P R SPRING COMBINED HYDROCARBON LEASE CONVERSION

Draft Environmental Impact Statement

Department of the Interior
Bureau of Land Management
Denver Service Center,
Division of Environmental
Impact Statement Services

MAY 1985

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
VERNAL DISTRICT OFFICE
170 South 500 East
Vernal, Utah 84078

IN REPLY
REFER TO:

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Dear Reader:

This draft Environmental Impact Statement (EIS) on the P R Spring Hydrocarbon Lease Conversion is provided for your information and use. Please retain this draft EIS for future reference as the final EIS may only be an addendum.

The purpose of this public review is to improve the impact analyses presented in the draft EIS. The final EIS will be prepared considering the comments received.

Comments on the draft EIS may be submitted in writing or presented verbally at the public hearing scheduled for June 19, 1985 at 7:00 p.m. in Vernal, Utah, at the Bureau of Land Management Office (170 South 500 East). In order to be considered in the final EIS, all comments must be received by July 18, 1985.

Please make your comments as specific as possible. Comments will be more helpful if they include suggested changes, sources, or methodologies. Comments providing only opinions or preferences will not have a formal response, but will be included as part of the decision-making process.

A copy of the final EIS will be sent to all persons who provide comments on the draft or to anyone requesting a copy. Please address written comments or requests for copies of the draft or final EIS to:

Robert E. Pizel, Project Leader
Bureau of Land Management
Division of EIS Services
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Sincerely yours,

Lloyd H Ferguson
District Manager
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Draft

Environmental Impact Statement

on the

P R SPRING COMBINED HYDROCARBON LEASE CONVERSION

Prepared by

BUREAU of LAND MANAGEMENT

May 1985

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COVER SHEET

P R Spring Combined Hydrocarbon Lease Conversion Environmental Impact Statement

(X) Draft ( ) Final

Lead Agency

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

Jurisdictions in Utah that could be Affected

Carbon County
Duschesne County
Grand County
Uintah County

Ute Indian Tribe
Uintah and Ouray Indian Reservation

Abstract

This EIS assesses the environmental consequences of federal approval of converting existing oil and gas leases within the P R Spring and Hill Creek Special Tar Sand Areas (STSAs) to combined hydrocarbon leases. The proposed lease conversions include the Beartooth A, Beartooth B, Bradshaw, Duncan, Enercor, Enserch, Farleigh, Kirkwood, Mobil, and Thompson projects. This EIS addresses the site-specific and cumulative impacts of the 10 proposed actions and No-Action alternatives. Cumulative impacts are those impacts that would occur as a result of the proposed actions plus other interrelated projects planned for development in the project areas during the analysis period.

Based on the issues and concerns identified during the scoping process, the EIS focuses on impacts to Water Resources, Socioeconomics, Air Quality, Soils and Vegetation, and Wilderness.

EIS Contact

Comments on this EIS should be directed to:

Robert E. Pizel, Project Leader
Bureau of Land Management
Division of EIS Services
555 Zang Street, First Floor East
Denver, Colorado 80228

Date by which Comments on the EIS must be Received

July 18, 1985

Date EIS made Available to EPA and the Public

May 20, 1985

PREFACE

This environmental impact statement (EIS) presents facts and projections for the proposed conversion to combined hydrocarbon leases of existing oil and gas leases within the P R Spring and Hill Creek Special Tar Sand Areas in Uintah and Grand counties, Utah. This EIS provides information on the Proposed Actions to assist the public in becoming aware of the proposals and for use as one of the considerations in the federal decision-making process.

The EIS has been prepared according to the requirements of the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality's regulations for implementing NEPA, effective July 30, 1979.

Throughout the discussions of the site-specific projects, the term *project area* is frequently used. This term refers to each lease area proposed for conversion by each applicant.

This EIS is divided into three major sections to avoid duplication of data and reduce the size of the document. Section A contains data on topics that apply to all or most of the site-specific projects and maps showing general project locations.

Section B contains site-specific analyses for each of the proposed conversions and site-specific maps which correlate to the maps in Section A. The 10 project analyses are divided into chapters similar to those found in a single EIS.

Section C contains five appendices which provide additional resource material to supplement the information contained in Sections A and B. Section C also contains References Cited, Glossary, and Acronyms and Abbreviations sections.

In addition to this EIS, an air quality technical report has been prepared by Aerocomp, Inc. (1985), which expands on the air quality analyses contained in this EIS. (A copy of the technical report may be obtained from the BLM, Vernal District Office, Utah; Division of EIS Services, Denver; or BLM, Utah State Office, Salt Lake City.)

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Section A

General Overview

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GENERAL SUMMARY

The P R Spring and Hill Creek Special Tar Sand Areas (STSAs) have the potential for tar sand resource development. In addition, the STSAs contain opportunities for a variety of other resource development and human activities that would be affected by tar sand development.

Proponents of 10 tar sand projects have filed applications with the Bureau of Land Management (BLM) to convert existing oil and gas leases within the STSA to combined hydrocarbon leases in accordance with the Combined Hydrocarbon Leasing Act of 1981. Approval of the conversion applications would permit phased tar sand development. Because the location and extent of the resource are not known, project designs are conceptual. Should a lease be converted, a more site-specific environmental analysis would be needed before the types of commercial production addressed in this environmental impact statement (EIS) would be permitted. See Map A-1 for general locations of the project areas.

The applicants' plans of operations estimate an individual project life span of 28 to 100 years or more. Each applicant plans to have 150 to 40,000 barrels of oil a day produced from its project.

The tar sand development would cause impacts either by displacing resources (such as removal of vegetation), using resources (such as water consumption), or creating other changed conditions (such as visual scars or community growth). The analysis in this environmental impact statement (EIS) focuses on these kinds of potential impacts by individual project. A separate, site-specific analysis has been prepared for each project. This EIS analyzes 10 projects in one EIS rather than 10 separate documents.

Almost 40 percent of the Beartooth B project area (598 acres of 1,520 acres proposed for lease conversion); 16 percent of the Enercor project area (4,206 acres of 26,583 acres proposed for lease conversion); 94 percent of the Enserch project area (1,020 acres of 1,080 acres proposed for lease conversion); and 12 percent of the Mobil project (404 acres of 3,337 acres proposed for lease conversion) lie within the 42,462 acres of the Winter Ridge WSA.

UNRESOLVED ISSUES

During EIS preparation, the following issues and potential conflicts were identified that would be subject to further discussion, coordination, and action and that would need to be resolved outside the EIS process and following lease conversion: socioeconomics, split estate (differing surface and subsurface ownership of a given area of land); and uncertainty of national prospects for a tar sand industry.

Socioeconomics

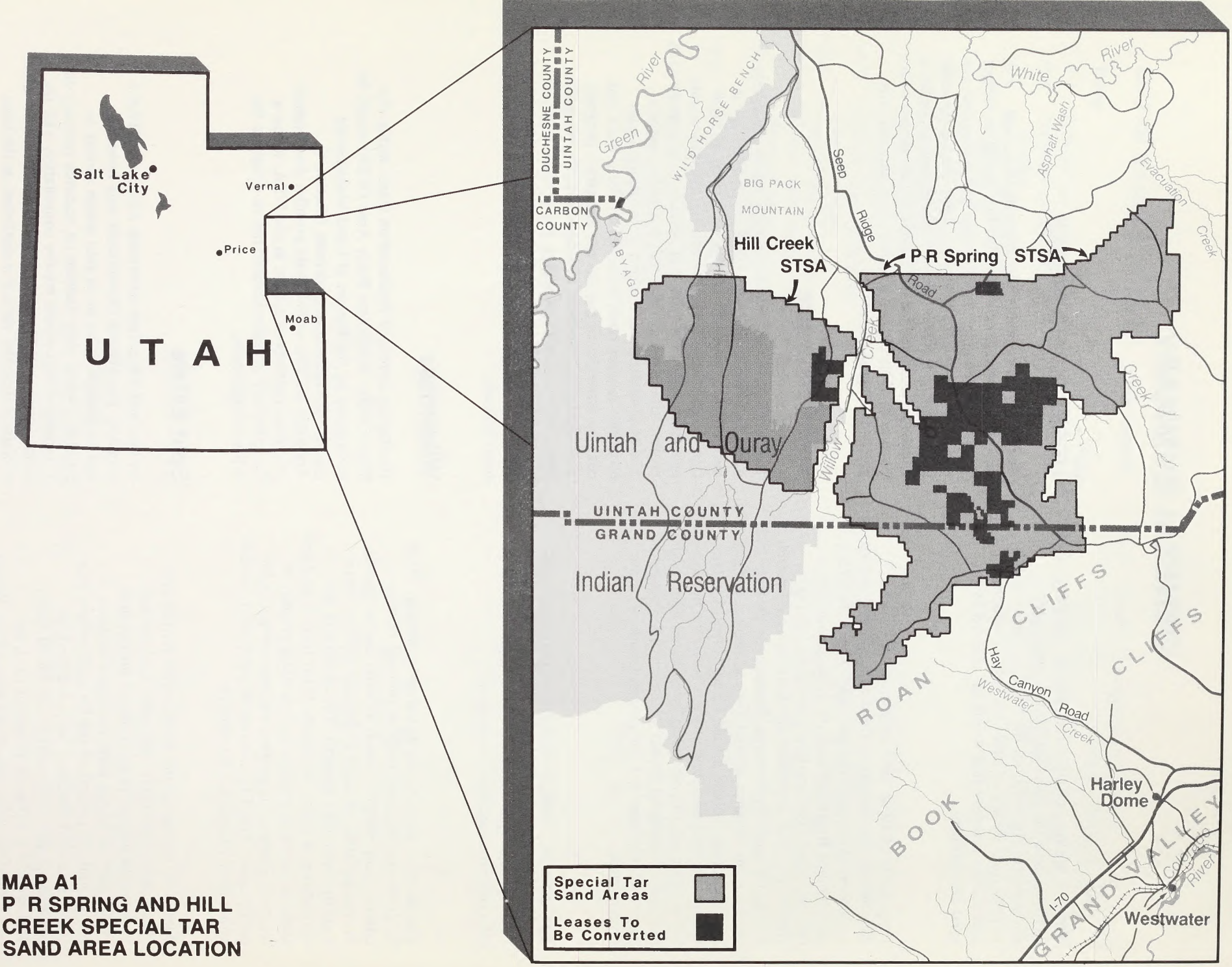
The extent to which socioeconomic impacts could be offset as a result of actions taken under Utah law is unresolved. Utah Code Annotated Section 63-51-10 (Supp. 1981)(Senate Bill 170) and the affected county permitting process require that developers of a major project submit a socioeconomic mitigation analysis. The analysis identifies the cost of providing socioeconomic services made necessary by the project and contains strategies to pay for the mitigation program. This legislation, however, mandates specific mitigation measures, and actual mitigation plans would be determined through negotiations between the project proponents, state agency representatives, and local government officials.

Wilderness

Developing combined hydrocarbon leases within the Winter Ridge Wilderness Study Area (WSA) would be constrained by the Bureau of Land Management (BLM) wilderness nonimpairment (Section C, Appendix 2). This would likely prohibit development of certain portions of a lease in the WSA, unless a Congressional decision is made not to designate the WSA as wilderness.

Split Estate

Surface and subsurface ownership within the STSA is complex. The Federal Government may have subsurface mineral rights to an area whose surface is privately owned. Any decision on resource recovery on a conversion area would involve consultation with the surface owner, BLM representatives, and the lessee or operator before the surface is disturbed or the lease rights are implemented.



MAP A1
P R SPRING AND HILL CREEK SPECIAL TAR SAND AREA LOCATION

Synfuels Uncertainties

Tar sand development within the STSA would be influenced by many complex factors, some of which are beyond the control of project proponents or agencies with authorizing actions. Such factors include (1) national policies on synfuels as related to other energy alternatives, (2) the availability of money in the private sector and the interest shown by large financial organizations, (3) the international price of oil, and (4) the effectiveness of energy conservation programs.

The uncertainty of these factors could continue indefinitely. Since the development of the proposed conversion areas would involve a program phase and a 28- to 100-year long financial commitment during commercial operation, the uncertainties would strongly influence decisions by the project proponents on the future scheduling and design of the proposed projects. Schedules and plans of operations discussed in this EIS represent the proponents' current objectives but may be revised as influenced by future events.

Synfuels uncertainties also make it difficult for local governments and others to plan services to meet the needs of project-related growth.

The major potential impacts from each of the Proposed Actions are detailed in Section B, by project, and summarized in 10 separate summaries, which are also in Section B. Each project is analyzed as though the others were not proposed, building on the premise that each is an individual proposal.

ANALYSIS CONCLUSIONS

The analysis indicates that, in general, each project by itself would have impacts of a nature and magnitude that could be managed without undue degradation to other natural resources or to socioeconomic conditions. The mitigation measures identified in Appendix 2 are designed to lessen impacts to resources and/or provide restoration of disturbed areas. Even so, individual projects would cause impacts, and these are noted in this EIS.

BLM PREFERRED ALTERNATIVES

The BLM preferred alternatives are given for each individual project in the individual project summaries (Section B).

INTRODUCTION

The P R Spring Combined Hydrocarbon Conversion Environmental Impact Statement (EIS) was initiated by combined hydrocarbon lease conversion applications and proposed plans of operations filed by 9 applicants for 10 tar sand projects. The 9 applicants, 12 applications, and 10 plans of operations are listed below:

APPLICANTS	PLANS OF OPERATIONS*	APPLICATIONS
Beartooth Oil and Gas Company	Beartooth A Beartooth B	Beartooth A Beartooth B
F. J. Bradshaw Estate	Bradshaw	Bradshaw
Walter Duncan Oil Properties	Duncan	Duncan
Enercor	Enercor	Enercor
Enserch Exploration Inc.	Enserch	Enserch
B. D. Farleigh	Farleigh	Farleigh
W. C. Kirkwood Oil & Gas Exploration & Production	Kirkwood	Kirkwood
Mobil Oil Corporation	Mobil	Mobil Mobil/Getty Texaco
J. C. Thompson	Thompson	Thompson

*The plans of operations represent the 10 projects analyzed in this EIS.

Beartooth filed two plans of operations for two separate projects—Beartooth A and Beartooth B. Anticipating the joint development of their converted leases in a single project, Mobil, Texaco, and Mobil/Getty submitted substantially similar plans of operations to convert their federal leases. (Getty filed a joint application on two leases with Mobil.) All references to Mobil in this EIS are intended to refer to this single project. The other applicants each filed separate plans of operations for a total of 10 plans of operations. The applicants have requested the conversion of 44 existing oil and gas leases within the P R Spring Special Tar Sand Area (STSA) to combined hydrocarbon leases under the Combined Hydrocarbon Leasing Act of 1981. Kirkwood is the only applicant to apply for lease conversion in the Hill Creek STSA. Because of the similar filing dates of the lease conversion applications and the processing requirements of the Combined Hydrocarbon Leasing Act, decisions on all of the applications are required within similar dates.

The descriptions of the projects analyzed in this EIS are based on individual, site-specific information provided by the applicants in their plans of operations. The impact analysis is based on existing data and several assumptions. Should a decision to convert a lease be made, more detailed environmental analyses based on more defined project design and base data would be required before the types of commercial production discussed in this EIS would be permitted. The Bureau of Land Management (BLM) would conduct such analyses as part of its ongoing mine plan review and monitoring program.

This EIS is closely related to three other EISs—the ***Utah Combined Hydrocarbon Regional Final EIS*** (BLM 1984a), the ***Uintah Basin Synfuels (UBS)***

Development Final EIS (BLM 1983a), and the *Book Cliffs Resource Management Plan Final EIS* (BLM 1984b). The Regional EIS analyzed the regional impacts of the proposed federal combined hydrocarbon leasing program on an individual STSA basis, as well as cumulative impacts. The P R Spring and Hill Creek STSAs are 2 of 11 special tar sand areas analyzed in the Regional EIS. See the final EIS on the Book Cliffs Resource Management Plan for analyses of land management decisions, such as leasing categories in the STSAs.

The UBS EIS analyzed the potential impacts of oil shale and tar sand development in the Uinta Basin (Utah). Since the same area of influence for interrelated projects would be affected, this EIS refers to the UBS EIS for cumulative impact analyses.

GENERAL DESCRIPTION

This EIS analyzes 10 Proposed Action and No-Action alternatives. (See Section B, Site-Specific Analyses, for details on each project and Table A-1 for a summary of the Proposed Actions.) Seven projects are small *in situ* processes, with plans of producing 150 barrels per day (bpd) each under commercial operation. These projects are Beartooth A, Beartooth B, Bradshaw, Duncan, Enserch, Farleigh, and Thompson. Kirkwood is proposing a 16,000 bpd *in situ* commercial operation. Enercor and Mobil are proposing surface mining operations and processing extraction plants. Enercor, having lease agreements with the Natural Gas Company of California, Pacific Transmission Supply Company, and Exxon Company U.S.A., is planning to produce 5,000 bpd during commercial operation. Mobil, which includes lease agreements with Texaco, Getty, and Kerr-McGee, is planning to produce 40,000 bpd during commercial operation.

Each of the 10 proposals includes a three-phased approach towards developing the tar sand resource. The first phase, exploration, usually involves a review of data obtained from drill holes and core samples, which are analyzed for the percent of bitumen in the tar sand, water content, size of rock particles, and cohesiveness of the tar sand. The second phase, pilot, involves construction and operation of a small scale, tar sand facility. In this phase, oil is actually produced and analyzed for factors such as compatibility with oil product pipelines and refineries, percent of bitumen extracted from the tar sand, and quality of oil. During the commercial operation phase, oil is produced in greater quantities and sold.

PURPOSE AND NEED OF PROPOSED ACTIONS

The purpose of the proposed conversions is to allow exploration and ultimately development of the tar sand resource. The need for each conversion is related to the national demand for petroleum products and the national goal to reduce dependence on foreign oil as set forth in the Energy Security Act (Public Law 96-294).

In recent years, domestic production of petroleum products has not kept pace with domestic demand. The Energy Information Administration's 1981 Annual Report to Congress shows that supply and demand have increased over levels established in the 1970s but that imports rather than domestic supply have been making up the difference. (See Table A-2 for summary of petroleum supply and demand.) (The Energy Information Administration's 1983 report considers total hydrocarbon supply and does not present specific data for petroleum derived from shale, tar sand, and synthetics. The Administration's 1981 projections for synfuels are the most recent.) Mid-range projections for 1985, 1990, and 1995 show domestic demand, imports, and total supply dropping from the 1979 level. Imports are expected to remain at almost 31 percent of demand by 1995. As in the past, long-term demand is expected to be greater than production.

Development of any of the proposed conversion areas would help mature the synfuels industry by applying present technology on a commercial scale.

LOCATION OF PROPOSED ACTIONS

Map A-2 shows the location of the leases proposed for conversion within the 273,950-acre P R Spring STSA and the 107,249-acre Hill Creek STSA. Both STSAs are located in southern Uintah County, Utah, with a portion of the P R Spring STSA also within northern Grand County, Utah. Affected BLM Districts are Vernal (Book Cliffs Resource Area) and Moab (Grand Resource Area). Even though a small portion of the P R Spring STSA is within the Moab District, the Vernal District manages the entire STSA under a Memorandum of Understanding (BLM 1983d) between Districts.

Surface and subsurface ownership in the study area is mixed. The Federal Government retains all mineral

TABLE A-1
SUMMARY OF PROPOSED ACTIONS

Action	Beartooth A	Beartooth B	Bradshaw	Duncan	Enercor	Enserch	Farleigh	Kirkwood	Mobil	Thompson
Production (bpd)	150	150	150	150	5,000	150	150	16,000	40,000	150
Target Date Full Production	1986	1986	1986	1986	1988	1994	1986	1992	2000	1986
Project Life (Years)	100+	100+	100+	100+	100	100+	100+	50	28	90
Proposed Conversion (Acres)	1,181.19	1,520.37	320.00	1,600.00	26,583.56	1,080.00	640.00	3,907.51	3,337.60	74.48
Project Area	1,181.19	1,520.37	320.00	1,600.00	31,663.56*	1,080.00	640.00	3,907.51	16,438.97*	74.48
Type of Operation	In Situ	In Situ	In Situ	In Situ	Surface Mine & Extraction Plant	In Situ	In Situ	In Situ	Surface Mine & Extraction Plant	In Situ

*Project area includes more than leases to be converted. See Section B for site-specific project descriptions.

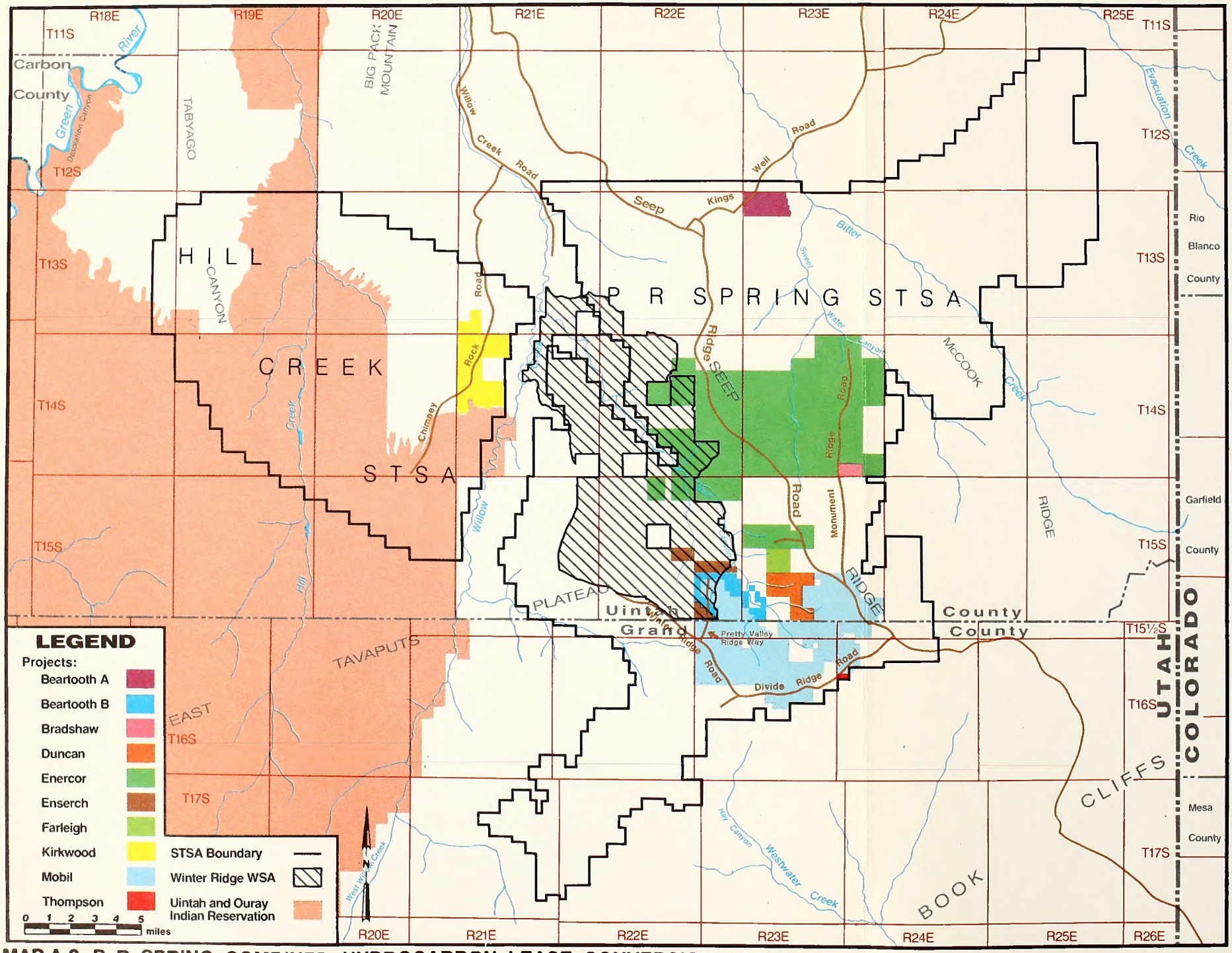
Note: bpd = barrels per year.

TABLE A-2
SUMMARY OF PETROLEUM SUPPLY/DEMAND BALANCE
(Million Barrels per Day)

	HISTORY			MID-RANGE PROJECTIONS		
Petroleum Balance	**1965**	**1973**	**1979**	**1985**	**1990**	**1995**
Domestic Supply	9.2	11.3	10.9	9.7	10.1	10.9
Shale, Tar Sand, and Synthetics	0	0	0	0.3	0.3	0.4
Net Imports	2.2	6.1	8.0	6.9	5.6	5.0
Total Supply*	11.4	17.4	18.0	16.6	15.7	15.9
Total Domestic Demand	11.5	17.3	18.9	16.6	15.7	15.9
Percent of Total Supply: Shale, Tar Sand, and Synthetics	0	0	0	1.81	1.91	2.52

Source: Energy Information Administration 1981.

*Numbers are rounded.



MAP A-2 P R SPRING COMBINED HYDROCARBON LEASE CONVERSION PROJECTS

rights to the proposed conversion areas. Four projects contain either state or private surface ownership over federal minerals. Federal, state, and private surface ownership in the proposed conversion areas are listed on Table A-3. The maps in Section C, Appendix 10 show ownership by project. Map A-2 shows the general location of each project.

TABLE A-3
SURFACE OWNERSHIP OF LEASES PROPOSED FOR CONVERSION
(Acres)

Proposed Conversion Area	SURFACE OWNERSHIP Federal	Private[1]	State[2]	Total
Beartooth A	1,181.19			1,181.19
Beartooth B	1,480.37	40.00		1,520.37
Bradshaw	320.00			320.00
Duncan	960.00		640.00	1,600.00
Enercor	25,933.56	650.00		26,583.56
Enserch	1,080.00			1,080.00
Farleigh	640.00			640.00
Kirkwood	3,427.51	480.00		3,907.51
Mobil	3,337.60			3,337.60
Thompson	74.48			74.48

Source: Applicants' plans of operations.

[1]Private surface estate over the federal mineral estate proposed for conversion.
[2]State surface estate over the federal mineral estate proposed for conversion.

AUTHORIZING ACTIONS

Decisions on the lease conversion application are based on the findings of this EIS and on the requirements of the Combined Hydrocarbon Leasing Act (CHLA). The Combined Hydrocarbon Leasing Act of 1981 (Public Law 97-78), which amends the Mineral Leasing Act of 1920, was enacted to facilitate and encourage the production of oil from tar sand and other hydrocarbon deposits. The Act redefines oil to include tar sand, provides for conversion of existing federal oil and gas leases and certain valid mining claims to combined hydrocarbon leases on special tar sand areas, and provides for the competitive issuance of new combined hydrocarbon leases within STSAs.

The CHLA and associated regulations are pertinent to this EIS because they permit lessees holding valid oil and gas leases within designated STSAs to convert their leases to combined hydrocarbon leases if they meet regulatory and environmental compliance provisions. Where the Secretary of the Interior finds that reasonable protection of the environment will not

be assured, all or portions of the leases may not be converted. (While the CHLA provides for the Secretary of the Interior to make the decision whether or not to convert the leases, this authority has been delegated to the BLM, Utah State Director.) A combined hydrocarbon lease conveys the rights to all hydrocarbons located on the lease except coal, oil shale, and gilsonite. The lease conversion decision must be based on a plan of operations submitted by the lessee/operator for tar sand development. If the leases are converted, a new lease is issued for an initial 10-year term to allow development of oil and gas and/or the tar sand resource. If the leases are not converted, they remain as valid oil and gas leases until the original lease term has elapsed.

Under the conversion regulations (43 CFR 3140), a decision on a conversion application must be made within 15 months after a completed plan of operations is received.

The applicants (or companies like Enercor that act as operators for other companies that hold leases) held valid oil and gas leases within the P R Spring and Hill Creek STSAs when their plans of operations were filed with BLM by November 15, 1983. The terms of one lease for 2,478.96 acres have been suspended pending the processing of the lease conversion application because the initial terms of the lease have expired. Should that lease not be converted, it would be terminated. The terms of the other 43 leases for 40,404.74 acres proposed for conversion have not been completed and could be extended beyond the normal termination date by timely drilling under the oil and gas regulations.

The CHLA requires that each lease conversion applicant file a complete, proposed plan of operations that assures reasonable protection of the environment and diligent tar sand development (43 CFR 3140.2.3(f)). (Reasonable environmental protection reflects a compromise between environmental protection and development of the tar sand resource; diligent development is considered to be production in accordance with an approved schedule starting in the 11th year of the lease (proposed regulations 43 CFR 3140, January 10, 1985). The ability to produce paying quantities depends on future oil prices, which cannot be accurately determined. The test of diligent development is subjective and must be reconciled or balanced with the stated CHLA objectives to promote tar sand development.) A plan of operations may include an exploration phase but must include a development phase. A plan of operations can be approved even though it may show that work under the exploration phase is needed to perfect the proposed plan for the development phase, as long as the overall plan of operations shows reasonable protection of the environment and diligent hydrocarbon development.

A plan of operations may be amended before or after conversion of a lease or valid mining claim to reflect changes in technology, slippages in schedule beyond the control of the lessee, new information about the resource or the economic or environmental aspects of its development, changes to or initiation of applicable unit agreements, or for other purposes. (Unit agreements refer to formal, written agreements between companies and/or a company acting as an operator for other companies.) BLM must approve significant changes to a plan of operations, at which time other government agencies and the public would have the opportunity to comment. These changes may begin the updating and supplementing of original environmental documents.

A combined hydrocarbon lease will contain all terms and conditions needed to ensure compliance with the plan of operations, including any needed stipulations that were part of the original oil and gas lease being converted (43 CFR 3570 and 43 CFR 3140). General provisions of an oil and gas lease that would likely be carried forward if a lease was converted are included in Appendix 2. The impact analysis of the applicants' proposed plans of operations assumes compliance with these provisions.

All leases would be accompanied by stipulations requiring compliance with all applicable federal, state, and local laws and regulations. Each lease conversion applicant would be responsible for obtaining these other authorizations and permits. Examples of federal authorizations and permits include those related to the Archaeological Resources Protection Act, Water Pollution Act, Safe Drinking Water Act, and Clean Air Act. General measures used in the analysis and to be required for these federal authorizations are listed in Appendix 2.

ALTERNATIVES CONSIDERED BUT ELIMINATED

No site-specific alternatives were eliminated from detailed analysis. As long as a lease conversion

applicant provides the data required by the CHLA and BLM lease conversion regulations, BLM cannot discount the validity of an application. These applications must be treated at face value and the National Environmental Policy Act (NEPA) process followed. The contents of each application represent the applicants' intentions toward diligent development. Alternatives to tar sand development such as conservation or solar energy are not considered in this EIS but are addressed in the ***Utah Combined Hydrocarbon Regional Leasing EIS*** (BLM 1983b), which discusses the entire federal tar sand program.

GENERAL DEVELOPMENT TECHNIQUES

Some aspects of the applicants' plans considered in this EIS are similar. This section discusses tar sand phased development; it is not intended to describe the actual approach to be used for any individual applicant's conversion area. Specific details on each applicant's plan of operations are provided in Section B, Site-Specific Analyses.

The following describes the typical exploration program, a small *in situ* pilot operation and commercial operation, and a typical commercial surface mining operation.

Exploration Phase

The exploration phase would determine the quantity and quality of tar sand ore underlying the conversion areas. For all applicants, the exploration phase would be critical to designing plans for commercial development because existing oil and gas leases do not permit tar sand exploration. Exploration for tar sand under a BLM-issued exploration license authorized under 43 CFR 3500 is allowed so that applicants can perfect their design plans. Current reserve estimates are speculative. Until reserve estimates are better defined, project plans can be only conceptual.

Generally, a two-phase exploration program, lasting from one to three summers, is planned. The first phase, reconnaissance exploration, identifies all existing data; provides familiarity with the physical characteristics of the area, including topography, roads, surface geology; and consolidates all the data before the next phase begins.

A field reconnaissance program entails driving on existing roads and hiking to selected locations to measure, describe, and hand-sample outcrop exposures. All existing data and the field data would be used to prepare an exploration drilling program.

The second phase would consist of drilling exploration wells and sampling cores, typically using a drilling rig mounted on a 2-ton truck chassis. The drill rigs typically have both air and mud drilling capabilities and are accompanied by a tandem-axle, water-hauling truck having a capacity of 200 to 2,000 gallons. Support vehicles would consist of one or two pickup trucks.

Drilling through the overburden down to the tar sand is usually accomplished by air drilling. Where a rotary bit is used, the cuttings are blown out of the hole with air.

Just before the tar sand zone is reached, the drilling method would change to core drilling using mud or water to remove the cuttings from the drill hole. Each hole is expected to be 200 to 300 feet deep.

The normal doughnut-shaped coring bit cuts a 3- to 4-inch diameter core of rock. The core sample would be visually inspected and then boxed for later sampling and testing.

Portable metal mud pits are usually used to prevent contamination of surface water.

Drill cuttings would be retained at the site, and if the test hole was free of ground water, the cuttings would be returned to the hole and the site reclaimed.

Wet holes where ground water is found would be plugged with concrete. Cuttings not disposed of downhole would be scattered on the surface as part of site reclamation.

Drilling crews would usually consist of three to five people. Exploration programs, including reconnaissance, drilling, geological logging, and reclamation, would involve 5 to 10 people at a time.

Actual drilling time per hole would be about 2 or 3 days. The entire exploration process, including reconnaissance, drilling, and reclamation, would not exceed 15 days per drill hole.

Because of the short time involved with most exploration processes, daily commuting to the job site is expected. For some larger drilling programs, local campsites would be established. During this phase, four vehicle trips per day are expected.

Drill pad size would vary from 50 feet by 50 feet to 100 feet by 100 feet with no more than ¼ acre needed for a drill site. Most drill sites would be located near existing roads and would not require any clearing. In a few cases, some temporary roads would be constructed and portions of the site leveled to accommodate equipment. All disturbance would be reclaimed when the road or site is no longer needed.

If the exploration drilling was successful in locating suitable tar sand for *in situ* pilot development and testing, the process would progress using the exploration hole as part of the pilot development.

Typical *In Situ* Operations

(The small *in situ* operation described below is typical of all proposed *in situ* projects except Kirkwood's, which is described in Section B.)

In situ combustion can occur in several modes. Forward combustion and reverse combustion, as shown on Figure A-1, are the two modes most likely to occur. In the forward combustion mode, the tar sand reservoir is ignited near the air injection well (air provides the oxygen to support the combustion as a burning front in the tar sand). The combustion front, supported by the air injection, radiates from the well bore. Continued injection of air maintains the combustion front through the reservoir in the general direction of the air flow. The mobilized oil moves ahead of the flame, driven by compressed air, and is brought to the surface in a production well. In the reverse combustion mode, the reservoir is ignited at the production well with air pumped at the injection well. The burn front volatilizes the bitumen as it moves from the production well to the injection well, while the compressed air drives the volatilized hydrocarbons through the zone that is not burned out.

Moderate amounts of water would be injected with the air stream. By using only the oxygen supplied in the air stream during the burning process, the water would flash into super-heated steam a short distance from the combustion front. Upon crossing the combustion front, the super-heated steam would mix with the nitrogen from the air and flue gas consisting mainly of carbon monoxide and carbon dioxide. This mixture of gases would displace the oil in front of the combustion zone, driving it into the producing well.

In the 10-acre well pattern size proposed, the combustion front would travel slowly (no more than 1 to 2 inches per day) and effectively sweep the oil toward the producing well.

The following description of the pilot and commercial process development applies equally to the forward and reverse process.

Pilot Phase

Five wells would be drilled on a 2½-acre pad. The distances and positions of these wells are shown on Figure A-2, 10-Acre Facility Pad Layout. The wells would be air-drilled using a small portable truck mounted rig, the same as described under exploration. The holes would be drilled with a 6 1/8-inch conventional bit to the top of the tar sand zone(s) at 150 to 300 feet. A core barrel and diamond core bit would then be run, and the completely saturated section of the zone(s) would be cored.

After the five wells have been drilled, cased, cemented, and perforated, an air flow test would be run to determine the air volumes and pressure needed to ignite and radiate the combustion front from the wells.

Following well completion, the support equipment shown in Figure A-2 would be installed, including a conventional oil well pumping unit.

During combustion, the oil in the tar sand may be ignited spontaneously by injecting air into the desired zone. The injected air may be heated to reduce the ignition time. Preheating is also used to control the initial location of ignition. Once ignited, the oil would begin to flow into the production well and the recovery evaluation would start.

The major uncertainty in the commercial *in situ* recovery of oil from the tar sands is not the field development process. The uncertainty lies in the amount of oil that can actually be produced and its rate of recovery. Thus, the traditional engineering study is replaced with a field or pilot test that serves to confirm the laboratory, scaled model, and analytical assessments. Once the assessment of air input and oil recovery is made in an actual field test, the project is scaled-up to a commercial-size venture.

As many as 20 workers, including 4 permanent operators, would be employed during operation of the pilot phase. Construction would take about 15 days. The total pilot phase would last for about 1 year, but several years would be needed to produce all the oil in the 2½-acre area.

About 30 bpd of produced oil would be trucked to a test facility and probably to a market in Utah. Pickups and carryalls would be used for transporting supplies and workers. Four vehicle trips per day is typical for this type of operation.

