis, list existing legal requirements and mitigations that can protect fossil material.

CHAPTER X

REFERENCES

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CHAPTER XI

GLOSSARY

AIR

Air mass.--A widespread body of air that is approximately homogenous in its horizontal and vertical extent, particularly with reference to temperatue and moisture distribution.

Air pollution.--The presence of material in the air in sufficient amounts and under such circumstances as to interfere significantly with the comfort, health, or welfare of persons, or with full use and enjoyment of property.

Ambient air quality.--Concentration levels in ambient air for a specified pollutant and a specified averaging time period within a given geographic region.

Ambient air quality standard.-- A level of ambient air quality established by Federal or State agencies which is to be achieved and maintained; primary standards are those judged necessary, with an adequate margin of safety, to protect the public health; secondary standards are those judged necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

Ambient air pollution isomap.--A graphic portrayal of the ambient burdens of a specific pollutant throughout various areas of a mapped region. Isolines are like the contour lines on a topographic map, but instead of indicating altitude, they indicate the ambient concentrations of a pollutant in the mapped land area to which they relate.

Atmosphere.--The earth's envelope of air containing several subdivisions all bound to the earth by gravitational attraction.

Atmospheric dispersion models.--A mathematical description of the meteorological trend, transport, and dispersion processes of an area on which are superimposed rates of emissions of pollutants from various sources from which one can obtain the concentration of any pollutant at any point in the area under consideration at any time.

Atmospheric dispersion potential.--The ability of the atmosphere over any defined area to diffuse or disperse air pollutants which are introduced into the atmosphere within the defined area from point line or area emission sources.

Atmospheric stability.--The diffusive capacity of the lower atmosphere. In general, stability may be classified as either stable, neutral, or unstable. With stable conditions, the temperature increases with height the intensity of turbulence is low because vertical motions are inhibited. Under these conditons, any pollutant emitted at the ground tends to accumulate, while effluents from elevated sources do not normally reach the ground until many kilometers downwind. Conversely, when temperature decreases rapidly with height, the atmosphere is unstable, and the intensity of turbulence is high causing enhanced vertical motion. Low-level emissions are dispersed rapidly upward while high-level emissions are brought rapidly to the ground. As a result, elevated sources

frequently make their maximum contributions to very short-term (less than one hour) ambient pollutant concentrations with unstable conditions. Between the stable and unstable conditions is the situation in which the temperature decreases adiabatically with height (about 1°C per 100 meters). This condition is called neutral stability with near-neutral conditons quite frequent in most locations. For sources with tall stacks the high wind speed neutral conditions supresses plume rise, and is often the case in which the highest ground-level concentrations are observed. For ground-level emissions, the concentrations for near-neutral conditions normally are between those for stable and unstable conditions.

Background level.--In air pollution studies, the concentration of a pollutant that would exist in the absence of the particular source under study; a "standard" against which the contribution of the particular source can be compared.

Clean Air Act (42 USC 1857 et seq.).--An act for air pollution prevention and control: (1) To protect and enhance public health and welfare and the productive capacity of its population. (2) To initiate and accelerate a national research and development program to achieve the prevention and control of air pollution. (3) To provide technical and financial assistance to State and local governments in connection with the development and execution of their air pollution prevention and control programs. (4) To encourage and assist the development and operation of regional air pollution control programs.

Climate.--The average condition of the weather at a place over a period of years as exhibited by temperature, wind velocity, and precipitation.

Climatology.--The study of the statistical collection of weather conditions during a specified interval time (usually several decades) at a specified area. The study of the long-term manifestations of weather.

Dispersion.--The physical process of diluting the concentration of a substance by molecular and turbulent motion; e.g., smoke in air.

Diurnal.--Showing a periodic alteration of condition with day and night.

Dry adiabatic lapse rate.--Decrease in temperatue with height at a rate of 1°C per 100 meters.

Dust.--Solid materials suspended in the atmosphere in the form of small irregular particles, many of which are microscopic in size. It imparts a tannish or greyish hue to distant objects. The sun's disk is pale or colorless or has a yellowish tinge at all periods of the day. Dust cannot be a stable component of the atmosphere because it must eventually fall back to the earth's surface when winds and turbulence become too weak to bear it aloft. Dust is due to many natural and artificial sources, volcanic eruptions, salt spray from the seas, blowing solid particles, plant pollen and bacteria, smoke and ashes of forest fires and industrial combustion processes, etc.

Emission.--The act of discharging into the atmosphere an air contaminant or an effluent which contains an air contaminant, or the effluent so discharged into the atmosphere.

Emission inventory.--A quantitative statement of the types and quantities of air pollutants emitted for specified source categories within a specified place or region over a specified period of time. For any pollutant, emissions usually are expressed in terms of the tons per day emitted from specific source categories.

Emission rate.--The amount of an air pollutant emitted into the atmosphere from a pollution source over a defined period of time.

Emission standards.--Legally defined and enforced prescriptions which prohibit the emission of more than a specified quantity of a pollutant from a specifically designated source of sources, which prohibit the operation of a source or the use of a type of fuel or product, or which require the use of a type of equipment, fuel, or air pollution control system.

Free atmosphere.--(Sometimes called "free air.") That portion of the earth's atmosphere, above the planetary boundary layer, in which the earth's surface friction on the air motion is negligible, and in which the air is usually treated (dynamically) as an ideal fluid. The base of the free stmosphere is usually taken as the geostrophic wind level.

Fugitive dust.--The solid, airborne particulate matter emitted from any source other than through a stack.

Haze.--Fine dust or salt particles dispersed through a portion of the atmosphere. The particles are so small that they cannot be felt or individually seen with the naked eye, but they diminish horizontal visibility and give the atmosphere a characteristic opalescent appearance that subdues all colors.

Implementation plan.--A document which describes a comprehensive plan of action for achieving specified air quality objectives and standards for a particular place or region within a specified time period.

Inversion.--(Also "temperature inversion.") A departure from the usual decrease in temperature with altitude. An inversion layer refers to the layer through which this increase in potential temperature with height occurs.

Inversion base.--The level in which the increase in potential temperature begins.

Inversion layer.--A layer in the atmosphere through which the temperature remains constant or increases with altitude.

Isopleth.--A line or contour drawn on a map denoting points having the same numerical value of an element; e.g., similar temperature (isotherm), pressure (isobar), or pollutant concentrations.

Isothermal.--No temperature change with height.

Lapse rate.--The change of temperature with height. A "lapse" condition usually means a decrease with height.

Limited mixing conditions.--A type of fumigation which may occur with light winds when an effluent is released and contained within a limited mixing volume beneath an inversion layer. Under these conditions, a plume will usually rise to the top of the surface based mixing layer and then undergo vetical mixing to the surface.

Looping plume.--Effluent plume being rapidly spread upward and downward by thermally induced eddies. Occurs in a highly unstable atmosphere because of rapid mixing.

Meteorlogical factors or elements.--Types of measurements necessary for the consideration of air pollution problems. Generally, these are pressure, temperature, and humidity of the atmosphere; speed and direction of the wind; and in some cases the amount of insolation (sun intensity).

Meteorology.--A science that deals with the atmosphere and its phenomena, especially with weather and weather forecasting.

Micro-scale.--In meteorology, having characteristic spatial dimensions of about 1 mile and less. Typical micro-scale phenomena include the retention of moisture by crops, etc.

Mixing depth.--Height of the layer of air where well-mixed conditions exist, usually the height of the first significant inversion above the surface.

National ambient air quality standards (NAAQS).--The allowable concentrations of air pollutants in the ambient air specified by the Federal Government and can be found in Title 40, Code of Federal Regulations, Part 50. The ambient air quality standards are divided into primary standards (based on the air quality criteria and allowing an adequate margin of safety, are requisite to protect the public health) and secondary standards (based on the air quality criteria and allowing an adequate margin of safety, are requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of air pollutants in the ambient air). Welfare is defined as including but not limited to, effects on soils, water, crops, vegetation, manmade materials, animals, wildlife, weather, visibility, and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being.

National emission standards for hazardous air pollutants.--Standards of performance for certain identified pollution emission sources for pollutants of asbestos, beryllium, and mercury. The standards are found in Title 40, Code of Federal Regulations, Part 61.

Nephelometer.--General name for instruments which measure, at more than one angle, the scattering function of particles suspended in a medium.

Neutral atmosphere.--An atmospheric condition in which the air cools, as altitude increases at the normal, dry adiabatic temperature lapse rate: 0.98°C for every 100 meters.

Opacity.--The degree to which emissions reduce the transmission of light and obscure the view of an object in the background. A state which renders material partially or wholly impervious to rays of light and causes obstruction of an observer's view.

Oxidant.--A gas that oxidizes: usually ozone.

Particulate matter.--Any material, except water in a chemically uncombined form, that is or has been airborne and exists as a liquid or a solid at standard temperature and pressure conditions. Minute particles of coal dust, fly ash, and oxides temporarily suspended in the atmosphere.

Photochemical.--Referring to chemical reactions that require light.

Photometry.--A physical method of measurement based on the transmission of light.

Pilot balloon.--A small balloon with known ascent rate whose track is followed by a theodolite (optical tracking instrument similar to a surveyor's transit). In order to obtain data for the computation of speed and direction of winds in the upper air.

Plume.--The volume of air space containing any of the substance emitted from a point source. For practical purposes, the limits of a plume have to be arbitrarily defined according to some minimum concentrations of the substance.

Plume rise.--The height attained by a plume from vertical momentum and bouyancy due to heat and molecular-weight difference of material released into the atmosphere. The behavior of this plume, the material contained in a volume of gas, will be influenced by chimney phenomena, surrounding buildings, terrain, as well as the velocity and buoyancy relative to the air and prevailing meteorological conditons.

Concentration.--A measure of the average density of pollutants usually specified in terms of pollutant mass per unit volume of air (typically in units of micrograms per cubic meter), or in terms of relative volume of pollutants per unit volume of air (typically in units of parts per million).

Pollution source.--A point, line, area, or volume at which pollution is added to a system, either instantaneously or continuously. Conversely, at a "sink" mass pollution is removed. Examples of sources in the context of air pollution are as follows: a smokestack is a "point source," a freeway or aircraft trajectory is a "line source;" and an entire city is a "plane source."

Precipitation.--Any of all the forms of water particles, whether liquid or solid, that fall from the atmosphere and reach the ground. Precipitation includes drizzle, rain, snow, snow pellets, snow grains, ice crystals, ice pellets, and hail.

Prevailing wind--The wind direction most frequently observed during a given period.

Rawinsonde.--Method of upper-air observation consisting of a computation of wind speed and direction, temperature, pressure and relative humidity by means of a balloon-borne radiosonde tracked by radar.

Relative humidity.--Generally, the relative measure of water vapor content in the atmosphere; precisely, the dimensionless ratio of the actual vapor pressure of the air to the saturation vapor pressure (usually given in percent).

Stability.--See Static stability.

Stability wind rose.--Average atmospheric conditons based on short- or long-term meteorological data set of joint fequency, wind direction, wind speed, and atmospheric stability.

Stable.--Pertaining to the atmosphere or an atmospheric layer in the condition of static stability, i.e., an atmosphere whose temperature lapse rate and moisture distribution is such as to suppress the vertical exchange of air.

Stagnation.--With respect to air pollution, the persistence of a given volume of stable air over a region, permitting an abnormal buildup of pollutants from sources within the region.

Static stability.--(Also called "hydrostatic stability," "vertical stability," or "convective" or "convectional stability.") The state of the

atmosphere when it is stable relative to vertical displacements. Such an atmosphere tends to remain stratified, in that any air that is displaced vertically is subjected to a buoyant force that tends to restore it to its original level. Static stability is determined primarily by the temperature lapse rate; an inversion layer is an extreme example of statically stable layer.

State implementation plan.--A document which describes a comprehensive plan of action for achieving specified air quality objectives and standards for a particular place or region within a specified time period.

Standards of Performance for New Stationary Sources (NSPS).--Standards of performance which set limitations on the pollution emissions of defined pollutants from specific pollution sources. The standards are found in Title 40, Code of Federal Regulations, Part 60.

Subsidence inversion.--Air inversion aloft caused by sinking air within a high pressure system which causes the temperature at the top of the layer to increase more than the temperature at the bottom of the layer. The effect is the creation of a limited mixing volume below the stable layer.

Surface winds.--Winds close to the earth's surface which are influenced in direction and speed by frictional interaction with the terrain.

Synoptic pressure pattern.--Pattern of isopleths (see glossary definition) of constant pressure over a horizontal surface (usually mean sea level) at a given time. Can also mean isopleths of height of a given pressure at a given time.

Turbidity.--A measure along the line of sight of the attenuation of solar radiation in a clear sky due to atmospheric suspensoids.

Unstable atmosphere.--A conditon characterized by a temperature decrease with height greater than the standard adiabatic lapse rate of 1°/C per 100 meters. Marked vertical mixing occurs and pollutants are rapidly dispersed.