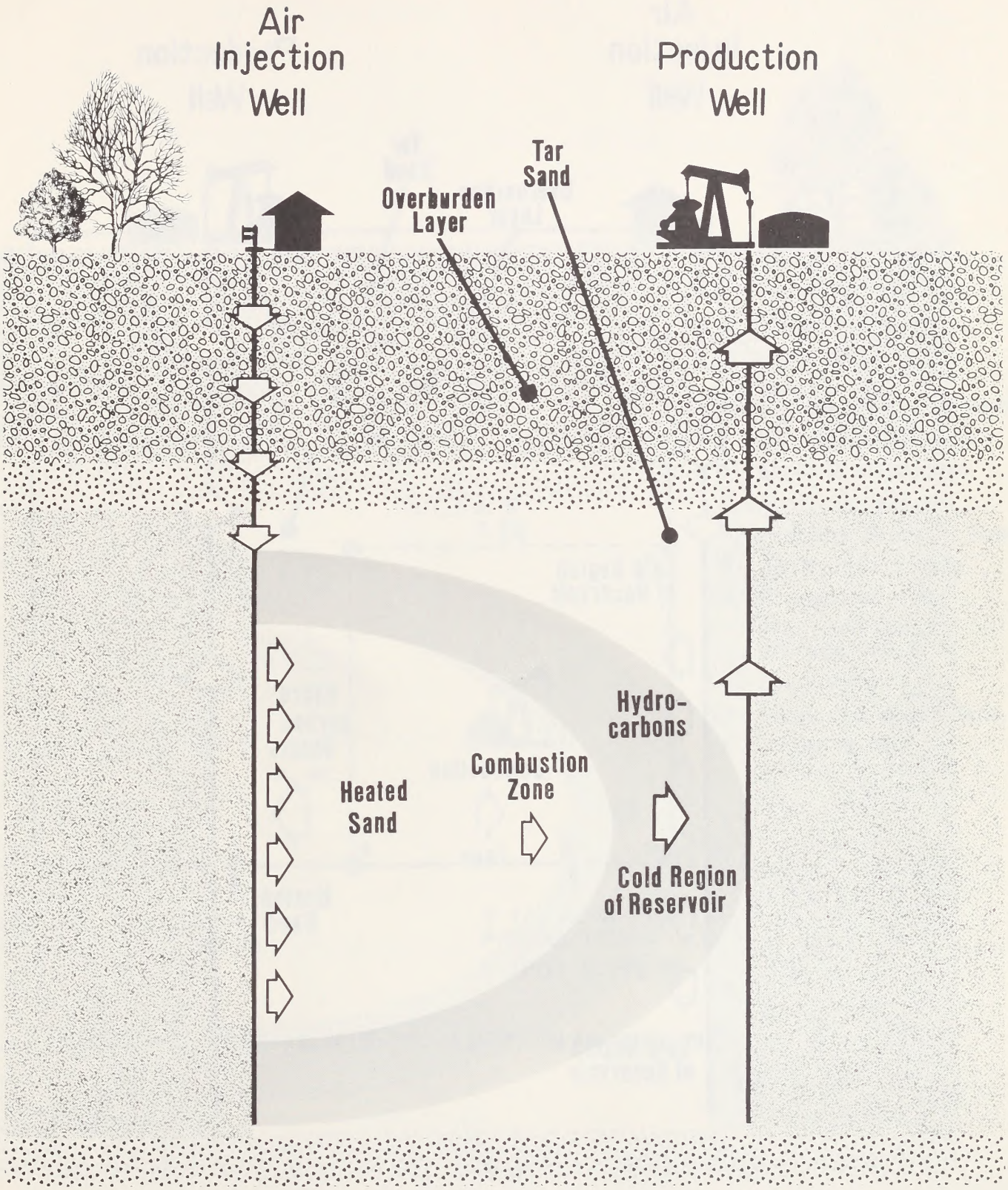


FIGURE A-1 FORWARD AND REVERSE COMBUSTION RECOVERY PROCESSES

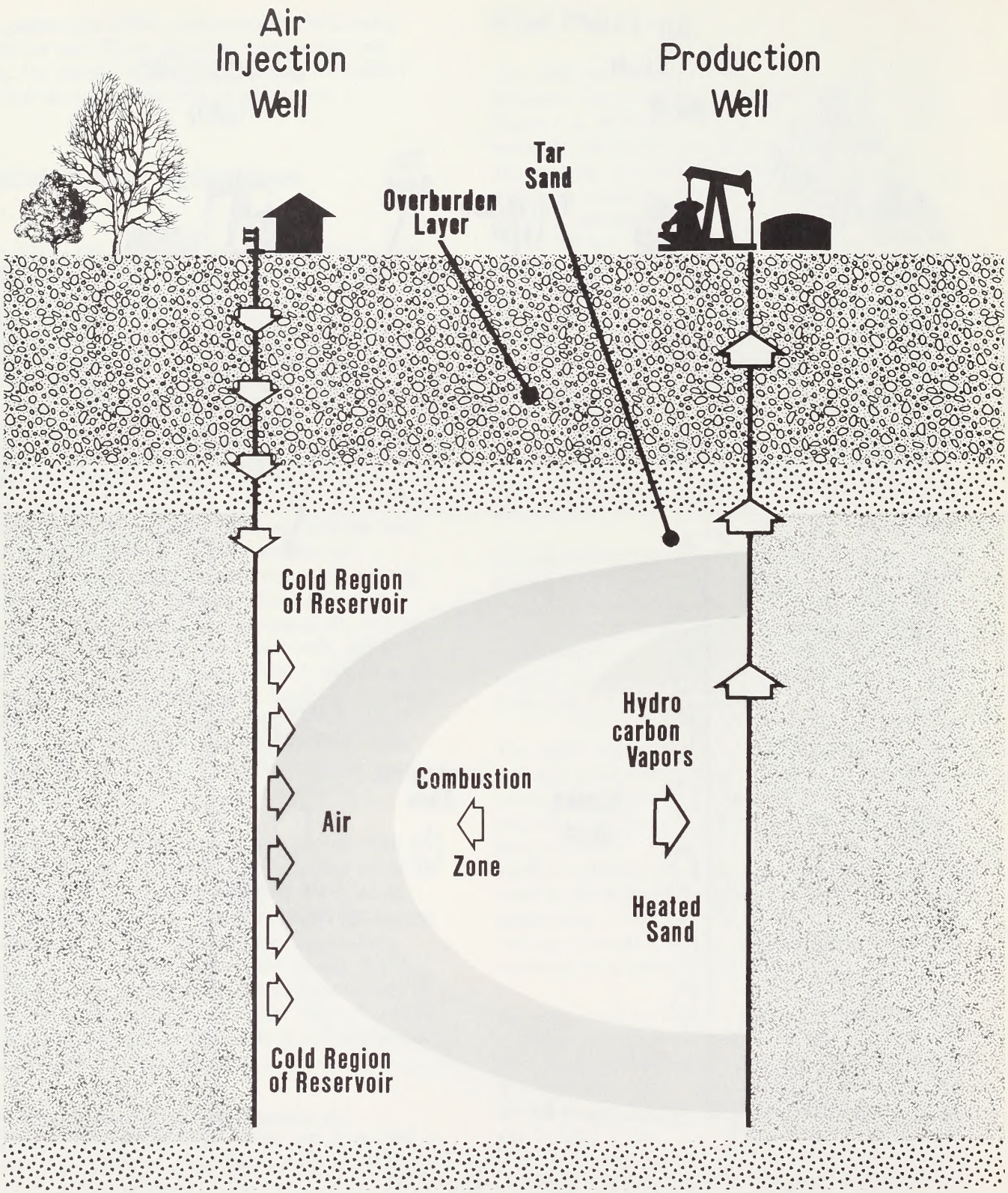
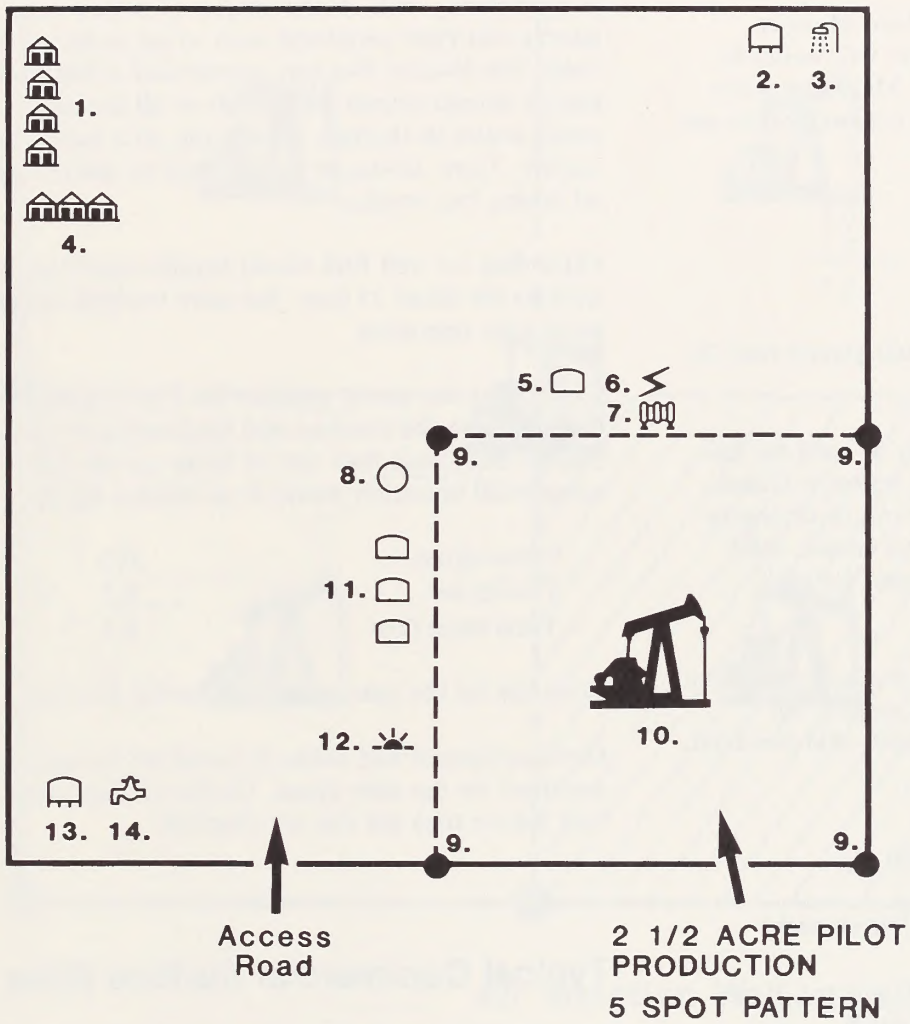


FIGURE A-1 (CONTINUED) FORWARD AND REVERSE COMBUSTION RECOVERY PROCESSES



KEY TO NUMBERS

1. Personnel Housing
2. Fresh Water Tank
3. Fresh Water Well
4. Supplies and Maintenance Warehouse
5. Diesel Fuel Storage
6. Electric Generator
7. Air Compressor
8. Propane Storage Tank
9. Air Injection Wells
10. Production Well
11. Produced Oil Storage Tanks
12. Dehydrator
13. Produced Water Tank
14. Water Pump

FIGURE A-2 PLAN VIEW OF PILOT SITE ON 10-ACRE PLOT

Four trailers would be provided during operation for the supervisory personnel required to be on location 24 hours a day. The trailer would be similar to present oil field camp facilities, which provide sleeping rooms, kitchens, bathrooms, and recreational rooms—all heated or air-conditioned as needed. Most likely, the trailers would be contract-facility-operated by an outside company. Power, heat, water, and sewage facilities would be provided.

To meet the need for the small amount of water required for the pilot facility, a water well would be drilled into the Wasatch formation. Maximum water use at the pilot facility would be as follows (gallons per minute—gpm):

Personal use	0.2
Facility use	2.5
Total requirement	2.7

A small 5,000-gallon water tank would gravity-feed the needed water.

A septic tank system would normally be used for disposing domestic sewage. Before the system is placed, adequate percolation tests would be run to determine leach field size and configuration. An on-site, solid waste disposal plan would be developed for each project.

The following equipment would be required during the pilot and commercial phases of this project. All proposed equipment would be portable, skid-mounted, and temporary.

- Air compression (1 MMcfd at 600 psi)
- Electric Generation (150 KW)
- Production Tanks (three at 210 barrels each)
- Dehydration Equipment
- Water Supply and Storage (5,000 gallons)
- Reservoir to Surface Recovery System
- Fuel Storage
  - a. Diesel (210 barrels)
  - b. Propane (domestic use with housing)
- Personnel Housing (four units)
- Supplies Warehouse and Repair Shop

To reduce the possibility of fire, vegetation would be removed within a 10-foot-wide area surrounding the proposed pilot site. Mobile fire equipment, such as fire extinguishers, and limited quantities of water would be used at the site in the event of fire.

Commercial Phase

After 1 year of successful operation, the pilot test site would be expanded into a full 10-acre commercial development. Eight more wells would be drilled as shown on Figure A-3. The northwest well in the original pilot project would be converted from an air injection well to a producing well. This conversion would allow the commercial project to operate with five producing wells on the interior of the air injection pattern and eight peripheral wells to act as air injection wells. The 10-acre, five-spot commercial production project should recover 150 barrels of oil per day, which would be trucked, once a day, to a local Utah market. Three 210-barrel tanks would be used to store oil during bad weather.

Expanding the well field would require only four more workers for about 15 days. No more workers would be needed for operation.

The 10-acre site would produce for 5 to 55 years depending on the numbers and thicknesses of the zones tapped. Maximum flow rate of water use for full commercial operation would be as follows (gpm):

Personal use	0.2
Facility use	8.3
Total water flow	8.5

Total use for the year would only be 0.3 acre feet.

Other equipment and methods would be the same as described for the pilot phase. On the average, only four vehicle trips per day are expected.

Typical Commercial Surface Mine

A truck-and-shovel mining operation would be the typical tar sand recovery method in the project areas. Generally, the tar sand beds dip 2 to 4 degrees to the northwest. The dipping structure, the highly variable overburden/interburden thicknesses, and the lens-shaped characteristics and variable bed thicknesses of the tar sands support the choice of a multi-bench, truck-and-shovel mining operation to ensure flexibility and economic reserve recovery. Throughout the mine life, more overburden/interburden benches and equipment would be added as required to uncover the deeper lying tar sands areas.

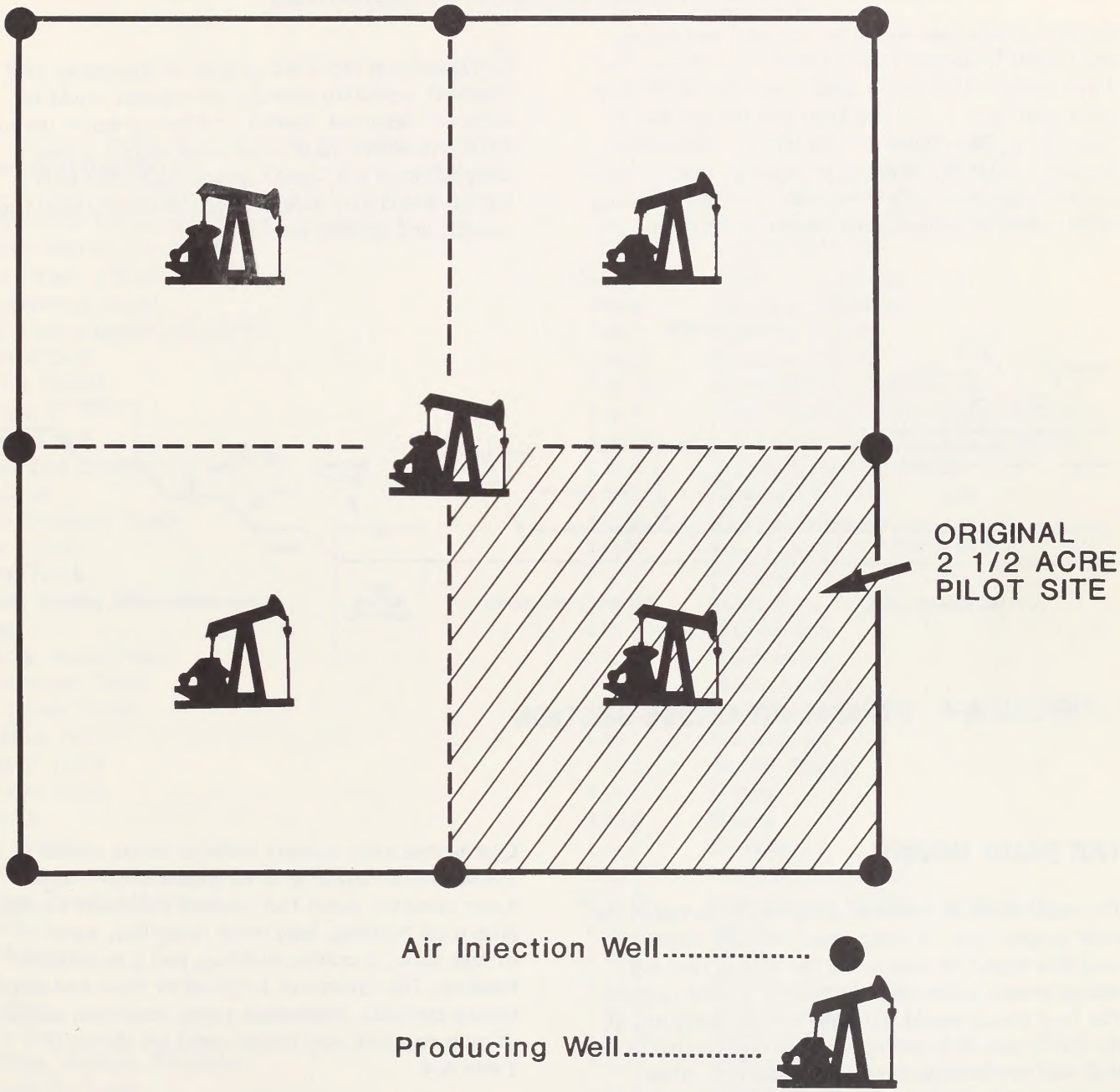


FIGURE A-3 EXPANDED 10-ACRE COMMERCIAL SITE

PREPARATION

Initially, topsoil materials would be identified and loaded by rubber-tired scrapers and temporarily stockpiled before the overburden was removed.

Exposed overburden would be loosened by blasting and loaded by 26-cubic-yard shovels into 170-ton end dump trucks. Haul trucks would carry the overburden and dump the material (backfill) into the previously mined area. (See Figure A-4 for typical cross-section diagram.) After the upper level tar sands were removed, the interburden materials overlying the lower sands would be removed and placed in the same manner as the overburden. This step would be followed by recontouring to approximate premining conditions, using dozers. During excavation, some temporary overburden and interburden stockpiling may be needed.

If material was identified as toxic or hazardous or if it inhibited vegetation growth, the material would be selectively removed, hauled, and buried below the root zones and above the ground water surface. Some compaction of the topsoil, overburden, and interburden would also occur during the normal haul truck, scraper, and grading activity cycles.

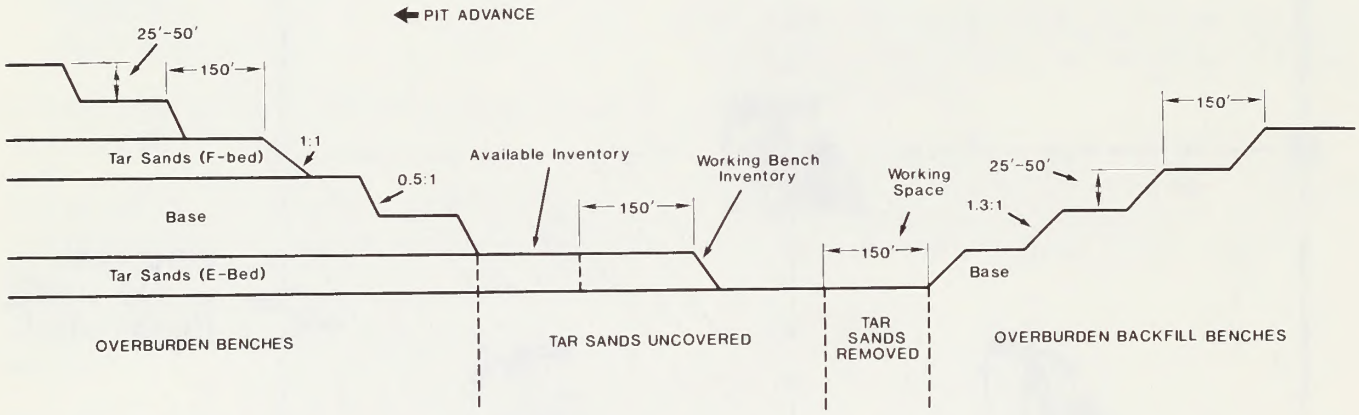


FIGURE A-4 TYPICAL PIT CROSS SECTION

TAR SAND MINING

Tar sands could be removed from two beds within the same project area. In some cases, only the upper tar sand bed would be mined, but the typical two-bed mining system is described because it is more complex. The haul trucks would transport the tar sands out of the pit by way of a system of ramps constructed in the beds and overburden/interburden material. After leaving the pit, the loaded trucks would follow the main haul road to the central processing plant. The tar sands would then be dumped into a crusher, conveyed to open storage piles, and sampled prior to on-site processing. After the bitumen was extracted, the spent sand would be returned to the pit in a manner similar to that used for interburden and overburden. That portion of the mine would then be reclaimed.

Commercial mine support facilities would consist of an administration building, a warehouse-shop-change house complex, diesel fuel storage, explosives storage, lube/wash building, haul truck ready line, water storage tanks, a utilities building, and a reclamation building. The equipment is typical of truck-and-shovel mining methods. Equipment types, maximum number of units required, and major use(s) are shown in Table A-4.

Construction employment for the proposed commercial surface mines could range from 200 to 2,800 workers; operation employment could range from 250 to 500. The workers would mainly perform the following tasks: (1) overburden/interburden stripping; (2) tar sands production; (3) reclamation; (4) surface facilities construction; (5) administration; and (6) supervision.

TABLE A-4
REQUIRED SURFACE MINE EQUIPMENT

Equipment Description	Number	Major Use
Overburden/Interburden Shovel, 26 cu. yd.	2 to 4	Overburden/Interburden Removal
Topsoil Shover, 26 cu. yd.	2 to 4	Topsoil Removal
Haul Truck, 170 ton	49 to 100	Cleanup, Regrading
Rubber-tired Dozer	4 to 8	Cleanup, Regrading
Overburden/Interburden Drill	2 to 4	Blasthole Drilling
Topsoil Drill	1 to 2	Blasthole Drilling
Motor Grader	5 to 10	Roadbuilding, Maintenance
Scraper	3 to 6	Topsoil/Subsoil Removal, Roadbuilding
Water Truck	5 to 10	Road Maintenance, Dust Suppression
Front End Loader	2 to 4	Topsoil Loading, General
Backhoe	1 to 2	Ditching, General
Bulk Explosive Truck	4 to 8	Explosives Handling
Fuel Truck	2 to 4	Maintenance
Lube Truck	2 to 4	Maintenance
Dump Truck, 14 cu. yd.	1 to 2	Maintenance, Utility
Crane	1 to 2	Maintenance
Electric Boom Truck	1 to 2	Maintenance
Electricians' Truck	1 to 2	Maintenance
Mechanics' Truck	1 to 2	Maintenance
Welding Truck	1 to 2	Maintenance
Flatbed Truck	1 to 2	Supply, Utility
Powder Truck	4 to 8	Supply
Forklift	4 to 8	Supply
Soil Sampler	1 to 2	Reclamation
Lowboy	1 to 2	Maintenance, Utility
Pickup Truck, 1/2 ton	40 to 80	Maintenance, Utility, Transportation
Firetruck	1 to 2	Safety
Ambulance	1 to 2	Safety
Lift	1 to 2	Maintenance
Pit Bus	5 to 10	Transportation
Tour Bus	1 to 10	Transportation
Welding Machine, Portable	3 to 6	Maintenance
Electric Pit Pump	2 to 4	Maintenance
Diesel Pit Pump	2 to 4	Maintenance
Light Plant	8 to 16	Safety

Note: cu. yd. = cubic yard.

RECLAMATION

Reclamation would occur in stages concurrent with mining operations. The typical reclamation sequence is shown in Figure A-5.

DRILLING AND BLASTING

Drilling and blasting would be needed at tar sand mines to loosen the overburden, interburden, and tar sand materials before excavation by the loading shovels. An ammonium nitrate and fuel oil mixture would be the major type of explosive used for this type of blasting. During the life of the mine, most of the overburden/interburden and tar sands would be blasted. The frequency of blasts would depend on the stripping and production requirements. All blasts would occur at the end of the work shift.

Blasting procedures would comply with federal, state, and local laws and regulations pertaining to the storage, handling, preparation, and use of explosives. Maximum charge flyrock distance restrictions and peak particle velocity restrictions would also comply with applicable laws and regulations.

MINE DRAINAGE SYSTEM

The commercial mine and associated disturbed areas would be maintained using various drainage structures to prevent significant water quality deterioration and stream bank erosion. These structures would be described in the mine plans. Each overburden/interburden stockpile or valley fill would be drained by a riprap-lined diversion ditch network leading into an adequately sized sedimentation structure before water was allowed to flow into an existing watercourse. Drainage structures would also be provided at required points along access roads, pit roads, and work areas to control runoff and erosion.

The pit area would have a riprap diversion ditch network built around the top of the highwall, along the pit ends at the ridge/tar sands outcrop, and at the crest of the backfill benches to prevent water inflow. Water that collects in the pit area would be drained using portable diesel and electric pumps. All water diverted or drained from the pit area would be moved to an adequately sized sedimentation structure before being introduced into the closest naturally existing water course. Water flow velocity reduction devices would be used wherever mine water would be introduced into existing drainages. These structures would be adequate to prevent significant deterioration of water quality, excessive particulate matter increases, and stream area erosion. Sedimentation ponds would be located in the reclaimed backfill or in neighboring valleys as appropriate. In addition, fences would be built around all long-life sedimentation structures and at all area access points to prevent livestock from entering the area.

COMMERCIAL PROCESSING

The ultimate goal of the proposed plans of operations is to produce synthetic crude oil for use in an oil refinery. To achieve this goal, the raw bitumen would need to be extracted from the host material and upgraded to desired specifications.

Run-of-mine ore would be delivered to a processing plant using trucks from the tar sand mine. The ore then would be moved by feeders and conveyors to crushers where it would be reduced to the size required for extraction.

Three general processes of tar sand extraction could be used: hot water extraction, solvent extraction, and thermal extraction. Specific processes for each project are described in Section B.

PROJECT-RELATED ASSUMPTIONS

The following resource assumptions were used in analyzing the impacts from the proposed projects:

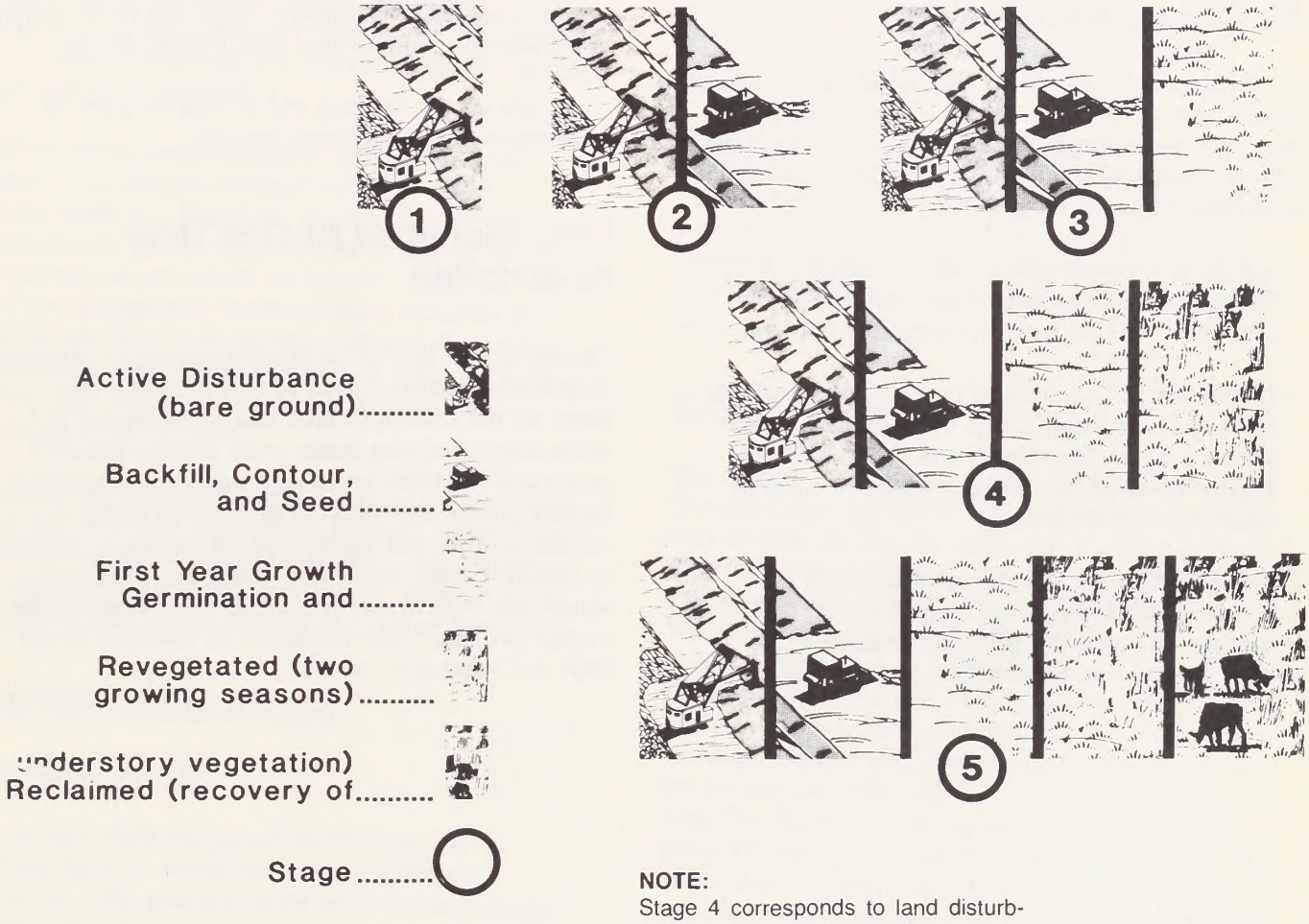
General Assumptions

1. Baseline conditions assume normal growth and changes are occurring in the study area.

2. The impact analyses for all resources are based on the measures identified in Appendix 2.

3. After lease conversion but before development, more environmental analyses and permit approvals may be required by federal regulatory agencies. State and local agencies may also require more studies, permits, or approvals.

4. Each project is analyzed as though none of the other proposed projects would occur. This approach



NOTE:
Stage 4 corresponds to land disturbances that occur at one time and includes all stages of reclamation (represented as "acres disturbed at one time" on Tables 1-19 through 1-22 and shown graphically on Figure 2-1).

FIGURE A-5 TYPICAL RECLAMATION SEQUENCE

allows the various federal, state, and local decision-makers to assess the effects of each project as though it was the only one to occur.

5. Analyses for the Beartooth B, Enercor, Enserch, and Mobil projects are based on the assumption that the Winter Ridge WSA would not be Congressionally designated as a wilderness and that the conversion areas would be developed.

Air Quality Assumptions

A screening-level analysis was used to identify potential air quality problem areas. Because engineering details have not been prepared for the proposed projects, the following assumptions were made in order to compile an emissions inventory:

— All the proposed projects would require a Prevention of Significant Deterioration (PSD) of Air Quality permit from the State of Utah; and

— During the PSD permitting process, Best Available Control Technology (BACT) and emission limitations would be determined, and site-specific air quality modeling to determine pollutant concentrations would be done.

The analysis in this EIS is intended to satisfy the requirements of NEPA rather than fulfill the PSD permitting requirements. However, because PSD permits would be needed, impacts are compared to the quantitative criteria contained in the PSD regulations. Also because NEPA requires analysis of all potentially significant impacts, other issues such as acid deposition, which is not specifically addressed in the PSD regulations, have also been considered.

Transportation Network Assumptions

— Either upgraded, all-weather roads will be developed to haul oil products from each project site, or

— On-site storage facilities will be built to store oil products during inclement weather.

Land Disturbed At One Time Assumption

Calculations of land disturbance occurring at one time, as shown in Section B data summary tables, were based on the amount of land that would be out of productive use during steady-state, commercial-level operations. Establishing enough understory vegetation (mainly grasses and forbs) to provide soil stability, erosion control, and initial livestock grazing is assumed to require 4 years. More time would be needed for shrubs and trees to recover to effective wildlife habitat or near-predisturbance conditions as discussed in the Soils and Vegetation sections.

DESCRIPTION OF THE AFFECTED ENVIRONMENT COMMON TO ALL PROJECTS

This chapter describes the baseline environmental conditions that would be affected by the applicants' proposed projects. These baseline conditions are the assumed future environmental conditions that would exist if normal growth and changes occurred in the area. The effects of the proposed projects and interrelated future baseline conditions (affected environment) focuses on the time when the impacts of each applicant's proposed project would be greatest—the year when each applicant's construction work force would peak and the year when its operation work forces would peak.

Energy development, primarily oil and gas development, has already changed the Uinta Basin environment in a significant manner. The oil and gas development and its effect on environmental elements are considered as part of the baseline conditions. Oil and gas development would probably continue at a similar rate of growth through 1985 and then have a slower or diminishing rate of growth (State of Utah 1983). This projected oil and gas impact is also included in the baseline.

The area for a particular resource or condition is the area that would be significantly affected, either directly or indirectly by the proposed projects. The extent of the area varies for different resources, depending on how far-reaching the effects of the project would be.

WATER RESOURCES

Surface Water

The project areas are located in the Green River drainage basin at elevations between 6,000 and 8,300 feet. This area is a gently northwesterly sloping plateau with deeply incised canyons formed by streams. Within this setting, three types of hydrologically similar watershed areas occur.

The headwater areas of the watersheds are on the undissected plateau tops. This area has gently rolling topography, fairly deep soils, and either a grass sagebrush or grass pinyon-juniper vegetation cover. Streams are ephemeral with low gradients but usually have fair bank cover. The middle portion of a typical watershed is dominated by steep slopes with shallow soil or bare rock outcrops. These areas may have grass, pinyon-juniper, or no vegetation cover. Numerous small springs and seeps occur as water-bearing rocks outcrop along these steep slopes. Runoff is rapid through steep, straight, narrow channels. At the bottom of the steep slope is the canyon bottom where the stream has formed a nearly level floodplain. This area has very deep soils and thick grass and sagebrush cover. Some springs occur near the base of the steeper-sloped part of the watershed. Stream flow through these bottomlands is maintained throughout much of the year by spring flow and the delayed release of water stored in the alluvial fill.

Overall, watersheds produce quick reactions to thunderstorms and snowmelt. High stream flows can occur within minutes because of the fine-grained soils, numerous rock outcrops, steep slopes, and straight channels. The high energy levels associated with these high stream flows can also produce high sedimentation rates.

Ground Water

The near-surface geology of this area consists of the Douglas Creek member of the Green River formation. This member dips to the north at a slightly greater rate than the land surface does. To the south, the Douglas Creek member is truncated by the Roan Cliffs. The Wasatch formation is below the Douglas Creek member. Both of these formations are composed of siltstones and sandstones. Water saturates the sandstone beds in the lower Douglas Creek and the Wasatch. These water zones may be below or above the tar sand deposits and vary in the degree of saturation. The Douglas Creek aquifer is about 1,000 feet below the surface, just north of the project areas. The upper water-bearing zones outcrop in the project areas and to the south along the Roan Cliffs. Yields from 4 to 15 gpm are reported by Lindskov and others (1983) for wells tapping the Green River formation, but none are within or near the project areas. Springs and seeps are located where these sandstones outcrop along steep slopes and drainageways. Most spring discharge is less than 10 gpm, and characteristics suggest that the ground water flow in the upper system is local (Lindskov and others 1983). Recharge is from precipitation and ponded water on the plateaus and upper slopes, while discharge is to springs, streams, and seepage to lower aquifers. Little recharge reaches the saturation zone by passing through the tar sand beds.

Ground water typically has a sodium-magnesium-calcium-sulfate-bicarbonate-type quality. In this area of new surface tar sands and oil shales, a relatively high organic water content may be expected.

Water Use

Water is not used extensively in the project areas. Livestock and wildlife watering are the only present uses within the areas. In the immediate vicinity but outside of the project areas, water is used for for domestic, industrial, and irrigation purposes (livestock, fish, and wildlife). A ranch house, located on private property along Main Canyon, uses ground water for a domestic supply. A small surface reservoir near the ranch house in Main Canyon supports a privately stocked trout fishery, and springs throughout the Book Cliffs area are used by wildlife. Runoff through side canyons as well as Main Canyon flood-irrigates and sub-irrigates grasslands on the canyon bottoms. Geokinetics operates an *in situ* oil shale facility north of Enercor's proposed project, which uses ground water from the Douglas Creek aquifer. Geokinetics only uses the wells for potable water for its field office.

SOCIOECONOMICS

The area of influence for socioeconomic impacts consists of Uintah and Duchesne counties. Communities and other jurisdictions that are expected to receive significant impacts are listed in Table A-5.

Population

The 1980 Uintah County population was 20,506. About 79 percent of the county's population live in the Vernal area, which serves as the region's retail and service center (BLM 1984b).

The 1980 Duchesne County population was 12,565. Duchesne, Myton, and Roosevelt are the largest communities in the county (USDC 1981). Duchesne, which would not receive significant impacts and is included under other CCDs in Table A-5, is not the same as Fort Duchesne, a small community in Uintah County that would receive significant impacts. Roosevelt (Duchesne County) and Ballard (in Uintah County) are treated as a single community.

In 1982, population of the Uintah and Ouray Indian Reservation totalled 2,270, including enrolled Utes and their families and about 200 non-Utes. An estimated 1,000 additional enrolled Utes and their families, presently living elsewhere, are entitled to reside on the reservation and are projected to move there by the year 2000. If many move, the total Indian population in that year would number about 3,000 (Ford, Bacon & Davis Utah Inc. 1982; BLM 1983a).

Employment and Unemployment

Mineral extraction, primarily oil and gas development, is the most important private industry in Uintah County. Growth in this industry was primarily responsible for the county's 62 percent population increase between 1970 and 1980. It directly accounts for nearly 23 percent of the employment and 36 percent of the income in the county. Other sectors that contribute to employment and support of the local economy include the Federal Government, which accounts for 5 percent; manufacturing, which accounts for 2 percent; agriculture, which accounts for 6 percent; and tourism, which accounts for all undefined parts of the total county employment.

Duchesne County has an economic base similar to that of Uintah County; however, it is more dependent on mineral extraction, primarily oil and gas development. Growth in the petroleum industry was mainly responsible for the county's 72 percent population increase between 1970 and 1980. It accounts for 30 percent of the employment and nearly 44 percent of the income. Duchesne County also has a small manufacturing sector (4 percent of employment) and the Federal Government sector (7 percent of employment). Another sector which generates local employment is agriculture (12 percent of local employment). Tourism accounts for all of the undefined parts of county employment (BLM 1984a).

Unemployment rates had risen to 13 percent in both Duchesne and Uintah counties by 1983 as a result of energy industry layoffs. Without large scale energy development, the area would likely continue to have a labor surplus.

Figures for the Ute Tribe on the Uintah and Ouray Indian Reservation in 1982 showed 48 percent of the potential labor force employed and 10 percent actively seeking work. Over half of those employed worked in clerical or crafts occupations. Many of the unemployed

TABLE A-5
ECONOMIC AFFECTED ENVIRONMENT

Community or Jurisdiction	1980 Population	1983 Total Employment	1980 Per Capita Personal Income
Duchesne County		6,120	$7,302
Myton	500		
Roosevelt-Ballard (part)[1]	3,842		
Other Roosevelt CCD	5,372		
Other CCDs	2,851		
Uintah County		10,060	$7,837
Fort Duchesne	1,000		
Gusher	25		
Lapoint	100		
Ouray	50		
Randlett	400		
Roosevelt-Ballard (part)[1]	558		
Other Uintah and Ouray CCD	2,205		
Vernal[2]	16,168		
Uintah and Ouray Indian Reservation	2,270	465	$8,600

See Appendix 3 for data sources and analysis methods.

[1]Roosevelt and Ballard are treated as a single community
[2]Vernal Census County Division.
[3]Figures for the Uintah and Ouray Indian Reservation are shown separately, but are also included in the county totals.

Note: CCD = Census County Division.

are hampered by lack of education, training, and work experience. Jobs supplied through the Tribe account for 60 percent of the recorded employment. These include tribal government operation and several tribal enterprises. Fewer than 10 Utes worked in the oil and gas industry (Ford, Bacon & Davis Utah Inc. 1982; National Institute for Socioeconomic Research 1982).

Some Native Americans receive royalty payments from oil and gas production on their land. Tribe members also receive annual dividends from the tribal budget. Income from these two sources is estimated to be less than $6,000 per capita (Coonrod 1984).

Per Capita Personal Income

Both Duchesne and Uintah counties have been below the Utah state average in per capita personal income (PCPI), but both have been increasing at a faster rate than the state. In 1980, Uintah County had surpassed the state average PCPI of $7,631 by 3 percent with a PCPI of $7,837, while Duchesne County's 1980 PCPI of $7,302 was just 4 percent below the state average (BLM 1983b).

The average PCPI of Utes living on the reservation was estimated to be $8,600. Because population and income estimates are not made every year, a PCPI for each year cannot be determined. As a result of high unemployment and relatively low-paying occupations, incomes earned from employment are estimated to account for less than half of the total income received by those on the reservation (Ford, Bacon & Davis Utah Inc. 1982).

Other Affected Industries

AGRICULTURAL OPERATIONS

Agriculture on the affected portion of the STSA consists entirely of livestock grazing. Most livestock operations depend on BLM allotments for part of their forage. Based on the average budgets of the varying operations, most operators should be able to cover their long-term costs. However, the ranching operations differ in degree of indebtedness, operating cost, and size of operations, suggesting that some operators may not be able to meet long-term or cash costs. The returns to smaller operators have generally been too small to be the sole source of their income (Hughes 1983; Duncan 1983).

HUNTING, FISHING, AND NONCONSUMPTIVE WILDLIFE USE EXPENDITURES

Hunting, fishing, and nonconsumptive use of wildlife such as birdwatching or photography bring income to the local economy in the form of local expenditures by both local and non-local persons. Purchases are made for lodging, food, gas, and sporting goods.

Infrastructure

A housing shortage in Uintah County was indicated by low vacancy rates and higher than average housing prices in 1980 and 1981. By 1983, this housing shortage no longer existed because of continued housing construction, a slump in the oil and gas industry, and completion of major projects (such as the Bonanza power plant).

Many of the schools in Uintah County have been operating over capacity. Three schools have been operating at 150 percent over capacity and one school, at 256 percent over capacity. To help alleviate the problem, two new elementary schools were opened in 1983. A new high school is under construction in Vernal and will be completed in 1986.

Both Duchesne and Uintah counties have existing shortages of medical personnel, particularly for mental health care. They also have deficient jail space. Uintah's jail does not comply with federal and state standards; however, a new expansion project will be completed during 1985 (BLM 1984b).

The water system for Vernal and the surrounding area is operating at 50 percent over capacity. Two new water systems are presently being developed. The sewer system is also operating over capacity; however, a new system with a 40,000-person capacity is now being installed (BLM 1984b).

Uintah County and the City of Vernal cooperate in maintaining the Ashley Valley Fire Department. The Department is staffed by 25 volunteers and has four pumpers and a foam- and dry-powder truck. Naples has its own volunteer fire department with 20 volunteers and one 1,000-gallon pumper.

Ballard is served by the Duchesne County Fire Department in Roosevelt. The Roosevelt Fire Department is adequate for existing needs. The Department is

equipped with two pumpers and a tanker with a combined capacity of more than 2,000 gallons (BLM 1983b).

At present the Uintah and Ouray Indian Reservation has a shortage of 65 housing units and an additional 35 units need to be replaced (Superintendent, Uintah and Ouray Agency 1984a). New housing construction by the Ute Indian Housing Authority has averaged 22 units a year. Enrolled Utes moving to the reservation are expected to increase the demand for housing (BLM 1983a).

Indian children attend either local public schools or Bureau of Indian Affairs (BIA) boarding schools. Population growth on the reservation would combine with other population increases in Uintah and Duchesne counties to place additional pressure on local school facilities. The current trend of closing BIA boarding schools could aggravate such problems (BLM 1983a).

An Indian Health Service medical clinic provides health care to the Indians; dental services are provided by the U.S. Public Health Service. Present levels of service are generally rated as satisfactory, but future baseline population growth would cause a need for additional personnel. The present average of one police officer for every 135 persons is well above the guidelines of two officers per 1,000 population suggested by the Utah State Government, but it is necessitated by the dispersed pattern of settlement. Future baseline growth would require more law enforcement personnel (Ford, Bacon & Davis Utah Inc. 1982).

Current water sources consist of springs that could accommodate a 9 percent annual population growth through 1999. However, the distribution system is already strained and would require improvements costing from $12 million to $20 million (1981 dollars). Water that is supplied to some local communities imposes a further burden on the system. The sewer system includes lagoons at several locations, most of which are currently experiencing problems or cannot be expanded. A regional system is under consideration but has not been designed or costed. Fire protection is provided by the BIA (BLM 1983a, BLM 1983c).

Quality of Life

Most of the social effects associated with the applicants' proposed projects would occur in Uintah and Duchesne (particularly the City of Roosevelt) counties, Utah. Because of oil and gas activity over the last several years, these counties have already experienced a moderate level of industrialization and significant population growth. The experience gained from shifting the local economic base from agricultural to industrial uses should be a valuable asset to both officials and residents (Mountain West Research 1982). The traditional western farming and ranching communities are losing their identity because of recent energy development. Despite a high proportion of Mormon residents, the importance of this factor in community life is declining, as large numbers of newcomers have entered the communities (BLM 1982a).

Social changes are already evident: the communities have become more diverse, segmented, and impersonal. Attitudes toward growth among leaders and residents are positive, but synfuel development is still considered an uncertainty. Residents appear to have limited misgivings about the social costs and benefits of growth. However, most residents in the area favor the placement of industrial facilities and associated jobs (APA Planning and Research 1981).

The Ute traditional life style emphasizes independence and self-reliance and does not readily combine with western cultural patterns of interdependence and collective action. The Utes want the freedom to maintain their traditional way of life to the extent possible and believe that preserving the integrity of the reservation offers their only hope of doing so. Degradation of their land, water, or air; improved access to reservation land; and the cultural pressures caused by outside population growth are seen as potentially threatening to their interests. These concerns are particularly strong in regard to the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation, an area closely associated with their cultural values (National Institute for Socioeconomic Research 1982).

Lack of training and work experience presently limit outside employment opportunities. The Tribe has recently started a vocational training program to improve the members' job skills, and applications have exceeded the program's planned capacity (Cuch 1984). Because of the economic slowdown in the area, trained Indians are having more difficulty finding work.

Federal law establishes the tribal government as an autonomous authority that is not subordinate to other

state and local governments. This independence means, however, that state and local laws providing impact mitigation, such as Utah Code Annotated Section 63-51-10 (Supp. 1981), also known as Senate Bill 170, would not apply to the reservation. Alternate sources of assistance would most likely be non-impact-related federal grant programs, such as those administered by the Environmental Protection Agency (EPA) and the Department of Housing and Urban Development (HUD). Because most impacts to the reservation would be secondary, the applicants and the Tribe would need to cooperate to provide mitigation similar to that available to other local jurisdictions through Senate Bill 170.

AIR QUALITY

Climate

The climate in the area of the P R Spring STSA is semi-arid continental. It is characterized by low relative humidity, abundant sunshine, low to moderate precipitation (16 to 20 inches per year), warm summers, and cold winters. The growing season in the area is approximately 100 days (EDS 1968). The precipitation patterns follow elevation contours, with the highest annual precipitation along the ridges and high plateaus.

Dispersion Climatology

The meteorological data most pertinent to the project areas is from the White River oil shale project, Tracts U-a/U-b, about 31 miles north-northeast of the project area. The site is located in the drainage shed of the White River, which flows from east to west in that area. Westerly winds dominate, attributed to both the regional westerly flow and the daytime upslope winds. A secondary peak out of the southeast results from nighttime and early morning drainage flow down the White River. Tracts U-a and U-b are influenced by local topography and, thus, not strictly applicable to the project area. However, given the lack of on-site wind data, the U-a/U-b monitoring site was judged the best available and was used for the modeling analysis.

Stability for the U-a/U-b data was determined using hourly wind direction, standard deviations, and wind speed according to methods proposed by Mitchell and Timbre (1979). Neutral conditions prevail in the P R Spring area, occurring 49 percent of the time. The atmosphere is unstable 27 percent of the time and stable about 24 percent of the time.

Criteria Pollutants

The project areas are principally rural with light industrial activity; therefore, the existing air quality is good. Ambient air quality has not been monitored within the project areas. Measured total suspended particulate matter (TSP), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2) concentrations at sites within or near the project areas are given in Tables A-6, A-7, and A-8, respectively. With the exception of TSP, ambient concentrations are well within the primary and secondary National Ambient Air Quality Standards (NAAQS). Carbon monoxide (CO) and ozone (O_3) were measured at the U-a/U-b site and were within the NAAQS, although ozone levels were relatively high for a rural area. The high ozone concentrations probably resulted from natural sources, possibly subsidence of stratospheric ozone, rather than human sources.

Lead has not been monitored in the project areas. Because of the lack of major industrial sources of this pollutant and relatively few vehicles, lead concentrations are expected to be well below the primary NAAQS.

Monitoring data indicate that eastern Utah experiences TSP annual geometric mean concentrations as low as 15 to 20 $\mu g/m^3$ and as high as 60 to 70 $\mu g/m^3$. Populated areas could currently approach the secondary NAAQS for the annual geometric mean. The measurements also show that the annual maximum 24-hour TSP concentrations currently range from 60 to 400 $\mu g/m^3$. The data show high values in towns, such as Price and Green River, and low values in undeveloped areas, such as Tracts U-a/U-b. Since the project areas lack major population centers, ambient particulate concentrations are probably within both the primary and secondary NAAQS.

Visibility

Background visual ranges at Canyonlands National Park and Dinosaur National Monument were measured by the National Park Service, EPA, and John Muir Institute from 1978 to 1981 using multi-wavelength telephotometers. The results are summarized in Table A-9. As shown, visibilities in the region are usually good, with seasonal average visual ranges of 97 to 129 miles at Canyonlands National Park and 103 to 123 miles at Dinosaur National Monument.

The geometric mean of visual range at the two parks is 118 miles at Canyonlands and 109 miles at Dinosaur.

TABLE A-6
AMBIENT PARTICULATE CONCENTRATIONS
($\mu g/m^3$)

Site	Year	Maximum 24-Hour Average	Second Maximum 24-Hour	Annual Geometric Mean
Green River	1979	196	169	64
	1980	163	154	53
	1981	196	172	58
	1982	167	163	64
	1983	262	218	54
U-a/U-b	1975	75	—	24
	1976	101	—	24
	1977	58	—	22
	1978	63	48	15
	1979	53	39	13
	1980	127	72	20
	1981	80	79	—
Vernal	1979	106	92	35
	1980	80	79	29
	1981	253	124	44
	1982	76	63	35
	1983	110	103	34

Source: Aerocomp 1985

State and Federal Standards

($\mu g/m^3$):	Annual	24-Hour
Primary	75	260
Secondary	60	150

Note: $\mu g/m^3$ = micrograms per cubic meter; U-a/U-b = Tracts of land in Utah used as part of a prototype program under authority of the Secretary of the Interior for oil shale leasing.

TABLE A-7
AMBIENT SULFUR DIOXIDE CONCENTRATIONS
($\mu g/m^3$)

Site	Year	3-Hour Average Max.	3-Hour Average 2nd Max.	24-Hour Average Max.	24-Hour Average 2nd Max.	Annual Arithmetic Mean
Green River	1978	26	13	13	13	13
	1979*	52	52	26	26	13
	1980*	26	26	26	13	13
U-a/U-b	1975	15	15	10	10	3
	1976	5	5	0	0	0
	1977	15	10	10	5	1
	1978	27	25	14	13	3
	1979	113	47	14	6	0

Source: Aerocomp 1985

*Incomplete year.

State and Federal Standards ($\mu g/m^3$):	Annual	24-Hour	3-Hour
Primary	80	365	—
Secondary	—	—	1300

Note: $\mu g/m^3$ = micrograms per cubic meter; U-a/U-b = Tracts of land in Utah used as part of a prototype program under authority of the Secretary of the Interior for oil shale leasing.

TABLE A-8
AMBIENT NITROGEN DIOXIDE CONCENTRATIONS
($\mu g/m^3$)

Site	Year	Maximum 1-Hour	Maximum 24-Hour	Annual Arithmetic Mean
Green River	1978	80	—	14
	1979	120	—	20
	1980	80	—	20
U-a/U-b	1975	—	—	5
	1976	—	—	5
	1977	—	—	0
	1978	—	—	1
	1979	—	—	1
	1980	—	—	2

Source: Aerocomp 1985.

State and Federal Standards ($\mu g/m^3$):	Annual
(Primary and Secondary)	100

Note: $\mu g/m^3$ = micrograms per cubic meter; U-a/U-b = Tracts of land in Utah used as part of a prototype program under authority of the Secretary of the Interior for oil shale leasing.

TABLE A-9
SEASONAL AVERAGE VISUAL RANGE (km)
CANYONLANDS NATIONAL PARK AND DINOSAUR NATIONAL MONUMENT
1978 to 1981

Park	Winter	Spring	Summer	Fall
Canyonlands National Park				
1978	—	—	—	200
1979	200	—	—	191
1980	191	181	—	196
1981	229	162	156	193
4-Year-Average	207	172	156	195
Dinosaur National Monument				
1978	—	—	190	—
1979	140	180	179	192
1980	170	170	154	203
1981	212	181	135	—
4-Year-Average	174	177	165	198

Note: Data not available; km = kilometer, thousand meters.

These values are also expected to be representative of the project areas.

Acid Deposition

Sulfur deposition rates are estimated to currently be 0.28 grams per square meter (g/m^2) per year (Dietrich and others 1983). This is about 60 percent of the rate of 0.50 g/m^2 per year at which damage may occur to sensitive ecosystem components (Oppenheimer 1982).

SOILS AND VEGETATION

Setting

The project areas consist of gently sloping to sloping narrow plateaus and mesas bordered by strongly sloping to steep and very steep sideslopes and mountains in the southern portion. Included are strongly sloping to steep convex ridges mainly in the northern portion. The area is dissected by a dendritic drainage pattern of intermittent and perennial streams with narrow floodplains that drain to the north and northwest.

The project areas are located in two major land resource areas (MLRAs) as described by the Soil Conservation Service (1981). The northern portion (including the Beartooth A, Bradshaw, Kirkwood, and north part of the Enercor project areas) is in MLRA 34—Central Desertic basin, mountain, and plateau area. The southern portion (including the Duncan, Farleigh, Beartooth B, Thompson, Enserch, and Mobil project areas) is in MLRA 48A—southern Rocky Mountains.

The Central Desertic basin, mountain, and plateau area (MLRA 34) is characterized by alluvial fans, pediment plains, and pediment slopes from the surrounding mountains to form broad intermountain basins. Where the project areas are located, elevations range from 5,335 to 6,860 feet; average annual precipitation ranges from 8 to 16 inches; and the frost-free period ranges from 90 to 140 days.

The southern Rocky Mountains area (MLRA 48A) is characterized by strongly sloping to very steep mountains dissected by narrow stream valleys having steep gradients. High plateaus and steep-walled canyons are common. In the project areas, elevations range from 6,860 to 7,620 feet; average annual precipitation ranges from 16 to 20 inches; and the frost-free period ranges from 60 to 90 days.

Soils

The project areas include a wide variety and complex combination of soils caused by variations in geologic parent material, topography, climate, and vegetation. A third order soil survey (SCS and BLM 1982) covers all project areas. The soil map units were combined into the following generalized soil groups, to evaluate potential impacts and to determine effective erosion control measures and soil reconstruction, reclamation, and revegetation potential in the area. (A brief description of each generalized soil group and the listing of the soil map units can be provided upon request.)

- Soil Group 1— Soils of the floodplains and terraces
- Soil Group 2— Soils of the gently sloping to strongly sloping mesas and plateau tops
- Soil Group 3— Soils of the moderately sloping to strongly sloping convex ridges and rolling hills
- Soil Group 4— Soils of the strongly sloping to steep plateaus, mountain sideslopes, and hills
- Soil Group 5— Soils of the steep and very steep plateau and mountain sideslopes, canyon walls, and mesa escarpments.

Vegetation

Native vegetation within the project areas is characteristic of the arid and semi-arid regions of the United States. Vegetation types follow a pattern that is strongly influenced by climate and elevation.

The vegetation inventory, forage availability, and vegetation potential information presented in this EIS is based on the Ecological Units as interpreted from the third order Soil Survey (SCS and BLM 1982 and the Vegetation Map of the Southeastern Uinta Basin, Utah and Colorado—Butler and England 1979). Orthophotograph interpretations were also used to determine areas where vegetation was changed by chaining, spraying, and burning.

The project areas support seven major vegetation types: grassland, sagebrush-grass, saltbush-greasewood, pinyon-juniper (woodland sites with sparse, medium, and high productivity), mountain shrub, mixed conifer, and riparian. These types combine several vegetation communities and range sites (ecological sites) and were used to evaluate potential impacts and determine revegetation potential. The following describes these vegetation types and their uses and importance.

GRASSLAND

The grassland vegetation type occurs mainly where vegetation manipulation (chaining, brush spraying, and burning) has controlled brush and tree species. This type most commonly occurs on the smoother sloping plateaus, mesas, sideslopes, canyon bottomlands, and floodplains. Common species include western wheatgrass, Indian ricegrass, and forbs. These areas are used mainly for livestock grazing and wildlife.

SAGEBRUSH-GRASS

The sagebrush-grass type most commonly occurs on benches, mesas, and park-like areas in the 8- to 12- and 12- to 16-inch average annual precipitation area. The dominant sage species include basin big sagebrush, Wyoming big sagebrush, and black sagebrush. The main grasses are salina wild rye, basin wild rye, blue grass, Indian ricegrass, and western wheatgrass. These areas provide forage for livestock and wildlife.

SALTBUSH-GREASEWOOD

The saltbush-greasewood type occurs in the basin and gently rolling areas where annual precipitation is 8 to 12 inches. Major shrub species include greasewood, shadscale, fourwing saltbrush, winterfat, some rabbitbrush, and big sagebrush. Common grasses are Indian ricegrass, galleta, salina wild rye, western wheatgrass, needle-and-thread, and squirreltail. This vegetation type is used for livestock grazing and wildlife. The fourwing saltbush community is crucial for survival of the wintering Book Cliffs male deer herd. The saltbush community has been used to delineate areas of crucial deer winter habitat from adjacent noncrucial areas. Forage capacity is commonly low.

PINYON-JUNIPER

The pinyon-juniper type occurs on the sloping plateaus and mesas and on the strongly sloping to steep and very steep sideslopes and escarpments. Species composition changes with elevation, slope, and aspect. Juniper and pinyon pine are the major species with pinyon pine increasing with elevation and precipitation to a point where it dominates the upper extremes of the area. At lower elevations where annual precipitation is 8 to 12 inches, the juniper becomes more sparse and a juniper-grassland condition commonly occurs.

Common species include juniper, pinyon pine, black sagebrush, birchleaf mountain mahogany, big sagebrush, and some Gambel oak in the higher elevations. Grasses include salina wild rye, galleta grass, western wheatgrass, and Indian ricegrass. These areas are used for livestock grazing, wildlife habitat, and the harvest of woodland products. Important products include firewood, cedar fence posts, and pinyon Christmas trees.

MOUNTAIN SHRUB

The mountain shrub type consists of several plant communities that occupy the convex plateaus and brush-covered sideslopes of higher elevations having more than 12 inches average annual precipitation. Most dominant species include mountain big sagebrush, Utah serviceberry, Gambel oak, birchleaf mountain mahogany, antelope bitterbrush, some juniper, Woods rose, needle-and-thread grasses, western wheatgrass, Indian ricegrass, blue grass, and forbs. These areas provide forage for livestock and are crucial habitat for wildlife.

MIXED CONIFER

The mixed conifer type consists of several plant communities that grow on mainly north-facing, steep and very steep sloping mountain and plateau sideslopes and ridges at higher elevations (above 7,000 feet) in more moist precipitation zones. Most common species are Douglas fir, ponderosa pine, pinyon pine, Utah serviceberry, snowberry, and fescue. Most of the mixed conifer type is used for wildlife habitat and limited livestock grazing. In addition, conifers are used for firewood. Timber stands, which are most common on

inaccessible, steep and very steep slopes (30 to 80 percent), lack commercial value (BLM 1984b).

RIPARIAN

This vegetation type occurs mainly in floodplains and bottomlands and low-lying areas bordering perennial streams. This type also occurs along the larger intermittent tributary streams that are poorly drained or receive runoff from adjoining slopes. Riparian vegetation includes grasses and woody plants growing along streams. This vegetation type consists of cottonwoods, willows, salt cedar, rabbitbrush, Kentucky blue grass, western wheatgrass, inland salt grass, and sedges. It is one of the highest producers of forage and is important to wildlife. Riparian vegetation also stabilizes stream banks, helps protect the quality stream water, and provides diversity to the area.

Threatened, Endangered, or Sensitive Plant Species

The project areas are located within the Book Cliffs Resource Area, which has been inventoried for threatened, endangered, and sensitive plant species. Known plant locations and potential habitat have been identified in Figure 3-9 of the Final Book Cliffs Resource Management Plan (BLM 1984b). Within the Book Cliffs Resource Area, the following plants have been listed as endangered, threatened, or sensitive and under review for listing:

ENDANGERED

None

THREATENED

Sclerocactus glaucus (Cactus, Hookless) (Uinta Basin)

SENSITIVE

Arabis sp. nov. (Rock Cress) (Gray Knolls, Uintah County)
Astragalus hamiltonii (Milkvetch, Hamilton)
Astragalus lutosus (Milkvetch, Dragon)
Astragalus equisolensis (Milkvetch) (Horseshoe Bend, Uintah County)
Cryptantha barnebyi (Catseye, Barneby)
Festuca dasyclada (Fescue, Sedge)
Glaucocarpum suffrutescens
Lepidium barnebyanum (Pepper Cress, Barneby)
Oenothera accutissima (Evening-Primrose) (Moffat, Daggett, & Uintah counties)
Penstemon grahamii (Beardtongue, Graham)
Penstemon goodrichii
Penstemon albifluvis (Beardtongue) (White River, Uintah County)
Thelypodiopsis argillacea (Thelypody, Clay)

Endangered, threatened, or sensitive plant species listed in the Fish and Wildlife Service letter (Appendix 4) have been identified by the Book Cliffs Resource Area inventory.

WILDLIFE

Habitat Types

Primary habitat types found in the project areas and descriptions of the various plant communities within each type are noted in the Soils and Vegetation section. Some wildlife species could be present in or near the project areas and their occurrence by habitat (vegetation) type are identified in Table A-10.

All of the proposed projects are located within deer herd unit 28A as described in the ***1984 Utah Big Game Investigations and Management Recommendations Book*** (UDWR 1984). Because the projects would affect deer in Unit 28A, impacts have to be assessed for all habitats within the deer unit, not just those in the Book Cliffs Resource Area.

From the standpoint of animal diversity and numbers of individuals per acre, probably the most important wildlife habitat type in the project areas is the riparian range type as classified by the Utah Division of Wildlife Resources (UDWR). (The UDWR classification is broader than that used in the vegetation section.) Even though this type forms only a small portion of the total wildlife habitat, studies in the Mountain West (Thomas and others 1978) indicate that the importance of this habitat type to wildlife is much greater than its frequency in the area would indicate.

The saltbush-greasewood habitat type furnishes year-round range for small rodents, predators, and birds, plus some high priority deer winter range. It also furnishes hunting and nesting habitat for several species of raptors.

TABLE A-10
SELECTED TERRESTRIAL AND AQUATIC SPECIES AND THEIR PREFERRED HABITATS*

Species	Riparian	Saltbush-Greasewood	Pinyon Juniper	Upland Sagebrush Grass	Grassland	Mountain Shrub	Mixed Conifer	Aquatic
Endangered or Threatened Federal List								
Black-footed Ferret		X						
Bald Eagle	X	(Wide ranging raptor which may occur in lowland habitats during the winter)						
American Peregrine Falcon	X	X	X	X	X	X		X
Whooping Crane	X	(Migrating in company of sandhill cranes)						
Colorado Squawfish								X
Humpback Chub								X
Bonytail Chub								X
State of Utah Declining Population								
Razorback Sucker								X
Big Game								
Mule Deer	X	X	X	X	X	X	X	
Pronghorn		X		X	X			
Wapiti (Elk)	X		X	X	X	X	X	
Black Bear				X		X	X	
Mountain Lion			X			X	X	
Small Mammals								
Desert Cottontail Rabbit	X	X	X	X	X			
Ord Kangaroo Rat	X	X	X					
Whitetail Prairie Dog		X						
Uinta Ground Squirrel	X	X	X	X	X	X		
Deer Mouse	X	X	X	X	X	X	X	
Coyote	X	X	X	X	X	X	X	
Least Chipmunk		X	X	X		X		
Birds								
Sage Grouse				X	X	X		
Blue Grouse					X		X	
Mourning Dove	X	X	X	X	X			
Brewers Sparrow		X		X	X			
Sage Thrasher				X	X			
Green-tailed Towhee			X	X	X			
Horned Lark		X	X					
Ferruginous Hawk	X	X	X		X			
Golden Eagle	X	X	X	X	X	X	X	X
Prairie Falcon		X	X		X			
Great Horned Owl	X		X		X	X		
Flammulated Owl	X		X		X	X		
Burrowing Owl		X						

*Preferred habitats, by species, based on *Vertebrate Wildlife Species of Utah* (UDWR 1981a); Refer to the Vegetation section for a description of the various vegetative types.

The pinyon-juniper habitat type is important to many species of birds, furnishes important deer winter range, and provides a home to several species of predators that prey on the many species of small mammals found there.

The sagebrush-grass habitat type is an interspersed type that furnishes food and cover on a year-round basis to mule deer, elk, many small animals, predators, and birds. This type is important because it furnishes forage diversity for the grazing and browsing wildlife species.

The mountain shrub type occupies the steeply eroded escarpment on the southern end of the area. This type is occupied by several big game species, large predators, many rodents, and small birds. It furnishes winter cover in its lower elevations.

The mixed-conifer habitat type is typical of north slopes and higher elevations in the project areas. This type furnishes thermal cover for big game animals and nesting habitat for many small birds and some species of raptors. Big game animals use this habitat type for cover rather than for foraging. Other species, such as blue grouse, snowshoe hares, and some raptors, depend on this type for most of their life-cycle requirements.

The aquatic environment in Uintah County, Utah consists of about 400 miles of classified warm-water streams and rivers, 58 miles of classified cold-water streams, 920 acres of warm-water lakes, and about 2,140 acres of cold-water lakes (UDWR 1981b). Also occurring are many small flowing streams and intermittent small tributaries that may not support any fish.

The crucial mule deer summer range on deer herd unit 28A is limited, both in area and the quality of the range involved. All things considered, summer range is the limiting factor for this herd (Karpowitz 1984). The herd unit consists of about 141,148 acres of crucial summer range, 440,064 acres of winter range, and 403,008 acres of crucial winter range (areas used by deer in extremely hard winters). See Table A-11 for vegetation types found in deer herd 28A.

That fawn production has been low in this herd unit in the past may also indicate a summer range problem (Karpowitz 1984). The crucial summer range in this area lies above the winter range limits, which leaves only a small belt of summer range along the ridge that divides the drainage between north and south Book Cliffs. This band of summer range contains only about 121,900 acres (BLM 1984b).

All of the projects would be located within elk herd unit 21 as described in the ***1984 Big Game Investigations and Management Recommendations*** book (UDWR 1984). The crucial elk summer range in elk herd unit 21 is limited both in area and forage quality. About 54,100 acres of elk crucial summer ranges and calving habitat occur in the herd unit. Also, about 192,300 acres of crucial elk winter range occur in this herd unit.

Habitat types that would be affected by individual site-specific projects are identified in Section B.

Terrestrial Wildlife

MAMMALS

Numbers of mule deer inhabiting herd unit 28A have not completely recovered from the severe declines of the late 1960s and 1970s. Reliable estimates of the regional mule deer population in herd unit 28A indicate that numbers are increasing at the present time (UDWR 1984) and total about 6,200. In spite of the present low population level, the mule deer is an important trophy and game species in the project areas.

The elk herd occupying unit 21 is estimated to be increasing but densities remain low throughout the unit (about 500 animals—UDWR 1984).

While not as numerous as deer or elk, the pronghorn antelope is an important big game animal in Uintah County. Population levels in both the Bonanza and East Bench herd units are thought to be increasing (UDWR 1984). Black bear and cougar are also found in some of the more remote areas of the STSAs. Population levels of these two species are thought to be stable.

Two subspecies of cottontail rabbits are found within the region. The mountain cottontail is found in the sagebrush and mountain shrub areas, and the desert cottontail is found in the more open, mixed-desert shrub areas. Populations of these animals are cyclic.

A large variety of furbearers, predators, and numerous small mammals can be found in the area. At least 85 species of small mammals could occur in Uintah County (UDWR 1981a).

TABLE A-11
VEGETATION TYPES FOUND ON DEER SUMMER AND WINTER RANGES
DEER HERD UNIT 28A*

Vegetation	Acres	Percent
Crucial Summer Range		
Mountain Shrub	12,544	8.9
Sagebrush-Grass	54,307	38.5
Sagebrush-Grass	45,203	32.0
Mixed Conifer	24,608	17.4
Aspen	4,486	3.2
Total:	141,148	100.0
Winter Range		
Sagebrush-Grass	27,339	6.2
Mountain Shrub	5,058	1.1
Pinyon-Juniper	396,846	90.1
Greasewood-Sagebrush	8,003	1.8
Agricultural Lands	2,818	0.8
Total:	440,064	100.0
Crucial Winter Range		
Sagebrush-Grass	25,536	6.3
Mountain Shrub	4,628	1.1
Pinyon-Juniper	363,372	90.2
Greasewood-Sagebrush	7,168	1.8
Agricultural Lands	2,304	0.6
Total:	403,008	100.0

*Based on Utah Division of Wildlife Resources Data (1984).

BIRDS

From the standpoint of harvest and hunter effort, the ring-necked pheasant, sage grouse, and the mourning dove are the major game birds in the project areas. The pheasant is found only in the agricultural areas around Vernal, Jensen, Randlett, Myton, and Roosevelt and inhabits an estimated 87,215 acres of irrigated croplands in these areas.

Ducks and geese found in the area are mostly migratory and, during the spring and fall migrations, many water areas in the region are used for resting. Some waterfowl nesting and brood rearing occur in rivers, streams, reservoirs, and stock ponds, but the area cannot be classified as a high waterfowl production area.

An estimated 174 species of nongame birds are found throughout Uintah County in suitable habitats (UDWR 1981a). In addition, abundant raptor nesting and hunting habitat can be found in the area. Concentrations of both bald and golden eagles can be found along the watercourses and upland areas of the STSAs during the winter. The golden eagle is not listed as either rare or endangered but is protected under the Bald Eagle Act. Several active golden eagle nests are known to occur near (more than a mile) some of the site-specific project areas considered in this EIS.

REPTILES AND AMPHIBIANS

Uintah County does not have many reptiles, although 15 species can be found in the Uintah County area. Because of the semi-arid nature of this area, amphibian numbers are relatively low, with only seven species occurring within the region (Stebbins 1966; UDWR 1981b).

Aquatic Wildlife

The cold-water streams in Uintah County support a sport fishery of brown, rainbow, brook, and cutthroat trout in suitable habitat. Cold-water lakes in the area mainly support rainbow, brook, and cutthroat, and brown trout sport fishing. Warm-water species, sought after in stream habitat, include channel catfish and walleye. Other warmwater species are found in very limited numbers.

Pelican Lake supports a bluegill-bass fishery that is of high regional significance and nationally recognized.

Both Bitter Creek and Willow Creek drain the project areas and could be affected by tar sand development. Inventories of these two streams found the following fish species (UDWR 1984):

Bitter Creek	**Willow Creek**
Brook Trout	Mountain Sucker
Roundtail Chub	Speckled Dace
Speckled Dace	
Red Shiner	
Fathead Minnow	

Threatened or Endangered Animal Species

Table A-12 indicates which species, noted in the Section 7 list from the Fish and Wildlife Service (Appendix 4), may occur on each project area. Since known colonies of whitetail prairie dogs are found in Uintah County, habitat also exists for the endangered black-footed ferret. Historically, this ferret ranged into northeastern Utah (Hall and Kelson 1959; Gates 1973) and could still occur there. Intensive searches for ferrets must be undertaken on all prairie dog colonies affected by project construction (Appendix 4).

Bald eagles winter in large numbers along the White and Green rivers and on Pelican Lake during December, January, and February. However, no bald eagles are known to nest in Uintah County (UDWR 1981a).

The endangered peregrine falcon is known to nest in Dinosaur National Monument, and these birds could range over the entire region. In addition, there have been five confirmed sightings of falcons (the falcons were believed to be migrating) in the project area. On several occasions, the federally listed whooping crane has been observed migrating over Uintah County, usually in the company of sandhill cranes. These birds could rest in this area.

TRANSPORTATION NETWORKS

The geographic limits of the project areas for transportation include Uintah County, the northern portion of Grand County, and the eastern half of Duchesne County. The roadways within the area of influence consist of several types of roads ranging from a two-lane principal arterial to primitive dirt roads and jeep trails. The secondary roads provide

TABLE A-12
FEDERALLY LISTED THREATENED OR ENDANGERED ANIMAL SPECIES THAT COULD OCCUR ON THE PROJECT AREAS

Project	Peregrine Falcon	Bald Eagle	Black-footed Ferret	Bonytail Chub	Colorado Squawfish	Humpback Chub
Beartooth A	X	X	X			
Beartooth B	X	X				
Bradshaw	X	X				
Duncan	X	X				
Enserch	X	X				
Enercor	X	X	X			
Farleigh	X	X				
Kirkwood	X	X	X			
Mobil	X	X		X	X	X
Thompson	X	X				

access for mineral development, recreation, and livestock grazing and serve area residents. Vehicular traffic (trucks and passenger vehicles) associated with the projects would use federal, state, and BLM-maintained roadways.

All of the major roads within the project areas need some minor or major road improvements, such as resurfacing, increasing shoulder width, adding lanes for safety, and redesigning. Refer to Table A-13 for average annual daily traffic (AADT), numbers of annual accidents, and percentage of truck use.

An AADT of 20,850 was recorded for U.S. Highway 40 between highway mileposts 141 and 147, a 6-mile stretch of roadway through Vernal. This high AADT for this stretch relates to 193 annual accidents, which is 43 percent of the accidents on U.S. Highway 40.

Uintah County has no short-range plans to upgrade Seep Ridge Road. Engineering plans have been designed for the upper portion of the road (Nicholson 1985). Upgrading would depend on the state or energy companies providing funds. The county does not maintain traffic counts, nor does it have a projected use baseline.

Vehicle accessibility could be restricted in the upper elevations within the PR Spring STSA between December and early spring because of heavy snowfall.

VISUAL RESOURCES

The Proposed Actions would all occur within the Colorado Plateaus physiographic province, which consists of a characteristic set of landscape features including landform and vegetation (Fenneman 1931). These features are used to determine existing visual values and to determine how changes caused by the projects would affect these visual values.

The portion of the Colorado Plateaus where the projects would be located is characterized as a mostly desert plateau with low rolling hills and heavily

TABLE A-13
GENERAL TRANSPORTATION DATA

Route Number	Beginning Mile Post	Ending Mile Post	Segment Length (Miles)	AADT	Annual Accidents	Trucks (%)
U.S. Highway 40	106.63	170.05	63.42	2,065-20,850	439	17
State Highway 88	0.00	16.87	16.87	340-390	4	18
County Road 264	0.00	14.27	14.27	550-1,800	10	8
Seep Ridge Road	0.00	59.6	59.6	20	2	30-35*

Source: National Academy of Sciences 1965.

*Estimated.

Note: AADT = Average Annual Daily Traffic

dissected drainage patterns carved out by tributaries of the Colorado River.

Six primary vegetation types cover the landform. Portions of the natural vegetation have been mechanically removed by chaining, while others have been altered by burning, resulting in areas of grassland. (See the Soils and Vegetation section for details.) Evidence of human occupancy is scattered, with occasional roads and trails, mineral development facilities, and ranching structures (fences, watering areas, and corrals).

The established Visual Resource Management (VRM) classes for the affected area relate to the physical characteristics of the physiographic province previously described and viewing conditions such as visual sensitivity and viewing distance.

Generally, the Proposed Actions are located within VRM Class IV areas, which are generally unseen by the public or have less diverse landscape features. The exceptions, Mobil and Thompson projects, are explained in detail in Section B (BLM 1979b).

WILDERNESS

The Winter Ridge Wilderness Study Area (WSA) (UT-080-730) lies within the area encompassed by the projects and would be partially overlain by portions of four of the projects: Beartooth B, Enercor, Enserch, and Mobil. Until Congress decides its final status, BLM must manage the WSA so as not to impair its wilderness characteristics. (See nonimpairment criteria, Section 603(c) of the Federal Land Policy and Management Act, 1976 and BLM 1979b.)

The Beartooth B, Duncan, Mobil, and Thompson projects would lie within 10 miles of the Flume Canyon WSA (UT-060-100B), which is located to the south of the project areas (BLM 1980a).

The Kirkwood project area would lie adjacent to an area established by the Ute Tribe and known as the Wildlife and Cultural Resource Protection Area on the Uintah and Ouray Indian Reservation (BLM 1984b). Only the Utes are permitted to hunt within the designated area since it is located on the reservation.