Upper winds.--Winds at sufficient altitude above the earth's surface, such as to be minimally influenced in direction and speed by terrain features.

Variance (as applies to air quality).--An order issued pursuant to law which extends to some person or persons the legal right to operate a specific air pollution source or sources in violation of air pollution laws, regulations, and emissions standards. Usually variances are authorized in order to give the owner or operator of a source sufficient time to comply with an emission standard.

Visibility.--The greatest distance in a given direction of which it is possible to see and identify with the unaided eye a prominent dark object against the sky at the horizon.

Weather.--The state of the atmosphere with respect to heat or cold, wetness or dryness, calm or storm; clearness or cloudiness.

Wind rose.--Any one of a class of diagrams designed to show the distribution of wind direction experienced at a given location over a specified period. The most common form consists of a circle from which sixteen lines emanate, one for each compass point. The length of the line is proportional to the frequency of the wind from that direction.

GEOLOGY

Anticline.--Term applied to rock strata which dip in opposite directions from a common ridge or axis, like the roof of a house.

Bentonite.--A clay mineral formed from decomposition of volcanic ash. Commonly has great ability to absorb or adsorb water and swell accordingly.

Dip.--The angle at which a stratum or any other planar feature is inclined from the horizontal.

Fold axis.--The line following the apex of an anticline or the lowest part of a syncline.

Monocline.--A steplike bend in otherwise horizontal or gently dipping beds.

Richter magnitude.--A quantity characteristic of the total energy released by an earthquake, as contrasted to "intensity" which describes its effects at a particular place.

Seismic.--Pertaining to, characteristic of, or produced by earthquakes or earth vibration.

Stratigraphy.--The branch of geology which treats of the formation, composition, sequence, and correlation of the stratified rocks as parts of the earth's crust.

Strike.--The bearing of the outcrop of an inclined bed on a level surface; it is perpendicular to the direction of the dip.

Structural basin.--An elliptical or roughly circular structure in which the rock strata are inclined toward a central point.

Syncline.--A fold in rocks in which the strata dip inward from both sides. The opposite of anticline.

Type locality.--The place at which the type specimen of a species was collected.

Type section.--A stratigraphic section recognized as the standard; generally the one from which a stratigraphic unit received its name.

SOILS

Alkaline soil.--Precisely, any soil horizon having a pH value greater than 7.0; practically, a soil having a pH above 7.3.

Alluvial fan.--A sloping, fan-shaped mass of sediment deposited by a stream where it emerges from upland onto a plain.

Alluvial soils.--Soils developed from transported and relatively recently deposited material (alluvium) characterized by a weak modification (or none) of the original material by soil forming processes.

Alluvial valley floors.--"Unconsolidated stream-laid deposits holding streams where water availability is sufficient for subirrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits from sheet erosion, deposits by unconcentrated runoff or movement accumulation and windblown deposits;" (as defined in the Federal Register, vol. 42, no. 230, December 13, 1977).

Alluvium.--Clay, silt, sand, and gravel or other rock material transported by flowing water and deposited as sorted or semi-sorted sediments.

Available water-holding capacity (soils).--The capacity to store water available for use by plants, usually expressed in linear depths of water per unit depth of soil.

Calcareous soil.--A soil that contains enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibily when treated with cold, dilute hydrocloric acid.

Slightly calcareous.--1 to 3 percent lime.

Moderately calcareous.--3 to 15 percent lime.

Strongly calcareous.--15 to 40 percent lime.

Very strongly calcareous.--More than 40 percent lime.

Carbonate.--A mineral compound characterized by a fundamental anionic structure of $CO_3^{=}$. Calcite and aragonite, $CaCO_3$, are examples of carbonates.

Clay.--As a soil separate, the mineral soil particles are less than 0.002 millimeters in diameter. As a soil textural class, the soil material is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Coarse fragments.--The gravel, cobblestones, or stones in a soil that range in size from 2 millimeters to 3 feet.

Cobbles.--Rounded mineral or rock fragments that range from 3 to 10 inches in diameter.

Colluvial, colluvium.--Loose and incoherent deposits consisting of alluvium and angular fragments of rocks usually at the foot of a slope or cliff and brought there by gravity.

Depth, soil.--The terms and their meanings used to describe depth of the soil over bedrock or over a restricting lay are:

Deep.--More than 36 inches.

Moderately deep.--20 to 36 inches.

Shallow.--10 to 20 inches.

Very shallow.--Less than 10 inches.

Disturbance, soil.--The act of altering natural soil characteristics, usually by mechanical means. This includes soil exposure (removal of the organic layer and vegetation), mixing of soil materials, compact ion, and soil displacement (moving from one place to another).

Drainage, soil.--The relative rapidity and extent of the removal of water from on and within the soil under natural conditions. Terms commonly used to describe drainage are:

Excessively drained.--Water is removed from the soil rapidly. The soils are typically sandy and porous.

Well drained.--Water is removed from the soil readily but not too rapidly. There is no evidence of wetness above a depth of 40 inches.

Moderately well drained.--Water is removed from the soil somewhat slowly so that the soil is wet for short but significant, periods of time.

Somewhat poorly drained.--Water is removed from the soil slowly enough to keep it wet for significant periods but not all the time. Wetness is apparent between a depth of 20 and 40 inches.

Poorly drained.--Water is removed from the soil so slowly that the water table is near the surface most of the time. Wetness is apparent within 20 inches of the surface.

Very poorly drained.--Water is removed from the soil so slowly that the water table is at or on the surface most of the time. These soils are generally in low areas or depressions.

Erosion.--The wearing away of the land surface by wind, running water, gravity, and other geological agents.

Erosion pavement.--The small surface gravel which is left on the land after the soil is eroded away.

Gypsum soils.--Soils which contain high amounts of hydrated calcium sulfate ($CaSO_4$, $2H_2O$), occurring in crystals and in masses. Calcium sulfate is water soluble and will dissolve out of the soil profile when exposed to high amounts of water, which in turn creates a piping effect (a downward or lateral movement of water through the soil).

Hardpan.--A hardened or cemented soil horizon, or layer. The soil material may be gravelly, sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substances.

Horizon soil.--A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. The following are major horizons:

O horizon.--The layer of organic matter on the surface of a mineral soil, consisting of decaying plant residues.

A horizon.--The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus.

The horizon may have lost one or more soluble salts, clay and sesquioxides (iron and aluminum oxides).

B horizon.--The mineral horizon just below an A horizon. The B horizon is in part a layer of change from the overlaying A to the underlying C horizon. The B horizon also has distinctive characteristics caused 1) by accumulation of clay, sesquioxides, humus, or some combination of these; 2) by prismatic or blocky structure; 3) by redder or stronger colors than the A horizon; or 4) by some combination of these. Combined A and B horizons are usually called the solum.

C horizon.--The weathered rock material immediately beneath the solum. In most soils, this material is presumed to be like that from which the overlying horizons were formed.

Hydrologic Soil Groups.--The hydrologic soil groups are used to estimate runoff from rainfall. Soil properties which are considered are those that influence the rate of infiltration obtained from a bare soil after prolonged wetting. Soil properties considered are: 1) depth of seasonally high water table, 2) intake rate and permeability after prolonged wetting, 3) depth to very slowly permeable layer. The soils have been classified into four groups, A through D. Group A soils have low runoff potential; group B soils have moderately low runoff potential; group C soils have moderately high runoff potential; and group D soils have high runoff potential.

Parent material.--Unconsolidated and partially weathered geologic material from which soils are presumed to form.

Permeability, soil.--That quality of the soil that enables it to transmit water or air. Terms used to describe permeability in inches per hour are:

Very slow.--Less than 0.06 inches.
Slow.--0.6 to 0.2 inches.
Moderately slow.--0.2 to 0.6 inches.
Moderate.--0.6 to 2.0 inches.
Moderately rapid.--2.0 to 6.0 inches.
Rapid.--6.0 to 2.0 inches.
Very rapid.--More than 20 inches.

pH.--A number that represents the negative logarithm, base 10, of the hydrogen-ion activity of a solution. A pH less than 7 indicates an acid solution; a pH greater than 7, an alkaline solution.

Prime farmland.--Those lands as defined in the Federal Register on August 23, 1977, that have been used for the production of cultivated crops, including nurseries, orchards, and other specialty crops, and small grains for at least 5 years out of the 20 years preceding the date of the mining permit application. A detailed definition is also given in the Federal Register, December 13, 1977.

Profile, soil.--A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil.--The degree of acidity or alkalinity of a soil expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour" soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. The degrees of acidity or alkalinity are expressed in the following words:

Extremely acid.--Below 4.5.
Very strongly acid.--4.5 to 5.0.
Strongly acid.--5.1 to 5.5.
Medium acid.--5.6 to 6.0.
Slightly acid.--6.1 to 6.5.
Neutral.--6.6 to 7.3.
Mildly alkaline.--7.4 to 7.8.
Moderately alkaline.--7.9 to 8.4.
Stongly alkaline.--8.5 to 9.0.
Very strongly alkaline.--9.1 and higher.

Reclamation.--The process of returning disturbed lands to their former uses or other productive uses.

Residual soil.--A soil formed in material weathered from bedrock without transportation from the original location.

Rockiness.--A description of rock expressed as a volume percentage of the surface. General classifications are:

Class 0.--Less than 2 percent.
Class I.--2 to 10 percent (rocky).
Class II.--10 to 25 percent (very rocky).
Class III.--25 to 50 percent (extremely rocky).
Class IV.--50 to 90 percent (rockland).
Class V.--Over 90 percent (rock outcrop).

Sand.--As a soil separate, the individual rock or mineral fragments in soils have diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be any mineral composition. As a soil textural class, soil material that is 85 percent or more sand and not more than 10 percent clay.

Saline soil.--A soil that contains soluble salts in amounts that impair growth of plants but that does not contain excess exchangeable sodium.

Sediment yield.--The amount of soil an area loses every year through natural processes, usually expressed in acre-feet per square mile per year. One acre-foot per square mile per year, reduced to simpler terms, means that a square mile of land loses about .01 inches of soil every year. This is a result of the normal and ongoing processes of water and wind erosion.

Sheet erosion.--The removal of a fairly uniform layer of soil from the land surface by runoff water.

Shrink-swell.--Describes that soil quality that determines its volume change with change in moisture content.

Silt.--As a soil separate, the individual mineral particles in a soil that ranges in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil material that is 80 percent or more silt and less than 12 percent clay.

Soil.--A natural, three-dimensional body on the earth's surface that supports plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil productivity.--The capacity of a soil in its normal environment for producing a specified plant or sequence of plants under a specified system of management.

Soil structure.--The combination or arrangement of primary soil particles (sand, silt, clay) into secondary particles, units, or peds. The secondary units or soil aggregates are characterized and classified on the basis of size, shape, and degree of distinctness into classes, types, and grades, respectively.

Soil texture.--The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse, fine, or very fine."

Solum.--This refers to the combined A and B horizons.

Stones.--Rock fragments greater than 10 inches in diameter, if rounded, and greater than 15 inches along the longer axis, if flat.

Subsoil.--Describes the B horizon of the soil profile, roughly the part of the solum below plow depth or below the dark colored A horizon.

Surface layer.--A term used in nontechnical soil descriptions for one or more layers above the subsoil. Includes A horizon and part of B horizon and has no depth limit.

Talus.--An accumulation of rock debris, formed close to a mountain wall, mainly through many small rockfalls.

Terrace.--1) An embankment or combination of an embankment and channel constructed across a slope to control erosion by diverting or storing surface runoff instead of permitting it to flow uninterrupted down the slope. 2) A level, usually narrow plain bordering a river, lake,

or sea. Rivers sometimes are bordered by terraces at different levels.

Topsoil.--The original or present dark-colored upper soil (A horizon) that ranges from a mere fraction of an inch to 2 or 3 feet thick on different kinds of soil.

WATER

Aquifer.--A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Artesian (confined) aquifer.--A water-yielding zone in which ground water is confined under pressure by impervious or semipervious strata.

Perched ground water.--Unconfined ground water separated from an underlying body of ground water by an unsaturated zone.

Head, static.--The height of a column of water above a standard datum that can be supported by the static pressure at a given point.

Water table.--That surface in an unconfined water body at which the pressure is atmospheric.

Acre-foot.--The quantity of water required to cover 1 acre to a depth of 1 foot; equal to 43,560 cubic feet for 325,851 gallons.

Base flow.--Sustained or fair weather runoff. In most streams, base flow is composed largely of ground-water effluent.

Bank storage.--The water absorbed into the banks of a stream channel when the water level rises above the water table in the bank formations.

Ephemeral stream.--A stream that flows only in direct response to precipitation, and whose channel is at all times above the water table.

Intermittent stream.--A stream that flows only at certain times of the year when it receives water from springs or form some surface source such as melting snow in mountainous areas.

Usable storage.--The volume of water normal available for release from a reservoir below the stage of the maximum controllable level.