RECREATION

According to a survey of residents conducted by the Institute of Outdoor Recreation and Tourism (1978), the five most frequent types of outdoor recreation activities in the Uinta Basin (in order of preference) are fishing, driving for pleasure, camping, big game hunting, and swimming. Because of the high percentage of federal land, most of the area of influence is used for undeveloped outdoor recreation such as off-road vehicle (ORV) use on designated or existing vehicle routes, back-country camping, and day use activities. Many recreation opportunities exist within a secondary zone of influence, defined as the area generally within a 2-hour driving time from Vernal, Roosevelt, or other small nearby population centers where workers would be housed. This distance is the maximum that most people are willing to drive for weekend outdoor recreation. Also within driving distance and frequently used by recreationists are Dinosaur National Monument; Ashley National Forest; Ouray National Wildlife Refuge; reservoirs, lakes, and rivers; and Utah State recreation areas.

Recreation opportunities and resources, including hunting and fishing, are also found on the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation, located west of the project areas.

Water-Oriented Activities

Several rivers, reservoirs, and lakes are within the secondary zone of influence and are important to the public for water-oriented recreation opportunities. These include the White, Green, and Yampa rivers; the Pelican and Big Sand lakes; and Steinaker, Red Fleet, Flaming Gorge, and Starvation reservoirs. Additionally, fishing opportunities occur in over 400 lakes and streams in the Uinta Mountains.

Land-Oriented Activities

Within the regional secondary zone of influence, the primary land-oriented recreation opportunities are hunting, ORV use, camping, and hiking.

The High Uintas Wilderness, north of Vernal, Utah, and portions of northwest Colorado have traditionally provided high quality elk and deer hunting experiences. Elk, deer, bear, cougar, coyote, and rabbit hunting also occur in the Book Cliffs area, along with upland bird hunting of mourning doves, sage grouse, and blue grouse. Hunting opportunities for pheasant, ducks, and geese occur along the lowlands and river drainages.

The secondary zone of influence includes Ashley National Forest, Dinosaur National Monument, four state parks in Utah, and one state park in Colorado; camping and hiking opportunities are plentiful in these areas. The Bottle Hollow resort, owned and operated by the Ute Indians, is the largest privately owned recreation facility in the region; it includes 90 campsite units.

Municipal and Regional Park Recreation Opportunities

Vernal and Roosevelt have active municipal recreation programs. Vernal has a golf course and about 5 years ago, Vernal built a year-round covered swimming pool. No community recreation center exists in Vernal. Roosevelt has two parks (one of which is a regional park having four softball diamonds and a day-use picnic area), a nine-hole golf course, and a 25-year-old outdoor swimming pool. No community recreation center exists in Roosevelt (BLM 1983c). No municipal or regional recreation facilities are known to exist in the other affected communities. However, various other types of facilities, such as bowling alleys, church-sponsored recreation facilities and activities, and rodeo arenas are scattered among the affected communities.

Recreation Opportunities near the Projects

Campsites within the immediate vicinity of the leases include PR Spring, which is the only camp with a developed water supply, and Meadow Ridge, Seep Ridge, and Hide Out, which were established through impromptu use by hunters and have no physical improvements.

Other popular forms of recreation in the immediate area include hunting, which is probably the highest use in the area, ORV travel related to small and large game hunting, sightseeing, wood products gathering (Christmas trees and firewood), and travel for sightseeing (Smith 1984).

Some sightseeing occurs along Seep Ridge Road from the project areas through the area to Book Cliffs

Divide Road. A 20-mile-long scenic corridor has been established along the Book Cliffs Divide Road along the edge of the Book Cliffs from PR Spring to the Grand Valley overlook near the Utah-Colorado border (BLM 1984b).

CULTURAL RESOURCES

Prehistory

The project areas lie within the Uinta Basin of the Colorado Plateau. Previous studies (Stokes 1979) indicate the presence of human activities in the area from 11,500 B.C. to the present. Within this time, population patterns have fluctuated according to environmental and socioeconomic constraints. These population patterns have been assigned by prehistorians to several cultural periods: Paleo-Indian, Archaic, Formative, and Numic-speaking (Forsyth 1980). Site density and type appear to correlate with vegetation zones; however, the associations vary from area to area.

An overview study of the Uinta Basin reviewed all previous cultural resource studies and identified 990 recorded sites (Jones and MacKay 1980), categorized according to cultural affiliation and distribution. The vegetation zones identified in the cultural resource studies are similar to those vegetation types discussed in the Vegetation section. The study concluded that the pinyon-juniper vegetation zone has the highest site density; the sagebrush zone has medium site density; and the shadscale, oakbrush, and mountain shrub zones have the lowest site densities. The even distribution of Archaic sites among the vegetation types suggests a broad subsistance pattern. Fremont sites were concentrated in pinyon-juniper vegetation areas (Jones and MacKay 1980). Because of additional work in the area, over 2,300 prehistoric and historic sites have been identified and recorded (BLM 1984b).

The northern portion of the project areas has had a systematic, statistically based inventory in addition to some project-specific surveys. The study area was stratified into five vegetation zones: 1) salt desert shrub; 2) juniper; 3) pinyon-juniper, Douglas fir-aspen; 4) big sagebrush; and 5) greasewood. The project areas also contain the following, which were not sampled in the study: pine, fir, and mountain shrub. This latter zone occupies the highest elevations of the Book Cliffs area. (These vegetation types correlate with the inventory rather than those identified in the Vegetation section of this EIS.)

The samples in the study were not selected from the pinyon-juniper and Douglas fir-aspen vegetation. The study's sample units, which included maximum elevations, varied between 6,400 feet above mean sea level (sagebrush, juniper, pinyon-juniper) to 7,700 feet above mean sea level on the east (pinyon-juniper, fir, pine). The study results may be useful in estimating site density within the project areas. The project areas range from 6,400 to 8,400 feet in elevation with various vegetation combinations between the east and west areas of the Book Cliffs.

Eighty known sites occur in the project areas. However, these sites do not represent all of the site types known within the Vernal District or within the Book Cliffs physiographic province.

PALEO-INDIAN

No known Paleo-Indian complexes occur in the project areas. This culture is poorly known in the Uinta Basin. To date, the late Paleo-Indian period (9000 B.C. to 6500 B.C.) is represented by a few projectile points of the Plano period; Folsom points have been found in questionable contexts (Phillips 1982).

ARCHAIC

Studies in the field indicate that a generalized hunting and gathering way of life was being pursued in the Book Cliffs by the middle Archaic period (4500 B.C.). Influences appear to come from the Great Basin and the northwest High Plains. The site population of the project areas, which represents this period, is essentially unknown because of the lack of diagnostic artifacts. The tool scatters, lithic scatters, and seasonal short-term camps are thought to be Archaic in age, but quantifiable data is absent.

FORMATIVE

This period (A.D. 0 to A.D. 1250) is well documented. The Fremont culture left numerous petroglyphs and pictographs in the project areas. Fremont camps, lithic scatters, and use and processing sites are probably represented but diagnostic artifacts are missing.

PROTOHISTORIC

Ute pictograph and petroglyph sites are known in the project areas. The rest of the prehistoric/historic Ute

cultural complex is missing because of the lack of diagnostic artifacts. Historic homesteads in the project areas may be Ute or Anglo. Some of these sites occur on the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation.

HISTORY

The project areas lie within the historic Ute territory. Contact with the Ute Indians was documented by the Spanish slave traders in the early 1800s. By 1825, fur trappers had ranged into the Uinta Mountains and traded with the Utes. Mormons settled in Utah in 1847 but were not successful in establishing a permanent early settlement in the Uinta Basin. Gilsonite, gypsum, and asphalt were discovered in the Uinta Basin in 1886, which led to subsequent mining and white settlement of the area (Jones and MacKay 1980).

The site inventory is limited to rock cairns which may represent a variety of cultural functions. Cow camps, petroglyph sites, homesteads, plus numerous other evidences of Euro-American energy exploration, development, hunting, and other recreational activities are present in the project areas.

A summary of the historical research of the region is provided in the overview report by Jones and MacKay (1980). The historic sites in the region represent trails of the early pioneers and fur traders, early railroad and telegraph lines, military activities, mining activities, and livestock camps. In addition to the National Register of Historic Places, historic sites are listed on the Utah State Register of Historic Places and the Century Register of Utah Historic Homes. Over 2,500 prehistoric and historic sites have been recorded in the Uinta Basin (Phillips 1984). Properties listed on the National Register of Historic Places that could be affected by the proposed projects are identified in the site-specific analyses.

MINERAL AND PALEONTOLOGICAL RESOURCES

Mineral Resources

The tar sand deposits addressed by all of the applicants are located in the southeastern portion of the Uinta Basin. The tar sands occur in the Green River formation, which is at the surface in the project areas and are stratigraphically above the Wasatch formation. Within the Green River formation, tar sand deposits occur primarily in the Douglas Creek member.

Data describing the tar sand ore bodies in the project areas is limited. The Laramie Energy Technology Center of the U.S. Department of Energy (Dana and Sinks 1981) has summarized existing drill hole data for the area. Generally, five principal zones of oil saturated sand occur, but the degree of oil saturation is extremely variable and discontinuous over the project areas. The cumulative net thickness of all zones varies from 3 to 109 feet and the tar sand occurs from 0 to 450 feet below the surface (Dana and Sinks 1981). The host sandstone beds dip slightly to the northwest, a little steeper than the land surface. The tar sand is deeper to the north of the project areas and outcrops along the Book Cliffs just south of the project areas.

Just above the Douglas Creek member is the Parachute Creek member of the Green River formation. This member contains large quantities of commercially valuable oil shale including the high quality Mahogany oil shale zone. These oil shale beds dip in a similar manner as the tar sands and outcrop along the northern edge of the area covered by the tar sand lease conversion applications. Oil shale deposits occur above the tar sand at the northern edge of the PR Spring STSA but only along the higher ridge tops in most of the project areas.

Oil and gas exploration, development, and production are occurring in the project area on a large scale. Uintah County ranked second in the State of Utah for cumulative oil and gas production and first for total footage drilled in 1980. There were 697 producing oil and gas wells in the Book Cliffs Resource Area in 1981. The number increased to over 800 in 1985. Cumulative production in the Book Cliffs Resource Area through 1980 was about 118,000,000 barrels of oil and 425,000,000 thousand cubic feet (Mcf) of gas. The specific number of oil and gas wells and amount of production in the project area are unknown.

Currently 450,000 acres within the Book Cliffs Resource Area are identified as Known Geologic Structures (KGSs). As new fields are discovered and existing areas are reanalyzed, the size of the KGS areas are expected to increase. The portion of the Book Cliffs Resource Area that encompasses the project area is rated as good to excellent for potential oil and gas development (BLM 1984b).

Other mineral resources such as gilsonite, sand and gravel, and building stone occur within the Uinta Basin but are not significant near the tar sand project areas (BLM 1984b). No known gilsonite deposits or designated building stone collection areas occur within any of the project areas.

Paleontological Resources

Many significant fossils have been found and studied within the Uinta Basin. Geologic formations range from Pennsylvanian to Quaternary age. A large variety of environments provided habitats for diverse populations of aquatic and terrestrial plants and animals. Many of these sites are nationally and world known. Not only are the rarity and diversity of fossils important, but the continuity of the fossil record as evolutionary and climatic changes occurred over time makes this area important.

While the Uinta Basin has produced many highly significant invertebrate and vertebrate fossils, invertebrate fossils have been primarily reported for some units of the Green River formation. Untermann and Untermann (1968) and Miller (1975) have reported invertebrate, bird and crocodile fossils in shales of the Parachute Creek member in other parts of the Uinta Basin. The Douglas Creek is the least paleontologically significant member of the Green River formation. No sites have been identified in the project areas, however, the area has not been intensively inventoried and does have a low potential for containing paleontological resources.

AGRICULTURE

Grazing

The livestock grazing and carrying capacity information presented in this EIS was gathered from the Book Cliffs Resource Management Plan EIS (BLM 1984b) and from range conservationists at the BLM Vernal District Office. Livestock grazing is authorized on state and federal lands where the proposed conversions are located. BLM has established grazing allotments that are legal parcels of land for which grazing privileges are authorized. These allotments also include lands administered by the State of Utah and privately owned lands. Allotment boundaries were determined by the location of permittees, private lands, qualified demands, and customary areas of use. Grazing allotments and pastures that would be affected by the Proposed Actions are identified for each project in Section B. Most of the operations are cow-calf or cow-calf-yearling operations with some sheep grazing.

Grazing capacities vary widely in the area due to vegetation types (range sites), landforms, slope, and range condition. Not all lands within the area are suitable for livestock grazing. Areas with slopes over 50 percent are generally unsuitable. Grazing capacities range from 7 to 30 acres per animal unit month (AUM). The lower capacity areas occur in the drought-prone lowlands and south-facing steep and very steep mountain slopes in the drier climatic zones; the higher capacity areas occur where the average annual precipitation is higher and at higher elevations, on smoother slopes, and on the narrow floodplains and riparian areas.

Cropland

No cropland occurs on any of the project areas. However, about 87,000 acres of cropland occur within the area that would be affected by urban expansion and development. Cropland occurs mainly in the Ashley Valley (Vernal-Jensen), Pelican Lake, and Roosevelt areas. Smaller acreages of cropland occur in the floodplains of the White, Duchesne, and Green rivers and Willow Creek, Hill Creek, Main Canyon, and Bitter Creek.

Low annual precipitation (6 to 12 inches) makes crop production in these areas dependent entirely upon irrigation. Surface irrigation occurs on most cropland, with some sub-irrigation along the major streams and sprinkler irrigation in the Pelican Lake area. About 30 percent of the cropland consists of prime agricultural land, which occurs on the nearly level terraces and floodplains (SCS 1979).

The main type of farming is the production of livestock feed. Alfalfa hay, the main crop, is grown on 65 percent of the cropland areas. Small grains (barley and oats), corn, and pasture and meadow hay are other crops grown (SCS 1982, SCS 1979).

RESOURCE SIGNIFICANCE CRITERIA

WATER RESOURCES

Impacts to water resources were considered significant if:

- the water resources were altered to such an extent that they could no longer serve their existing function;
- the Standards of Water Quality for the State of Utah were violated;
- salinity levels changed in the Colorado River system;
- potentiometric heads or gradients of aquifers were altered enough to adversely affect established water uses (the magnitude of changes required to produce adverse effects would vary with specific aquifers and water uses); or
- water quality in any given aquifer zone was degraded by introducing foreign substances, increasing natural substances, or by causing a mixing of good quality water with poorer quality water. (The degree of degradation required to produce a significant impact would depend on established uses of the affected aquifer.)

SOCIOECONOMICS

Socioeconomic impacts were considered significant if changes in any of the following were 5 percent or more from the baseline:

- population of a community or the Uintah and Ouray Indian Reservation; or
- total employment or per capita personal income of a county.

AIR QUALITY

Impacts to air quality were considered significant if:

- The primary and secondary NAAQS and state ambient air quality standards or the PSD regulations that apply to this project were violated (see Tables A-14 and A-15 for these standards);
- plume/sky, plume/terrain, or sky/terrain contrast were greater than 0.10 or less than 0.10; or
- total sulfur deposition exceeded 0.5 $g/m^2/yr$.

TABLE A-14
PREVENTION OF SIGNIFICANT DETERIORATION INCREMENTS

Pollutant	Averaging Time	Maximum Allowable Increased Concentrations ($\mu g/m^3$) Class I	Class II
Sulfur Dioxide	Annual	2	20
	24-hour	5	91
	3-hour	25	512
Total Suspended Particulates	Annual	5	19
	24-hour	10	37

Source: Aerocomp 1985.

Note: $\mu g/m^3$ = micrograms per cubic meter.

TABLE A-15
UTAH, COLORADO, AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Primary ($\mu g/m^3$)	Secondary ($\mu g/m^3$)
Oxidant (ozone)	1-hour[a]	235	[b]
Carbon Monoxide	8-hour	10,000	[b]
	1-hour	40,000	
Nitrogen Dioxide	Annual	100	[b]
Sulfur Dioxide	Annual	80	-
	24-hour	365	-
	3-hour	-	1,300
Total Suspended Particulates	Annual	75	60
	24-hour	260	150
Lead	Calendar	1.5	[b]
	Quarter		
Hydrocarbons[c]	3-hour	160	[b]
	(6-9 AM)		

Source: Aerocomp 1985.

Note: National standards, other than for ozone or those based on annual averages, are not to be exceeded more than once per year. ($\mu g/m^3$) = micrograms per cubic meter.

[a] The number of days during a calendar year in which one or more hourly values could equal or exceed the ozone standard must be less than or equal to 1.
[b] Same as primary standard.
[c] Guideline for Oxidant Control is no longer a national standard.

SOILS AND VEGETATION

Soil impacts were considered significant if:

- the loss of soil and reduction of soil productivity and stability from land disturbance prevented successful restoration and recovery to near-predisturbance conditions;
- following construction, more than 5 years was required to establish ground cover to near-predisturbance densities;
- the diversity of predisturbance vegetation types was not restored because of topographic or microclimatic changes;
- invader plants (noxious weeds) became established and occupied more than 10 percent of a specific vegetation type where none existed before;
- poisonous plants increased by 2 percent or more of a specific vegetation type; or
- any federally listed threatened or endangered plant species or sensitive plant species (candidate and state rare species and rare plant associations) were affected or lost.

WILDLIFE

Impacts to wildlife were considered significant if:

- more than 6 percent of the crucial mule deer winter range, more than 3 percent of the crucial mule deer summer range, or any of the crucial fawning habitat in deer herd unit 28A was disturbed;
- more than 6 percent of the crucial elk winter range, more than 3 percent of the crucial elk summer range, any of the crucial elk calving habitat in elk herd unit 21, or any sage grouse leks were disturbed;

  (See UDWR 1984 for locations of deer herd unit 28A and elk herd unit 21.)
- any identified, or subsequently discovered, raptor nesting areas were affected by development activities;
- the Utah Department of Wildlife Resources identified any projected increase in poaching, harassment, and wanton killing over predisturbance levels; or
- any of the riparian habitat within the project area was disturbed.

Impacts to threatened or endangered animals were considered significant if:

- water use from the Green or White rivers reduced annual average flows below levels established for protection of endangered fish (the Fish and Wildlife Service has determined that any depletion of water from the Colorado River system, which includes the Green and White rivers, will affect the endangered Colorado squawfish); or
- any threatened, endangered, or sensitive wildlife species were affected.

TRANSPORTATION NETWORKS

Impacts to transportation networks were considered significant if:

- Project actions resulted in vehicle travel delays of more than 15 minutes per hour;
- Downstream traffic flow at the end of each working day caused safety problems because of the lack of merging and passing opportunities;
- The projected average annual traffic reduced the level-of-service to below Level C, as defined in the Highway Capacity Manual (National Academy of Sciences 1965);
- Projected roadway impacts exceeded the baseline, requiring upgrading of roadway facilities, and capital expenditures to mitigate vehicle flow and safety deficiencies exceeded the fiscal capabilities of the responsible agency;
- The addition of autos and trucks exceeded baseline auto and truck demand, accelerating the deterioration and related maintenance costs of area roadways beyond those scheduled by the responsible agency; or
- The increase in vehicle miles of travel (VMT) resulted in a vehicle accident probability exceeding the state average.

VISUAL RESOURCES

Impacts to visual resources were considered significant if:

- Modification in the landform and vegetation or the addition of a structure did not meet the minimum standards of the BLM VRM class for the area where the project component would be located.

WILDERNESS

Impacts to the wilderness resources were considered significant if:

- Any project component(s) crossed the boundary of a WSA managed under the Interim Management Policy and Guidelines for Lands Under Wilderness Review (BLM 1979b) and Section 603(c) of the Federal Land Policy and Management Act of 1976 and caused permanent and substantially noticeable intrusions upon wilderness characteristics;

- Outside sights and sounds permanently and substantially intruded upon the quality of the wilderness or WSA's naturalness or user opportunities for solitude or primitive recreation; or

- Any project component crossed the boundary of a wilderness area designated by any other political entity, such as the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation.

RECREATION

Impacts to recreation were considered significant if:

- Demand in a recreation area increased by 10 percent or more over baseline conditions or overcrowding was expected to occur;

- Ten percent or more of the land presently used or planned for developed recreation facilities or visually sensitive areas were permanently altered; or

- The availability of land for undeveloped recreation opportunities were reduced or eliminated, and the public's expectation for a quality recreation experience was diminished or overcrowding was expected to occur.

CULTURAL RESOURCES

Impacts to cultural resources were considered significant if:

- Any information was lost that impeded efforts to explain cultural processes or to reconstruct the prehistory or history of the region (36 CFR 800 criteria);

- Impacts occurred to any cultural resource on or eligible for inclusion on the National Register of Historic Places; or

- Native American concerns, such as religious or traditional use areas, were affected.

MINERAL AND PALEONTOLOGICAL RESOURCES

Impacts to mineral and paleontological resources were considered significant if:

- Tar sand development precluded or delayed recovery of other mineral resources (oil, gas, building stone, oil shale); or

- Fossils of scientific value were destroyed without having been recorded.

AGRICULTURE

Impacts to agriculture were considered significant if:

- The amount of forage lost to grazing within an allotment and pasture exceeded 5 percent;

- The amount of forage lost reduced livestock stocking rates by 5 percent or more in affected pastures or allotments;

- Project construction and operation activities allowed an open trench or other obstruction

(without crossings) which prevented livestock access to water for more than 1 day or disrupted grazing patterns for more than 2 weeks;

- The productivity of any cropland was diminished within the project area;
- More than 5 acres of cropland within the project area was irreversibly converted to other uses; or
- Cropland outside the project areas was affected to the extent that more than 5 percent of the total cropland in the area was irreversibly converted to other uses because of project development.

Section B

Site-Specific Analysis

INTRODUCTION

This section of the P R Spring Hydrocarbon Lease Conversion environmental impact statement (EIS) analyses the 10 following site-specific projects:

Beartooth A
Beartooth B
Bradshaw
Duncan Oil
Enercor
Enserch
Farleigh
Kirkwood
Mobil
Thompson

A separate site-specific impact analysis has been prepared for each of the 10 projects. Each of these is, in effect, an EIS covering the topics that the Council on Environmental Quality (CEQ) regulations require. The major difference between these analyses and a typical EIS is that 10 projects are analyzed in one document instead of 10 separate documents. Each project is analyzed as if none of the other projects proposed by the applicants would occur. This approach allows the various federal, state, and local decisionmakers to assess the effects of each project as if it was the only one to occur. Therefore, if economic conditions force a change in the applicants' plans and schedules of development, this EIS would still be useful in reaching the required decisions pertinent to a particular project.

The environmental consequences (impacts) of implementing the Proposed Actions are discussed in this section by project. The impacts are discussed at a level of detail corresponding to the degree or severity of impact. Significant impacts (those based on the significance criteria outlined in Section A) are discussed in detail; insignificant impacts are summarized.

Industrial accidents occurring with the Mobil and Enercor projects would be typical of those associated with any surface mining operation. Accidents occurring during *in situ* operations would be typical of conventional (standard) oil and gas production.

Land use plans are not discussed in any of the site-specific analyses, since all 10 projects are in compliance with federal, state, county, and local plans, thus requiring no land use planning amendments.

The impact analyses assume certain types of mitigation would be implemented that would alleviate or minimize adverse impacts. These types of mitigation are required. See Appendix 2 for measures and stipulations.

To avoid duplication and reduce the size of this EIS, other topics that are the same as those identified in Section A are not addressed again in this section.

The following appendices contain additional information relating to specific resources:

Appendix	Information Provided
2	Required mitigation measures and stipulations affecting resource analyses; mitigation measures suggested by the Bureau of Land Management but currently not committed to by the applicants.
3	Methodology used for soils and vegetation, socioeconomics, and air quality analyses.
4	Correspondence from Fish and Wildlife Service regarding threatened, endangered, or sensitive plant and animal species.
5	Land status and stipulation maps.

BEARTOOTH A PROJECT

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BEARTOOTH A PROJECT SUMMARY

WATER RESOURCES

The project would require about 0.3 acre-feet of water per year, which would be insignificant. The amount of sedimentation produced by the clearing required for the project would depend on the location of the drill pads for each well. By following the proper construction methods detailed in Appendix 2, no significant sedimentation impacts would occur. Since ground water in the area is mostly below the tar sand beds, no significant direct impacts would occur. Once the bitumen is removed, the remaining sand bed would have different hydrologic characteristics that may lead to a change in the flow or location of local springs and seeps.

SOCIOECONOMICS

None of the phases would cause any significant impacts to the local towns or communities. Total employment and per capita personal income would increase by less than 1 percent in all jurisdictions in each of the phases of development. Effects on housing, public services and facilities, and social conditions in the area of influence would be insignificant.

AIR QUALITY

Increased sulfur dioxide (SO_2) and total suspended particulate concentrations would be a fraction of the Prevention of Significant Deterioration increments, and total concentrations of all criteria pollutants would be within the National Ambient Air Quality Standards. Visibility impacts and acid deposition rates were predicted to be well within the significance criteria. None of the air quality impacts are expected to be significant.

SOILS AND VEGETATION

Over the life of the project a total of 1,050 acres could be disturbed, with approximately 30 acres disturbed at any one time. Of that total, 965 acres of sensitive soil would be disturbed. No significant impacts would occur to soils or vegetation and all disturbed land would be reclaimed through the use of the measures outlined in Appendix 2. Threatened, endangered, or sensitive plant species could occur within the project area; therefore, the area must be surveyed and cleared, as prescribed by law before any surface disturbance begins.

WILDLIFE

The project would disturb 0.2 percent of the 403,008 acres of crucial mule deer winter range in deer herd unit 28A and about 0.5 percent of the total crucial elk winter range in herd unit 21. These impacts would not be significant.

No significant impacts would occur to reptiles and amphibians, regional sport fisheries, or sage grouse.

Although endangered peregrine falcons and bald eagles could overfly the area, no impacts are anticipated. If prairie dog colonies are found, the project area must be surveyed for black-footed ferrets.

TRANSPORTATION NETWORKS

Hauling of the commercial product could significantly affect the condition of 3 miles of the Kings Well Road because local funding may not be sufficient to meet increased maintenance needs. No other roads would be significantly affected.

VISUAL RESOURCES

Significant impacts would occur within the VRM Class IV foreground/middleground viewing area from Kings Well Road as a result of structural changes (drill rig, production well, trucks, support buildings, etc.) and vegetation clearings. These impacts would remain until physical structures were removed and revegetation returned portions of the landscape to predisturbance conditions. Of the total 1,050 acres that would be disturbed over the life of the project, about 40 percent of the area, or 420 acres, would be significantly affected.

WILDERNESS

The Beartooth A project area would not cross the boundary of an existing wilderness or wilderness study area (WSA). The project would be located within 5 miles (and to the northeast) of the Winter Ridge WSA.

No significant impacts arising from sights and sounds outside the WSA are anticipated, since it is unlikely that the project area could be viewed or heard from the WSA.

RECREATION

No significant long-term impacts would occur to the recreation resource, other than to the sightseeing opportunity. About 20 acres per year would be removed from use for undeveloped recreation opportunities. The project is not expected to interfere with hunting, ORV activities, or other types of opportunities in the area.

CULTURAL RESOURCES

The project would disturb about 965 acres of high site density probability and about 48 acres of medium site density probability over the life of the project. Indirect impacts from unauthorized collection of artifacts would not be significant, given the small work force increases.

MINERAL AND PALEONTOLOGICAL RESOURCES

No significant impacts to mineral or paleontological resources would occur. *In situ* recovery would result in recovering 40 to 50 percent of the in-place oil. No conflict would occur to oil and gas development and only minor conflicts could occur to oil shale development. No other mineral resources would be affected by tar sand development.

AGRICULTURE

Impacts to forage production would amount to less than 0.1 percent of the total forage, which is insignificant. Invader plants would occupy less than 10 percent of the disturbed area and poisonous plants, less than 2 percent. These impacts would also be insignificant. Forage that could be lost through disruption of watering facilities and grazing patterns is unknown; however, the probability of this occurring is expected to be low. No cropland would be converted to urban uses from project-related population increases; no cropland occurs in the project area itself.

BLM PREFERRED ALTERNATIVE

Conversion of the two leases as proposed, including mitigation discussed in Appendix 2, is the BLM preferred alternative. BLM supports this alternative because it would lead to more efficient and orderly tar sand recovery consistent with the diligent development and reasonable environmental protection objectives of the Combined Hydrocarbon Leasing Act.

CHAPTER 1

DETAILED DESCRIPTION OF THE BEARTOOTH A PROPOSED ACTION

INTRODUCTION

The purpose and need for the Proposed Action, Authorizing Actions, and Alternatives Considered but Eliminated from Detailed Analysis sections can be reviewed in Section A of this document. The Interrelationships with Other Proposed or Existing Projects section appears at the end of Section B under the Cumulative Analysis.

Location of Project

The area proposed for lease conversion on two existing oil and gas leases is located in southern Uintah County in east-central Utah and within the P R Spring Special Tar Sand Area (STSA). Map B-1 shows the detailed location of the project area.

History and Background

The Beartooth Oil and Gas Company (Beartooth) holds two valid oil and gas leases on 1,181.19 acres. One was issued on September 1, 1978 and one on September 1, 1981.

Five core holes have been drilled in the general area. A pilot site was selected on the basis of information obtained from these cores. Preliminary biological data have been developed, and project planning and design initiated by Beartooth.

OVERVIEW OF PROPOSED ACTION

Description

The Beartooth proposed plan of operations (Averett Consultants 1983a) is summarized on Table B-1. Section A, General Development Techniques, provides a description of the proposed plan of operations and typical *in situ* operations.

Land Status and Ownership

The two leases are on federal surface and federal mineral estate managed by BLM. Map C-1, located in Section C, Appendix 5, shows the land status and ownership of the 1,181.19 acres proposed for lease conversion within the P R Spring STSA.

Project Schedule

Figure B-1 shows the proposed schedule for the Beartooth A *in situ* project.

PROPOSED ACTION

Exploration Phase

One pre-pilot exploration well (Map B-1) would be used to verify the previous data and site for the pilot operation. The operation is described in Section A, General Development Techniques. The roadways providing the main access to the project site include 3 miles of Kings Well Road and 36 miles of Seep Ridge Road.

Pilot Phase

The pilot phase is as described under Typical *In Situ* Operation in Section A. For the location of the pilot site, see Map B-1. Any portion of the site could be leveled as needed to accommodate specific pieces of equipment. Production and storage facilities could either be at higher or lower elevations than the five-spot well site to allow adequate drainage downslope to the water disposal pit for any water produced from the dehydration facilities.

For the pilot site location, no new road would be built because existing roadways would be used. The roads would be used slightly more because only a few workers would be needed to maintain this operation.

TABLE B-1
BEARTOOTH A DATA SHEET

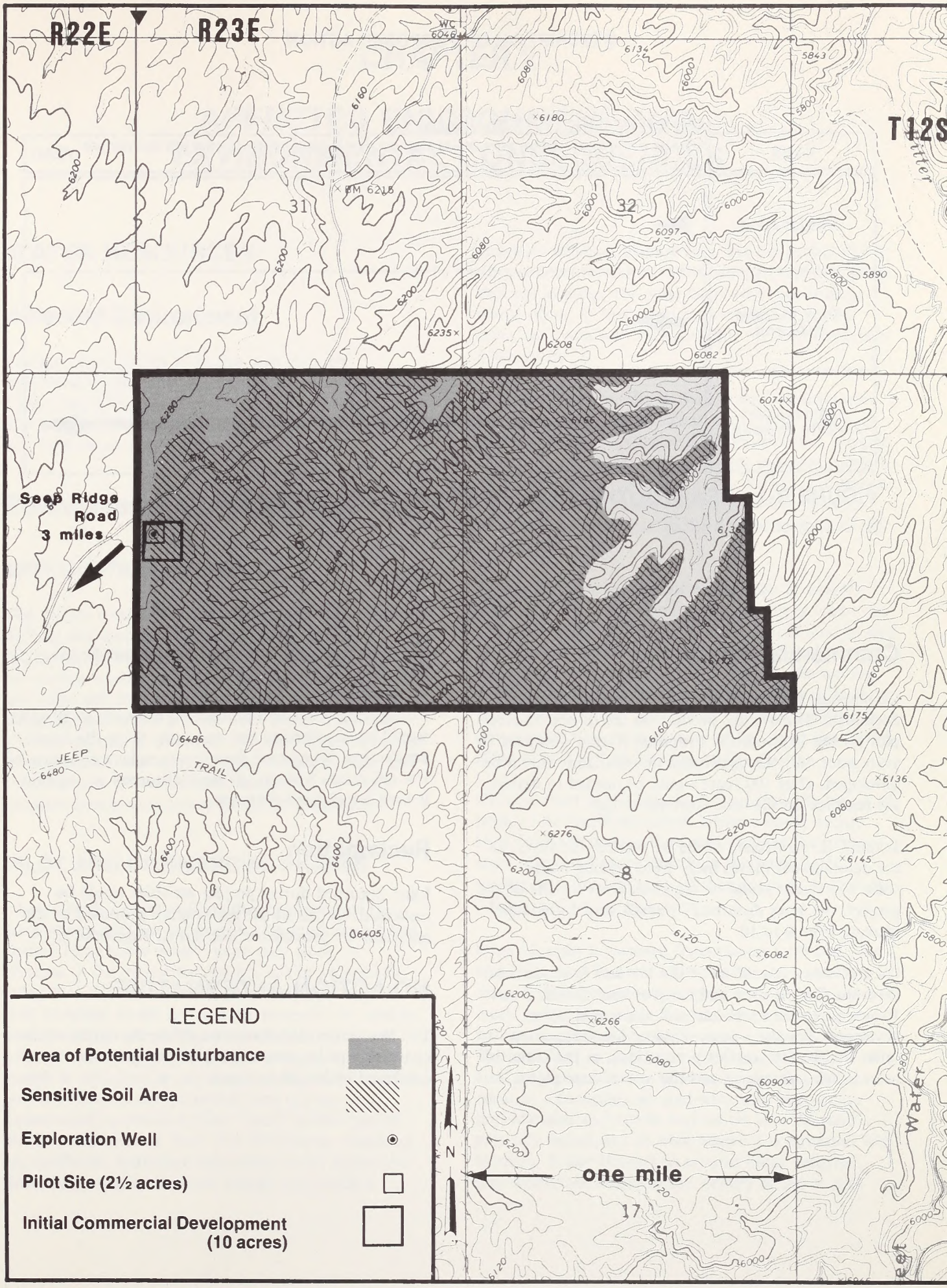
GENERAL

• Type of Operation	Small *In Situ*, progressing in 10-acre increments
• Leases to be Converted (2)	1,181.19 Acres
• Number of Acres to be Developed	1,050
• Percent of Lease to be Developed	89
• Production Life of one 10-acre Plot	16 years
• Number of Tar Sand Zones to be Mined	1

PHASE

Item	Exploration	Pilot	Commercial
Production bbl/day		30	150
Duration of Phase	15 days	1 year	100+ years
Acres Disturbed			
At One Time			
Core Drill	0.25		
Drill Pads		2.5	
Roads			0–10
Production Plot			10–20
Total:	0.25	2.5	10–30
Used For Analyses	0.25	2.5	30
Acres Removed			
Life of Project (Roads)			0–10
Water Use			
ac-ft/year	minor	0.1	0.3
Source	—	Ground Water	Ground Water
Peak Construction			
Year	1984	1985	1986
Personnel	7	20	4
Peak Operation			
Year	—	1985	1986
Personnel	—	4	4
Transportation			
Trips Per Day	4		
Construction	—	4	4
Operation	—	4	4

Note: bbl/day = barrels per day; ac-ft/year = acre feet per year.



MAP B-1 BEARTOOTH A PROJECT

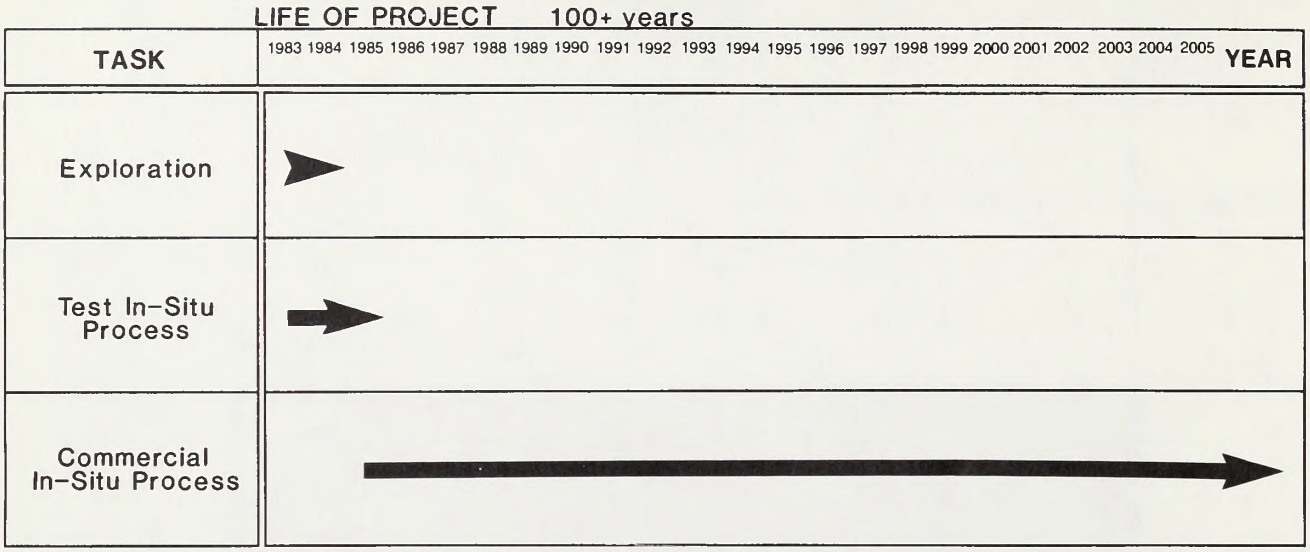


FIGURE B-1 BEARTOOTH A PLAN OF OPERATIONS SCHEDULE

Commercial Phase

Commercial development would be as described in Section A. The average production life of one 10-acre plot for the Beartooth A Proposed Action would be 16 years since only the uppermost tar sand zone would be developed. Over 100 years would be needed to develop the resource on the total conversion area.

Initially, no new roads would be needed. However, as the development moves away from existing roads, some new roads would be required. Over the life of the project, the acres disturbed by roads would gradually increase from 0 to 10.