100-year 6-hour precipitation.--The precipitation of 6-hour duration that will be equalled or exceeded once every 100 years on the average.

RANGE AND VEGETATION

Animal unit month.--The volume of forage consumed by one cow or five sheep in one month. A measure of range carrying capacity.

Carrying capacity.--(Range) The maximum use of the range possible without inducing damage to vegetation or related resources. (Also called "grazing capacity.")

Grazing capacity.--Also called "carrying capacity."

Vegetation type.--A plant community with observable features.

WILDLIFE

Browse.--Tender shoots or twigs of shrubs and trees as food for deer, cattle, etc.

Coniferous.--Belonging or pertaining to cone-bearing evergreen trees or shrubs.
Exotic species.--Introduced species. Not native to a given area.
Eyrie.--The nest of a bird of prey.
Hunter-day.--Time spent hunting by one hunter. It may include all or part of one day.
Life zone.--An area characterized by a particular set of organisms, whose presence is determined by environmental conditions.
Omnivores.--An animal or bird that eats all kinds of foods indiscriminately.
Raptor.--Living on prey; a group of carnivorous birds consisting of the hawks, eagles, falcons, vultures, and owls.
Riparian.--Living on or adjacent to a water supply such as a riverbank, lake, or pond.

RECREATION

Backcountry.--An area of land used for hiking, backpacking, undeveloped area camping, solitude, fishing and hunting. Generally located some distance from developed roads and the sights and sounds of users can enjoy an unconfined, uncrowded and generally unregulated recreation experience.
Carrying capacity.--The number of people, expressed in PAOT that an area or facility can accomodate without impairment of the natural, cultural or developed resource.
Developed site.--designated area with picnic tables, grills, garbage collection, sanitary facilities, parking and play areas developed primarily by families, organized groups or individuals for overnight camping or day-use activities.
Dispersed area.--General environment areas, including recreation woods, trails, lakes, ponds, streams and general undeveloped areas suitable and used for recreation, and not codified as development sites.
Recreation experience level (5).--

a) Primitive.--Uncrowded, void of developments, where the user feels as though he is a part of nature and his presence and survival is dependent on his own skills and ability.
b) Semi-primitive.--Similiar to primitive, but the user has the feeling that civilization is not far away. Generally located some distance from civilization, but user may have reached destination by motorized carrier and some development and evidence of previous use may be present in area. Solitude and a sense of personal achievement is necessary.
c) Intermediate.--Usually adjacent to developed roads or facilities other people present and some developed facilities and roads exist in the proximity of the area being used.
d) Secondary-modern.--Developed facilities, such as picnic tables, grills, open-vault toilets are present, area is usually occupied by others, evidence of mans activities, developments, etc. are present and substantially noticeable.
e) Modern.--Developed facilities are modern: i.e. flush toilets, trailer hook-ups, hard-surfaced roads, developed play areas, etc. User experience level is definitely associated with use by

other individuals and is usually restricted or regulated to a high degree (i.e., travel and camping is restricted to developed and surfaced sites and fees for use are usually charged to the user).

Extreme use.--Of the greatest severity; drastic, excessive.

Heavy use.--Intense or sustained, large in numbers.

Moderate use.--Not excessive or extreme, of medium or average quantity or extent.

Light use.--Of relatively low density, generally non-impactive, insignificant.

NRA.--"National Recreation Area:" a designated or classified area of land (and water) dedicated for recreation use by the public.

ORV.--"Off-road vehicle," including four wheel drive, trail bikes, hovercraft, snowmobiles, etc., but excluding helicopters, fixed wing aircraft and boats, and capable of travelling over land, water, ice, snow, sand, marshes, etc.

PAOT.--"People at One Time:" used to quantify the number of people an area can accomodate at any one time without deterioration to the natural, cultural or developed character of a given area - see carrying capacity.

Primitive area.--A formally or informally classified area set aside for its wild, undeveloped character, used and maintained for its natural values for nature studies, wildlife, sight-seeing, watershed and recreation. Few if any man-made intrusions exist and man is only a temporary visitor who does not remain.

Rare I - Rare II.--Roadless area resource evaluation system - used to identify and inventory area without developed roads and substantial intrusion by man for inclusion or exclusion in the Wilderness Preservation System. Rare II is an intensified and expanded inventory and evaluation of the Rare I process.

Roadless area.--Without formally designated or developed and maintained roads, or substantial developments and man-made intrusions.

Significant impact.--Important, of consequence, of or pertaining to a major change or impact to an existing situation.

Visit.--The entry of any person upon a site, or area of land or water for recreation purposes. No time element involved; may be for a few minutes or a number of days. Term is usually used to report recreation use by National Park Service, Bureau of Land Management and Utah State Division of Parks and Recreation.

V/D's - Visitor Days Use.--12 visitor-hours which may be aggregated continously, intermittently, or simultaneously by one or more persons for recreation purposes. Term is used primarily by USDA Forest Service for determining use of recreation areas and resources.

Wilderness area.--A formally classified area under the Wilderness Act of 1964, where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. Undeveloped Federal land retaining its primeval character; has outstanding opportunities for solitude or a primitive and unconfined type of recreation and may contain ecological, geological or other features of scientific, educational, scenic or historical value(s).

ARCHEOLOGY AND HISTORY

Artifact.--A single, portable man-made or man-altered object; usually culturally diagnostic.

Ceremonial Site.--A site exhibiting multiple dwelling structures of religious function characterized by religious art and (or) kivas.

Cist.--Storage pit in the ground usually lined with rock slabs.

Cultural resources.--Physical remains of human activity over 100 years old.

Extended camp.--A non-architectural site of varying size, exhibiting hearth or fire pits; ceramics; lithic and grinding tools, especially non-transportable metates.

Historic Site.--A site exhibiting artifacts that postdate the first Mormon settlements in Utah in 1847.

Hunting site.--A location characterized by projectile points or point fragments only.

Kill-butchering site.--A location with points or point fragments and knives, choppers and (or) scrapers.

A location characterized by the predominance of butchering tools, including knives, choppers, utilized flakes, and (or) scrapers.

Lithic scatter site.--Characterized by the presence of flaked tools, chips, cores, or flakes only.

Multiple habitation.--Multiple structures that would accomodate more than one family.

Petroglyph.--Figures, symbols, or scenes pecked or etched in rock.

Pictograph.--Figures, symbols, or scenes painted on rock.

Quarry site.--A lithic mine showing presence of hammerstones, flakes, cores, and unfinished tools.

Rock shelter.--A small or large rock overhang used as a protective dwelling; characterized by the presence of artifacts and smoke-blackened rock overhand.

Single habitation.--Small structure such as a pithouse that would accomodate a single family.

Site.--Locus of human activity identified by a minimum of four flakes within a five-meter radius, from documents, or by archeological techniques.

Temporary camp.--A small site exhibiting no architecture; characterized by a hearth or fire pit, lithic and small grinding tools, and ceramics.

ESTHETICS

Two visual resource inventory and evaluation systems are used for lands involved, Bureau of Land Management system for public lands and the National Forest landscape management system on National Forest lands. National Park Service lands fall within the special classified area designation (see definition above). Where Bureau of Land Management and Forest Service terms have similar meaning, only one definition is provided. Where a term applies only to public lands, it is footnoted with a^1. System terms applicable only to National Forest lands are footnoted with a^2. Additional information concerning the Bureau of Land Management visual resource system may be obtained by writing to:

Office of the State Director, Bureau of Land Management, University Club Building, 136 East South Temple, Salt Lake City, Utah 84111. For National Forest information, write to: Regional Forester, Federal Office Building, 324 -25th Street, Ogden, Utah 84401.

Adverse visual impact.--Any impact on the vegetation, landform, or any introduction of a structure or activity which interrupts or adversely changes the visual character of the landscape and disrupts the harmony of the natural elements.

Background.--The distant part of a landscape, picture, etc.; surroundings, especially those behind something and providing harmony or contrast; surrounding area or surface. Area located from 3-5 miles to infinity from the viewer.

Background.--The area of a visual zone which lies beyond the foreground-middleground. Usually from a minimum of 3-5 miles to a maximum of about 15 miles from a travel route or use area. Atmospheric conditions in some areas may limit the maximum to about 8 miles or increase it beyond 15 miles.

Basic elements.--The four major elements (form, line, color, and texture) which determine how the character of a landscape is perceived.

Characteristic.--That which constitutes a character; that which characterizes; a distinguishing trait, feature, or quality; a peculiarity.

Characteristic landscape.--The established landscape within an area being viewed. This does not necessarily mean a naturalistic character. It could refer to a farming community, an urban landscape, or a primarily natural environment.

Character type.--Large physiographic area of land which has common characteristics of landforms, rock formations, water forms, and vegetative patterns.

Character subtype.--A division of a major character type which is significantly different in visual characteristics from the other subtypes.

Common.--Refers to prevalent, usual, or widespread landscape variety within a character type. It also refers to ordinary or undistinguished visual variety.

Contrast.--The effect of a striking difference in the form, line, color, or texture of an area being viewed.

Distance zones.--Areas of landscapes denoted by specified distances from the observer. Used as a frame of reference in which to discuss landscape characteristics or activities of man.

Distinctive.--Refers to unusual and (or) outstanding landscape variety that stands out from the common features in the character type.

Diverse.--Refers to having variety in landscape character.

Dominance elements.--Form, line, color, and texture. They are the visual recognition parts which make up the characteristic landscape.

Dominant.--Ruling; governing; predominant; exercising great influence.

Dynamic.--Active or changing.

Enhancement.--A short-term management alternative which is done with the express purpose of increasing positive visual variety where little variety now exists.

Evident.--That which is apparent to the casual visitor.

Feature.--A visually distinct or outstanding part, quality, or characteristic of something.

Foreground.--The detailed landscape found within 0 to 1/4-1/2 mile from the observer.

Foreground-middleground.--The area visible from a travel route or use area to a distance of 3-5 miles. The outer boundary of this zone is defined as the point where the texture and form of individual plants is no longer apparent in the landscape. Vegetation is apparent only in patterns or outline.

Form.--The shape or structure of something as opposed to the material of which it is composed.

Intrusion.--A feature (land, vegetation, or structure) which is generally considered out of context with the characteristic landscape.

Landscape character.--The arrangement of a particular landscape as formed by the variety and intensity of the four basic elements of form, line, color, and texture.

Landscape modifying activities.--Any action which changes the vegetation or landform or places structures on the landscape.

Line.--a. an intersection of two planes. A point that has been extended; silhouette of form.
b. any of various things that are or may be considered as arranged in a row or sequence.

Management activity.--An activity of man imposed on a landscape for the purpose of harvesting, traversing, transporting, or replenishing natural resources.

Maximum modification.--A visual quality objective meaning man's activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

Middleground.--The space between the foreground and the background in a picture or landscape. The area located from 1/4-1/2 to 3-5 miles from the viewer.

Minimal.--Refers to little or no visual variety in the landscape. Monotonous or below average compared to the common features in the character type.

Modification.--A visual quality objective meaning man's activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Monotony.--Complete repetition; tedious sameness.

Naturalistic character.--A landscape situation where the basic elements are displayed in a composition that appears natural within the surrounding area or character type.

Partial retention.--A visual quality objective which in general means man's activities may be evident but must remain subordinate to the characteristic landscape.

Perception.--1) Man's impression of an object or space as based on past and (or) anticipated experiences. 2) Making one's self aware of all conditions and applicable factors; comprehension.

Preservation.--"P" or "I" areas: a visual quality objective that provides for ecological change only. (See definitions below.)

Rehabilitation.--A short term management alternative used to return existing visual impacts in the natural landscape to a desired visual quality.

Retention.--"R" or "II" areas: a visual quality objective which in general means man's activities are not evident to the casual visitor. (See definitions below.)

Scenic quality.--The quality of the scenery as determined through the use of the scenic evaluation process or the visual resource inventory and evaluation systems.

Seen area.--Total area observed. May be measured in terms of foreground, middleground, and background.

Seldom seen.--Areas that are seen from low-use volume transportation routes or are beyond the 15-20 mile background zone for other routes.

Sensitivity level(s).--An index of the relative importance or value of visual response to an area in relation to other areas in the planning unit, or a particular degree or measure of viewer interest in the scenic qualities of the landscape.

Special classified area.--Those areas such as wilderness, historical, biological, or geological sites which are of such significance that specific management direction is given as part of policy or legislation.

Subordinate.--Inferior to or placed below another in size, brightness, etc.; secondary in visual impact.

Texture.--The visual result of the tactile surface characteristic of an object or objectives.

Use volume.--The total volume of visitor use each segment of a travel route or use area receives.

Variety.--The state or quality of being varied and having the absence of monotony or sameness.

Variety class or scenic quality class.--A particular level of visual or diversity of landscape character. (Generally applicable to both public lands and National Forest lands. Some difference may apply.)

Visitor.--Temporary inhabitor of an area. Recreation visitor--one who is in an area temporarily for refreshment in body and (or) mind. Usually has a significant conscious or subconscious interest in the scenic qualities of an area.

Visual management unit.--An area of land where there is no variation in the visual zone, sensitivity zone, and scenic quality zone.

[1]Visual resource management classes.--The degree of alteration that is acceptable within the characteristic landscape. It is based upon the physical and sociological characteristics of any given homogeneous area.

- Class I: natural ecological changes only.
- Class II: changes must not be evident.
- Class III: changes may be evident but must remain subordinate to natural landscape characteristics.
- Class IV: changes may subordinate but should reflect natural occurrences.
- Class V: rehabilitation or enhancement needed.

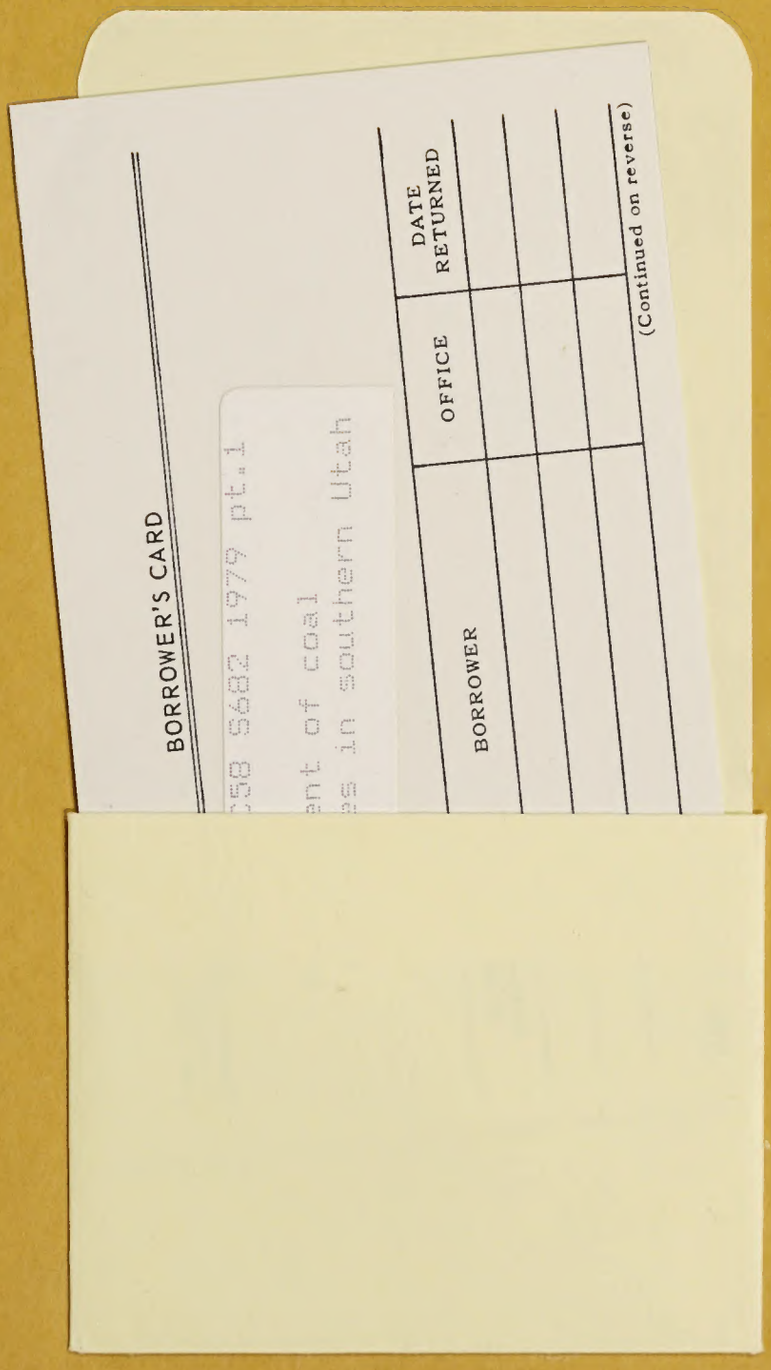
[2]Visual quality objective.--A desired level of excellence based on physical and sociological characteristics of an area. Refers to degree of acceptable alteration of the characteristic landscape.

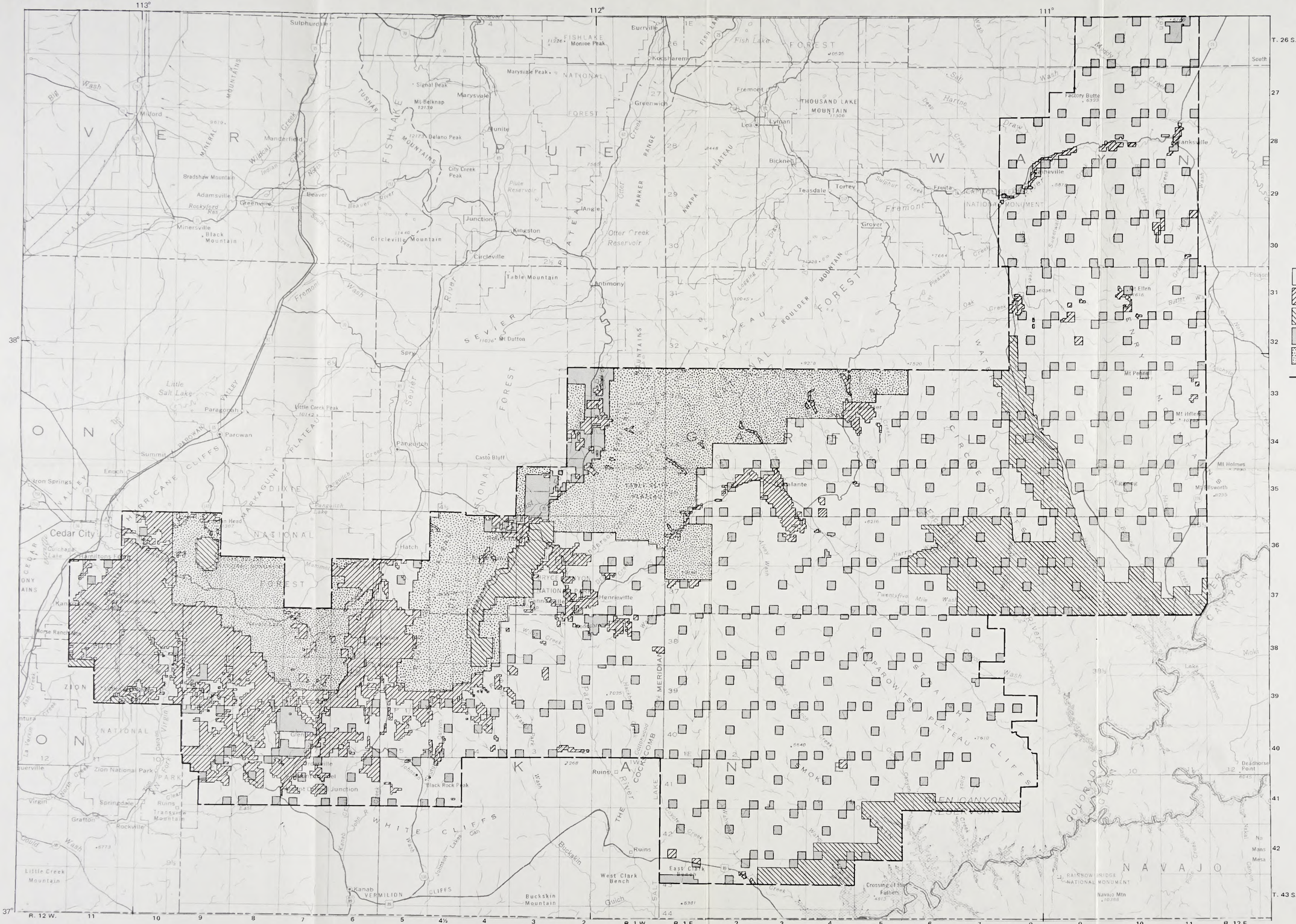
P preservation	MM maximum modification
R retention	reh rehabilitation
PR partial retention	e enhancement
M modification	

Visual resource.--The land, water, vegetative, animal, and other features that are visible on all lands.

Visual zones.--The area that can be seen, such as foreground, middleground, etc. (See previous definitions.)

* U.S. Government Printing Office: 1979—677-026/34





Base from U.S. Geological Survey
State base map 1:500,000, 1969
Roads as of 1978

Figure II-16.--Map of Southern Utah Coal Region showing land ownerships.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FINAL EIS, SOUTHERN UTAH COAL
MINING AND RECLAMATION PLAN
FIGURE II-21

Southern Utah Coal Region recreation influence zone (For up to 29.3 mty coal production)

Southern Utah Coal Region recreation influence zone for 46.0 mty production

Developed recreation site and number

Site specific coal mine locations (12.0 mty)

Supplemental coal mining locations for 29.3 mty (46.0 mty sites not specified)

Population areas most likely to support proposed actions within region

Southern region boundary

1. Red Cliff Rec. Site
2. Virgin River Rec. Site
3. Ponderosa Grove C.G.
4. Calf Creek Rec. Area
5. Pine Valley Campgrnd.
6. Oak Grove Campgrnd.
7. Navajo Lake Campgrnd.
8. Te-Ah Campgrnd.
9. Panguitch Lake North CG
10. Spruces Campgrnd.
11. Panguitch Lake South CG
12. Duck Creek Campgrnd.
13. Pine Lake Campgrnd.
14. Blue Spruce Campgrnd.
15. Posy Lake Campgrnd.
16. Little Cottonwood CG
17. Little Reservoir CG
18. Ponderosa Picnic Area
19. Kents Lake Campgrnd.
20. Anderson Meadow C.G.
21. Jacob's Lake Campgrnd.
22. DeMott Campgrnd.
23. Point Supreme C.G.
24. Pnt. Supreme Picnic Site
25. South Campgrnd.
26. Watchman Campgrnd.
27. North Campgrnd.
28. Sunset Campgrnd
29. Wahweap CG and Marina
30. Lee's Ferry Campgrnd.
31. Carl Hayden Visitor Center
32. North Rim Campgrnd.
33. North Rim Group Area
34. Snow Canyon Rec. Site
35. Gunlock Res. Rec. Site
36. Minersville Rec. Site
37. Coral Pink Sand Dunes Rec. Site
38. Kodachrome Basin Rec. Site
39. Otter Creek Reservoir Rec. Site
40. Escalante Petrified Forest
41. Pipe Springs Nat'l Monument
42. Paria Canyon Primitive Area
43. Devil's Garden Natural Area

Base from U.S. Geological Survey
Arizona, 1974, and Utah, 1969
State base maps 1:500,000

Figure II-21.--Recreation Influence Zone.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FINAL EIS, SOUTHERN UTAH COAL
MINING AND RECLAMATION PLAN
FIGURE II-11

Vegetation types
1 Non-productive
2 Agricultural
3 Streamside
4 Grassland
5 Desert shrubs
6 Sagebrush-grass
7 Pinyon-juniper woodland
8 Mountain brush
9 Ponderosa pine
10 Aspen
11 Conifer-aspen

Location of 1977 collection areas
Endangered plant species
A *Astragalusiloanus*
B *Astragalus pardalinus*
C *Astragalus perianus*
D *Astragalus serpers*
E *Castilleja aquariensis*
F *Eriogonum zionis*
Threatened plant species
G *Astragalus barnebyi*
H *Astragalus striatiflorus*
I *Castilleja scabrida*
J *Draba subalpina*
K *Eriogonum panguicense*
L *Geranium marginale*
M *Gilia mcvickerae*
N *Lesquerella rubicundula*
O *Lomatium minimum*
P *Penstemon caespitosus*
Q *Penstemon leiophyllus*
R *Penstomon parvus*
S *Hymenopappus filifolius* var. *tomentosus*

Contact between vegetation types
Southern Utah coal region boundary

Base from U.S. Geological Survey
Escalante and Salina, 1956 revised 1970
Cedar City, 1953 revised 1971
Richfield, 1953 revised 1972 1:250,000

Modified from Foster, 1968; Hackman, 1973; and Smith, 1962

Figure II-11.--Distribution of vegetation types, endangered plants and threatened plants.