On a 16-year-cycle, as all of the bitumen is produced from the first 10 acres and the plot abandoned, a new 10-acre plot next to the old plot site would be developed. For the 5 years required for reclamation (after the first 16 years of production), as the initial 10 acres is being reclaimed and the new 10-acre plot is being developed, a total of 20 acres would be disturbed.

Considering roads and production plots, 10 to 30 acres would be disturbed at any one time. Since the fixed production disturbance time versus reclamation time is low (16 versus 5 years), 30 acres disturbed at one time is used for analysis purposes.

Reclamation

Land disturbed during project activities would be reclaimed. Details of the reclamation proposed by the applicant are provided in Section C, Appendix 2.

NO-ACTION ALTERNATIVE

The No-Action Alternative would be the denial of the conversion of the two existing oil and gas leases to combined hydrocarbon leases.

CHAPTER 2

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

WATER RESOURCES

Affected Environment

Surface runoff drains from this area through ephemeral stream channels for about a mile to Bitter Creek, the White River, and then to the Green River. The project area consists mostly of upland plateaus and some steep-sloped areas.

Environmental Consequences

EXPLORATION PHASE

The surface would be disturbed in small areas by the drill rig and support vehicles (Table B-1), thus increasing the potential for sedimentation increases in the surface water courses that run through the project area. The drill holes could create the opportunity for intermixing different ground water zones. However, with the mitigation measures and stipulations identified in Appendix 2, the short duration of disturbance, and the small area of disturbance, impacts to the water resource during exploration would be insignificant.

PILOT AND COMMERCIAL PHASES

The ore body outcrops along the upper part of the steep-sloped area, so tar sand *in situ* development and surface disturbance would occur only along the plateaus in the headwater portion of the watersheds (Map B-1). Surface disturbance associated with drill hole locations would increase the potential for erosion and stream sedimentation. About 2.5 acres for the pilot phase and 30 acres for the commercial phase would be disturbed at any one time. Since drill sites would be located on the low-sloping plateaus and constructed to contain surface runoff sedimentation, stream sedimentation from this disturbance would not be significant. Individual rainstorms could exceed the drill pad's capacity to retain runoff and produce increased sediment downstream, but the probability of this occurring would be low. Generally, the steeper the drill site location, the more likely sediment impacts would occur. If such an event occurred, increased sediment would only be significant for a short distance downstream.

Assuming access to the *in situ* tar sand facilities was from Seep Ridge Road, disturbances from road construction would only occur along the plateaus. Proper construction practices should reduce sediment production, but some would occur in the ditches and stream channels near the roadways. The sediment changes would not be significant in the streams located on the bottomlands.

During the pilot and commercial phases of development, heat from the subsurface burn would warm the surface. During the winter, the heat would tend to melt or evaporate the snowpack and during the rest of the year, increase evaporation rates. Overall, the surface area directly over the burn would be a little drier and produce less runoff. This would not be significant to downstream flow rates because of the small size of the affected area and its location on the plateau.

Ground water in the area is mostly below the tar sand beds, so no significant direct impacts would occur. Heat from the process burn may increase the temperature of ground water slightly in the immediate vicinity, but this temperature change would not be significant a short distance away.

Once bitumen is removed from the tar sand bed, the remaining sand bed would have different hydrologic characteristics. Water would pass through the sand bed much easier, and where the sand bed once was a barrier to recharge, it may become a recharge path. This may lead to changes in the flows or locations of local springs and seeps. Whether or not this would occur at a particular site and what may happen are unpredictable and would depend on how the sand presently occurs and to what degree it is saturated with bitumen. If any changes to ground water occurred, they would occur only in the vicinity of the *in situ*-

processed tar sand. This would not affect the deeper ground water zones or downstream surface water.

Little is known about the effects of the *in situ* process on ground water quality. McTernan (1983) reported that pilot *in situ* experiments yielded highly variable water quality during production. Some increase in organics and oils is expected to occur to ground water that comes into contact with the *in situ* process. This would probably not be significant because of the small volume and local extent of the shallow water system. Also, the water already comes into the contact with the tar sands.

The applicant proposes to use ground water at a rate of 0.3 acre-feet per year for a potable water supply. Water is available to meet this requirement without affecting other uses.

SOCIOECONOMICS

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

None of the phases (exploration, pilot, or commercial) of the Proposed Action would cause any significant impacts. As a result of the exploration and pilot phases in 1985, population growth is expected to range from 4 percent in some of the small communities to less than 1 percent in the large communities. Population growth from commercial development, 1986 onward, would be less than 1 percent (1 to 5 people) in all communities. Total population growth would be 90 from the pilot phase and 10 from commercial development.

Total employment and per capita personal income would increase by less than 1 percent (2 to 18 jobs and $1 to $31, respectively) in all jurisdictions in each of the phases. Employment would grow to 20 primary jobs and 9 secondary jobs from the pilot phase and 4 primary jobs and 1 secondary job from the commercial phase. All of these impacts fall below the 5 percent significance criteria; therefore the effects on housing, public services and facilities, and social conditions in the area of influence would also be insignificant.

Impacts to local businesses and to the Utah Division of Wildlife Resources (UDWR) because of revenue loss are not predicted to be significant because of the small number of people involved with the project and the insignificant impacts to wildlife populations by the project.

AIR QUALITY

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

The impacts are presented for the commercial phase. Impacts during the exploration and pilot phases would be insignificant.

Estimated pollutant emission rates are shown in Table B-2. Projected impacts are compared to the National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) increment limitations in Tables B-3 and B-4. Increased SO_2 and TSP concentrations would be a fraction of the PSD increments, and total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates were predicted to be well within the significance criteria; therefore, impacts are expected to be insignificant.

TABLE B-2
ESTIMATED AIR POLLUTANT EMISSION RATES FOR THE BEARTOOTH A PROJECT

Pollutant	Emission Rate* (kg/hr)
Total Suspended Particulates	9.1
Sulfur Dioxide	4.5
Nitrogen Dioxide	8.4
Carbon Monoxide	1.8
Hydrocarbons	0.9

Source: Aerocomp 1985.

*Long-term average; short-term emission rates may be higher; kg/hr = kilograms per hour.

TABLE B-3
COMPARISON OF MAXIMUM SITE-SPECIFIC IMPACTS WITH NAAQS FOR THE BEARTOOTH A PROJECT

Pollutant Avg. Time	SOURCE CATEGORY CONCENTRATION ($\mu g/m^3$) 2005 Baseline Sources	PROJECT SOURCES Secondary	Direct	Maximum Concentrations	NAAQS
SO_2					
3-hour	18	0	8	26	1,300
24-hour	7	0	4	11	365
Annual	1	0	<1	1	80
TSP					
24-hour	69	0	5	74	150
Annual	21	0	3	24	60
NO_2					
Annual	2	0	1	3	100
CO					
1-hour	1,500	0	4	1,504	40,000
8-hour	900	0	3	903	10,000

Source: Aerocomp 1985.

Note: Secondary = emissions resulting from population growth; Direct = emissions from the Beartooth A project; $\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; SO_2 = sulfur dioxide; TSP = total suspended particulates; NO_2 = nitrogen dioxide; CO = carbon monoxide.

TABLE B-4
SUMMARY OF PSD INCREMENT CONSUMPTION FOR THE BEARTOOTH A PROJECT

Areas of Special Concern	SO_2 ($\mu g/m^3$) 3-hour	24-hour	Annual	TSP ($\mu g/m^3$) 24-hour	Annual
Winter Ridge WSA	1	<1	<1	<1	<1
Uintah & Ouray Reservation	<1	<1	<1	<1	<1
State of Colorado	<1	<1	<1	<1	<1
Maximum Impact	8	4	<1	5	3
Class II Increment	512	91	20	37	19

Source: Aerocomp 1985.

Note: PSD = prevention of significant deterioration; SO_2 = sulfur dioxide; $\mu g/m^3$ = micrograms per cubic meter; TSP = total suspended particulates; WSA = Wilderness Study Area.

SOILS AND VEGETATION

Affected Environment

The Beartooth A project is located in an area of predominantly strongly sloping to moderately steep and steep (4 to 50 percent slope) convex ridges and hills with various intermittent stream floodplains. The area is dissected by a dendritic drainage pattern. Annual precipitation is 8 to 12 inches and the frost-free season is 110 to 140 days.

SOILS AND VEGETATION TYPES

Soils are predominantly shallow to moderately deep loams and clay loams with large volumes of rock fragments (mainly channery) on the surface. Deep loamy soils occupy the narrow floodplains, alluvial fans, and toe slopes. The following general soil groups occur within the project area:

Soil Group 1 - Soils of the floodplains and terraces
Soil Group 2 - Soils of the moderately sloping to strongly sloping convex ridges and hills
Soil Group 3 - Soils of the strongly sloping to steep plateaus, mountain sideslopes, and hills

The project would affect three major vegetation types: pinyon-juniper (sparse), sagebrush-grass, and riparian. See Section A, Vegetation, for a description of vegetation types and their uses.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

The Beartooth A project is located within the threatened, endangered, or sensitive plant habitat area outlined in the Book Cliffs Resource Management Plan (BLM 1984b). See Section A, Vegetation, for a discussion of threatened, endangered, or sensitive plant species. The Uinta Basin hookless cactus, ***Sclerocactus glaucus***, is listed as a threatened plant species and could occur on the project area.

Environmental Consequences

EXPLORATION AND PILOT PHASES

Land disturbance associated with the exploration phase would be 1/4 acre and with the pilot phase, 2 1/2 acres. Land disturbance would be reclaimed as discussed for the commercial phase. Impacts to soil and vegetation during the exploration and pilot phases would be insignificant.

COMMERCIAL PHASE

Project activities would result in the physical disturbance of soil, some soil compaction, vegetation removal, as well as crushing of vegetation on the project area. About 30 acres of soil and its related vegetation would be disturbed at any one time. Disturbance of the 10-acre blocks would continue over the project life with approximately 16 years between each period of disturbance. Reclamation on the previously disturbed acreage would be completed within 5 years after the disturbance of the new tract. Using the significance criteria for soils and vegetation (Section A), the impacts associated with disturbance from the Proposed Action would not be significant.

Since the location and exact sequence of the blocks of disturbance are currently unknown, the amount of sensitive soil or associated vegetation types to be disturbed at any one time cannot be identified. However, over the projected 100-year life of the project, of the total 1,050 acres that could be disturbed, 965 acres of sensitive soil, most susceptible to impacts, would be disturbed (Map B-1). These sensitive areas contain less favorable soil, slope, and climatic conditions; are more susceptible to erosion hazards; and have a lower revegetation potential. The Beartooth A project could disturb 965 acres of pinyon-juniper (requires 50 years to be returned to near-predisturbance density and composition), 68 acres of sagebrush-grass (requires 10 years to be returned to near-predisturbance density and composition), and 17 acres of riparian (requires 5 years to be returned to near-predisturbance composition), over the life of the project. The highly productive woodland sites would be returned to predisturbance conditions, while the less productive sites would be converted to grassland vegetation (BLM 1984b).

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

Threatened, endangered, or sensitive plant species could occur within the project area; therefore, the area must be surveyed and cleared, as prescribed by law, before any surface disturbance begins.

WILDLIFE

Affected Environment

HABITAT TYPES

The primary wildlife habitat (vegetation) types found on the project area include pinyon-juniper, sagebrush-grass, and some riparian vegetation, which occurs as small (unmappable), elongated stringers along intermittent streambeds. (See Section A, Soils and Vegetation, for a description of these types and also Wildlife, for a description of wildlife species occurring in these types.)

TERRESTRIAL WILDLIFE

The entire project area is classified as crucial mule deer winter range (UDWR 1981; BLM 1984b). Deer typically occupy their winter ranges from October 15 to May 15. The project area is also classified as crucial elk (Wapiti) winter range and is used by the elk from November 1 to May 15 (BLM 1984b). The project area is also classified as substantial value sage grouse yearlong range by the UDWR. Mourning doves nest and feed on the project area.

Raptors common to the project area include red-tailed hawks, golden eagles, prairie falcons, marsh hawks, and American kestrels. The sage-covered draws on the project area furnish habitat for ground-nesting raptors such as marsh hawks. The entire area furnishes hunting habitat for all species of raptors. No raptor nests are known to occur on the project area.

The species of nongame mammals and birds, reptiles, and amphibians that could be found on the project area are similar to those found throughout the Uinta Basin. See Section A, Wildlife, for a discussion of these species.

THREATENED OR ENDANGERED ANIMAL SPECIES

The Fish and Wildlife Service indicates that several federally listed species could occur on the project area (Table A-12, Section A, and Appendix 4).

Environmental Consequences

HABITAT

Since the acreages disturbed are small during the exploration and pilot phases (¼ acre for exploration and 2½ acres for pilot) and of short duration, no significant adverse impacts to wildlife vegetation habitats are anticipated since the disturbed acres are far less than the 6 percent significance criteria.

Since this is an *in situ* project, permanent project facilities are limited to 10 acres of roads. Once the project began, an additional 20 acres would be disturbed, resulting in 30 acres of habitat being out of big game forage production at any one time. The locations of disturbance would change as production by the *in situ* process cycles through different sites. Since the project site is located entirely on crucial mule deer and elk winter range (Karpowitz 1984), direct impacts from this project would be to wintering mule

deer and elk. Essential browse species in this area, such as sagebrush, serviceberry, oakbrush, and mountain mahogany, could take 10 to 20 years to reach predisturbance conditions (Soils and Vegetation section). Trees, such as pinyon-juniper, usable by big game and other wildlife, could take 50 years to reach predisturbance conditions. Therefore, the reclaimed areas, consisting of grass and emergent browse and trees, would have a carrying capacity for foraging big game animals that is lower than current levels for these periods.

Once the project was initiated, 30 acres would be out of winter forage production for 31 years. Thereafter, a steady-state disturbance/reclamation would be reached, and 30 acres would constantly be out of forage production for the rest of the project life. Deer herd unit 28A contains about 403,008 acres of crucial mule deer winter range, of which about 0.2 percent would be disturbed. Since this is below the significance criteria, no significant impacts to wintering mule deer are anticipated. The project would disturb about 0.5 percent of the total crucial elk winter range in elk herd unit 21. Therefore, no significant impacts to elk are anticipated.

In addition to mule deer and elk winter habitat removed by project facilities, other losses of habitat would be associated with project activities. These types of losses would be areas of habitat that were not physically removed but were within a zone of influence around a project area that would become temporarily unusable by deer or other wildlife species because of isolation, noise, dust, or other disturbance factors. The zone of influence would be a different size for each species of wildlife under consideration, because each species has a different tolerance toward humans and their activities, and each has a different cruising radius. When these habitat areas become unusable, animals occupying them have to move to adjacent areas where overcrowding and stress could occur.

WILDLIFE POPULATIONS

No significant impacts are expected to wildlife populations from the exploration phase because only 15 days are planned for this phase of the project and only ¼ acre would be disturbed. Impacts to wildlife populations from pilot phase activities are also not expected to be significant.

During the commercial phase, impacts to wildlife populations in the project area, particularly to wintering mule deer, would be associated with harassment and displacement rather than vegetation habitat alterations. Reliable estimates of population losses based upon displacement-caused stress cannot be reliably estimated at present levels of knowledge. Since the project would affect wintering deer, the more susceptible pregnant does are subject to winter stress in addition to human-caused stress. Harassment added to natural stresses could increase weight loss below the critical limit (Geist 1971).

Some poaching and illegal killing of deer or elk is expected but would probably be minimal because of the small number of people involved with this project.

While the project area is classified as substantial value yearlong habitat for sage grouse, no significant impacts are anticipated to this species because of the large total habitat in the Book Cliffs area.

The project would disturb small songbird species habitat. Although large numbers of birds are produced and lost each year in habitats that are in a natural, undisturbed state, additional losses through project activity could be considerable. However, because of the high reproductive potential of these birds, repopulation would be rapid once habitat was reclaimed. Therefore, no significant impacts to these species are anticipated.

Removal of topsoil and storage for later reclamation and upgrading of access roads would cause direct mortality to an unknown number of small mammals. While these losses could be heavy locally, they would not be significant because of the total small mammal habitat in the vicinity of the project. Once reclamation was completed, repopulation would be rapid because of the high reproductive potential of these species.

Losses of wildlife from vehicle/animal collisions are not expected to be significant. Traffic is projected to increase by only four extra trips per day for the 15-day exploration phase and by eight trips per day for both the 1-year pilot phase and the commercial phase, lasting 100+ years (Table B-1).

Reptiles and amphibians would suffer direct mortality during construction of the proposed project. Density estimates of these species are not generally known for this area, but losses arising from the applicants' proposal would probably be replaced as soon as reclamation was completed and suitable habitat developed. Therefore, no significant long-term impacts to these species are anticipated.

The proposed project is not anticipated to cause direct impacts to regional sport fisheries.

THREATENED OR ENDANGERED ANIMAL SPECIES

Endangered peregrine falcons and bald eagles could overfly the area, but no impacts are anticipated. If prairie dog colonies were found on the area, Fish and Wildlife Service-approved surveys for black-footed ferrets must be completed before the Notice to Proceed can be issued.

TRANSPORTATION NETWORKS

Affected Environment

The vehicular traffic flow would enter and leave the project site at the west side of the lease (Map B-1). The roadways starting at the project site include 3 miles of Kings Well Road and 36 miles of Seep Ridge Road before reaching State Highway 88, County Road 264, and U.S. Highway 40.

See Section A for traffic data on Seep Ridge Road, U.S. Highway 40, State Highway 88, and County Road 264. The Kings Well and Seep Ridge roads are dirt and gravel; all the other identified roads are paved.

Environmental Consequences

EXPLORATION PHASE

The 1985 exploration phase involves a seven-person work force and four truck trips per day for 15 days. The projected traffic volume would not cause any significant transportation impacts to the roadways as stated in the significance criterion.

PILOT PHASE

The 1985 pilot construction phase involves a 20-person labor force for 15 days and a 4-person work force for 1 year. The projected traffic volume would not cause any significant transportation impacts to the roadways as stated in the significance criterion.

Production of 30 barrels per day would result in two truck trips every 6.6 days, at 200 barrels per truck (one trip loaded, the other to return empty). Therefore, no significant impacts would occur to the Kings Well and Seep Ridge roads, State Highway 88, County Road 264, and U.S. Highway 40.

COMMERCIAL PHASE

The construction phase would involve a four-person work force, which would not cause a significant impact on the roadways.

Production of 150 barrels per day would result in two truck trips per 1.3 days, at 200 barrels per truck (one truck loaded, the other to return empty). The truck trips would affect 3 miles of Kings Well Road. Although the increased truck traffic may increase the rate of road deterioration, the Kings Well Road would likely be maintained by the applicant. If the applicant did not maintain the road, present funding formulas may not meet the maintenance needs required and may be inadequate to pay for more road construction. Funding to maintain roadways affected by increased traffic flow would strain local proposed maintenance budgets.

No significant transportation impacts would occur to major roadways such as Seep Ridge Road, State Highway 88, County Road 264, and U.S. Highway 40, since the traffic increase would remain within state safety standards

VISUAL RESOURCES

Affected Environment

The Beartooth A project area is a rolling to moderately dissected landscape covered with pinyon-juniper vegetation. The project would be located entirely within a Visual Resource Management (VRM) Class IV area comprising Class C (low diversity) scenery. Scenery has been rated low because it is typical of the entire region, lacks color and vegetation contrast, and is common to the viewer. Viewer sensitivity was determined to be medium in the foreground/middleground view from Kings Well Road, which covers approximately ¼ of the area, with the remaining portion being rated as seldom seen.

Environmental Consequences

The concepts contained in the BLM Contrast Rating System, which analyzes contrasts in form, line, color, and texture of the landscape and the duration before the impact would be reduced to an acceptable condition, were used to determine the significance of impacts (BLM 1975b).

The visual contrast was evaluated for the exploration, pilot, and commercial phases of the project. Surface scars to landform and removal of vegetation for all phases were evaluated, as were the effects of introduced structures placed on the landscape: buildings, pipelines, drill rigs, and other facilities and equipment.

No significant impacts would occur in the VRM Class IV areas outside the foreground/middleground viewing area from Kings Well Road. *In situ* operations were determined to be generally compatible with the VRM objectives for that area. The landform and vegetation changes, as well as the mining structures, would not create dominant features to be introduced into the characteristic landscape in terms of scale as viewed by the casual observer. However, in those areas viewed from Kings Well Road, the characteristic landscape would be dominated by changes brought about by mineral extraction.

Although the exploration phase is expected to last only 15 days, the drill rig would cause a significant short-term impact while in place. The rig would dominate the landscape in scale as viewed from Kings Well Road. No significant landform modification is anticipated, nor would the ¼ acre vegetation clearing be significant.

Structural changes during the pilot phase, such as the addition of the production well, tanks, pipelines, support buildings, and other miscellaneous facilities, would place a significant impact on 2½ acres of the characteristic landscape. The forms, lines, colors, and textures of the structures would dominate the landscape, as would the vegetation clearing for the duration of this phase. No significant landform modification is anticipated.

Long-term impacts occurring during the commercial phase would last for the life of the project plus the time needed to allow vegetation to mature to heights, colors, and textures (in terms of patterns) similar to the surrounding vegetation. Structural impacts would be similar to those viewed during the pilot phase but would be moved around the leased area. No significant landform modification is anticipated. Of the total 1,050 acres that would be disturbed over the life of the project, only about 40 percent of the area (420 acres) viewed from Kings Well Road, would be significantly affected. Within the 420 acres, the visible changes would exceed changes allowed under the VRM Class IV classification for the area, which would be a significant impact.

WILDERNESS

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

The Beartooth A project area would not cross the boundaries of any existing wilderness or WSA. The project would be located within 5 miles and to the northeast of the Winter Ridge WSA. No significant impacts from sights and sounds outside the WSA are anticipated, since the project area would not likely be viewed or heard from the WSA.

RECREATION

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

No significant long-term impacts would occur to the recreation resource, other than to the sightseeing opportunity, during any of the three phases of the Beartooth A project. The conclusion is based on the assumption that the recreation demand in the zone of secondary influence would directly increase with population growth, except for sightseeing, which depends on viewer sensitivity (Visual Resource section) The population increase is not expected to be greater than 4 percent for any of the population centers, with most increases expected to be less than 1 percent as

stated in the Socioeconomics section. Therefore, the significance criteria for recreation impacts would not be exceeded.

In addition, very little land would be removed from use for undeveloped recreation opportunities. For this lease, only 30 acres would be disturbed at one time. The project is not expected to reduce the public's expectation for a quality recreation experience while hunting, enjoying ORV activities, or experiencing other types of opportunities usually found in the area. See the Visual Resource section for a discussion of impacts associated with sightseeing from Kings Well Road. No known recreation facilities would be directly affected by proposed lease activities during any phase.

CULTURAL RESOURCES

Affected Environment

No surveys have been done on or near the project area; therefore, no sites are known. However, based on the Jones and MacKay study (1980), site density for the pinyon-juniper vegetation type, which occurs in the project area, is high. Since the vegetation type in the project area is predominantly pinyon-juniper (965 acres), the likelihood of sites occurring in this project area is high. Forty-eight acres of sagebrush-grass, which is of medium site density, would occur in the project area. No mountain shrub (low site density) occur in the project area. See Section A for discussion of site density associated with vegetation types.

Environmental Consequences

Potential impacts to existing sites in the project area were evaluated for the exploration, pilot, and commercial phases of the project. Major surface alterations would not occur with *in situ* extraction. However, the potential for disturbance of cultural resources (archaeological and historic sites) would increase for the exploration, pilot, and commercial sequence.

The Beartooth A project would disturb about 965 acres of high site density probability and about 48 acres of medium site density probability over the life of the project.

The mitigation measures outlined in Section C, Appendix 2, would be used to recover archaeological data. However, project activities, especially excavation, would remove existing sites from the local and regional site population. These impacts would be considered significant to any sites on or eligible for inclusion on the National Register of Historic Places. Indirect impacts could result from unauthorized collectors removing or displacing artifacts or features located on or near the project area. Since the work force increases are expected to be small for all project phases, no significant impacts are expected. The number of sites that could be affected is unknown.

MINERAL AND PALEONTOLOGICAL RESOURCES

Affected Environment

Data describing the tar sand ore body in this project area are limited. From Dana and Sinks (1981) and information supplied by the applicant, BLM has derived the area of probable tar sand occurrence shown on Map B-1 as the area of potential disturbance.

The applicant plans *in situ* development of one tar sand bed at each well. Over the entire project area, only the uppermost tar sand zone would be developed. This tar sand zone lies stratigraphically above the Mahogany oil shale bed.

A Known Oil Shale Lease Area (KOSLA) covers 80 acres of the project area. KOSLAs are areas where economically mineable oil shale deposits are known to exist. The 80-acre-area would represent about 4 million barrels of oil recoverable from the oil shale (BLM 1984b). (See Section A, Mineral and Paleontological Resources, for descriptions of minerals.)

No inventory exists for paleontological resources within the project area. In areas that have been inventoried, the Parachute Creek member has moderate potential and the Douglas Creek member, low potential, for fossil occurrence. No known sites have been identified in the project area.

Environmental Consequences

Impacts to mineral and paleontological resources from tar sand exploration would not be significant.

The *in situ* recovery technique would recover less of the inplace oil resource compared to a strip mine recovery technique. Part of this difference is due to consumption during the burning process and part is due to inefficiencies of the burning over the project area caused by variations in bitumen saturation and bed continuity. An estimated 40 to 50 percent of the in-place oil would be recovered. This compares to 80 to 85 percent recovery for a strip mine and process plant operation. Tar sand bitumen not recovered during the *in situ* process would probably not be economically available in the future.

A conflict between oil and gas and tar sand recovery would not occur because of the limited area occupied by tar sand development facilities. Oil and gas wells could be slant-drilled to avoid the tar sand development facilities. In addition, the right to develop oil and gas on these lease areas would be held by the same company.

Oil shale occurs in this area above the upper tar sand zone, so conflicts between oil shale and tar sand development could occur. While *in situ* tar sand facilities were operating, oil shale development would be precluded. This conflict would occur only in the 20-acre-area that would be under development at any one time. The location of the 20-acre-area would vary, and oil shale could be developed before or after an area was developed for tar sand. Oil shale development rights are not conveyed under combined hydrocarbon leases. No other mineral resources would be affected by this tar sand development.

The *in situ* process could disturb paleontological resources at the surface during construction of drill sites and access roads. With preconstruction inventories, the potential for disturbance to paleontological resources would be low. If fossils were found during inventories or monitoring, a positive impact would occur from the tar sand development.

AGRICULTURE

Affected Environment

The Beartooth A project would affect Pasture 2 located within the Olsen allotment. The project would affect one sheep operation during the winter and spring. The pasture contains 42,536 acres, with a total of 1,701 animal unit months (AUMs).

No cropland occurs within the project area. See Section A, Cropland, for discussion of cropland areas potentially affected by urban expansion.

Environmental Consequences

Forage loss from land disturbance associated with the exploration phase (¼ acre) and pilot phase (2½ acres) would be less than 1 AUM and considered insignificant based on the significance criteria.

During the commercial phase, forage loss would result from land disturbance caused by the *in situ* recovery process and land being occupied by roads. Thirty acres of vegetation would be disturbed or out of use at any one time. Because the location and exact sequence of the blocks of disturbance are currently unknown, specific forage losses cannot be identified. An average of 3 AUMs of forage could be lost annually.

Forage loss from this project represents less than 0.1 percent of the total forage within the affected pasture, which is much less than the 5 percent criterion. Therefore, impacts would be insignificant. The potential for invasion of poisonous and invader plants would be highest in this area because of the low annual precipitation (8 to 12 inches). However, because of the time interval and nature of disturbance, poisonous plants would be less than 2 percent of the disturbed area and other invader plants, less than 10 percent. Therefore, the invasion of invader plants would be insignificant.

More AUMs could be lost by grazing areas becoming inaccessible due to project activities. This problem could result from (1) disruption of livestock watering facilities and (2) disruption of grazing patterns. AUM loss cannot be measured because specific details on the *in situ* recovery sequence is unknown. However, the probability of this occurring is expected to be low.

No cropland is expected to be converted to urban uses from project-related population increases.

NO-ACTION ALTERNATIVE

None of the impacts associated with the project, beneficial or adverse, would occur. However, impacts from oil and gas lease activities could still continue in the area.

CHAPTER 3

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS; LONG-TERM ENVIRONMENTAL CONSEQUENCES; AND COMMITMENT OF RESOURCES

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS

Since no new mitigation measures monitoring systems were proposed or committed to and the impact analysis in Chapter 2 considered the general measures and stipulations stated in Appendix 2, the unavoidable adverse impacts for each resource are the same as discussed in Chapter 2. More mitigation and monitoring systems will be developed when specific mining plans are submitted.

LONG-TERM ENVIRONMENTAL CONSEQUENCES

Trends Having Significant Impacts

Developing the proposed project at a commercial level would further advance synfuels technology in the United States and establish a trend for continuing tar sand resource use. A successful and maturing tar sand industry could be established in the project area by developing the proposed conversions as described in the applicant's proposed plan of operations. This development could result in expanding production above the initial proposal or in developing more tar sand resources.

If tar sand resources in the project area were developed, beneficial impacts of increased employment and income could also carry with it an increased risk of a *boom and bust* economy.

The Clean Air Act (Public Law 95-95) ensures through NAAQS and PSD provisions that air quality will not deteriorate beyond standards. Regulatory agencies cannot issue permits resulting in air quality violations, and BLM lessees cannot conduct their activities in violation of air quality standards or related plans of implementation. A maturing tar sand industry would, therefore, tend to increase the competition for existing consumable air resource increments and may preclude some future industrial developments.

Because adverse impacts to wildlife would occur throughout the life of the project, the Proposed Action would cause a long-term decline in wildlife populations.

Developing the proposed conversion area would improve portions of the road system, with associated potential recreation-related damage to wildlife, and cultural and paleontological resources.

Hunting opportunities and the quality of hunting experiences could diminish. Positive trends could involve new and different sightseeing opportunities offered on improved road systems.

Benefits and Trade-Offs

Table B-5 is an overview of the benefits and tradeoffs that could be associated with the proposed projects. Direct quantification of the trade-offs is not possible for all resources. A review of the table shows the items and resources that would benefit (in general, those showing increases in quality or quantity) and those that would be exchanged (those showing decreases) to achieve the benefits.

COMMITMENT OF RESOURCES

Implementing the Proposed Action would result in commitments to use the area more intensively and would alter some resource uses. The use and consumption of land and resources would be irreversible (once initiated, use and impacts would continue and could not be reversed for a long time, if at all) or irretrievable (irrecoverable for a long time or permanently). Some commitments would be both irreversible and irretrievable. Should federal land be authorized for the proposed projects, some resources would be committed for the short term until certain renewable resources could be reestablished. Other resources would be committed for the long term, after which resources would return to prior use or conditions.

TABLE B-5
BENEFITS AND TRADEOFFS FROM THE BEARTOOTH A PROJECT

Resource/Item	Benefits	Trade-Offs	Variable
Oil Energy Production	X		
Tar Sand Resources[1]		X	
Tar Sand Reserves[2]			X[3]
Employment Opportunities	X		
Income Levels	X		
Local Prices and Wages		X	
Service Infrastructure			X[4]
Public Revenues[4]	X		
Quality of Life			X[5]
Air Quality			
Quality as related to NAAQS		X	
PSD Increment Availability		X	
Visibility		X	
Water Quality		X	
Water Quantity		X	
Vegetation Production			X[6]
Soil Productivity			X[6]
Wildlife Populations			X
Agriculture			X[6]
Transportation Network Use		X	
Road Quality			X[4]
Recreation Resource Quality of Undeveloped Sites		X	
Cultural Resources		X	
Visual Resources		X	
Paleontological Resources		X[7]	

[1] Tar sand resources refers to the total quantity of minerals in the ground, as defined within specified limits.

[2] Tar sand reserves refers to the resources with known location, quantity, and quality which are economically recoverable through present technology.

[3] Knowledge of reserves could increase or decrease depending on information derived from mining and on-going exploration, and on the use of reserves through development.

[4] Most indicators commonly used to describe this resource/item would be likely to improve with proper planning and use of project-generated revenues, but likely would deteriorate in the absence of such measures.

[5] Quality of life is dependent on the viewers perspective and values. For example, while certain aspects of life quality could increase because of the increased income and infrastructure, other aspects would decrease because of decreased natural resource or increased population, all caused by the same development.

[6] Productivity could generally improve with successful soil reconstruction and reclamation. Adverse conditions such as severe climatic conditions and lack of successful reclamation would cause a decrease in productivity.

[7] Resources could decrease; however, the understanding of the depositional environment could increase.

Note: NAAQS = National Ambient Air Quality Standards; PSD = prevention of significant deterioration.

Table B-6 shows the irreversible and irretrievable commitment of resources that would result from implementing the Proposed Action, as well as short-term and long-term impacts.

Erosion would gradually return to normal rates after revegetation and soil stabilization occurred. Long-term productivity would not be impaired.

TABLE B-6
SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE BEARTOOTH A PROPOSAL

Resource	Irreversible	Irretrievable	Short-Term	Long-Term
Water Resources			X	
Socioeconomics			X	X
Soils and Vegetation		X	X	
Wildlife		X	X	X
Transportation Networks	X	X	X	X
Visual Resources			X	X
Recreation			X	X
Cultural Resources	X	X	X	X
Agriculture		X	X	

Air Quality and Wilderness would have no irreversible, irretrievable, short-term, or long-term impacts resulting from the Beartooth A proposal.

Water Resources

The *in situ* tar sand process would not commit a significant amount of water to use nor have a significant long-term affect on water resources.

Socioeconomics

Small increases would occur in employment, personal income, and local government revenues. There would be few if any impacts to local prices and wages, local government expenditures, and quality of life.

Soils and Vegetation

Vegetation would be restored to a productive condition for grazing and long-term productivity.

Wildlife

Short-term decreases in local populations of small mammals and birds could occur. Direct mortality to small mammals would occur during road and pad construction. Wildlife forage would be restored to a productive condition for long-term productivity.

Transportation Networks

No short-term or long-term impacts would occur.

Visual Resources

Some visual resources impacts would remain over the long term until physical structures were removed and

portions of the landscape returned to predisturbance conditions.

Wilderness

No short-term or long-term impacts would occur.

Recreation

Few recreation experiences would be foregone for the life of the project until lands (20 acres) were restored for recreation use. Some recreationists would experience a loss in sightseeing along Kings Well Road, lasting until original conditions were restored.

Cultural Resources

Implementation of the Proposed Action would cause an irretrievable commitment of archaeological values to exploration and investigation under current technical procedures. Once destroyed, these values could not be used for future study. Archaeological sites could not be studied using more advanced technological methods that may be developed in the future. Increased population levels could exert some additional pressure on these resources, resulting in overuse and destruction. An unknown number of sites could be affected.

Agriculture

Loss of forage production from land disturbance would be short term for 4 to 5 grazing seasons. As the *in situ* process moves across the project area, an average of 3 AUMs would be lost annually for the life of the project (150 years). However, mining operations could cause disruption of grazing access to adjoining areas, creating a long-term grazing impact in certain areas.

BEARTOOTH B PROJECT

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BEARTOOTH B PROJECT SUMMARY

WATER RESOURCES

The project would require about 0.3 acre-feet of water per year, which would be insignificant. The amount of sedimentation produced by the clearing required for the project would depend on the location of the drill pads for each well. By following the proper construction methods detailed in Appendix 2, no significant sedimentation impacts would occur. Since ground water in the area is mostly below the tar sand beds, no significant direct impacts would occur. Once the bitumen is removed, the remaining sand bed would have different hydrologic characteristics that may lead to a change in the flow or location of local springs and seeps.

SOCIOECONOMICS

None of the phases would cause any significant impacts to the local towns or communities. Total employment and per capita personnel income would increase by less than 1 percent in all jurisdictions in each of the phases of development. Effects on housing, public services and facilities, and social conditions in the area of influence would be insignificant.

AIR QUALITY

Increased SO_2 and TSP concentrations would only be a fraction of the PSD increments, and total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates were predicted to be well within the significance criteria. None of the air quality impacts are expected to be significant.

SOILS AND VEGETATION

Over the life of the project a total of 575 acres could be disturbed, with approximately 20 acres disturbed at any one time. Of that total, 286 acres of sensitive soil would be disturbed. No significant impacts would occur to soils or vegetation and all disturbed land would be reclaimed through the use of the measures outlined in Appendix 2. Threatened, endangered, or sensitive plant species would not be adversely affected since none are known to occur within the area of disturbance.

WILDLIFE

The Beartooth B project would disturb 0.2 percent of the crucial elk winter range in herd unit 21; this impact would not be significant. No significant adverse impacts to elk are anticipated. Impacts to blue grouse, sage grouse, and regional sport fisheries would not be significant. Endangered peregrine falcons could overfly the area, but no impacts are anticipated.

TRANSPORTATION NETWORKS

Hauling of the commercial product could significantly affect the condition of 2.6 miles of Pretty Valley Ridge Way, 3.2 miles of Winter Ridge Road, and 8.4 miles of the Divide Ridge Road. Local funding may not be sufficient to meet increased maintenance needs. No other roads would be significantly affected.

VISUAL RESOURCES

No significant impacts would occur to the visual resource. In situ operations would be generally compatible with the VRM Class IV objectives for the project area.

WILDERNESS

Although almost 40 percent of the Beartooth B project area (598 acres) lies within the Winter Ridge WSA, the lease could still be converted to combined hydrocarbon use (Office of the Solicitor 1983). Development of that lease, however, would be constrained by the wilderness nonimpairment criteria (Section C, Appendix 2) which would likely prohibit development of that portion of the lease in the WSA unless a Congressional decision is made not to designate the WSA as a wilderness. If the Winter Ridge WSA was designated wilderness, the portion of the Beartooth B project located in the WSA would likely not be developed. The project would be located within 10 miles of the Flume Canyon WSA and over 10 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation; no direct impacts are anticipated.

RECREATION

No significant long-term impacts would occur to the recreation resource. Little land would be removed from

use for undeveloped recreation opportunities. The project is not expected to interfere with hunting, ORV activities, or other types of opportunities in the area.

CULTURAL RESOURCES

The project would disturb about 272 acres with high site density probability and about 81 acres with low site density probability over the life of the project. One potentially significant site, a pictograph in a rock shelter, is not in a probable disturbance area, so no impacts should occur. Indirect impacts from unauthorized collection of artifacts would not be significant, given the small work force increases.

MINERAL AND PALEONTOLOGICAL RESOURCES

No significant impacts to mineral or paleontological resources would occur. *In situ* recovery would result in recovering 40 to 50 percent of the in-place oil. The project would not affect oil and gas, oil shale, or other mineral development.