EXPLANATION

Quaternary and Tertiary sedimentary rocks includes alluvium, dune deposits, landslide deposits, glacial moraines, and deposits of uncertain age that may be Quaternary and (or) Tertiary

Quaternary and Tertiary volcanic rocks includes basalt, basaltic lava flows, and ash-flow tuffs

Tertiary and Upper Cretaceous sedimentary rocks includes:
- Wasatch Formation (Tertiary), as much as 1,750 feet of limestone, mudstone, and sandstone
- Canaan Peak Formation (Upper Cretaceous and Paleocene), 0 to as much as 1,500 feet of sandstone and conglomerate, limestone, mudstone, and bentonitic claystone
- Kaiparowits Formation (Upper Cretaceous), 2,300 to 3,000 feet of sandstone
- Mesaverde Formation (Upper Cretaceous), 330 feet of conglomeratic sandstone and interbedded shale

Upper Cretaceous coal-bearing rocks includes:
- Wahweap Formation, 1,000 to 1,600 feet of mudstone and cliff-forming sandstone
- Straight Cliffs Formation, as much as 1,600 feet of cliff-forming sandstone, shale, mudstone, and thin to thick beds of coal
- Mancos Shale, about 3,300 feet of sandstone, mudstone, bentonitic shale, carbonaceous shale, and coal
- Tropic Shale, 630 to 1,600 feet of shale
- Dakota Sandstone, as much as 165 feet of sandstone with interbedded mudstone, shale, and coal

Pre-Cretaceous rocks includes Jurassic, Triassic, and Permian rocks:
- Morrison Formation (Upper Jurassic), 0 to 630 feet of sandstone and bentonitic mudstone
- Entrada Sandstone (Upper Jurassic), from 0 to 1,000 feet of siltstone and sandstone
- Carmel Formation (Middle Jurassic), 0 to 1,000 feet of siltstone, sandstone, limestone, and gypsum
- Navajo Sandstone (Triassic (?) and Jurassic), 500 to 2,000 feet of water-bearing sandstone. Forms cliffs
- Kayenta Formation (Upper Triassic (?)), about 260 feet of sandstone, siltstone, and shale; minor amounts of limestone
- Moenave Formation (Upper Triassic (?)), 0 to 430 feet of cliff-forming sandstone, slope-forming sandstone, siltstone, and mudstone
- Wingate Sandstone (Upper Triassic), 0 to 430 feet of cliff-forming sandstone
- Chinle Formation (Upper Triassic), 430 to 1,300 feet of sandy, limy, muddy, and bentonitic rocks
- Moenkopi Formation (Lower and Middle (?) Triassic), 100 to 1,100 feet of shale, sandstone, limestone, and evaporites
- Kaibab Limestone (Permian), 0 to 1,150 feet of dolomitic limestone, siltstone, and sandstone

Contact

Fault—Dashed where approximately located; dotted where concealed. Bar and ball on downthrown side

▲ U.S. Geological Survey stream-gaging station (number refers to table)

Southern region boundary

WATER-BEARING PROPERTIES

Quaternary and Tertiary sedimentary rocks—Yields small to large to wells and springs. Thick gravel beds in Fremont River basin yield as much as 1,400 gal/min. Yields moderate to small (less than 50 gal/min) from deposits of gravel, sand, or silt less than 50 feet thick. Some springs yield as much as 150 gal/min.

Quaternary and Tertiary volcanic rocks—Large quantities of water, generally. Expected well yields as much as 50 gal/min. In Fremont drainage basin, wells may yield 2,000 gal/min and springs as much as 8,000 gal/min. May not yield water in some places

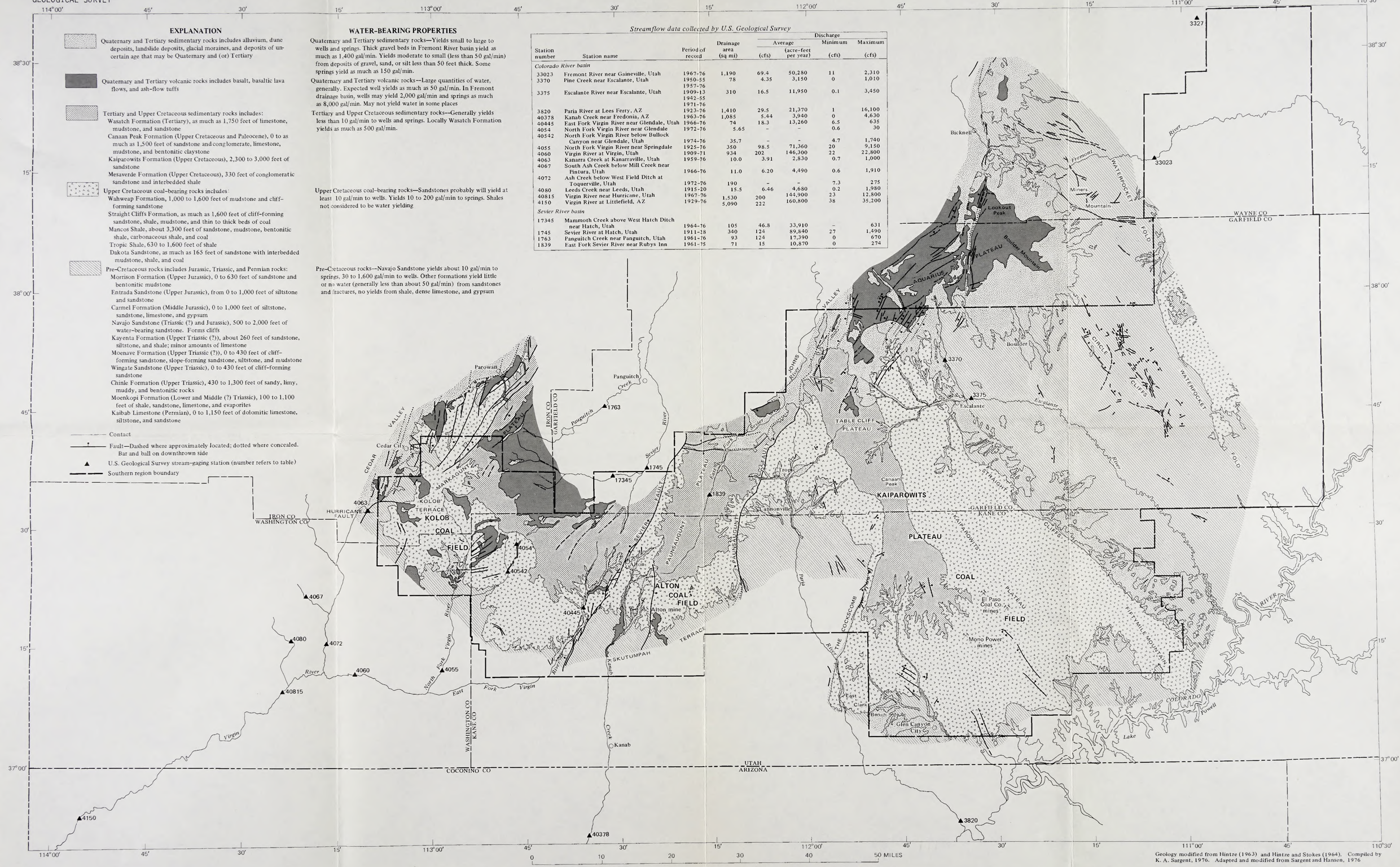
Tertiary and Upper Cretaceous sedimentary rocks—Generally yields less than 10 gal/min to wells and springs. Locally Wasatch Formation yields as much as 500 gal/min.

Upper Cretaceous coal-bearing rocks—Sandstones probably will yield at least 10 gal/min to wells. Yields 10 to 200 gal/min to springs. Shales not considered to be water yielding

Pre-Cretaceous rocks—Navajo Sandstone yields about 10 gal/min to springs, 30 to 1,600 gal/min to wells. Other formations yield little or no water (generally less than about 50 gal/min) from sandstones and fractures, no yields from shale, dense limestone, and gypsum

Streamflow data collected by U.S. Geological Survey

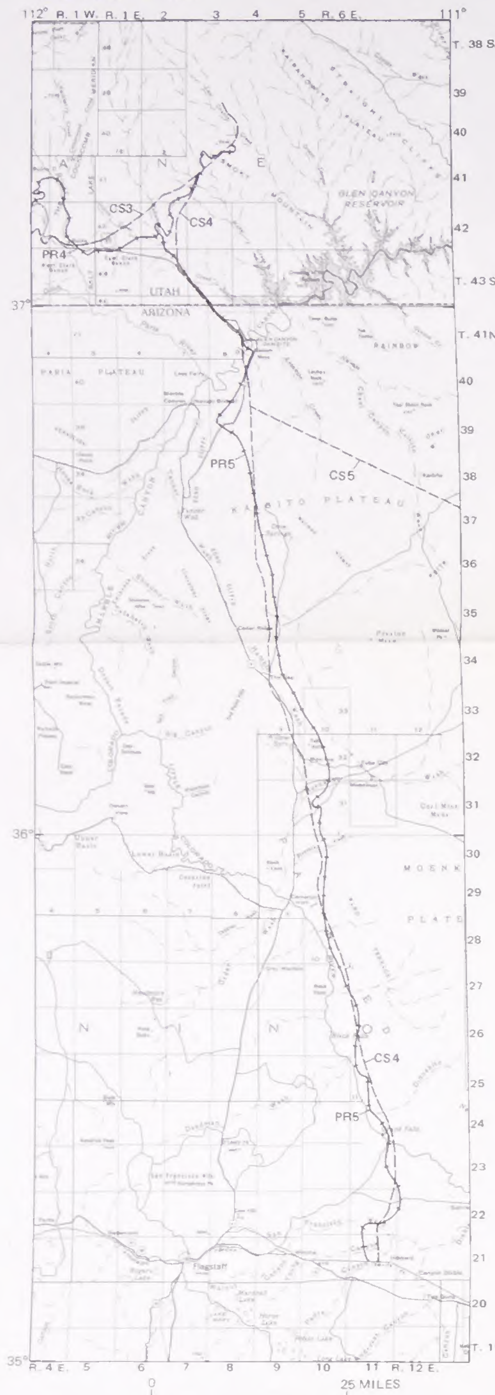
Station number	Station name	Period of record	Drainage area (sq mi)	Discharge: Average (cfs)	Discharge: Average (acre-feet per year)	Discharge: Minimum (cfs)	Discharge: Maximum (cfs)
Colorado River basin							
33023	Fremont River near Gaineville, Utah	1967-76	1,190	69.4	50,280	11	2,310
3370	Pine Creek near Escalante, Utah	1950-55 1957-76	78	4.35	3,150	0	1,010
3375	Escalante River near Escalante, Utah	1909-13 1942-55 1971-76	310	16.5	11,950	0.1	3,450
3820	Paria River at Lees Ferry, AZ	1923-76	1,410	29.5	21,370	1	16,100
40378	Kanab Creek near Fredonia, AZ	1963-76	1,085	5.44	3,940	0	4,630
40445	East Fork Virgin River near Glendale, Utah	1966-76	74	18.3	13,260	6.5	635
4054	North Fork Virgin River near Glendale	1972-76	5.65	–	–	0.6	30
40542	North Fork Virgin River below Bullock Canyon near Glendale, Utah	1974-76	35.7	–	–	4.7	1,740
4055	North Fork Virgin River near Springdale	1925-76	350	98.5	71,360	20	9,150
4060	Virgin River at Virgin, Utah	1909-71	934	202	146,300	22	22,800
4063	Kanarra Creek at Kanarraville, Utah	1959-76	10.0	3.91	2,830	0.7	1,000
4067	South Ash Creek below Mill Creek near Pintura, Utah	1966-76	11.0	6.20	4,490	0.6	1,910
4072	Ash Creek below West Field Ditch at Toquerville, Utah	1972-76	190	–	–	7.3	275
4080	Leeds Creek near Leeds, Utah	1915-20	15.5	6.46	4,680	0.2	1,980
40815	Virgin River near Hurricane, Utah	1967-76	1,530	200	144,900	23	12,800
4150	Virgin River at Littlefield, AZ	1929-76	5,090	222	160,800	38	35,200
Sevier River basin							
17345	Mammoth Creek above West Hatch Ditch near Hatch, Utah	1964-76	105	46.8	33,910	–	631
1745	Sevier River at Hatch, Utah	1911-18	340	124	89,840	27	1,490
1763	Panguitch Creek near Panguitch, Utah	1961-76	93	124	17,390	0	670
1839	East Fork Sevier River near Rubys Inn	1961-75	71	15	10,870	0	274



Geology modified from Hintze (1963) and Hintze and Stokes (1964). Compiled by K. A. Sargent, 1976. Adapted and modified from Sargent and Hansen, 1976