AGRICULTURE

Impacts to forage production would amount to less than 1 percent of the total forage, which is insignificant. Invader plants would occupy less than 10 percent of the disturbed area and poisonous plants, less than 2 percent. These impacts would also be insignificant. The forage that could be lost through disruption of watering facilities and grazing patterns is unknown; however, the probability of this occurring is expected to be low. No cropland would be converted to urban uses from project-related population increases; no cropland occurs in the project area itself.

BLM PREFERRED ALTERNATIVE

Conversion of all leases as proposed, including mitigation discussed in Appendix 2, is the BLM preferred alternative. BLM supports this alternative because it would lead to more efficient and orderly tar sand recovery consistent with the diligent development and reasonable environmental protection objectives of the Combined Hydrocarbon Leasing Act.

CHAPTER 1

DETAILED DESCRIPTION OF THE BEARTOOTH B PROPOSED ACTION

INTRODUCTION

The Purpose and Need for the Proposed Action, Authorizing Actions, and Alternatives Considered but Eliminated From Detailed Analysis sections can be reviewed in Section A of this document. The Interrelationships with Other Proposed or Existing Projects section appears at the end of Section B under the Cumulative Analysis.

Location of Project

The area proposed for lease conversion on three existing oil and gas leases is located in southern Uintah County in east-central Utah and within the P R Spring STSA. Map A-2 shows the general location of the project area (Section A). Map B-2 shows the detailed location of the project area.

History and Background

Beartooth holds three leases on 1,520.37 acres. The leases were issued on March 1, 1980 and April 1, 1981.

Sixteen core holes have been drilled in the general area. A pilot site has been selected on the basis of information obtained from these cores. Preliminary biological data have been developed, and project planning and design initiated by Beartooth.

OVERVIEW OF PROPOSED ACTION

Description

The Beartooth proposed plan of operations (Averett Consultants 1983b) is summarized in Table B-7. Section A, General Development Techniques, describes the proposed plan of operations and typical *in situ* operations.

Land Status and Ownership

The three leases, which are federal-mineral-estate managed by BLM, are on 40 acres of private surface with the remainder on BLM surface. Map C-2, located in Section C, Appendix 5, shows the land status and ownership of the 1,520.37 acres proposed for lease conversion within the P R Spring STSA.

Project Schedule

Figure B-2 shows the proposed schedule for the Beartooth B *in situ* project.

PROPOSED ACTION

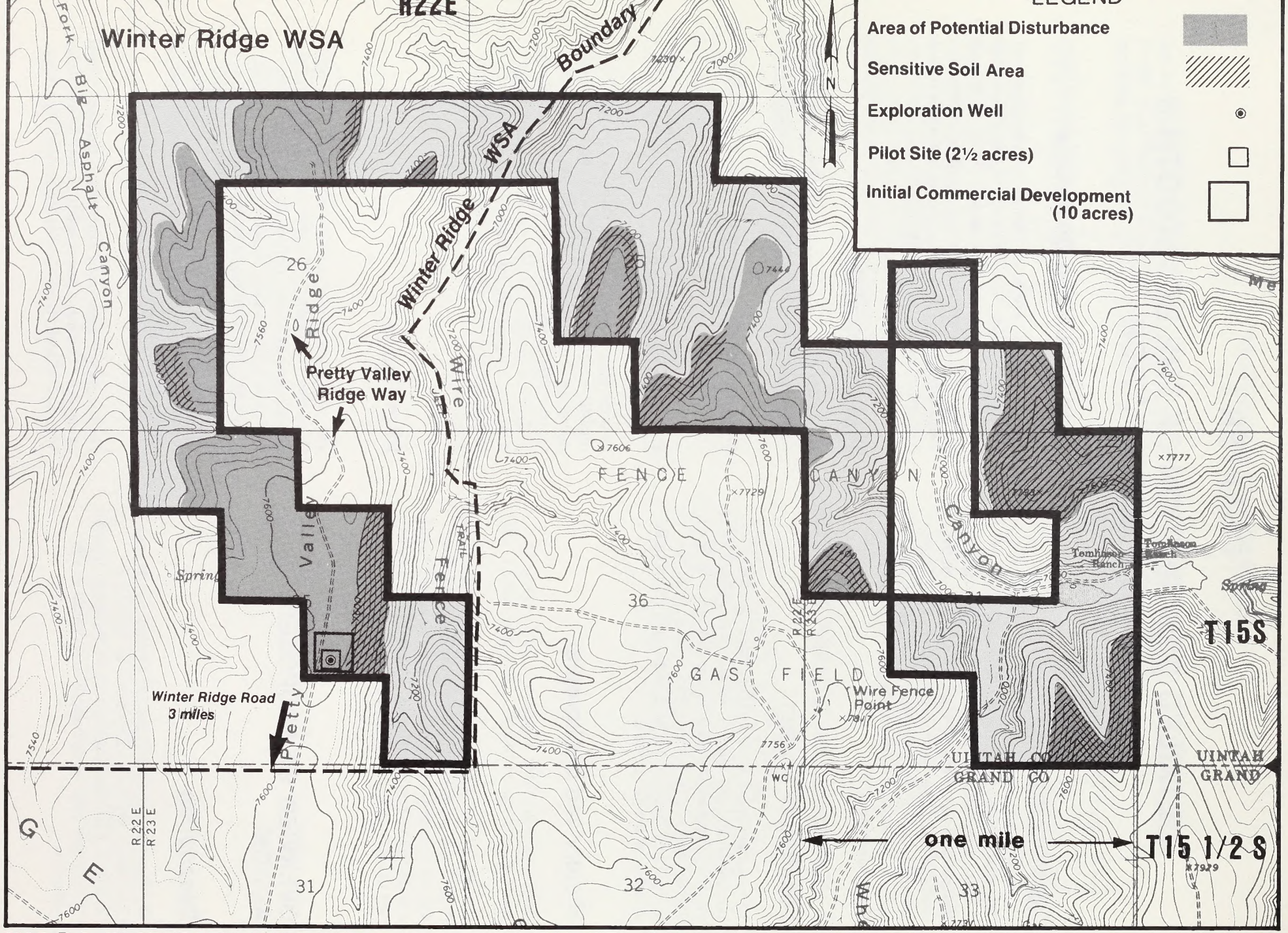
Exploration Phase

One pre-pilot exploration well (Map B-2) would be used to verify the previous data and site for the pilot operation. The operation is described in Section A, General Development Techniques. Main access to the project site include 2.6 miles of Pretty Valley Ridge Way, 3.2 miles of Winter Ridge Road, 8.4 miles of Divide Ridge Road, and 59.6 miles of Seep Ridge Road.

Pilot Phase

The pilot phase is as described under Typical *In Situ* Operation in Section A. For the location of the pilot site, see Map B-2. Any portion of the site could be leveled as needed to accommodate specific pieces of equipment. Production and storage facilities could either be at higher or lower elevations than the five-spot well site, to allow adequate drainage downslope to the water disposal pit for any water produced from the dehydration facilities.

For the pilot site location, some road upgrading would be needed. The main access roads (Pretty Valley Ridge Way and Winter Ridge, Divide Ridge, and Seep Ridge



MAP B-2 BEARTOOTH B PROJECT

TABLE B-7
BEARTOOTH B DATA SHEET

GENERAL

• Type of Operation	Small *In Situ*, progressing in 10-acre increments
• Leases to be Converted (3)	1,520.37 Acres
• Number of Acres to be Developed	575
• Percent of Lease to be Developed	38
• Production Life of one 10-acre Plot	44 years
• Number of Tar Sand Zones to be Mined	4

PHASE

Item	Exploration	Pilot	Commercial
Production bbl/day		30	150
Duration of Phase	15 days	1 year	100+ years
Acres Disturbed			
At One Time			
Core Drill Sites	0.25	—	—
Drill Pads	—	2.5	—
Roads	—	—	0–10
Production Plot	—	—	10–20
Total:	0.25	2.5	10–30
Used For Analyses	0.25	2.5	20
Acres Removed, Life of Project (Roads)	—	—	0–10
Water Use			
ac-ft/year	—	0.1	0.3
Source	—	Ground Water	Ground Water
Peak Construction			
Year	1985	1985	1986
Personnel	7	20	4
Peak Operation			
Year	—	1985	1986
Personnel	—	4	4
Transportation			
Trips Per Day	4	—	—
Construction	—	4	4
Operation	—	4	4

Note: bbl/day = barrels per day; ac-ft/year = acre feet per year.

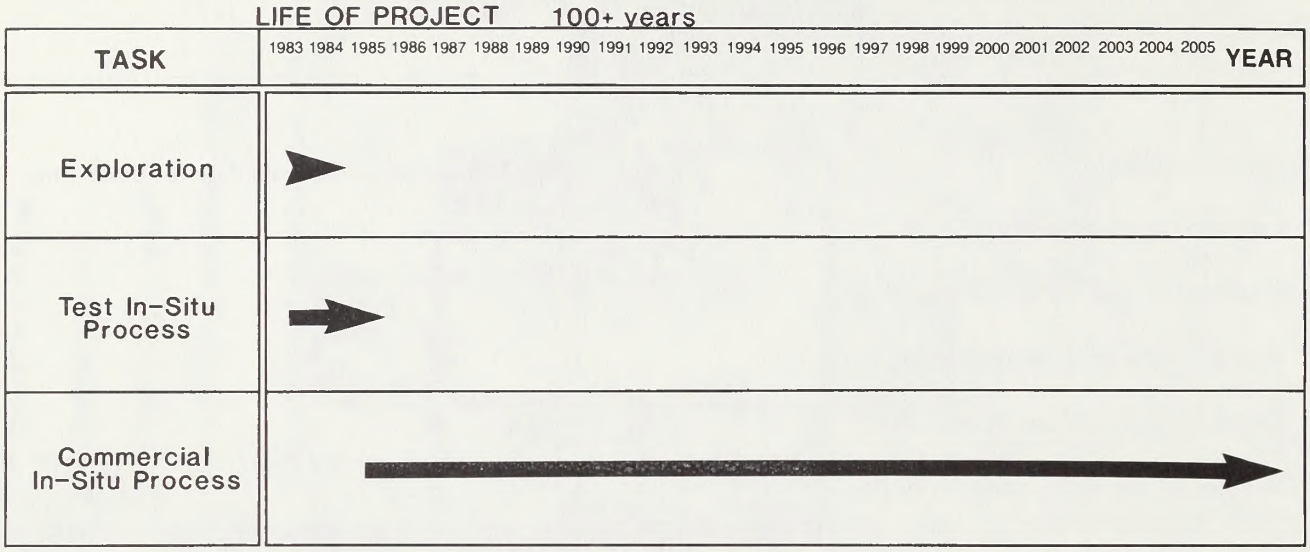


FIGURE B-2 BEARTOOTH B PLAN OF OPERATIONS SCHEDULE

roads) would be used slightly more because only a few workers would be needed to maintain this operation.

Commercial Phase

Commercial development would be as described in Section A, Commercial Development. The average production life of one 10-acre plot for the Beartooth B Proposed Action would be 44 years, since four different tar sand zones would be developed. Over 100 years would be needed to develop the resource on the total conversion area.

Initially no new roads would be needed. However, as the development moves away from existing roads, some new roads would be required. Over the life of the project, the acres disturbed by roads would gradually increase from 0 to 10.

On a 44-year cycle, as all of the bitumen is produced from the first 10 acres and the plots are abandoned, a new 10-acre plot next to the old plot site would be developed. For the next 5 years, as the initial 10 acres is being reclaimed and the new 10-acre plot is being developed, a total of 20 acres would be disturbed. Considering roads and production plots, 10 to 30 acres would be disturbed at any one time.

Because the fixed production disturbance time versus reclamation time is high (44 versus 5 years), 20 acres disturbed at one time is used for analysis purposes.

Reclamation

Land disturbed during project activities would be reclaimed. Details of the reclamation proposed by the applicant are provided in Section C, Appendix 2.

NO-ACTION ALTERNATIVE

The No-Action Alternative would be the denial of the conversion of three existing oil and gas leases to combined hydrocarbon leases.

CHAPTER 2

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

WATER RESOURCES

Affected Environment

Surface runoff drains from this area through ephemeral stream channels for less than a mile to Main Canyon, Willow Creek, and then to the Green River. The project area consists of steep-sloped areas and some plateaus and bottomland areas. A portion of the Main Canyon bottomland contains a privately owned reservoir.

Environmental Consequences

Impacts to water resources would be similar to those described for the Beartooth A project.

SOCIOECONOMICS

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

The impacts from the Beartooth B project would be the same as those described for the Beartooth A project.

AIR QUALITY

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

The impacts are presented for the commercial phase. Impacts during the exploration and pilot phases would be insignificant.

Estimated pollutant emission rates are shown in Table B-8. Projected impacts are compared to the NAAQS and PSD increment limitations in Tables B-9 and B-10. Increased SO_2 and TSP concentrations would be a fraction of the PSD increments and total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates were predicted to be within the significance criteria; therefore, impacts are expected to be insignificant.

SOILS AND VEGETATION

Affected Environment

The Beartooth B project is located on narrow plateaus bordered by strongly sloping to steep and very steep sideslopes. Narrow floodplains occur along intermittent streams. The area is dissected by a dendritic drainage pattern. The average annual precipitation is 12 to 16 inches and the frost-free season is 90 to 110 days.

TABLE B-8
ESTIMATED AIR POLLUTANT EMISSION RATES FOR THE BEARTOOTH B PROJECT

Pollutant	Emission Rate* (kg/hr)
Total Suspended Particulates	13.6
Sulfur Dioxide	4.5
Nitrogen Dioxide	8.4
Carbon Monoxide	1.9
Hydrocarbons	0.9

Source: Aerocomp 1985.

*Long-term average; short-term emission rates may be higher; kg/hr = kilograms per hour.

SOILS AND VEGETATION TYPES

Soils on the plateaus are predominantly deep and moderately deep loams and clay loams. Shallow to moderately deep, loam and clay loam soils with varying amounts of rock fragments (15 to 65 percent) occur on the strongly sloping to steep and very steep sideslopes. Deep, well-drained to poorly drained soils occur on the narrow floodplains. The following general soil groups occur within the project area:

Soil Group 1 - Soils of the floodplains and terraces
Soil Group 2 - Soils of gently sloping to strongly

TABLE B-9
COMPARISON OF MAXIMUM SITE-SPECIFIC IMPACTS WITH NAAQS FOR THE BEARTOOTH B PROJECT

Pollutant Avg. Time	SOURCE CATEGORY CONCENTRATION ($\mu g/m^3$) 2005 Baseline Sources	PROJECT SOURCES Secondary	Direct	Maximum Concentrations	NAAQS
SO_2					
3-hour	18	0	5	23	1,300
24-hour	7	0	2	9	365
Annual	1	0	<1	1	80
TSP					
24-hour	69	0	13	82	150
Annual	21	0	7	28	60
NO_2					
Annual	2	0	3	5	100
CO					
1-hour	1,500	0	2	1,502	40,000
8-hour	900	0	1	901	10,000

Source: Aerocomp 1985.

Note: Secondary = emissions resulting from population growth; Direct = emissions from the Beartooth B project; $\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; SO_2 = sulfur dioxide; TSP = total suspended particulates; NO_2 = nitrogen dioxide; CO = carbon monoxide.

TABLE B-10
SUMMARY OF PSD INCREMENT CONSUMPTION FOR THE BEARTOOTH B PROJECT

Areas of Special Concern	SO_2 ($\mu g/m^3$) 3-hour	24-hour	Annual	TSP ($\mu g/m^3$) 24-hour	Annual
Winter Ridge WSA	4	21	1	3	2
Uintah & Ouray Reservation	1	1	1	1	1
State of Colorado	1	1	1	1	1
Maximum Impact	5	2	1	13	7
Class II Increment	512	91	20	37	19

Source: Aerocomp 1985.

Note: PSD = prevention of significant deterioration; SO_2 = sulfur dioxide; $\mu g/m^3$ = micrograms per cubic meter; TSP = total suspended particulates; WSA = Wilderness Study Area.

sloping mesas and plateau tops
Soil Group 3 - Soils of the moderately sloping to strongly sloping convex ridges and hills
Soil Group 4 - Soils of the steep and very steep plateaus, mountain sideslopes, canyon walls, and mesa escarpments

The project would affect five major vegetation types: pinyon-juniper, mountain shrub, riparian, mixed conifer, and grassland. See Section A, Vegetation, for descriptions of vegetation types and their uses.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

This project is located outside the threatened, endangered, or sensitive plant habitat area outlined in the Book Cliffs Resource Management Plan (BLM 1984b). See Section A, Vegetation, for discussion of threatened, endangered, or sensitive plant species. No endangered, threatened, or sensitive plant species are known to occur on the project area.

Environmental Consequences

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. Impacts during the commercial phase would be the same as described for the Beartooth A project, with the following exceptions:

Twenty acres of soil and its related vegetation would be disturbed at any one time. Disturbance of the 10-acre blocks would continue over the project life with approximately 44 years between each period of disturbance. Based on the significance criteria for soils and vegetation (Section A), the impacts associated with the disturbance from the Beartooth B project would not be significant.

Over the projected 100-year life of the project, of the total 575 acres that could be disturbed, 286 acres of sensitive soil would be disturbed (Map B-2). (See Beartooth A project for definition of sensitive soils.)

The Beartooth B project could disturb 106 acres of grassland, 272 acres of pinyon-juniper, 116 acres of mixed conifer, and 81 acres of mountain shrub. Impacts to grassland-type vegetation would be insignificant because grasses and forbs are expected to become established within 5 years. However, overstory vegetation (trees and shrubs) would take longer to become established. The mountain shrub vegetation type would take 20 to 30 years to return to near-predisturbance density and composition. The areas of pinyon-juniper and mixed conifer would take 30 to 50 or more years to return to near-predisturbance conditions. The highly productive woodland sites would be returned to premining conditions, while the less productive sites would be converted to grassland (BLM 1984b).

Threatened, endangered, or sensitive plant species would not be adversely affected, since none are known to occur within the area of distubance.

WILDLIFE

Affected Environment

HABITAT TYPES

Five primary wildlife habitat (vegetation) types are found on the project area: riparian, grassland, pinyon-juniper, mountain shrub, and mixed conifer. (See Section A, Soils and Vegetation, for a description of plant communities and species composition and also the Wildlife section for descriptions of wildlife species occurring in these types.)

TERRESTRIAL WILDLIFE

The project area would be located on 1,520 acres of crucial elk winter range. Elk generally occupy their crucial winter ranges from November 1 to May 15.

High priority sage grouse summer range is found on 1,132 acres in the project area. About 1,248 acres of the project area is classified by the UDWR as substantial value blue grouse habitat (1981).

Raptors common to the project area include redtailed hawks, Cooper's hawks, goshawks (during winter), sharp-shinned hawks, turkey vultures, American kestrels, great horned and long-eared owls, and golden eagles. Nesting habitat for woodland nesting species of raptors is found on the project area, but the entire area furnishes hunting habitat for all species of raptors

common to the area. At the present time, no known raptor nests occur on the project area.

The various species of nongame mammals and birds, reptiles, and amphibians that could be found on the project area are similar to those found throughout the Uinta Basin. Refer to Section A, Wildlife, for a discussion of these species.

THREATENED OR ENDANGERED ANIMAL SPECIES

The Fish and Wildlife Service has indicated that several federally listed species could occur in the project area (Table A-12 and Appendix 4).

Environmental Consequences

HABITAT

Impacts to wildlife habitat during the exploration and pilot phases would be the same as noted for Beartooth A. Long-term impacts to wildlife vegetation habitats during the commercial phase are not anticipated. Impacts during the commercial phase would also be the same, with the following exceptions.

Once the project was initiated, 20 acres would be out of predisturbance forage production for 44 years. For the next 15 years, 30 acres would be out of production; at year 59, the disturbed area would reduce to 20 acres for the next 30 years, at which time the disturbance/reclamation cycle would repeat itself.

The Beartooth B project would disturb about 0.2 percent of the crucial elk winter range in herd unit 21, which is below the significance criteria. No significant adverse impacts to elk are anticipated.

WILDLIFE POPULATIONS

Impacts during the exploration, pilot, and commercial phases would be the same as described for the Beartooth A project.

Endangered peregrine falcons could overfly the area, but no impacts are anticipated.

TRANSPORTATION NETWORKS

Affected Environment

The vehicular traffic flow would enter and leave the project site at the south side of the lease (Map B-2). The roadways starting at the project site include 2.6 miles of Pretty Valley Ridge Way, 3.2 miles of Winter Ridge Road, 8.4 miles of Divide Ridge Road, and 59.6 miles of Seep Ridge Road before reaching State Highway 88, County Road 264, and U.S. Highway 40. (See Section A for traffic data on Seep Ridge Road, U.S. Highway 40, State Highway 88, and County Road 264.)

Pretty Valley Ridge Way, and Winter Ridge and Divide Ridge roads range from jeep-sized trails to 20-foot-wide roads. Surfaces range from packed dirt to gravel. Road use ranges from pickups, other vehicles with high clearance, four-wheel drives, and heavy equipment vehicles. Accessibility during winter is discussed in Section A.

Environmental Consequences

Impacts during the exploration, pilot, and commercial phases would be of the same type, magnitude, and significance as described for Beartooth A, except that the Beartooth B project would affect a different set of roads (Pretty Valley Ridge Way, and Winter Ridge and Divide Ridge roads) until the Seep Ridge Road is reached.

VISUAL RESOURCES

Affected Environment

The Beartooth B project area includes flat to gently rolling to moderately dissected landscape covered with pinyon-juniper, mixed conifer, mountain shrub, and grassland in areas manipulated by chaining. The project would be located entirely within a VRM Class IV area comprising Class C (low diversity) scenery, which indicates the landscape character is common to the viewer within the region. Viewer sensitivity was determined to be low; the area is viewed either as background or seldom seen from distant roads. Oil and gas field activities can be viewed within 1 mile of portions of the project area.

Environmental Consequences

No significant impacts would occur to the visual resource. *In situ* operations were determined to be generally compatible with the VRM objectives for the area where the operations would occur. The landform and vegetation changes, as well as the addition of structures, would not create dominant features in the landscape in terms of scale as viewed by the casual observer. Therefore, the significance criteria would not be exceeded, since VRM Class IV objectives would be met.

WILDERNESS

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

Although almost 40 percent of the Beartooth B project area (598 acres) would lie within the Winter Ridge WSA, the lease could still be converted to combined hydrocarbon use (Office of the Solicitor 1983). Development of that lease, however, would be constrained by the wilderness nonimpairment criteria (Section C, Appendix 2), which would likely prohibit development of that portion of the lease in the WSA, unless a decision is made not to designate the WSA as a wilderness. If the Winter Ridge WSA was designated a wilderness, the portion of the Beartooth B project located in the WSA would likely not be developed. Also, because the tar sand resource in this portion of the project area is believed to be substantial, the viability of the development of the entire lease could be questionable. The analysis of the Beartooth B proposal is based on the assumption that the WSA would not be designated as a wilderness and the conversion area would be developed. The project would also be located within 10 miles of the Flume Canyon WSA. Because of the distance, the impacts to the WSA would be insignificant. No other WSAs are within 10 miles of the project.

The project area is over 10 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation. No direct impacts are anticipated.

RECREATION

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

No significant impacts would occur to the recreation resources during any of the three phases of development of the Beartooth B project. See Beartooth A for a further explanation.

CULTURAL RESOURCES

Affected Environment

Two sites are known to exist within the lease boundary. One site, a pictograph in a rock shelter, is considered a potentially eligible site for placement on the National Register of Historic Places. The other site is located on private land adjacent to the project area boundary. Three other sites are located 1 mile northeast of the project area boundary. Well pads and roads have been surveyed, but no statistically valid surveys have been conducted.

The likelihood of other sites occurring in this project area is high given that pinyon-juniper is the predominant vegetation type (272 acres). No sagebrush-grass (medium site density) exists in the project area, and only 81 acres of mountain shrub (low site density) occur. See Section A for discussion of site density associated with vegetation types.

Environmental Consequences

The Beartooth B project would disturb about 272 acres of high site density probability and 81 acres of low site density probability, over the life of the project. The potentially significant site is not in a probable disturbance area, so no impacts should occur. Potential impacts to any unknown sites would be the same as described for the Beartooth A project.

MINERAL AND PALEONTOLOGICAL RESOURCES

Affected Environment

The affected environment would be similar to that described for the Beartooth A project. BLM has derived the area of probable tar sand occurrence shown on Map B-2 as the area of potential disturbance. The applicant plans in situ development of one tar sand bed at each well. Over the entire project area, four different tar sand zones would be developed. The Mahogany oil shale zone is not economically viable in this project area. (See Section A for descriptions of minerals.)

No inventory exists for paleontological resources within the project area. In areas that have been inventoried, the Douglas Creek member has shown a low potential for fossil occurrence. No known sites have been identified in the project area.

Environmental Consequences

Impacts to mineral and paleontological resources from tar sand exploration would not be significant. The impacts would be the same as described for the Beartooth A project except the Beartooth B project would not affect oil shale development.

AGRICULTURE

Affected Environment

The Beartooth B project would affect grazing in three pastures. Table B-11 shows the pastures, number of operators affected, and current status.

No cropland occurs within the project area. See Section A, Cropland, for discussion of cropland areas potentially affected by urban expansion.

Environmental Consequences

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project.

During the commercial phase, forage loss would result from land disturbance caused by the *in situ* recovery process and land being occupied by roads. Twenty acres of vegetation would be disturbed or out of use at any one time.

Because the location and exact sequence of the block of disturbance are currently unknown, specific forage losses cannot be identified. An average of 2 AUMs of forage could be lost annually. Table B-11 shows the potential annual 2-AUM forage loss compared to each pasture affected, number of operators, and the percentage of each affected pasture's carrying capacity. The forage loss from this project represents less than 1 percent of the total forage within any of the affected pastures. This is less than the 5 percent criterion and would therefore be insignificant. The potential for invasion of poisonous and invader plants would not be as great due to the higher annual precipitation (16 to 20 inches). Because of the nature of disturbance and more favorable precipitation, invader plants are expected to occupy less than 10 percent of the disturbed area and poisonous plants, less than 2 percent. Therefore, impacts would be considered insignificant.

More AUMs could be lost by grazing areas becoming remote or inaccessible due to project activities. This problem could result from (1) disruption of livestock watering facilities and (2) disruption of grazing patterns. AUM loss cannot be measured because specific details on the *in situ* recovery sequence are unknown. However, the probability of this occurring is expected to be low.

No cropland is expected to be converted to urban use from project-related population increases.

NO-ACTION ALTERNATIVE

The impact of the No-Action Alternative would be the same as described for Beartooth A.

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS; LONG-TERM ENVIRONMENTAL CONSEQUENCES; AND COMMITMENT OF RESOURCES

Mitigation, monitoring, and unavoidable adverse impacts; long-term environmental consequences; and commitment of resources would be similar to those identified for the Beartooth A project.

TABLE B-11
GRAZING ALLOTMENTS AFFECTED AND GRAZING LOSSES CAUSED BY THE BEARTOOTH B PROJECT

	CURRENT STATUS					POTENTIAL GRAZING LOSSES (AUMS)		
Allotment and Pasture	Number of Operations	Livestock Class[1]	Season of Use[2]	Total AUMS	Total[3] Pasture Acreage	Acreage[4] Affected, Disturbed	AUM[5] Loss	Percent of Allotment or Pasture
Winter Ridge (8827)								
Pasture 4	1	C	S,F	872	14,918	536	2	0.2
Pasture 5	1	C	W	247	1,930	102	2	0.8
Book Cliffs Pasture (8828)	1	C	S	1,414	24,313	29	2	0.1

Source: Livestock grazing and Forage Carrying Capacity information presented in this table was gathered from the ***Book Cliffs Resource Area Management Plan Draft EIS*** (BLM 1984b) and from Range Conservationists at the Vernal BLM Office.

[1] Class of Livestock: C = Cattle, S = Sheep, and H = Horses
[2] Season of Use: S = Spring, SU = Summer, F = Fall, W = Winter, and Y = Yearlong
[3] Total acreage of pasture including private, state and federal land.
[4] Total acreage of land disturbance for project life within pasture.
[5] AUM figure is the annual forage loss caused by projct activities for land disturbed at any one time and is compared with each pasture affected in the table.

Note: AUM = animal unit month.

BRADSHAW PROJECT

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BRADSHAW PROJECT SUMMARY

WATER RESOURCES

The project would require about 0.3 acre-feet of water per year, which would be insignificant. The amount of sedimentation produced by the clearing required for the project would depend on the location of the drill pads for each well. By following the proper construction methods detailed in Appendix 2, no significant sedimentation impacts would occur. Since ground water in the area is mostly below the tar sand beds, no significant direct impacts would occur. Once the bitumen is removed, the remaining sand bed would have different hydrologic characteristics that may lead to a change in the flow or location of local springs and seeps.

SOCIOECONOMICS

None of the phases would cause any significant impacts to the local towns or communities. Total employment and per capita personal income would increase by less than 1 percent in all jurisdictions in each of the phases of development. Effects on housing, public services and facilities, and social conditions in the area of influence would be insignificant.

AIR QUALITY

Increased SO_2 and TSP concentrations would only be a fraction of the PSD increments, and total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates were predicted to be well within the significance criteria. None of the air quality impacts are expected to be significant.

SOILS AND VEGETATION

Over the life of the project a total of 260 acres could be disturbed, with approximately 20 acres disturbed at any one time. Of that total, 35 acres of sensitive soil would be disturbed. No significant impacts would occur to soils or vegetation and all disturbed land would be reclaimed through the use of the measures outlined in Appendix 2. Threatened, endangered, or sensitive plant species would not be adversely affected since none are known to occur within the area of disturbance.

WILDLIFE

The project would disturb 0.1 percent of the crucial elk winter range in herd unit 21; this impact would be insignificant. Sage grouse, blue grouse, mourning doves, and regional sport fisheries would not be adversely affected. Endangered peregrine falcons could overfly the area, but no impacts are anticipated.

TRANSPORTATION NETWORKS

Hauling oil during the commercial production phase could significantly affect the condition of 4.4 miles of Monument Ridge Road. Local funding may not be sufficient to meet increased maintenance needs. No other roads would be significantly affected.

VISUAL RESOURCES

No significant impacts would occur to the visual resource. *In situ* operations would be generally compatible with the VRM Class IV objectives for the project area.

WILDERNESS

The Bradshaw project area would not cross the boundary of an existing wilderness or WSA. The project would be located within 6 miles of the Winter Ridge WSA and over 14 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation; no direct impacts are anticipated.

RECREATION

No significant long-term impacts would occur to the recreation resource. Little land would be removed from use for undeveloped recreation opportunities. The project is not expected to interfere with hunting, ORV activities, or other types of opportunities in the area.

CULTURAL RESOURCES

The project would disturb about 144 acres of high site density probability over the life of the project. Indirect impacts from unauthorized collection of artifacts

would not be significant, given the small work force increases.

MINERAL AND PALEONTOLOGICAL RESOURCES

No significant impacts to mineral or paleontological resources would occur. *In situ* recovery would result in recovering 40 to 50 percent of the in-place oil. No oil and gas, oil shale, or other mineral development would be affected by this project.

AGRICULTURE

Impacts to forage production would amount to less than 0.1 percent of the total forage, which is insignificant. Invader plants would occupy less than 10 percent of the disturbed area and poisonous plants, less than 2 percent. These impacts would also be insignificant. The forage that could be lost through disruption of watering facilities and grazing patterns is unknown; however, the probability of this occurring is expected to be low. No cropland would be converted to urban uses from project-related population increases; no cropland occurs in the project area itself.

BLM PREFERRED ALTERNATIVE

Conversion of all leases as proposed, including mitigation discussed in Appendix 2, is the BLM preferred alternative. BLM supports this alternative because it would lead to more efficient and orderly tar sand recovery consistent with the diligent development and reasonable environmental protection objectives of the Combined Hydrocarbon Leasing Act.

CHAPTER 1

DETAILED DESCRIPTION OF THE BRADSHAW PROPOSED ACTION

INTRODUCTION

The Purpose and Need for the Proposed Action, Authorizing Actions, and Alternatives Considered but Eliminated From Detailed Analysis sections can be reviewed in Section A of this document. The Interrelationships with Other Proposed or Existing Projects section appears at the end of Section B under the Cumulative Analysis.

Location of Project

The area proposed for lease conversion on one existing oil and gas lease is located in southern Uintah County in east-central Utah and within the P R Spring STSA. Map A-2 shows the general location of the project area (Section A). Map B-3 shows the detailed location of the project area.

History and Background

The F.J. Bradshaw Estate (Bradshaw) holds one lease on 320 acres, which was issued July 1, 1976. To date, no core holes have been drilled. One pre-pilot core hole would be drilled and used to evaluate this acreage. Preliminary biological data have been developed, and project planning and design initiated by Bradshaw.

OVERVIEW OF PROPOSED ACTION

Description

The Bradshaw proposed plan of operations (Averett Consultants 1983) is summarized on Table B-12. Section A, General Development Techniques, describes the proposed plan of operations and typical *in situ* operations.

Land Status and Ownership

The lease is on federal surface and federal-mineral-estate managed by BLM. Map C-3, located in Section C, Appendix 5, shows the land status and ownership of the 320 acres proposed for lease conversion within the P R Spring STSA.

Project Schedule

Figure B-3 shows the proposed schedule for the Bradshaw *in situ* project.

PROPOSED ACTION

Exploration Phase

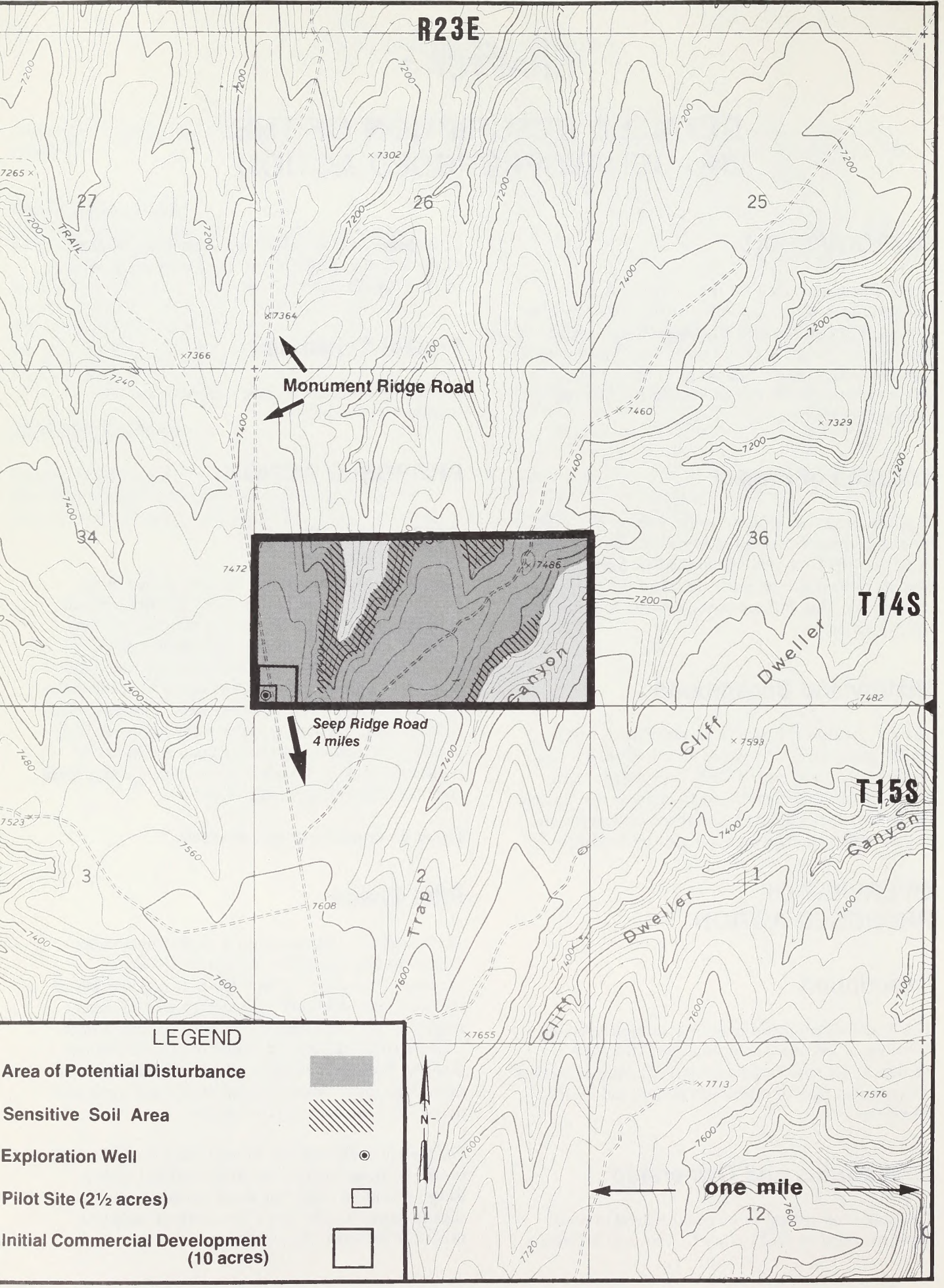
Nine core holes have reportedly been drilled in the general vicinity of the project area. The depositional placement of the tar sand reserves requires only one pre-pilot core hole (Map B-3) to be drilled on site to evaluate this acreage. Therefore, only one well (other than in the pilot area) would be needed to evaluate the reserves for this 10-acre *in situ* project. This operation is described in Section A, General Development Techniques. The roadways providing main access to the project site include 4.4 miles of Monument Ridge Road and 55.6 miles of Seep Ridge Road.

Figure B3 Proposed Project Schedule

Pilot Phase

The Bradshaw pilot operation is as described under Typical *In Situ* Operation in Section A. For the location of the pilot site see Map B-3. Any portion of the site could be leveled as needed to accommodate specific pieces of equipment. Production and storage facilities could either be at higher or lower elevations than the five-spot well site to allow adequate drainage downslope to the water disposal pit for any water produced from the dehydration facilities.

For the pilot site location, no new road would be built because existing roads (Seep Ridge and Monument Ridge) would be used. The roads would be used slightly more because only a few workers would be needed to maintain this operation.