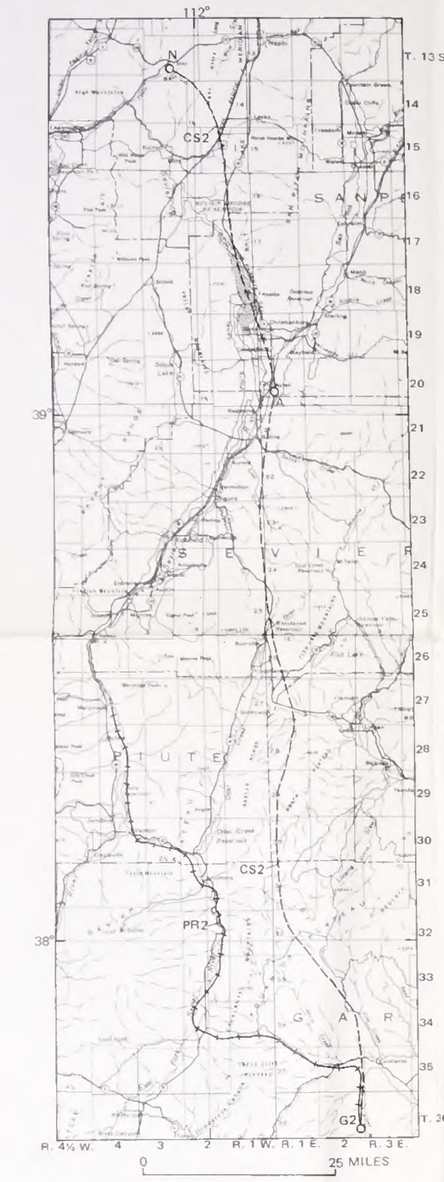
Figure II-4.--Generalized Geologic-Hydrologic Map of Coal Areas of South-Central Utah.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



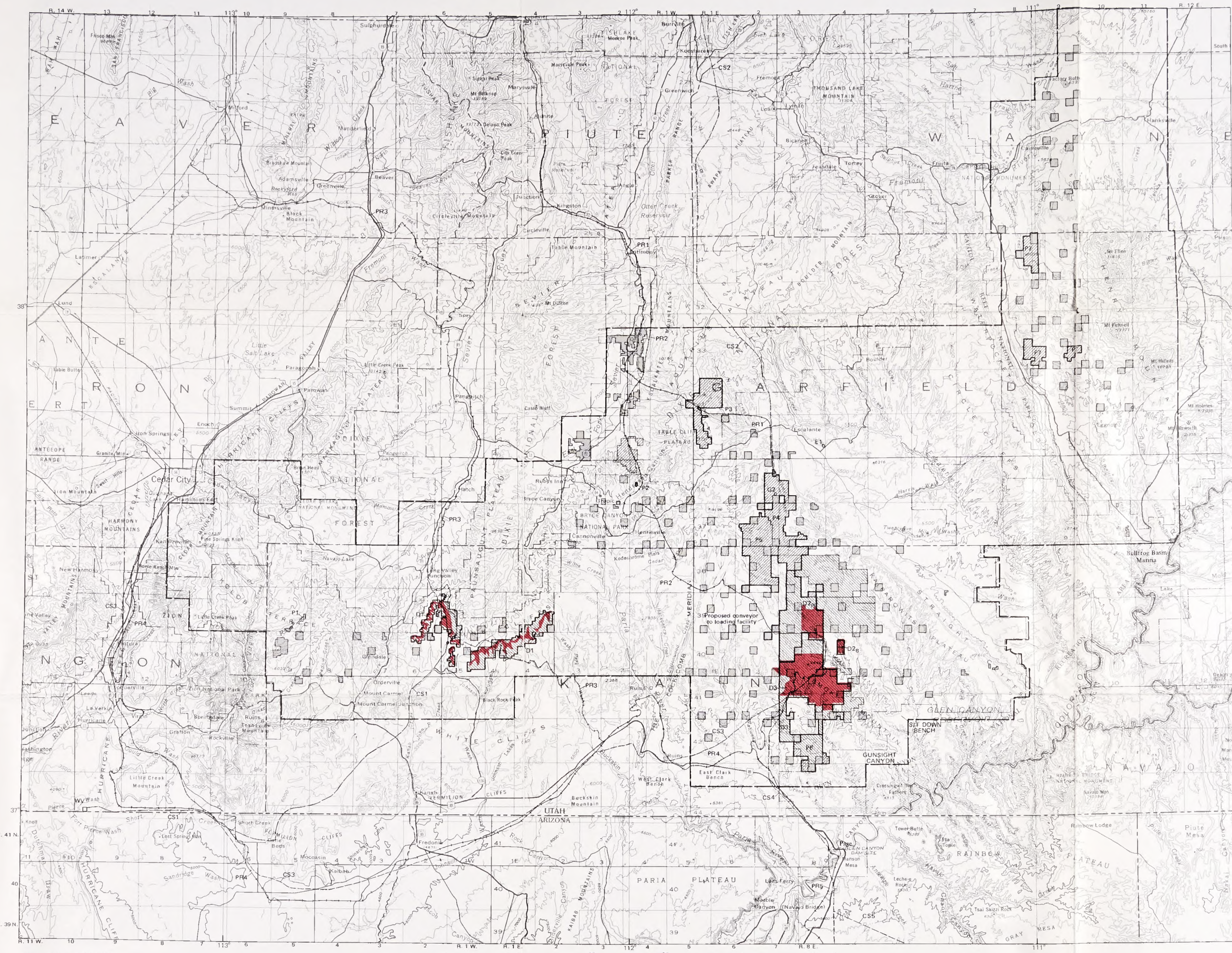
Base from U.S. Geological Survey Arizona, 1974, and Utah, 1969 State base maps 1:500,000

Proposed coal-slurry pipeline route (CS4) and proposed Santa Fe railroad (PR5) to Flagstaff, Arizona.



Base from U.S. Geological Survey State base map 1:500,000, 1969

Proposed coal-slurry pipeline route (CS2) to Axtell (A) and Nephi (N) generating stations and proposed Denver and Rio Grande railroad (PR2) to Marysvale, Utah.



Coal leases

Existing leases on Federal lands

Preference Right Lease Applications (PRLA) on Federal lands

Existing leases on State lands

Proposed mining areas

Detailed mining proposals

D1	Alton coal-strip mine, Nevada Electric Investment Co., Utah International, Inc.
D2	Red(R) and Blue(B) mines, El Paso Coal Co.
D3	Kaiparowits Nos. 1, 2, 3, 4, and 5 mines, Mono Power, et al

Preliminary mining proposals

P1	King Cannel Coal Co., Kane County
P2	Fulton and Denton, Shakespeare mine
P3	Woods Petroleum Corp., White Mountain mine
P4	Utah Power and Light Co., Garfield County
P5	Sunoco Energy Development Co., Right Hand Collet Canyon
P6	Hiko Bell Mining and Oil Co. and AU Mines, Inc., South Nipple Butte mine
P7	Meadowlark Farms, Inc., Garfield County

□	Detailed powerplant proposal
WV	Nevada Electric Investment Co., et al, Warner Valley generating station

o	Preliminary powerplant proposal
E1	U.P.B. Escalante generating station
G2	Utah Power and Light Co., alternate Garfield generating station

Detailed coal slurry pipeline proposal

CS1	Nevada Electric Investment Co., et al, to Warner Valley and Harry Allen generating stations

Preliminary coal slurry pipeline proposals as alternatives to railroads

CS2	Utah Power and Light Co. to Nephi, Utah
CS3	El Paso Coal Co. to Cedar City, Utah
CS4	El Paso Coal Co. to Flagstaff, Arizona
CS5	El Paso Coal Co. To Walsenburg, Colorado

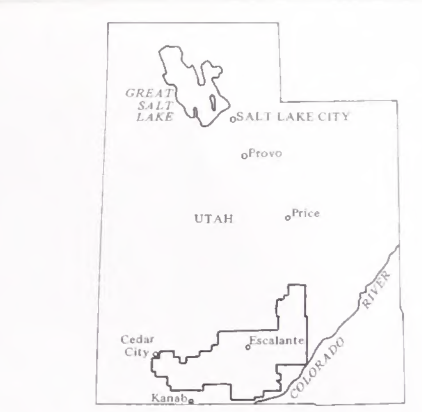
Preliminary railroad proposals

PR1	Utah Power and Light Co. to Marysvale, Utah
PR2	Denver and Rio Grande Railroad to Marysvale, Utah
PR3	Union Pacific Railroad to Milford, Utah
PR4	Union Pacific Railroad to Cedar City, Utah
PR5	Santa Fe Railroad to Flagstaff, Arizona

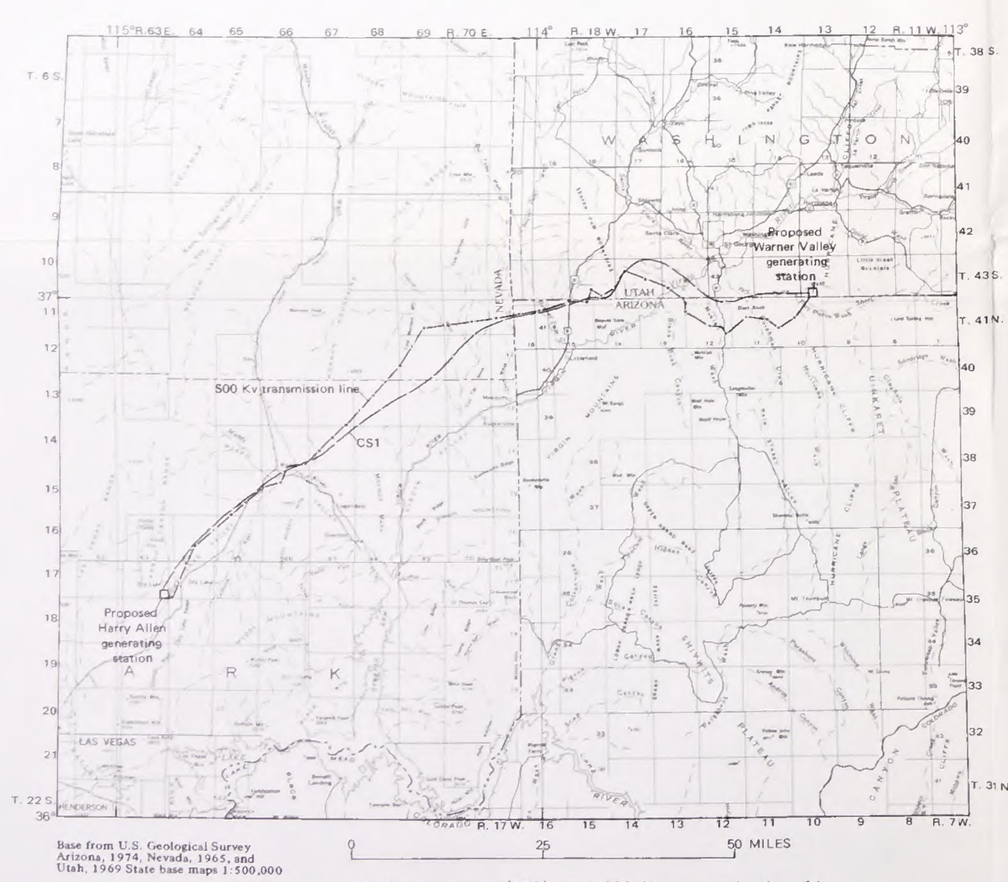
Southern region boundary

Base from U.S. Geological Survey Arizona, 1974, and Utah, 1969 State base maps 1:500,000 Roads as of 1978

Map showing locations of Federal and State coal leases, all existing mines, proposed mines, coal-fired generating stations, coal haul railroads, and coal-slurry pipelines routes.

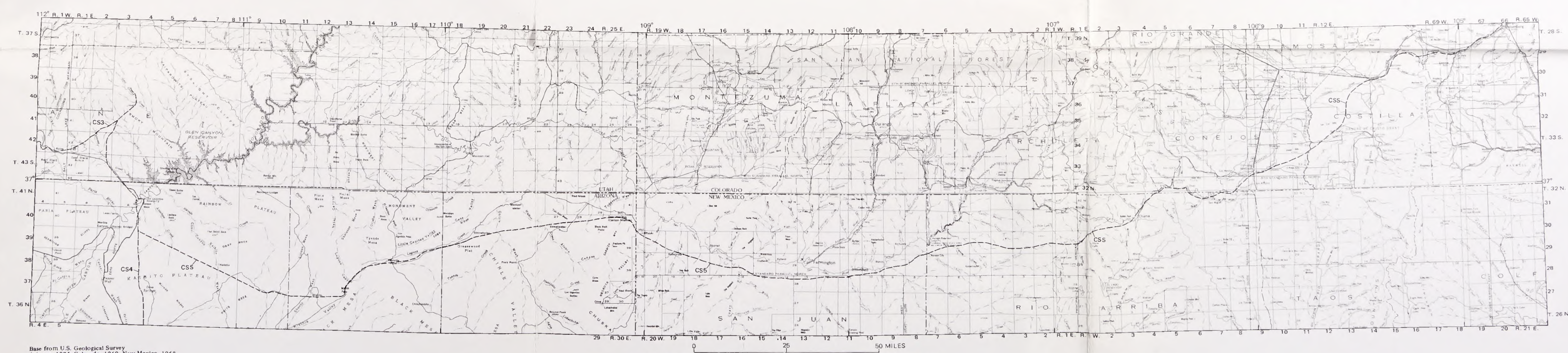


Index map showing location of the southern Utah coal region.