AP B-3 BRADSHAW PROJECT

TABLE B-12
BRADSHAW DATA SHEET

GENERAL

• Type of Operation	Small *In Situ*, progressing in 10-acre increments
• Leases to be Converted (1)	320 Acres
• Number of Acres to be Developed	260
• Percent of Lease to be Developed	81
• Production Life of one 10-acre Plot	10 years
• Number of Tar Sand Zones to be Mined	1

PHASE

Item	Exploration	Pilot	Commercial
Production bbl/day		30	150
Duration of Phase	15 days	1 year	100+ years
Acres Disturbed			
At One Time			
Core Drill Sites	0.25	—	—
Drill Pads	—	2.5	—
Production Plot	—	—	10–20
Total:	0.25	2.5	10–20
Used For Analyses	0.25	2.5	20
Water Use			
ac-ft/year	—	0.1	0.3
Source	—	Ground Water	Ground Water
Peak Construction			
Year	1985	1985	1986
Personnel	7	20	4
Peak Operation			
Year		1985	1986
Personnel	—	4	4
Transportation			
Trips Per Day	4	—	—
Construction	—	4	4
Operation	—	4	4

Note: bbl/day = barrels per day; ac-ft/year = acre feet per year.

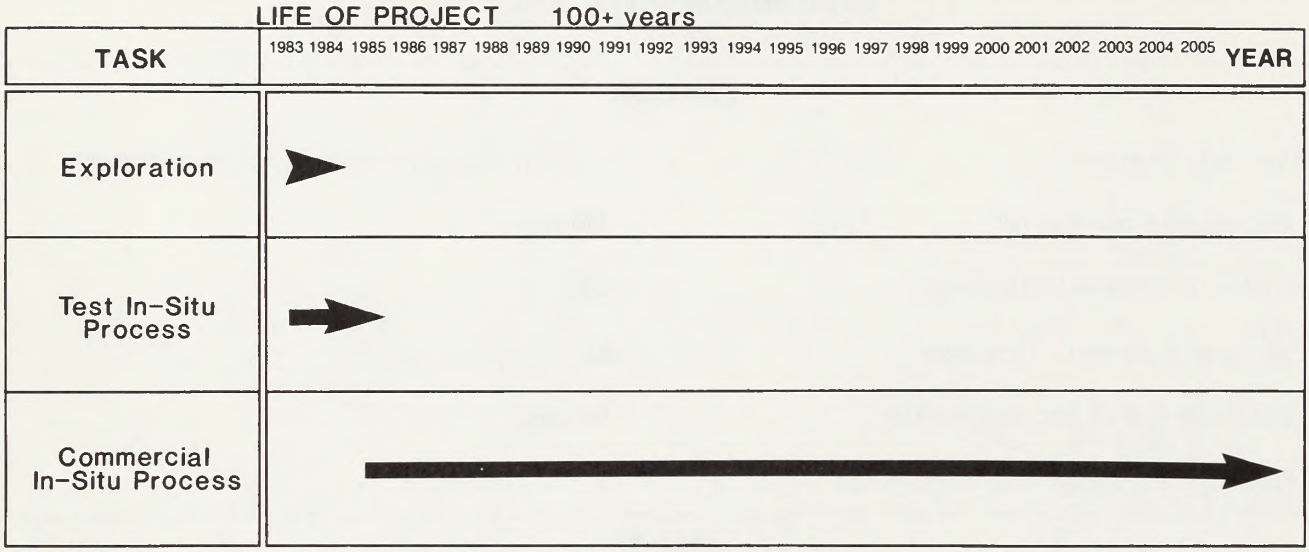


FIGURE B-3 BRADSHAW PLAN OF OPERATIONS SCHEDULE

Commercial Phase

The commercial phase would be as described in Section A. The average production life of one 10-acre plot for the Bradshaw Proposed Action would be 10 years, since only the uppermost tar sand would be developed. Over 100 years would be needed to develop the resource on the total conversion area.

On a 10-year cycle, as all of the bitumen is produced from the first 10 acres and the plot abandoned, a new 10-acre plot, adjacent to the old plot, would be developed. For the 5 years required for reclamation (following the first 10 years of production), as the initial 10 acres is being reclaimed and the new 10-acre plot is being produced, a total of 20 acres would be disturbed. Since the fixed production disturbance time versus reclamation time is low (10 years versus 5 years), 20 acres disturbed at one time is used for analysis purposes.

Reclamation

Land disturbed during project activities would be reclaimed. Details of the reclamation proposed by the applicant are provided in Section C, Appendix 2.

NO-ACTION ALTERNATIVE

The No-Action Alternative would be the denial of the conversion of the existing oil and gas lease to a combined hydrocarbon lease.

CHAPTER 2

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

WATER RESOURCES

Affected Environment

Surface runoff drains from this area through ephemeral stream channels for about 4 miles to Sweet Water Canyon, Bitter Creek, the White River, and then to the Green River. The project area consists mostly of upland plateaus and some steep-sloped areas.

Environmental Consequences

Impacts to water resources would be similar to those described for the Beartooth A project.

SOCIOECONOMICS

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

The impacts from the Bradshaw project would be the same as those described for the Beartooth A project.

AIR QUALITY

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

The impacts are presented for the commercial phase. Impacts during the exploration and pilot phases would be insignificant.

Estimated pollutant emission rates are shown in Table B-13. Projected impacts are compared to the NAAQS and PSD increment limitations in Tables B-14 and B-15. Increased SO_2 and TSP concentrations would be only a small fraction of the PSD increments, and total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates were predicted to be well within the significance criteria; therefore, impacts are expected to be insignificant.

TABLE B-13
ESTIMATED AIR POLLUTANT EMISSION RATES FOR THE BRADSHAW PROJECT

Pollutant	Emission Rate* (kg/hr)
Total Suspended Particulates	12.1
Sulfur Dioxide	4.5
Nitrogen Dioxide	8.4
Carbon Monoxide	1.9
Hydrocarbons	0.9

Source: Aerocomp 1985.

*Long-term average; short-term emission rates may be higher; kg/hr = kilograms per hour.

SOILS AND VEGETATION

Affected Environment

The Bradshaw project is located on a gently sloping to sloping plateaus bordered by strong sloping to steep sideslopes. Average annual precipitation is 14 to 16 inches and the average frost-free period is 90 to 110 days.

SOILS AND VEGETATION TYPES

Soils on the plateaus are primarily moderately deep, well-drained loam and clay loam soils containing some

TABLE B-14
COMPARISON OF MAXIMUM SITE-SPECIFIC IMPACTS WITH NAAQS FOR THE BRADSHAW PROJECT

Pollutant Avg. Time	SOURCE CATEGORY CONCENTRATION ($\mu g/m^3$) 2005 Baseline Sources	PROJECT SOURCES Secondary	Direct	Maximum Concentrations	NAAQS
SO_2					
3-hour	18	0	13	31	1,300
24-hour	7	0	6	13	365
Annual	1	0	<1	1	80
TSP					
24-hour	69	0	5	74	150
Annual	21	0	3	24	60
NO_2					
Annual	2	0	1	3	100
CO					
1-hour	1,500	0	8	1,508	40,000
8-hour	900	0	6	906	10,000

Source: Aerocomp 1985.

Note: Secondary = emissions resulting from population growth; Direct = emissions from the Bradshaw project; $\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; SO_2 = sulfur dioxide; TSP = total suspended particulates; NO_2 = nitrogen dioxide; CO = carbon monoxide.

TABLE B-15
SUMMARY OF PSD INCREMENT CONSUMPTION FOR THE BRADSHAW PROJECT

Areas of Special Concern	SO_2 ($\mu g/m^3$) 3-hour	24-hour	Annual	TSP ($\mu g/m^3$) 24-hour	Annual
Winter Ridge WSA	1	<1	<1	1	1
Uintah & Ouray Reservation	<1	<1	<1	<1	<1
State of Colorado	<1	<1	<1	<1	<1
Maximum Impact	13	6	<1	5	3
Class II Increment	512	91	20	37	19

Source: Aerocomp 1985.

Note: PSD = prevention of significant deterioration; SO_2 = sulfur dioxide; $\mu g/m^3$ = micrograms per cubic meter; TSP = total suspended particulates; WSA = Wilderness Study Area.

coarse rock fragments (channers). The strongly sloping and steep sideslopes have shallow and moderately deep loam and clay loam soils containing varying amounts of coarse fragments (10 to 65 percent) varying in size from gravel to stone. The following general soil groups occur within the project area:

Soil Group 1 - Soils of gently sloping to strongly sloping mesas and plateau tops
Soil Group 2 - Soils of the strongly sloping to steep plateaus, mountain sideslopes, and hills
Soil Group 3 - Soils of the steep and very steep plateaus, and mountain sideslopes, canyon walls, and mesa escarpments

This project would affect four major vegetation types: grassland, pinyon-juniper, mixed conifer, and riparian. See Section A, Vegetation, for descriptions of vegetation types and their uses.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

This project is located outside the threatened, endangered, or sensitive plant habitat area outlined in the Book Cliffs Resource Management Plan (BLM 1984b). See Section A, Vegetation, for discussion of threatened, endangered, or sensitive plant species. No threatened, endangered, or sensitive plant species are known to occur on the project area.

Environmental Consequences

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. Impacts during the commercial phase would also be the same, with the following exceptions:

Twenty acres of soil and its related vegetation would be disturbed at any one time. Disturbance of the 10-acre blocks would continue over the project life with approximately 10 years between each period of disturbance. Based on the significance criteria for soils and vegetation (Section A), impacts associated with the disturbance from the Bradshaw project would not be significant.

Over the projected 100-year life of the project, of the total 260 acres that could be disturbed, 35 acres of sensitive soil would be disturbed (Map B-3). The Bradshaw project could disturb 51 acres of grassland, 144 acres of pinyon-juniper (classified as moderate woodland), and 65 acres of mixed conifer. Impacts to grassland-type vegetation would be insignificant because grasses and forbs are expected to become reestablished within 5 years.

However, overstory vegetation (trees and shrubs) would take longer to become established. The mixed conifer and pinyon-juniper vegetation types would take 30 to 50 years or more to return to near-predisturbance conditions. The highly productive woodland sites would be returned to premining conditions, while the less productive sites would be converted to grassland.

Threatened, endangered, or sensitive plant species would not be adversely affected, since none are known to occur within the area of disturbance.

WILDLIFE

Affected Environment

HABITAT TYPES

Four primary wildlife habitat types are found on the project area: riparian, grassland, pinyon-juniper, and mixed conifer. (See Section A, Vegetation and Soils, for a description of the plant communities and species composition in these types and also Wildlife, for a description of wildlife species occurring in these types.)

TERRESTRIAL WILDLIFE

The entire project area is classified by UDWR as crucial elk winter range. The project area is also located in the middle of the Monument Ridge deer migration corridor. This vital habitat zone is used approximately 2 to 3 weeks in the spring and fall, as deer migrate from one seasonal range to another.

High priority sage grouse summer range is found throughout the project area, as well as substantial value blue grouse habitat. Mourning doves also nest and feed in the area.

Raptors common to the project area include red-tailed hawks, sharp-shinned hawks, goshawks (in the winter months), American kestrels, turkey vultures, and great

horned and long-eared owls, and golden eagles. Habitat for both woodland and ground-nesting raptors exists on the project area, and the entire area is used as hunting habitat for all raptor species common to the area. The common species of nongame birds and mammals, reptiles, and amphibians that could be found on the project area are similar to those found throughout the Uinta Basin. Refer to Section A, Wildlife, for a discussion of these species.

THREATENED OR ENDANGERED ANIMAL SPECIES

The Fish and Wildlife Service has indicated that several federally listed species could occur on the project area (Table A-12 and Appendix 4).

Environmental Consequences

HABITAT

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. Impacts during the commercial phase would also be similar, with the following exceptions:

Since the project site is located entirely on crucial elk winter range (Karpowitz 1984), all impacts to elk from this project would be to wintering animals.

Once the project is initiated, 20 acres would be out of big game predisturbance forage production for 10 years. Reclamation would then be started on these 20 acres and an additional 20 acres would be disturbed, causing 40 acres to be out of production for 20 years. Since reclamation of the first 20 acres is estimated to take 15 years, there would be a 5-year period with 60 acres disturbed, then disturbed acres would reduce to 40. This 25-year cycle would be repeated for the life of the project.

The estimated acreages of wildlife vegetation habitat types that would be disturbed by this project are below the levels of significance. Therefore, no significant adverse impacts are anticipated to wildlife vegetation habitats from this project.

This project would disturb an estimated 0.1 percent of the elk crucial winter range in herd unit 21. This amount of disturbance is not significant.

WILDLIFE POPULATIONS

Impacts to wildlife during the exploration and pilot phases would be the same as described for the Beartooth A project.

Impacts to wildlife populations during the commercial phase, particularly to wintering elk, would be associated with harassment and displacement rather than vegetation habitat alterations. The small number of acres disturbed at any one time would not exceed the significance criteria, so no significant impacts to elk are anticipated from vegetation removal. However, project development on crucial elk winter range and the associated zone of influence around the project area would reduce big game populations because of harassment and displacement.

Blue grouse and mourning doves are not expected to be adversely affected by this project.

Endangered peregrine falcons could overfly the area, but no impacts are anticipated.

TRANSPORTATION NETWORKS

Affected Environment

The vehicular traffic flow would enter and leave the project site at the southwest corner of the lease (Map B-3). The roadways starting at the project site include 4.4 miles of Monument Ridge Road and 55.6 miles of Seep Ridge Road before reaching State Highway 88, County Road 264, and U.S. Highway 40.

Traffic data for the Seep Ridge Road, U.S. Highway 40, State Highway 88, and County Road 264 are provided in Section A. Monument Valley road ranges from packed dirt to some gravel; use ranges from vehicles with high clearances to heavy drilling equipment vehicles. Accessibility during the winter months is discussed in Section A.

Environmental Consequences

Impacts during the exploration and pilot phases would be similar to those described for the Beartooth A project, except they would occur on Monument Ridge Road.

Impacts during construction of the commercial phase would be the same as described for the Beartooth A project. During operation, the types and magnitude of impacts to Monument Ridge Road would be the same as described for the Beartooth A project.

VISUAL RESOURCES

Affected Environment

The Bradshaw project area includes flat to gently rolling landscape indented by a side drainage predominantly covered with pinyon-juniper, with mixed conifer and grassland interspersed along the western and northern boundary as a result of chaining and burning. The project would be located entirely within a VRM Class IV area comprising Class C (low diversity) scenery, which indicates the landscape character is common within the region. Viewer sensitivity was determined to be seldom seen or low as viewed in the foreground/middleground from two unimproved roads that transect the area. Except for the unimproved roads, no cultural modifications are evident in the area.

Environmental Consequences

No significant impacts would occur to the visual resource. *In situ* operations were determined to generally be compatible with the VRM objectives for the area where the operations would occur. The landform and vegetation changes, as well as the addition of structures, would not create dominant features on the landscape in terms of scale as viewed by the casual observer.

WILDERNESS

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The impacts from the Bradshaw project would be the same as described for the Beartooth A project. The Bradshaw project would be located within 6 miles and to the east of the Winter Ridge WSA, but no significant impacts resulting in outside sights and sounds impinging on the WSA are anticipated. The project area could not be viewed or heard from the WSA.

The project area is over 14 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation. No direct impacts are anticipated.

RECREATION

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

No significant long-term impacts would occur to the recreation resource during any of the three phases of development of the Bradshaw project. See the Beartooth A description for a further explanation.

CULTURAL RESOURCES

Affected Environment

No cultural resource sites are known to exist in the Bradshaw project area. However, sites are known to exist within 1 mile south and southeast of the project area. Only areas for wellpads and roads have been surveyed. The likelihood of sites occurring in this project area is high given the fact that pinyon-juniper predominates (144 acres). No sagebrush-grass (medium site density) or mountain shrub (low site density) occur in the project area. See Section A for a discussion of site density associated with vegetation types.

Environmental Consequences

The Bradshaw project would disturb about 144 acres of high site density probability for the life of the project. Potential impacts to any unknown sites would be the same as discussed for the Beartooth A project.

MINERAL AND PALEONTOLOGICAL RESOURCES

Affected Environment

The affected environment would be similar to that described for the Beartooth A project. (See Section A for descriptions of minerals.) BLM has derived the area of probable tar sand occurrence shown on Map B-3 as the area of potential disturbance. The applicant plans *in situ* development of one tar sand bed. Over the entire project area, only the uppermost tar sand zone would be processed. No inventory exists for paleontological resources within the project area. In areas that have been inventoried, the Douglas Creek member has shown a low potential for fossil occurrence. No known sites have been identified in the project area.

Environmental Consequences

Impacts to mineral and paleontological resources would be similar to those described under the Beartooth A project, except that no oil shale development would be affected by this project.

AGRICULTURE

Affected Environment

The Bradshaw project would affect the Monument pasture located within the Sweetwater Allotment. The project would affect one cattle operation during the spring, summer, and fall. Total acreage of the pasture is 19,731 acres, which provides 1,672 total AUMs.

No cropland occurs within the project area. See Section A, Cropland, for discussion of cropland areas potentially affected by urban expansion.

Environmental Consequences

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. During the commercial phase, forage loss would result from the land disturbance caused by the *in situ* recovery process and land being occupied by roads. Twenty acres of vegetation would be disturbed or out of predisturbance land use at any one time. Because the location and exact sequence of the block are unknown, specific amounts of forage loss cannot be identified. An average of 2 AUMs of forage could be lost annually to one operator.

Forage loss from this project (2 AUMs of the 1,672 total AUMs) would represent less than 0.1 percent of the total forage within the affected pasture. This is less than the 5 percent criterion and would therefore be insignificant. The potential for invasion of poisonous and invader plants would not be as great because of the higher annual precipitation (16 to 20 inches). Because of the time interval, the nature of land disturbance, and more favorable precipitation, invader plants are expected to occupy less than 10 percent of the disturbed area and poisonous plants, less than 2 percent. Therefore, impacts would be considered insignificant.

More AUMs could be lost by grazing areas becoming remote or inaccessible. This problem could result from (1) disruption of livestock watering facilities and (2) disruption of grazing patterns. AUM loss cannot be measured because specific details on the *in situ* recovery sequence are not known. However, the probability of this occurring is expected to be low.

No cropland is expected to be converted to urban use from project-related population increases.

NO-ACTION ALTERNATIVE

Impacts from the No-Action Alternative would be the same as described for the Beartooth A project.

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS; LONG-TERM ENVIRONMENTAL CONSEQUENCES; AND COMMITMENT OF RESOURCES

Mitigation, monitoring, and unavoidable adverse impacts; long-term environmental consequences; and commitment of resources would be similar to those identified for the Beartooth A project.

DUNCAN PROJECT

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DUNCAN PROJECT SUMMARY

WATER RESOURCES

The project would require about 0.3 acre-feet of water per year, which would be insignificant. The amount of sedimentation produced by the clearing required for the project would depend on the location of the drill pads for each well. By following the proper construction methods detailed in Appendix 2, no significant sedimentation impacts would occur. Since ground water in the area is mostly below the tar sand beds, no significant direct impacts would occur. Once the bitumen is removed, the remaining sand bed would have different hydrologic characteristics that may lead to a change in the flow or location of local springs and seeps. No significant impact would occur to the public water reserve located near this project.

SOCIOECONOMICS

None of the phases would cause any significant impacts to the local towns or communities. Total employment and per capita personnel income would increase by less than 1 percent in all jurisdictions in each of the phases of development. Effects on housing, public services and facilities, and social conditions in the area of influence would be insignificant.

AIR QUALITY

Increased SO_2 and TSP concentrations would only be a fraction of the PSD increments, and total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates were predicted to be well within the significance criteria. None of the air quality impacts are expected to be significant.

SOILS AND VEGETATION

Over the life of the project a total of 1,120 acres could be disturbed, with approximately 20 acres disturbed at any one time. Of that total, 765 acres of sensitive soil would be disturbed. No significant impacts would occur to soils or vegetation and all disturbed land would be reclaimed through the use of the measures outlined in Appendix 2. Threatened, endangered, or sensitive plant species would not be adversely affected since none are known to occur within the area of disturbance.

WILDLIFE

The project would disturb 2 percent of the crucial elk winter range in herd unit 21, which would not be significant. Sage grouse would be adversely affected by harassment during the strutting, nesting, and brooding seasons. Impacts to regional sport fisheries would not be significant. Endangered peregrine falcons could overfly the area, but no impacts are anticipated.

TRANSPORTATION NETWORKS

Two miles of jeep trails could be significantly affected during commercial operation. No other roads would be significantly affected.

VISUAL RESOURCES

No visual impacts would occur to the VRM Class IV areas outside the foreground/middleground viewing area from Seep Ridge Road. However, significant impacts would occur within this viewing area as a result of structural changes and vegetation clearings. These impacts would remain until physical structures were removed and revegetation returned portions of the landscape to predisturbance conditions. Of the total 1,120 acres that would be disturbed over the life of the project, only about 6 percent of the area, or 65 acres, would be significantly affected.

WILDERNESS

The Duncan project area would not cross the boundary of an existing wilderness or wilderness study area (WSA). The project would be located within 2 miles of the Winter Ridge WSA. However, the impacts arising from sights and sounds outside the WSA would be insignificant because distance and visual screening (vegetation and topography) would obscure project development activities. The project area would be located over 10 miles from the Flume Canyon WSA and over 12 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation; no direct impacts are anticipated.

RECREATION

No significant long-term impacts would occur to the recreation resource, other than to the sightseeing

opportunity. Little land would be removed from use for undeveloped recreation opportunities. The project is not expected to interfere with hunting, ORV activities, or other types of opportunities in the area.

CULTURAL RESOURCES

The project would disturb about 277 acres with high site density probability and about 747 acres with low site density probability over the life of the project. Indirect impacts from unauthorized collection of artifacts would not be significant, given the small work force increases.

MINERAL AND PALEONTOLOGICAL RESOURCES

No significant impacts to mineral or paleontological resources would occur. *In situ* recovery would result in recovering 40 to 50 percent of the in-place oil. No oil and gas, oil shale, or other mineral development would be affected by this project.

AGRICULTURE

Impacts to forage production would amount to less than 1 percent of the total forage, which is insignificant. Invader plants would occupy less than 10 percent of the disturbed area and poisonous plants, less than 2 percent. These impacts would also be insignificant. The forage that could be lost through disruption of watering facilities and grazing patterns is unknown; however, the probability of this occurring is expected to be low. No cropland would be converted to urban uses from project-related population increases; no cropland occurs in the project area itself.

BLM PREFERRED ALTERNATIVE

Conversion of all leases as proposed, including mitigation discussed in Appendix 2, is the BLM preferred alternative. BLM supports this alternative because it would lead to more efficient and orderly tar sand recovery consistent with the diligent development and reasonable environmental protection objectives of the Combined Hydrocarbon Leasing Act.

CHAPTER 1

DETAILED DESCRIPTION OF THE DUNCAN PROPOSED ACTION

INTRODUCTION

The Purpose and Need for the Proposed Action, Authorizing Actions, and Alternatives Considered but Eliminated From Detailed Analysis sections can be reviewed in Section A of this document. The Interrelationships with Other Proposed or Existing Projects section appears at the end of Section B under the Cumulative Analysis.

Location of Project

The area proposed for lease conversion on one existing oil and gas lease is located in southern Uintah County in east-central Utah and within the P R Spring STSA. Map A-2 shows the location of the project area (Section A). Map B-4 shows the detailed location of the project area.

History and Background

Walter Duncan Oil Properties (Duncan) holds one lease on 1,600 acres, which was issued September 1, 1971. Nine core holes have been drilled in the general vicinity of the project area. A pilot site has been selected on the basis of information obtained from these cores. Preliminary biological data have been developed and project planning and design initiated.

OVERVIEW OF PROPOSED ACTION

Description

Duncan's proposed plan of operations (Averett Consultants 1983d) is summarized in Table B-16. Section A, General Development Techniques, describes the proposed plan of operations and typical *in situ* operations.

Land Status and Ownership

The lease tract lies on both federal surface and minerals estate (960 acres), as well as state surface and federal mineral estate (640 acres). Map C-4, located in Section C, Appendix 5, shows the land status and ownership of the 1,600 acres proposed for lease conversion within the boundary of the P R Spring STSA.

Project Schedule

Figure B-4 shows the proposed schedule for the Duncan *in situ* project.

PROPOSED ACTION

Exploration Phase

One pre-pilot exploration well (Map B-4) would be used to verify the previous data and site for the pilot operation. The operation is described in Section A, General Development Techniques. The roadways providing the main access to the project site include 0.25 mile of a jeep trail and 55.2 miles of Seep Ridge Road.

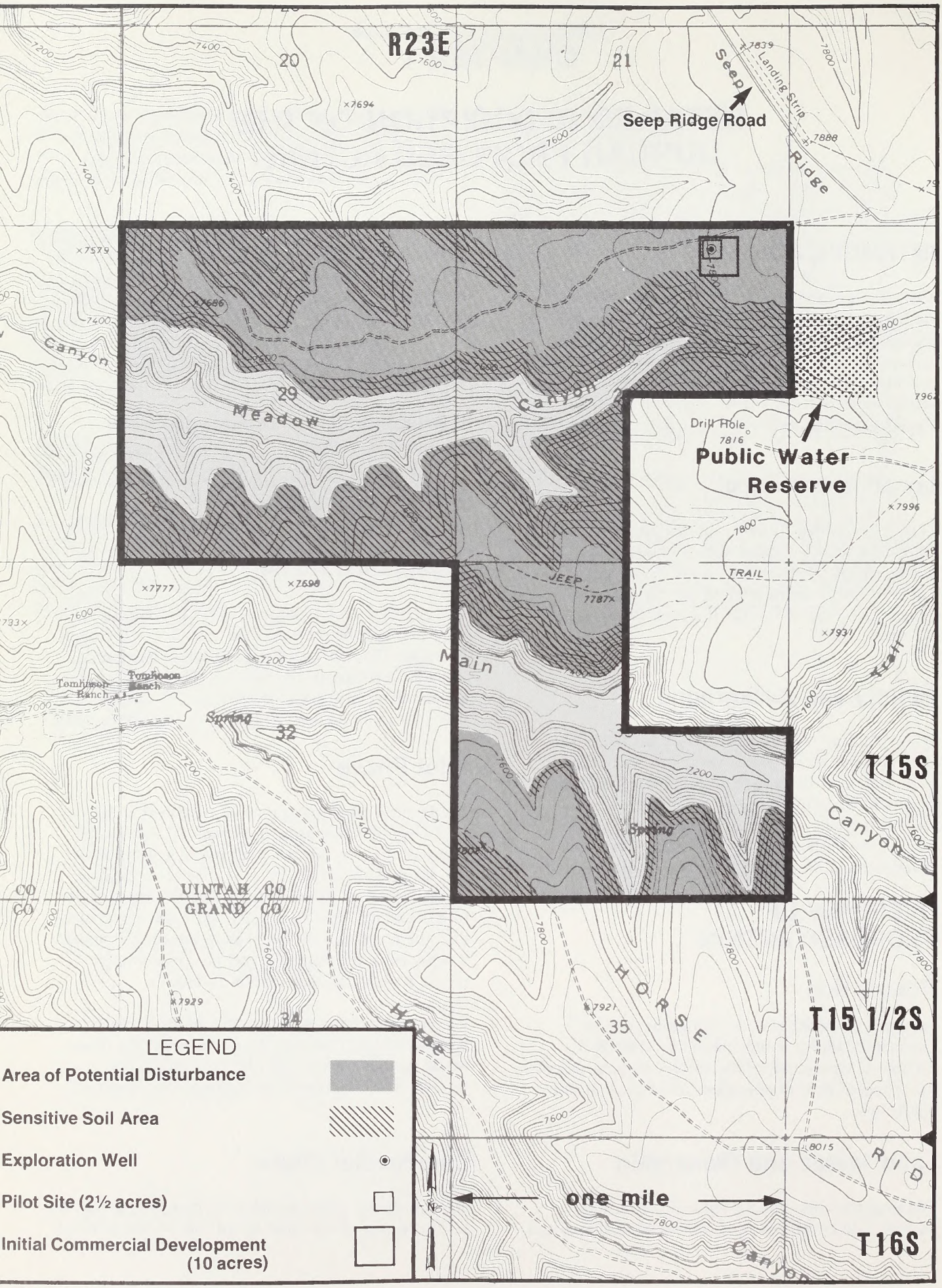
Pilot Phase

The Duncan pilot operation is as described under Typical *In Situ* Operation in Section A. For the location of the pilot site see Map B-4. Any portion of the site could be leveled as needed to accommodate specific pieces of equipment. Production and storage facilities could either be at higher or lower elevations than the five-spot well site to allow adequate drainage downslope to the water disposal pit for any water produced from the dehydration facilities.

For the pilot phase, no new roads would be built because existing roadways would be used. The roads would be used slightly more because only a few workers would be needed to maintain this operation.

Commercial Phase

The commercial phase would be as described in Section A. The average production life of one 10-acre plot for



AP B-4 DUNCAN PROJECT

TABLE B-16
DUNCAN DATA SHEET

GENERAL

• Type of Operation	Small *In Situ*, progressing in 10-acre increments
• Leases to be Converted (1)	1,600 Acres
• Number of Acres to be Developed	1,120
• Percent of Lease to be Developed	70
• Production Life of one 10-acre Plot	40 years
• Number of Tar Sand Zones to be Mined	4 or 5

PHASE

Item	Exploration	Pilot	Commercial
Production bbl/day		30	150
Duration	15 days	1 year	100+ years
Acres Disturbed			
At One Time			
Core Drill Sites	0.25		
Drill Pads		2.5	
Roads			0–10
Production Plot			10–20
Total:	0.25	2.5	10–30
Used For Analyses	0.25	2.5	20
Acres Removed			
Life of Project Roads	—	—	0–10
Water Use			
ac-ft/year	—	0.1	0.3
Source	—	Ground Water	Ground Water
Peak Construction			
Year	1985	1985	1985
Personnel	7	20	4
Peak Operation			
Year	—	1985	1986
Personnel	—	4	4
Transportation			
Trips Per Day	4		
Construction		4	4
Operation		4	4

Note: bbl/day = barrels per day; ac-ft/year = acre feet per year.

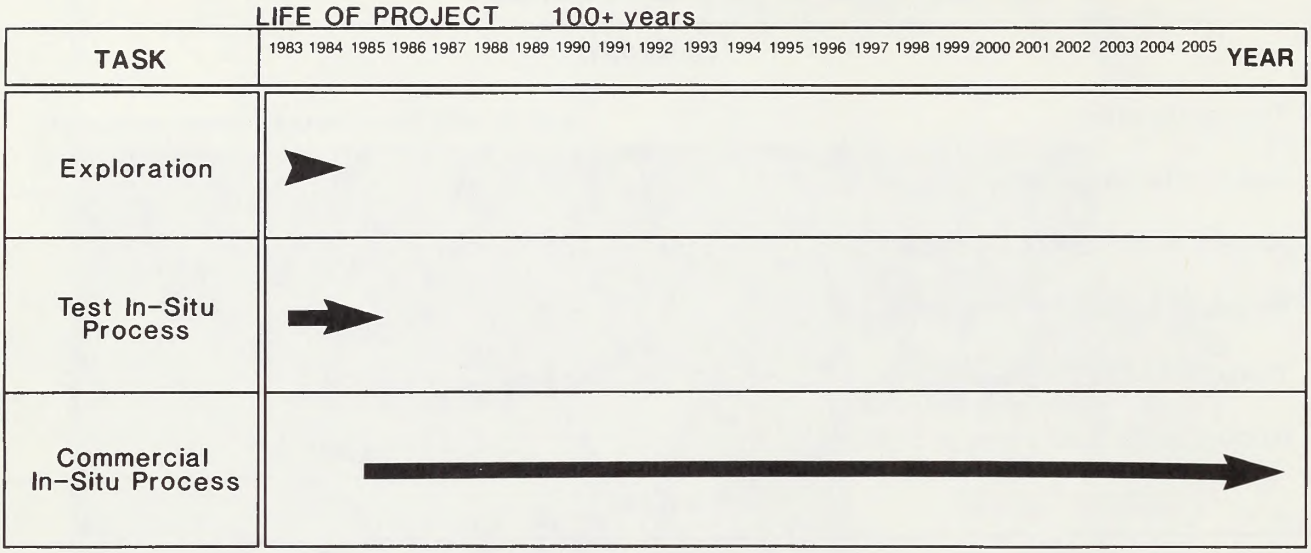


FIGURE B-4 DUNCAN PLAN OF OPERATIONS SCHEDULE

the Duncan Proposed Action would be 40 years since four or five tar sand zones would be developed. Over 100 years would be needed to develop the resource on the total conversion area.

Initially, no new roads would be needed; however, as the development moves away from existing roads, some new roads would be required. Over the life of the project, the acres disturbed by roads would gradually increase from 0 to 10. On a 40-year cycle, as all of the bitumen is produced from the first 10 acres and the plot abandoned, a new 10-acre plot adjacent to the old plot, would be developed. For the 5 years required for reclamation (following the first 10 years of production), as the initial 10 acres is being reclaimed and the new 10-acre plot is being developed, a total of 20 acres would be disturbed.

Considering roads and production plots, 10 to 30 acres would be disturbed at any one time. Since the fixed production disturbance time versus reclamation time is high (40 years versus 5 years), 20 acres disturbed at one time is used for analysis purposes.

Reclamation

Land disturbance from project activities would be reclaimed. Details of the reclamation proposed by the applicant are provided in Section C, Appendix 2.

NO-ACTION ALTERNATIVE

The No-Action Alternative would be the denial of the conversion of the existing oil and gas lease to a combined hydrocarbon lease.

CHAPTER 2

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

WATER RESOURCES

Affected Environment

Surface runoff drains from this area through ephemeral stream channels for less than ¼ mile to Meadow Canyon, Main Canyon, Willow Creek, and then to the Green River. The project area consists of uplands, steep-sloped areas, and bottomlands along Main Canyon and Meadow Canyon. A public water reserve is located just outside the project area (Map B-4).

Environmental Consequences

Impacts to water resources would be similar to those discussed for the Beartooth A project. *In situ* develop ment of this project area would not affect flow from the public water reserve.

SOCIOECONOMICS

Affected Environment

The affected environment would be the same as in Section A.

Environmental Consequences

The impacts from the Duncan project would be the same as those described for the Beartooth A project.

AIR QUALITY

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

The impacts are presented for the commercial phase. Impacts during the exploration and pilot phases would be insignificant.

Estimated pollutant emission rates are shown in Table B-17. Projected impacts are compared to the NAAQS and PSD increment limitations in Tables B-18 and B-19. Increased SO_2 and TSP concentrations would be only a small fraction of the PSD increments, and total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates were predicted to be well within the significance criteria; therefore, impacts are expected to be insignificant.

TABLE B-17
ESTIMATED AIR POLLUTANT EMISSION RATES FOR THE DUNCAN PROJECT

Pollutant	Emission Rate* (kg/hr)
Total Suspended Particulates	12.5
Sulfur Dioxide	4.5
Nitrogen Dioxide	8.4
Carbon Monoxide	1.9
Hydrocarbons	0.9

Source: Aerocomp 1985.

*Long-term average; short-term emission rates may be higher; kg/hr = kilograms per hour.

SOILS AND VEGETATION

Affected Environment

The Duncan project is located in an area of narrow plateaus and small mesa-like areas, bordered by strongly sloping to steep and very steep sideslopes. The

TABLE B-18
COMPARISON OF MAXIMUM SITE-SPECIFIC IMPACTS WITH NAAQS FOR THE DUNCAN PROJECT

Pollutant Avg. Time	SOURCE CATEGORY CONCENTRATION ($\mu g/m^3$) 2005 Baseline Sources	PROJECT SOURCES Secondary	Direct	Maximum Concentrations	NAAQS
SO_2					
3-hour	18	0	5	23	1,300
24-hour	7	0	2	9	365
Annual	1	0	<1	1	80
TSP					
24-hour	69	0	16	85	150
Annual	21	0	4	25	60
NO_2					
Annual	2	0	4	6	100
CO					
1-hour	1,500	0	2	1,502	40,000
8-hour	900	0	2	902	10,000

Source: Aerocomp 1985.

Note: Secondary = emissions resulting from population growth; Direct = emissions from the Duncan project; $\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; SO_2 = sulfur dioxide; TSP = total suspended particulates; NO_2 = nitrogen dioxide; CO = carbon monoxide.

TABLE B-19
SUMMARY OF PSD INCREMENT CONSUMPTION FOR THE DUNCAN PROJECT

Areas of Special Concern	SO_2 ($\mu g/m^3$) 3-hour	24-hour	Annual	TSP ($\mu g/m^3$) 24-hour	Annual
Winter Ridge WSA	1	<1	<1	2	1
Uintah & Ouray Reservation	<1	<1	<1	<1	<1
State of Colorado	<1	<1	<1	<1	<1
Maximum Impact	5	2	<1	16	4
Class II Increment	512	91	20	37	19

Source: Aerocomp 1985.

Note: PSD = prevention of significant deterioration; SO_2 = sulfur dioxide; $\mu g/m^3$ = micrograms per cubic meter; TSP = total suspended particulates; WSA = Wilderness Study Area.

area is dissected by a dendritic drainage pattern with narrow floodplains along intermittent drainages. Average annual precipitation is 16 to 18 inches, and the average frost-free period is 90 to 110 days.

SOILS AND VEGETATION TYPES

Soils on the gently sloping to sloping plateau tops and mesa-like areas are mainly moderately deep and deep, well-drained loam and clay loam soils. The strongly sloping hills and sideslopes and steep to very steep plateaus and mesa sideslopes have shallow and moderately deep loam and sandy loam soils containing varying amounts of rock fragments (10 to 65 percent) ranging in size from gravel to stone and channers. The following general soils groups occur within the project area:

Soil Group 3 -Soils of the moderately sloping to strongly sloping convex ridges and hills
Soil Group 4 -Soils of the strongly sloping to steep plateaus, mountain sideslopes, and hills
Soil Group 5 -Soils of the steep and very steep plateaus, mountain sideslopes, canyon walls, and mesa escarpments

This project would affect four major vegetation types: grassland, pinyon-juniper, mountain shrub, and mixed conifer. See Section A, Vegetation, for descriptions of vegetation types and their uses.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

This project is located outside the threatened, endangered, or sensitive plant habitat area outlined in the Book Cliffs Resource Management Plan. No threatened, endangered, or sensitive plant species are known to occur within the area. See Section A, Vegetation, for discussion of threatened, endangered, and sensitive plant species.

Environmental Consequences

The impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. Impacts during the commercial phase would be the same as described for the Beartooth A project, with the following exceptions:

About 20 acres of soil and its related vegetation would be disturbed at any one time. Disturbance of 10-acre blocks would continue over the project life with approximately 40 years between each period of disturbance. Based on the significance criteria for soils and vegetation (Section A), the impacts associated with disturbance from the Duncan project would not be significant.