Base from U.S. Geological Survey Arizona, 1974, Nevada, 1965, and Utah, 1969 State base maps 1:500,000

Coal-slurry pipeline route (CS1) and 500 kV transmission line from Warner Valley to Harry Allen generating stations.



Base from U.S. Geological Survey Arizona, 1974, Colorado, 1969, New Mexico, 1968, and Utah, 1969 State base maps 1:500,000

Proposed coal-slurry pipeline route (CS5) to Walsenburg, Colorado.

Figure I-2.--MAPS OF SOUTHERN UTAH COAL REGION AND ADJACENT STATES SHOWING LOCATION OF COAL DEVELOPMENT AND COAL-ASSOCIATED PROPOSALS.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

KOLOB AND ALTON COAL FIELDS

Coal reserve, in millions of short tons[1]

	AREA	COAL CLASSES[2] I, II	II	III	III, IV	IV	SUBTOTALS (BY AREA)
KOLOB FIELD	1					8.1	8.1
	2			23.4			23.4
	3		28.1				28.1
	4		5.4				5.4
	5			43.4			43.4
	6				265.3		265.3
	7	63.6		10.7			74.3
	8	55.7		15.7			71.4
	9	55.4					55.4
	10	27.9					27.9
	11			19.95			19.95
	12					7.82	7.82
	13			11.15			11.15
	14			55.74			55.74
	15			30.86			30.86
	16			81.73			81.73
	17			16.7			16.7
	18			4.38			4.38
	19		3.06				3.06
	20	85.67					85.67
	21	20.92					20.92
	22			45.38			45.38
	23	48.33					48.33
	24	189.80		207.83			397.63
	25		99.53	461.65			561.18
	26A, 26B	Area of potential but thickness of cover most probably exceeds 3,000 feet (approximately the area underlain by Tertiary rocks)					
ALTON FIELD	27	Area of potential coal but data insufficient to calculate quantity					
	28	Area of potential coal where thickness of cover over coal exceeds 3,000 feet					
	29A, 29B, 29C					278.7	278.7
	30					197.11	197.11
	31		102.42	418.19			520.61
	32		135.24[4]				135.24
	33[4]						296.67
	34		135.82	189.58		78.99	404.39
	35	Some coal possible, data insufficient to calculate quantity					
	36	Some coal possible, data insufficient to calculate quantity					
	37		71.01	48.62		12.44	132.07
		(Data insufficient to calculate other possible coal reserve)					
	38		54.05				54.05
	39		2.97	54.72		72.32	130.01
	40	Coal present, but Doelling and Graham (1972a, p. 40) consider it to be substandard					
	41	No potentially mineable coal					
	42	Data insufficient					
	43	Little or no potentially mineable coal					
	44	Data insufficient to calculate					
COAL, BY CLASS, IN MILLIONS OF TONS		547.3	637.6	1,739.7	265.3	655.5	TOTAL COAL, ALL CLASSES 4,142.1

[1] Sources of data: Doelling and Graham, 1972; and Cashion, 1961.
[2] Coal classes used here are generally the same as used by Doelling and Graham (1972), see explanation.
[3] Coal under less than 1,000 feet overburden.
[4] Unclassified.

REFERENCES

Cashion, W. B., 1961, Geology and fuel resources of the Orderville-Glendale area, Kane County, Utah: U.S. Geol. Survey Coal Investigations Map C-49.

Doelling, H. H., 1970, Coal in Utah—1970, in Doelling, H. H., Central Utah coal fields: Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery, 571 p. (see especially p. 549).

Doelling, H. H., and Graham, R. L., 1972, Southwestern Utah coal fields: Alton, Kaiparowits Plateau and Kolob-Harmony: Monograph Series No. I: Utah Geol. and Mineralogical Survey, 333 p.

Federal ownership of mineral rights

State and private ownership of mineral rights

Coal, potentially mineable, reserve for area shown in tables

Coal outcrop, dashed where concealed, uncertain, or approximately located; stippled pattern behind outcrop

Inferred limit of potentially mineable coal, generally based on thickness or, locally, on other data, such as limits of burned coal; dashed where undertain or approximately located

Other boundary between reserve areas, such as political, available data, etc.

3,000-foot depth of potentially mineable coal

Fault, dashed where concealed or approximately located

Volcanic vent, potentially mineable coal possibly absent

Southern region boundary

COAL CLASSES[1]

Class I *Measured reserves* based on adequate exploration data; properly correlated; control no more than one-half mile apart.

Class II *Indicated reserves* based on geologic measurement supplemented by limited drill-hole information and limited to 1½ miles from a control point.

Class III *Inferred reserves* based on geologic inference and projection of the habit of the coal beyond 1½ miles from control points.

Class IV *Potential reserves* based on geographic and geologic position with little surrounding data; includes coal covered by no more than 3,000 feet of overburden.

Most of the coal reserve is based on surface measurements which are not always as reliable as the drill. The reserve commonly is underestimated because surface measurements usually are smaller than thickness penetrated by drilling. Class I and II figures are combined in these reports; no attempt was made to separate the more reliable figure. The first three reserve classes constitute the principal reserve and more nearly reflect the current potential. The reserves include only coal beds that average 4 feet or greater thickness and are covered by less than 3,000 feet of overburden except where otherwise noted. Less than 50 percent of the total reserves are economically mineable.

[1] The division of coal into four classes generally follows that described by Doelling (1972c, p. 549).

KAIPAROWITS PLATEAU COAL FIELD

Preliminary estimate: 20,000,000,000 short tons coal beds 4 feet or more thick; overburden no thicker than 3,000 feet.

HENRY MOUNTAINS COAL FIELD

Coal reserve, in millions of short tons[1]

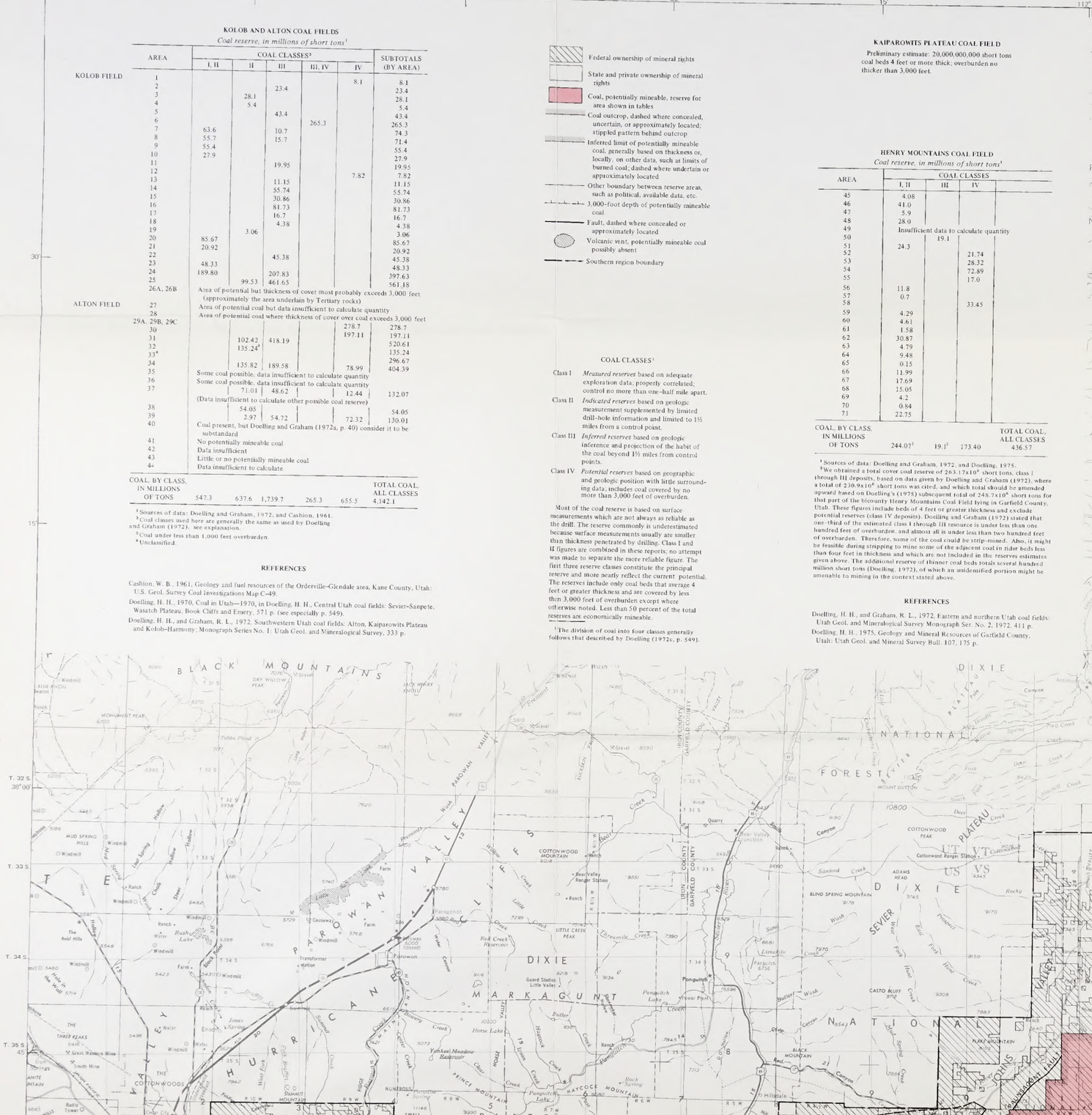
AREA	COAL CLASSES I, II	III	IV
45	4.08		
46	41.0		
47	5.9		
48	28.0		
49	Insufficient data to calculate quantity		
50		19.1	
51	24.3		
52			21.74
53			28.32
54			72.89
55			17.0
56	11.8		
57	0.7		
58			33.45
59	4.29		
60	4.61		
61	1.58		
62	30.87		
63	4.79		
64	9.48		
65	0.15		
66	11.99		
67	17.69		
68	15.05		
69	4.2		
70	0.84		
71	22.75		
COAL, BY CLASS, IN MILLIONS OF TONS	244.07[2]	19.1[3]	173.40	TOTAL COAL, ALL CLASSES 436.57

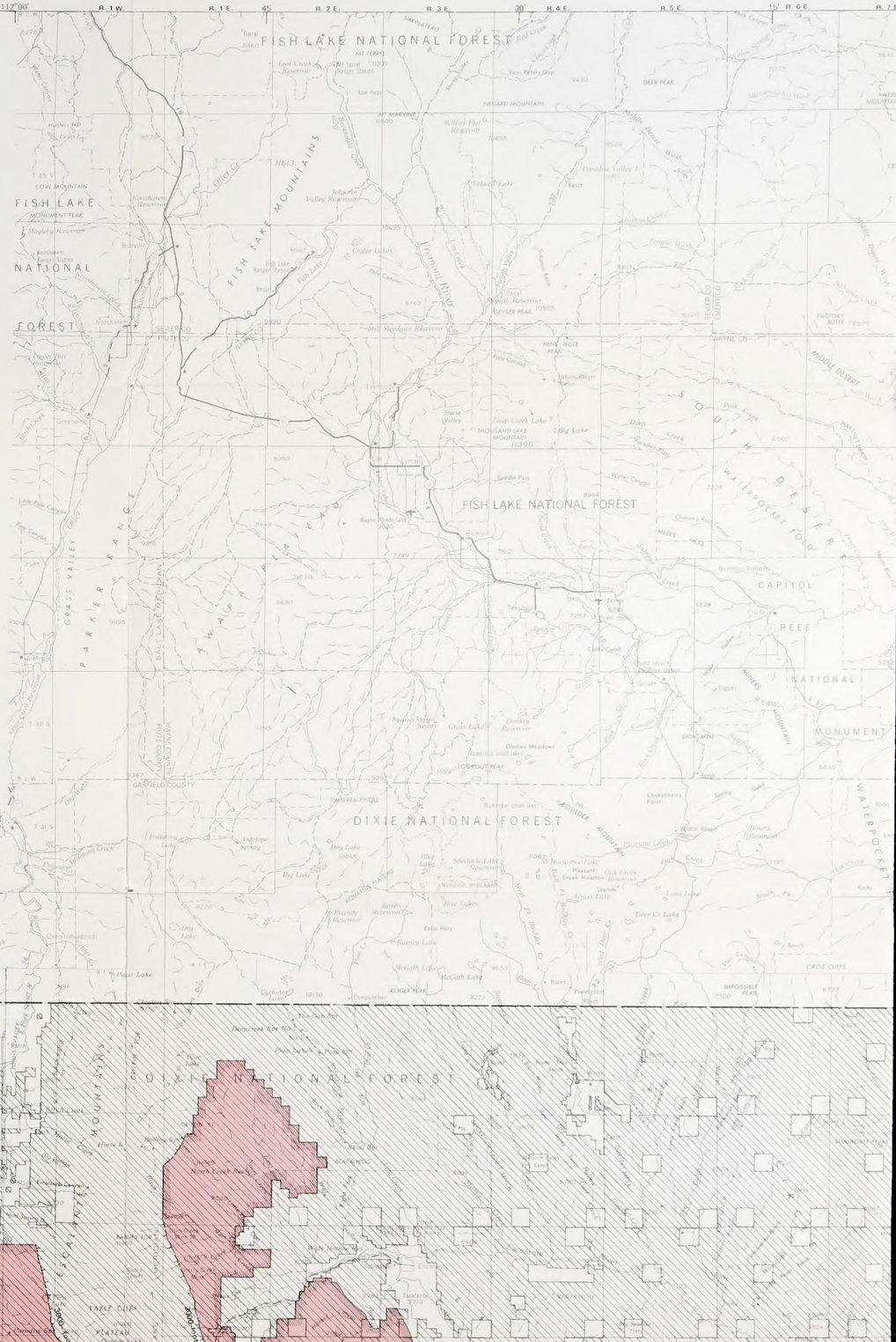
[1] Sources of data: Doelling and Graham, 1972, and Doelling, 1975.
[2] We obtained a total cover coal reserve of 263.17×10^6 short tons, class I through III deposits, based on data given by Doelling and Graham (1972), where a total of 230.9×10^6 short tons was cited, and which total should be amended upward based on Doelling's (1975) subsequent total of 248.7×10^6 short tons for that part of the bicounty Henry Mountains Coal Field lying in Garfield County, Utah. These figures include beds of 4 feet or greater thickness and exclude potential reserves (class IV deposits). Doelling and Graham (1972) stated that one-third of the estimated class I through III resource is under less than one hundred feet of overburden, and almost all is under less than two hundred feet of overburden. Therefore, some of the coal could be strip-mined. Also, it might be feasible during stripping to mine some of the adjacent coal in rider beds less than four feet in thickness and which are not included in the reserves estimates given above. The additional reserve of thinner coal beds totals several hundred million short tons (Doelling, 1972), of which an unidentified portion might be amenable to mining in the context stated above.

REFERENCES

Doelling, H. H., and Graham, R. L., 1972, Eastern and northern Utah coal fields: Utah Geol. and Mineralogical Survey Monograph Ser. No. 2, 1972, 411 p.

Doelling, H. H., 1975, Geology and Mineral Resources of Garfield County, Utah: Utah Geol. and Mineral Survey Bull. 107, 175 p.





Federal ownership of mineral rights

State and private ownership of mineral rights

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Coal outcrop, dashed where concealed, uncertain, or approximately located; stippled pattern behind outcrop

Inferred limit of potentially mineable coal, generally based on thickness or, locally, on other data, such as limits of burned coal; dashed where undertain or approximately located

Other boundary between reserve areas, such as political, available data, etc.

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Southern region boundary

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3,000 feet of overburden except where
wise noted. Less than 50 percent of the total
es are economically mineable.

he division of coal into four classes generally
ws that described by Doelling (1972c, p. 549).

KAIPAROWITS PLATEAU COAL FIELD

Preliminary estimate: 20,000,000,000 short tons coal beds 4 feet or more thick; overburden no thicker than 3,000 feet.

HENRY MOUNTAINS COAL FIELD

Coal reserve, in millions of short tons[1]

AREA	COAL CLASSES I, II	III	IV
45	4.08		
46	41.0		
47	5.9		
48	28.0		
49	Insufficient data to calculate quantity		
50		19.1	
51	24.3		
52			21.74
53			28.32
54			72.89
55			17.0
56	11.8		
57	0.7		
58			33.45
59	4.29		
60	4.61		
61	1.58		
62	30.87		
63	4.79		
64	9.48		
65	0.15		
66	11.99		
67	17.69		
68	15.05		
69	4.2		
70	0.84		
71	22.75		
COAL, BY CLASS, IN MILLIONS OF TONS	244.07[2]	19.1[2]	173.40
TOTAL COAL, ALL CLASSES	436.57		

[1] Sources of data: Doelling and Graham, 1972, and Doelling, 1975.
[2] We obtained a total cover coal reserve of 263.17×10^6 short tons, class I through III deposits, based on data given by Doelling and Graham (1972), where a total of 230.9×10^6 short tons was cited, and which total should be amended upward based on Doelling's (1975) subsequent total of 248.5×10^6 short tons for that part of the bicounty Henry Mountains Coal Field lying in Garfield County, Utah. These figures include beds of 4 feet or greater thickness and exclude potential reserves (class IV deposits). Doelling and Graham (1972) stated that one-third of the estimated class I through III resource is under less than one hundred feet of overburden, and almost all is under less than two hundred feet of overburden. Therefore, some of the coal could be strip-mined. Also, it might be feasible during stripping to mine some of the adjacent coal in ruder beds less than four feet in thickness and which are not included in the reserves estimates given above. The additional reserve of thinner coal beds totals several hundred million short tons (Doelling, 1972), of which an unidentified portion might be amenable to mining in the context stated above.

REFERENCES

Doelling, H. H., and Graham, R. L., 1972, Eastern and northern Utah coal fields: Utah Geol. and Mineralogical Survey Monograph Ser. No. 2, 1972, 411 p.

Doelling, H. H., 1975, Geology and Mineral Resources of Garfield County, Utah: Utah Geol. and Mineral Survey Bull. 107, 175 p.

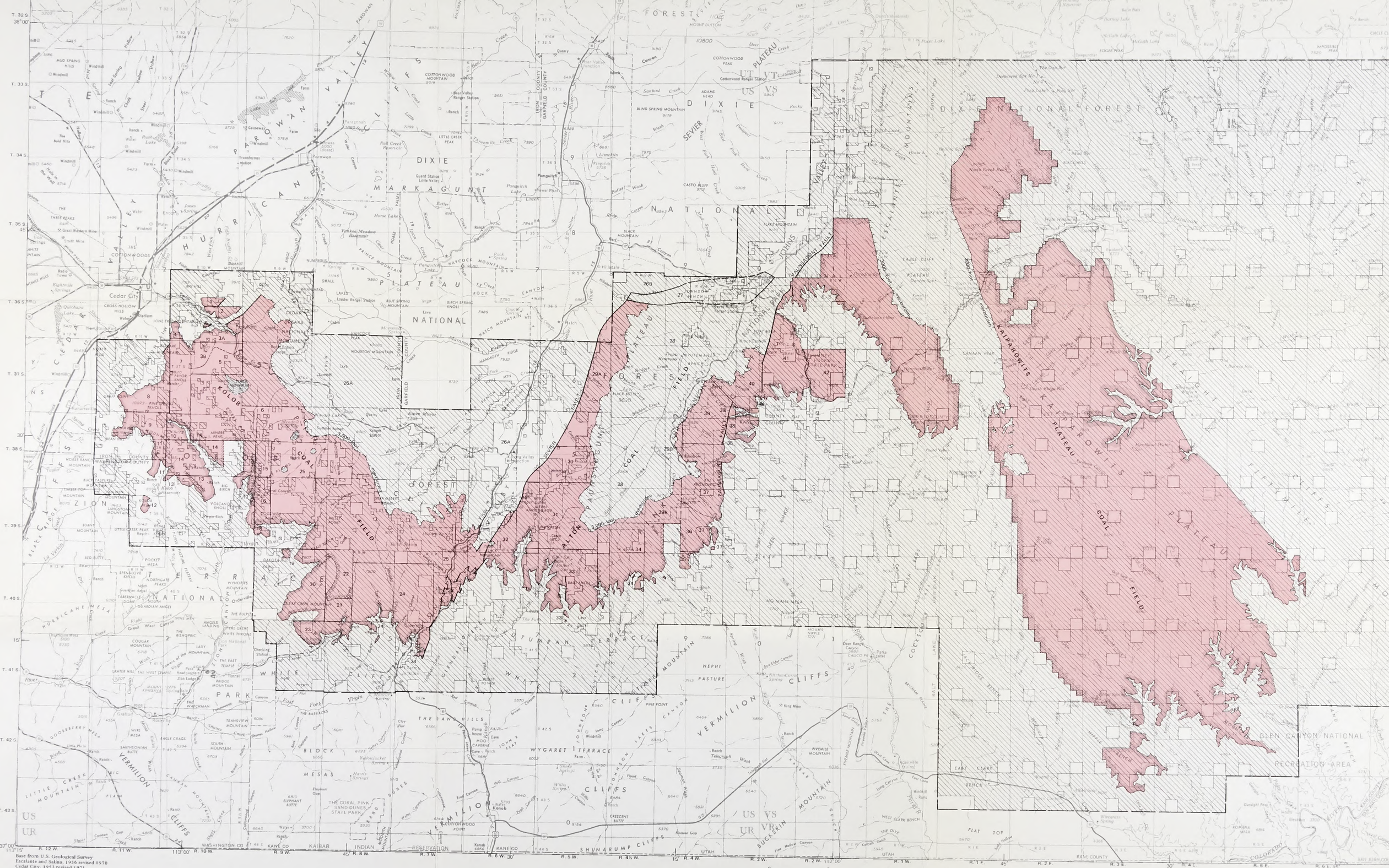

Figure II-6.--Coal reserves by area.

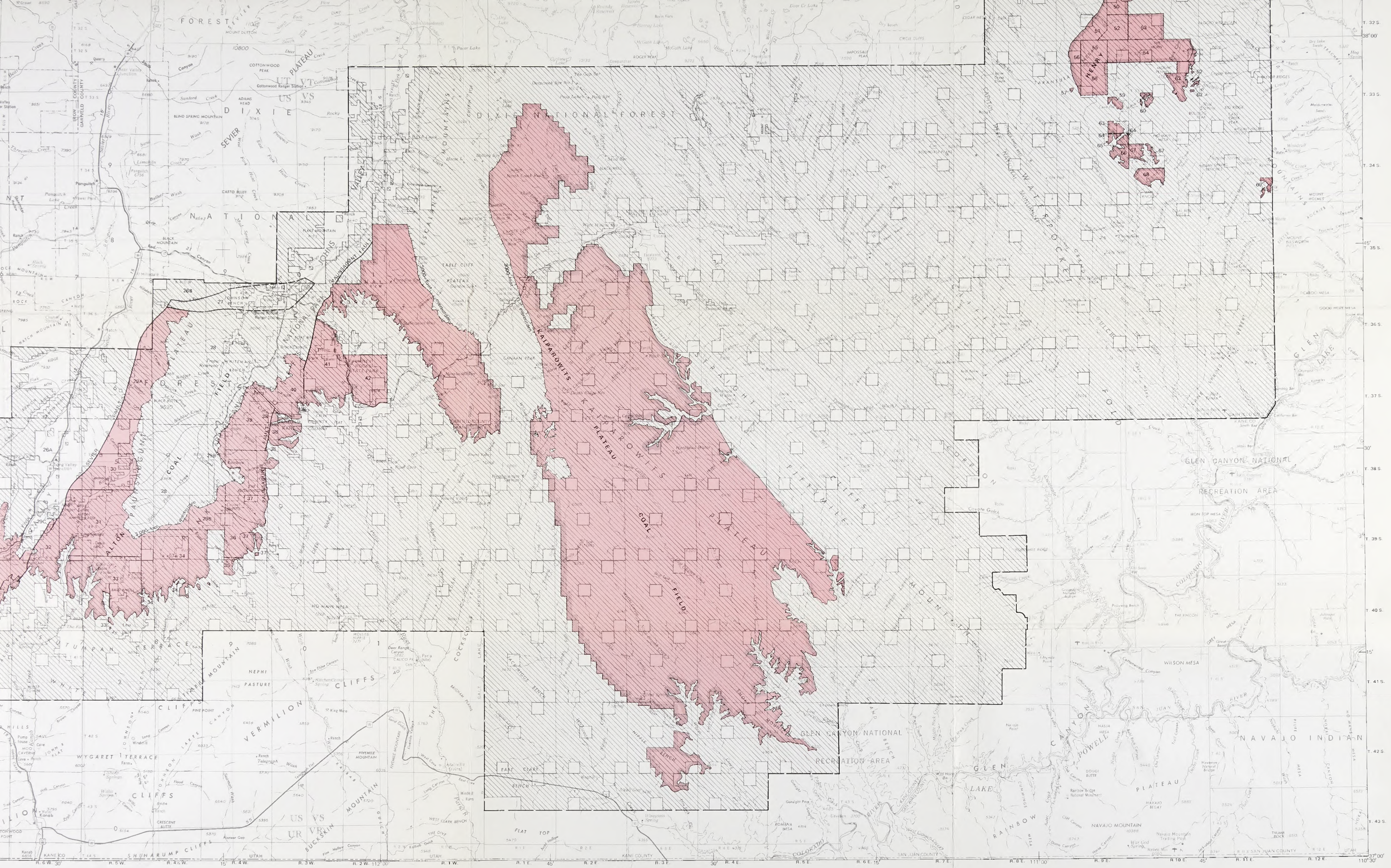

Figure II-6.--Coal reserves by area.