Over the projected 100-year life of the project, of the total 1,120 acres that could be disturbed, 765 acres of sensitive soil would be disturbed (Map B-4). The Duncan project would disturb 27 acres of grassland, 277 acres of pinyon-juniper, 747 acres of mountain brush, and 69 acres of mixed conifer. Impacts to grassland-type vegetation would be insignificant because grasses and forbs are expected to become established within 5 years.

Overstory vegetation (trees and shrubs) would take longer to become established. The mountain shrub vegetation type would take 20 to 30 years to return to near-predisturbance conditions. The areas of pinyon-juniper would take 30 to 50 years or more to return to predisturbance conditions. The highly productive woodland sites would be returned to premining conditions, while the less productive sites would be converted to grassland.

Threatened, endangered, or sensitive plant species would not be adversely affected, since none are known to occur within the area of disturbance.

WILDLIFE

Affected Environment

HABITAT TYPES

Four primary wildlife habitat types are found on the project area: grassland, pinyon-juniper, mountain brush, and mixed conifer. See Section A, Soils and Vegetation, for descriptions of the plant communities and species composition of these habitat types and also Section A, Wildlife, for a discussion of wildlife species occurring in these types.

TERRESTRIAL WILDLIFE

Crucial deer and elk summer range occurs on about 1,200 acres of the project area. The range is used by

elk from about May 15 to about November 1 and by deer from about May 15 to October 15.

High priority sage grouse summer range is found throughout the project area, with one strutting ground and its associated nesting and brooding habitat located immediately adjacent to the project area at the northeast corner. The entire project area is also classified as substantial value blue grouse habitat by the UDWR.

Raptors common to the project area include red-tailed hawks, goshawks (during winter), Cooper's hawks, sharp-shinned hawks, turkey vultures, and golden eagles. Nesting habitat for woodland nesting species of raptors is found on the project area, but the entire area furnishes hunting habitat for all species of raptors common to this part of Utah. At the present time, no raptor nests are known to exist on the project area. The species of nongame mammals and birds, reptiles, and amphibians that could be found on the project area are similar to those found throughout the Uinta Basin. Refer to Section A, Wildlife, for a discussion of these species.

THREATENED OR ENDANGERED ANIMAL SPECIES

The Fish and Wildlife Service has indicated that several federally listed species could occur on the project area (Table A-12 and Appendix 4).

Environmental Consequences

HABITAT

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. Impacts during the commercial phase would be similar, with the following exceptions:

Since the project site is located on about 1,200 acres of crucial elk summer range, most of the impacts would occur to summering elk.

Once the project is initiated, 20 acres of habitat would be out of big game predisturbance forage production for 40 years. For the next 15 years, a total of 40 acres would be out of production while the initial 20 acres are being reclaimed to browse. The disturbed area would be reduced to 20 acres after this time and the same 55-year cycle would repeat itself. The small number of acres disturbed are not significant according to the significance criteria. The Duncan project would disturb about 2 percent of the total crucial elk summer range in herd unit 21 (Section A). This amount of disturbance is not significant.

WILDLIFE POPULATIONS

Impacts to wildlife during the exploration and pilot phases would be the same as described for the Beartooth A project. Impacts during the commercial phase would also be the same, with the following exceptions:

Impacts to elk populations in the project area, would be associated with harassment and displacement rather than vegetation habitat alterations. The small number of acres disturbed at any one time would not exceed the significance criteria, so no significant impacts to elk are anticipated from vegetation removal. However, project development within the associated zone of influence around the project area would cause big game population reductions because of harassment and displacement. Therefore, a reduction in reproductive success could occur and long-range population strategies for this elk population by the UDWR would be at least delayed. Some poaching and illegal killing could be expected but would be minimal because of the few people involved with this project.

The sage grouse population would be adversely affected by this project, resulting not so much because of direct impacts as because of a reduction in reproduction from harassment during the strutting, nesting, and brooding seasons. Some harassment to strutting grouse could be expected from project personnel watching the grouse or trying to take pictures. If these harassment levels were high enough, adult grouse would abandon the strutting grounds, severely reducing the population found in this area. Endangered peregrine falcons could overfly the area, but no impacts are expected.

TRANSPORTATION NETWORKS

Affected Environment

The vehicular traffic flow would enter the project site at the northeast corner of the lease (see Map B-4). The

roadways starting at the project site include 2 miles of jeep trails and 55.2 miles of Seep Ridge Road before reaching State Highway 88, County Road 264, and U.S. Highway 40.

The jeep trails are packed dirt and use ranges from vehicles with high clearance to heavy drilling equipment vehicles. Accessibility during the winter months is described in Section A.

The traffic data for Seep Ridge Road, U.S. Highway 40, State Highway 88, and County Road 264 are defined in Section A.

Environmental Consequences

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project, except the impacts would occur on 2 miles of jeep trails.

Since a four-person work force would be needed during construction of the commercial phase, no significant transportation impacts to the roadways would occur. During operation of the commercial phase, the type and magnitude of impacts would be the same as described for Beartooth A.

VISUAL RESOURCES

Affected Environment

The Duncan project area includes flat to gently rolling landscape, predominantly covered with mountain brush, with lesser amounts of pinyon-juniper, mixed conifer, and some grassland. The project would be located entirely within a VRM Class IV area, comprised of Class C (low diversity) scenery, which indicates the landscape character is common to view within the region. Viewer sensitivity was determined to be medium where seen as foreground/middleground from Seep Ridge Road, with the remainder and majority of the area classified as being seldom seen.

Environmental Consequences

Impacts would be similar to those identified for the Beartooth A project, except that they would occur as viewed from Seep Ridge Road. No significant landform modification is anticipated. Of the total 1,120 acres that would be disturbed over the life of the project, only about 6 percent of the area (about 65 acres) as viewed from Seep Ridge Road would be significantly affected.

WILDERNESS

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The impacts would be the same as described for the Beartooth A project. The project would be located within 2 miles and to the southeast end of the Winter Ridge WSA. However, the impacts arising from sights and sounds outside the WSA would be insignificant because of the distance and visual screening (vegetation and topography), which would obscure development activities from the WSA. The project would also be located within 10 miles of the Flume Canyon WSA. Because of the distance, the impacts to the WSA would be insignificant.

The project area is over 12 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation. No direct impacts are anticipated.

RECREATION

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

No significant long-term impacts would occur to the recreation resources during any of the three phases of development of the Duncan project other than the impacts on sightseeing from Seep Ridge Road. See Beartooth A for a further explanation.

CULTURAL RESOURCES

Affected Environment

No cultural resource sites are known to exist in this project area, but one site does exist 1/2 mile west of the project area. Only areas for wellpads and roads have been surveyed. Mountain shrub occupies 747 acres of the project area and pinyon-juniper occupies 277 acres. No sagebrush-grass (medium site density) occurs. The likelihood of sites occurring in this project area is low since mountain brush comprises the most acreage. If sites do exist in the area, the density would tend to be higher in the pinyon-juniper vegetation zone. See Section A for a discussion of site density associated with vegetation types.

Environmental Consequences

The Duncan project would disturb about 277 acres with high site density probability and about 747 acres with low site density probability, over the life of the project.

Potential impacts to any unknown sites would be the same as those discussed for the Beartooth A project.

MINERAL AND PALEONTOLOGICAL RESOURCES

Affected Environment

The affected environment would be similar to that described for the Beartooth A project. BLM has derived the area of probable tar sand occurrence shown on Map B-4 as the area of potential disturbance. The applicant plans *in situ* development of one to four tar sand beds at each well. Over the entire project area, five different tar sand zones would be developed. No inventory exists for paleontological resources within the project area. In areas that have been inventoried, the Douglas Creek member has shown a low potential for fossil occurrence. No known sites have been identified in the project area.

Environmental Consequences

The impacts would be the same as described for Beartooth A except no oil shale development would be affected by the project.

AGRICULTURE

Affected Environment

The Duncan project would affect grazing in three pastures. Table B-20 shows the pastures, number of operators affected, and current status.

No cropland occurs within the project area. See Section A, Cropland, for discussion of cropland areas potentially affected by urban expansion.

Environmental Consequences

The impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. Therefore, the following analysis is for the commercial phase of the Duncan Proposed Action.

Forage loss would occur from land disturbance caused by the *in situ* recovery process and land being occupied by roads. About 20 acres of the vegetation would be disturbed or out of use at any one time.

Since the location and exact sequence of plots of disturbance are unknown, specific forage losses by pasture cannot be identified. About 2 AUMS of forage would be lost annually. Table B-20 shows the potential annual 2-AUM forage loss compared to each pasture affected, number of operators, and the percentage of each pasture affected.

Forage loss from this project represents less than 1 percent of the total forage of any of the affected pastures. This is less than the 5 percent criterion and would therefore be insignificant. The potential for invasion of poisonous and invader plants would not be as great because of the higher annual precipitation (16 to 20 inches). Because of the nature of land disturbance and more favorable precipitation, invader plants are expected to occupy less than 10 percent of the disturbed area and poisonous plants, less than 2 percent. Therefore, impacts would be considered insignificant.

More AUMs could be lost by grazing areas becoming remote or inaccessible. This problem could arise

TABLE B-20
GRAZING ALLOTMENTS AFFECTED AND GRAZING LOSSES CAUSED BY THE DUNCAN PROJECT

Allotment and Pasture	CURRENT STATUS					POTENTIAL GRAZING LOSSES (AUMS)		
	Number of Operations	Livestock Class[1]	Season of Use[2]	Total AUMS	Total[3] Pasture Acreage	Acreage[4] Affected, Disturbed	AUM[5] Loss	Percent of Allotment or Pasture
Pine Spring Pasture	1	C	S,SU,F	2,156	25,446	678	2	0.1
Winter Ridge (8827)[6] Pasture 5	1	C	W	247	1,930	262	2	0.8
Book Cliffs Pasture (8828)	1	C	S	1,414	24,813	180	2	0.1

Source: Livestock Grazing and Forage Carrying Capacity information presented in this table was gathered from the ***Book Cliffs Resource Area Management Plan Draft EIS*** (BLM 1984b) and from Range Conservationists at the Vernal BLM Office.

[1] Class of Livestock: C = Cattle, S = Sheep, and H = Horses
[2] Season of Use: S = Spring, SU = Summer, F = Fall, W = Winter, and Y = Yearlong
[3] Total acreage of pasture including private, state and federal land.
[4] Total acreage of land disturbance for project life within pasture.
[5] AUM figure is the annual forage loss caused by project activities for land disturbed at any one time and is compared with each pasture affected in the table.

Note: AUM = animal unit month.

through (1) disruption of livestock watering facilities and (2) disruption of grazing patterns. AUM loss cannot be quantified because specific details on the *in situ* recovery sequence are unknown. However, the probability of this occurring is expected to be low.

No cropland would be affected by the *in situ* recovery operations. No cropland is expected to be converted to urban use because of project-related population increases.

NO-ACTION ALTERNATIVE

Impacts from the No-Action Alternative would be the same as described for the Beartooth A project.

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS; LONG-TERM ENVIRONMENTAL CONSEQUENCES; AND COMMITMENT OF RESOURCES

Mitigation, monitoring, and unavoidable adverse impacts; long-term environmental consequences; and commitment of resources would be similar to those identified for the Beartooth A project.

ENERCOR PROJECT

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ENERCOR PROJECT SUMMARY

WATER RESOURCES

Disturbances to local watershed areas from core drilling activity during the exploration phase would be insignificant. Mine construction, overburden and topsoil stockpiling, road construction, and facility construction could affect surface water on the project site during the pilot and commercial phases. With the use of the various required mitigation measures outlined in Appendix 2, impacts to water quality would be insignificant. Also, since the disturbance would occur on the upland plateaus, changes in sediment levels for streams outside the project area would be insignificant. As the surface mine is opened, some shallow ground water zones may be interrupted, thereby affecting some springs and seeps. However, no impacts are anticipated to any ground water aquifers or springs and seeps in strata zones below the tar sands. If 700 acre-feet of water was acquired from the Douglas Creek aquifer for the proposed project, the flows of an undetermined number of springs and seeps near the proposed project site could be reduced or eliminated.

Impacts to the public water reserve would probably occur from surface mining upstream. Although a sediment pond would be located above the reserve, the pond may not be sufficient to hold increased runoff. These impacts could also permanently reduce spring flow or water quality at the reserve's water source.

SOCIOECONOMICS

Commercial development from 1986 onward would result in significant population increases from 1 to 17 percent in smaller communities such as Gusher and Ouray, Utah. Project-related population growth would mainly affect infrastructure and quality of life. Inadequate housing, further crowding of local public schools, inadequate Indian health services, and additional personnel for tribal police are likely to affect smaller communities within the Uintah and Ouray Indian Reservation. Increased incidences of trespass and potential disturbance of cultural sites and burial locations could also affect the quality of life on the reservation. However, the project would provide additional employment and income opportunities for tribal members and nontribal members. No major impacts would occur to the larger communities in the area, such as Vernal and Roosevelt, Utah, nor to small communities farther from the project area.

AIR QUALITY

During the commercial phase, TSP concentrations would exceed the 24-hour and annual significance criteria. SO_2 impacts are expected to be well within Class II increments and NAAQS. Level I visibility screening could be significant, but no adverse visual impacts are anticipated for level 2 screening. Acid deposition estimates and nitrogen deposition rates would be considered insignificant. Increased SO_2 and NO_2 would be within PSD increments and NAAQS.

SOILS AND VEGETATION

During the commercial phase, project activities would disturb 18,310 acres for the life of the project with 40 acres removed for the plant site and access roads. About 140 acres would be removed from land use production at any one time. No significant impacts would occur to soils or vegetation and all land disturbance would be reclaimed through the use of the measures outlined in Appendix 2.

Threatened, endangered, or sensitive plant species could occur within the project area; therefore, the area must be surveyed and cleared, as prescribed by law before any surface disturbance began.

WILDLIFE

The project would significantly affect about 34 percent of 54,100-acres of crucial elk summer range (herd unit 21). The project would also disturb 0.4 percent of the 141,148 acres of crucial summer range and 1.1 percent of the 403,008 acres of crucial winter range in deer herd unit 28A.

Sage grouse would be adversely affected during the strutting, nesting, and brooding seasons. Impacts to feral horses and regional sport fisheries would not be significant.

Impacts to total wildlife populations from vehicle/animal collisions would be insignificant. Although endangered peregrine falcons could overfly the area, no impacts are anticipated. If prairie dog colonies are found, the project area must be surveyed for black-footed ferrets.

TRANSPORTATION NETWORKS

Transporting 5,000 barrels of oil per day in addition to the work force could cause traffic flow to fall below a safe operating level and would significantly affect the condition of 47.2 miles of Seep Ridge Road. This would be significant. In addition, local funding may not be sufficient to meet increased maintenance needs.

VISUAL RESOURCES

Significant long-term impacts would occur to the visual resource during the commercial phase. Landform modification, removal of vegetation, and the introduction of structures such as drill rigs, test pits, surface mining activity and other project facilities would not meet the objectives of the VRM Class IV area. About 18,310 acres would be disturbed over the life of the project. The impacts would remain until landform modifications were blended with the natural topography, and vegetation returned to similar forms, lines, colors, and textures with surrounding natural vegetation.

WILDERNESS

The project area would directly overlay 4,206 acres of the Winter Ridge Wilderness Study Area (WSA). Development of the lease would be constrained by the wilderness nonimpairment criteria (Section C, Appendix 2) which would likely prohibit development of that portion of the lease unless a Congressional decision is made not to designate the WSA as a wilderness. If the Winter Ridge WSA was designated a wilderness, the portion of the Enercor project located in the WSA would likely not be developed. No other WSAs are within 10 miles of the project area. The Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation is over 5 miles from the project area; no significant direct impacts are expected.

RECREATION

Recreation demand for municipal recreation facilities in small communities, especially during the commercial phase, may cause some significant impacts. Although 18,310 acres are predicted to be disturbed over the life of the project, this acreage is not thought to be large enough to significantly affect the undeveloped recreation opportunities in the area. A significant impact could occur as a result of increased trespass on recreation lands within the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation.

CULTURAL RESOURCES

The project would disturb 5,349 acres with high site density probability, 6,043 acres with medium site density probability, and 1,300 acres of low-site density probability, over the life of the project. Indirect impacts from unauthorized collection of artifacts would be significant, given the large work force increases.

MINERAL AND PALEONTOLOGICAL RESOURCES

No significant impacts to mineral or paleontological resources are expected to occur from exploration activities. During the pilot and commercial phases, a conflict between oil and gas activity and tar sand recovery could occur. While the tar sand mine was operating, oil and gas could not be developed where the mine and facilities were located. Oil and gas development would be delayed until after the tar sand was mined. About 880 acres of known oil shale lease areas would be significantly affected by the project.

During surface mining, the oil shale beds would be mixed with other shale, making future recovery of the oil shale impractical. This would occur only along Seep Ridge. No significant impacts would occur to the building stone resource.

As the overburden is removed, any fossils that occurred in the overburden could be destroyed or displaced. If fossils are found during premining inventory and monitoring during mining, new information would be gained about the paleontological past of the area, causing a positive effect.

AGRICULTURE

During the commercial phase, an average of 18 AUMs of forage would be lost annually. This forage loss would amount to less than 0.1 to 2.5 percent of the total forage, which would be insignificant. No cropland would be affected by surface mining, but

cropland loss is expected from population expansion. Although most land conversion would occur in existing subdivisions or on natural rangeland, about 16 acres of cropland could be converted to urban uses along the Duchesne River, Pelican Lake, and Vernal areas. This cropland would be considered insignificant based on the total cropland in the area.

BLM PREFERRED ALTERNATIVE

Conversion of the 24 leases as proposed, including mitigation discussed in Appendix 2, is the BLM preferred alternative. BLM supports this alternative because it would lead to more efficient and orderly tar sand recovery consistent with the diligent development and reasonable environmental protection objectives of the Combined Hydrocarbon Leasing Act.

CHAPTER 1

DETAILED DESCRIPTION OF THE ENERCOR PROPOSED ACTION

INTRODUCTION

The Purpose and Need for the Proposed Action, Authorizing Actions, and Alternatives Considered but Eliminated From Detailed Analysis sections can be reviewed in Section A of this document. The Interrelationships with Other Proposed or Existing Projects section appears at the end of Section B under the Cumulative Analysis.

Location of Project

The area proposed for lease conversion on 24 existing oil and gas leases is located in southern Uintah County in east-central Utah. Map A-2 shows the general location of the project area within the P R Spring STSA (Section A). Map B-5 shows the detailed location of the project area.

History and Background

Enercor proposes to convert 24 leases on 26,583.56 acres. Enercor has performed preliminary plant and mining design engineering, which defined the scope of the project and identified important air, water, and other plant effluents. These studies found that recovery of tar sand bitumen from the P R Spring properties is technically feasible and that a detailed evaluation of a commercial project is justified. Enercor does not hold any of the 24 leases but is applying for conversion (based on formal agreements) on behalf of the Natural Gas Corporation of California, Pacific Transmission Supply Company (both subsidiaries of Pacific Gas and Electric Company), and Exxon Company, U.S.A. Enercor lease conversion would be based on a unitized operation.

OVERVIEW OF PROPOSED ACTION

Description

Enercor's proposed plan of operations (1983) for surface mining and a processing plant is summarized on Table B-21.

Enercor proposes to convert 26,583.56 acres, comprised of 25,933.56 acres of federal surface and mineral estate, and 650 acres of private surface and federal mineral estate ownership. Only 17,620 acres are considered mineable for commercial development. In addition to the 26,583.56 acres proposed for conversion, 5,080 acres of state surface and mineral estate are contiguous to the federal-mineral-estate acreage. Therefore, the analysis of the Enercor proposal evaluates a total of 31,663.56 acres (Map B-5). Section A, General Development Techniques, describes the proposed operation and typical commercial surface mine operations.

Land Status and Ownership

The 24 lease tracts (26,583.56 acres) are administered by BLM (both surface and subsurface ownership). The 5,080 acres of state land (about eight sections) contiguous to the federal mineral estate lands are part of the project analysis.

The land status and federal and subsurface ownership of the 31,663.56 acres are shown on Map C-5 (Appendix 5, Section C).

Project Schedule

Figure B-5 shows the proposed schedule for the Enercor surface mining and processing extraction plant project.

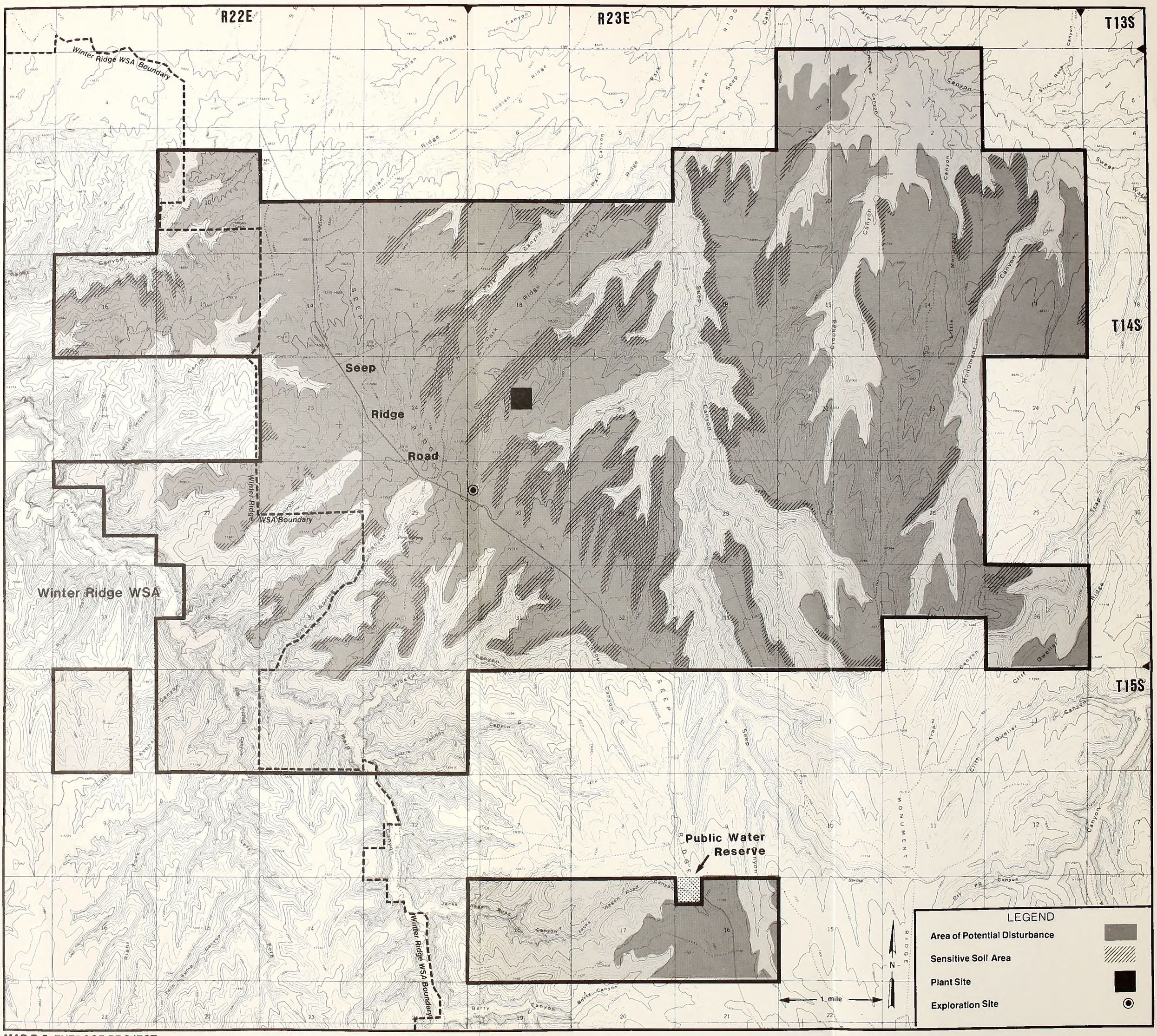
TABLE B-21
ENERCOR DATA SHEET

GENERAL	
• Type of Operation	Surface Mine and Extraction Plant
• Leases to be Converted (24)	26,583.56
• Project Area (includes State Land)	31,663.56 acres
• Number of Acres to be Developed	18,310
• Percent of Acres to be Developed	69

TABLE B-21 (Continued)

	PHASE		
Item	**Exploration**	**Pilot**	**Commercial**
Production bbl/day		25	5,000
Duration	30 days	1 year	100 years
Acres Removed for the Life of the Project			
Main Access Road	—	—	
(Seep Ridge Road)			24
Plant Site	—	—	10
Acres Disturbed At One Time			
Drill Pads	1.25	—	—
Mine			
Active	4	2	20
In Process of Being Reclaimed	—	—	80
Roads & Plant Site Area			40
Total:	5.25	2	140
Water Use ac-ft/year	N/A	Negligible City of Albuquerque New Mexico	700 Ground Water
Peak Construction			
Year	1984	(Existing Plant)	1986
Personnel	3	0	200
Peak Operation			
Year	N/A	1985	1988
Personnel	N/A	4	202
Tar Sand Mined			
Tons/Year	N/A	1,200	10.5 million
Total Tons Life of Project		1,200	1.05 billion
Transportation			
Trips Per Day	—	—	
Construction	—	—	114
Operation	—	4	212

Note: bbl/day = barrels per day; ac-ft/year = acre feet per year.



MAP B-5 ENERCOR PROJECT

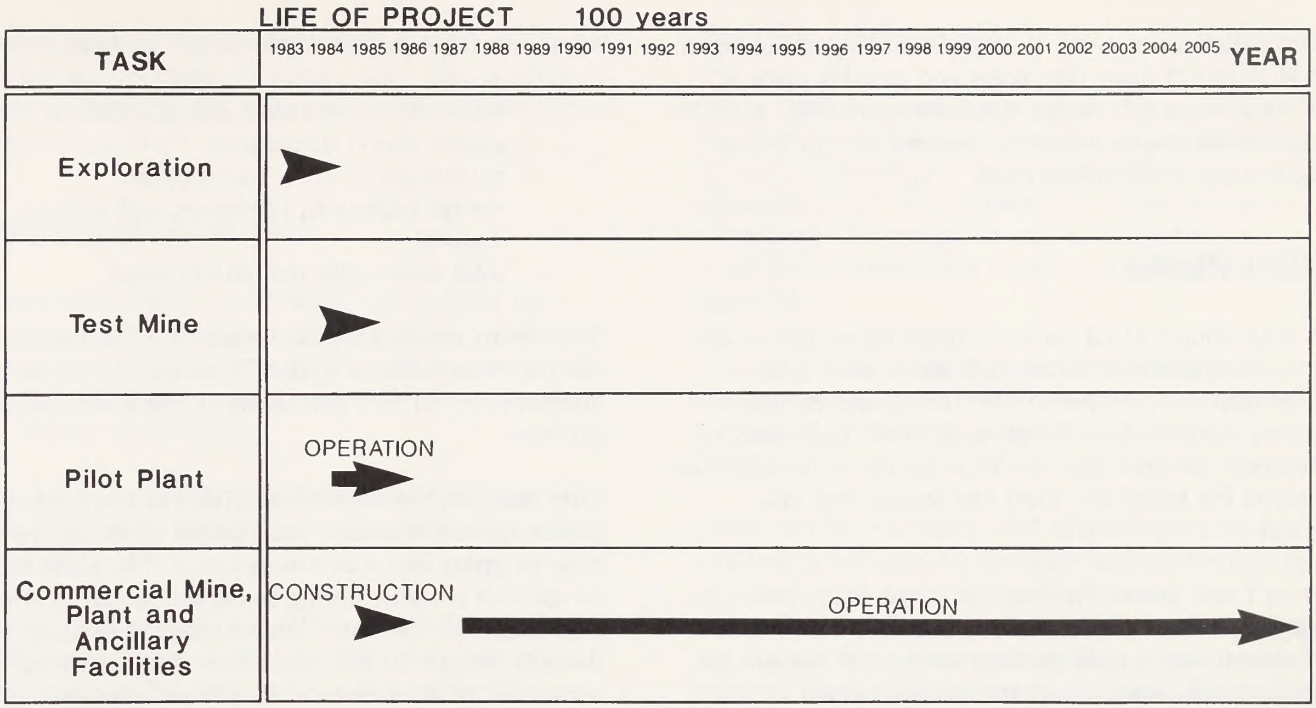


FIGURE B-5 ENERCOR PLAN OF OPERATIONS SCHEDULE

PROPOSED ACTION

Enercor proposes to build a 5,000-barrel-per-day (bpd) tar sand processing plant for a surface mine in the P R Spring STSA. The plant (Map B-5) could be built as early as 1986, with full production occurring shortly thereafter. Road improvements and site development work would occur before plant construction. Tar sand reserves are believed to be large enough to support an overall operation for about 100 years (20 years or more of proven reserves based on recent core hole samples tests for 1,600 acres).

The project would use a solvent extraction technique to recover crude bitumen from the ore. Water used in the process would be recycled. Approximately 20 percent of the sand tailings weight would be water. After processing, the sand tailings would be returned to the mine area for disposal.

The synthetic oil-based products would be hauled to customers by tank trucks. As currently planned, about 60 percent of the recovered crude bitumen would be used for asphalt paving. The remaining crude bitumen would be upgraded into oil, having no asphalt, and used for heating.

The plant is expected to be nearly self-sufficient with the exception of 1.11 MMcfd (million cubic feet per day) of natural gas to fire the solvent extraction process heater. Since the plant is located in a remote area, water lines, roads, and other support facilities would be required.

The production facility would be designed in compliance with federal and state air and water quality control standards. Mining would involve surface stripping of overburden, removal of tar sand, waste and tailing disposal into previously mined areas, and restoration grading including erosion control and reseeding.

Exploration Phase

Enercor proposes to explore the project area to determine the amount and quality of tar sand ore. Important geological, geophysical, hydrological, and geochemical data would also be obtained for tar sand ore and overburden.

With a BLM exploration license to better perfect its application, Enercor has drilled and analyzed 33 core holes for 1,600 acres of the leases (about 6 percent of the total leases). Each hole is between 200 to 300 feet deep and intersects tar sand members of the Douglas Creek formation. A test pit has also been opened. Two 50-ton samples and a 75-ton sample have been extracted from the test pit.

More exploration work is anticipated. Enercor plans to drill 50 to 125 more core holes and possibly open up 2 to 4 more test pits during the summer of 1985. A BLM exploration license would be required for any future exploration work on the lease.

Pilot Phase

A bulk sample of tar sand ore (exploration phase) has been trucked to the solvent extraction pilot plant in Albuquerque, New Mexico for testing and preliminary mining analysis. Two 25-ton trucks have been used to transport the pilot test ore. Four people were needed to operate the bulldozer, front-end loader, and two trucks.

From 1 to 2 acres have been disturbed at the test mining pit. The site for the test mine pit was chosen because it would have the least amount of overburden and allow the least disturbance to the terrain. Additional test pits could disturb up to 4 acres; however, the locations of these additional pits are unknown.

Road work (grading) and other temporary measures were needed to facilitate the movement of ore trucks to the deposit. This mining work was done during dry weather, in as short a time as possible.

The overall pilot operation would identify any changes to the process that needed to be incorporated into the commercial plant design. It would also identify product quality characteristics essential for establishing product refining options and marketing strategy. Ten people would be required for the pilot plant operation in Albuquerque and the entire phase would last about a year (1985).

Commercial Phase

MINE

The mine area would include the mine; mine-related facilities; primary crushing and tar sand handling systems; and milling, processing, and upgrading facilities. Enercor plans to use shovel-truck combinations at the surface mine plant, building up to full production for tar sand development. The tar sand units and overburden may require blasting—making ripper-scrapper and bucket wheel excavation methods impractical.

Mine utility systems would consist of the following:

- water supply treatment and distribution
- electric power distribution
- natural gas or other fuel supplies
- sewage collection, treatment, and effluent disposal
- solid waste collection and disposal.

The mining design program would be a continuation of the preliminary design studies. It would also be an interactive effort with procurement and construction activities.

Mine planning would further define the mine development sequence. Detailed plans would be developed for mine stripping and road construction. The plans would be updated monthly during construction and quarterly beginning with Enercor's mining operations going through buildup to full production. Studies would be performed to determine the most cost-sensitive components of the plan. The following information would be developed in support of the mine and extraction facility:

- right-of-way and corridor routing for all electrical power to the site, water pipelines, roads, communication systems;
- transportation methods and routing from mine to processing plant;
- preliminary designs for plant waste impoundment areas, water storage reservoirs, and sand disposal areas;

  product pipelines and routes; and
- storm surface water diversion and runoff systems;

Conventional surface mining, with shovels, trucks, and similar mining equipment, would most likely be used for primary excavation and materials handling. Dozers, scrapers, and front-end loaders would also be used to support the mining process.

Mining would be conducted on horizontal benches. Final working slopes would be determined by the characteristics of the rock. Haulage roads would be of minimum width, and grades limited to about 10 percent.

Once a working area has been fully developed, the normal mining sequence would occur. (See Section A, General Development Techniques, for a typical surface mining sequence.)

PROCESSING PLANT

A processing plant would be built to separate the bitumen from the tar sand ore to produce a commercial product. The preliminary plant engineering work would be analyzed in detail to identify exact locations for all project facilities.

The plant site would occupy 40 acres and require a mill, warehouse, changehouse, and dispatching and supervisory offices.

During peak construction (1968), about 200 workers would be required on site. A steady-state operation work force of 297 workers is anticipated in 1988.

Reclamation

For a discussion of reclamation procedures and measures to be used during the surface mining operation, see Section C, Appendix 2.

Transportation

The company has proposed overnight facilities to be used only by workers actually on duty. Since the work would be performed in 10-hour shifts for 3 days at a time, trips carrying workers back into town would occur on a 3-day cycle. Enercor has stated that bus service would be provided. Assuming that about 25 percent of the construction work force would drive their own vehicles to and from the job site and the remainder would ride buses carrying 50 workers, 106 trips per day would be needed. An additional 8 trips per day would be needed for supplies and construction materials, making a total of 114 trips per day for the construction phase. Using the same assumption, 158 trips per day would be needed to transport workers: 50 trips per day for transporting the product and 4 trips per day for supplies. Therefore, 212 trips per day would be required during the operation phase.

During commercial operation, workers are expected to make 15 trips per day. Supplies would account for another 4 trips, and product hauling would require 50, making a total of 69 trips per day under commercial operation.

WATER FACILITIES

In the mining and milling of tar sand ore, 700 acre-feet per year of water would be needed. Water sources in the area seem adequate to meet the needs of a processing plant. Applications to change this water from direct flow irrigation uses to project storage needs for industrial uses would require State of Utah approval.

Most of the water rights in the area belong to the Uintah and Ouray Indian Reservation, although some are owned by the local ranchers and used for irrigation.

Water can be purchased, and negotiations have been continuing between the applicant and landowners to acquire needed water rights. Applications for permission to drill any wells would be made through the State of Utah Engineering Office. Water would be pumped from well locations to the plant. Determining the water source, with its attendant pump station and pipeline right-of-way, is the subject of on-going studies.

A 20-day supply of raw water would be stored in a reservoir or in holding tanks at the plant site. Process water would be used on an *as received* basis. Domestic water would be stored, filtered, and chlorinated to meet Utah health standards.

Transmission Lines

The Moon Lake Electric Cooperative plans to install a 138 kV transmission line that could be used as a source of power for the proposed facility. Until that line is completed, Enercor would proceed with its plans to generate power from portable on-site generators.

Work Camp

About 200 workers would be on site during construction and 297 permanent employees at a full, 5,000-bpd operating capacity. Enercor is considering a 4-day, 10-hour work schedule, with an off-site work camp to be used during the work week. Enercor has met with companies that specialize in work camp facilities. The development of such a facility is also the subject of on-going studies.

NO-ACTION ALTERNATIVE

The No-Action Alternative would be the denial of the conversion of the 24 existing oil and gas leases to combined hydrocarbon leases.

CHAPTER 2

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

WATER RESOURCES

Affected Environment

This project area lies along Seep Ridge which forms a watershed divide between Bitter Creek, less than a mile to the northeast, and Main Canyon, less than a mile to the southwest. Main Canyon runs to Willow Creek and then to the Green River, while Bitter Creek goes to the White River and then to the Green River. The area consists mostly of the upland plateau along Seep Ridge but also includes steep-sloped areas and bottomlands along Main Canyon, Sweetwater Canyon, and some smaller canyons. The ore body that the applicant proposes to mine, however, underlies only the upland watershed areas.

A public water reserve is located outside the project boundary and downstream from the ore body (Map B-5). The water source of this reserve is a seep, located in the southeast corner of the reserve. The seep is unimproved but provides some water for wildlife and livestock.

Environmental Consequences

EXPLORATION PHASE

Disturbances from drilling would increase the potential for erosion and sedimentation. This impact would be insignificant because activity would be minimal in extent (Table B-21), located on the upland watershed areas, and conducted to lessen disturbance. Exploration activities would have no impact on the public water reserve.

PILOT AND COMMERCIAL PHASES

Surface disturbances affecting surface water include pit construction, overburden and topsoil stockpiling, road construction, and facility construction. These disturbances would occur in the potential disturbance area shown on Map B-5. As the mine pits are opened, the vegetation cover would be removed, which would increase sedimentation and total dissolved solids (TDS) levels in local streams. In other areas, overburden and topsoil stockpiling, road construction, and land clearing in preparation for facility construction would also increase the potential for high sedimentation and TDS in surface waters. The applicant has committed to implement various required and agreed to mitigation measures that would lessen impacts to water quality (Appendix 2). With these types of measures in place and since the disturbances would occur on the upland plateaus, changes in sediment levels for streams outside the project area would be insignificant. The mitigation basins and berms would be designed for a certain level of runoff, so this design level probably would not be exceeded any time during the mine's life. If the design level was exceeded, sediment levels could increase significantly outside the project area.

Operating a mine with these types of sediment control structures would also result in less runoff or none leaving the area. This change in runoff could be significant in the intermittent streams near the project area depending on the mine pit layout. Reduction in runoff would not be significant in Main Canyon because of the small size of the non-contributing area compared to the size of the total Main Canyon watershed, and because the excluded area would be on the plateaus. When the area was reclaimed, the water control structures would be removed, and the area would contribute runoff to area streams. However, the replaced spoils would be less compacted and less consolidated than they were originally. Although this would increase infiltration and decrease runoff, the long-term change in runoff would be insignificant.

The major ground water zones in this area are below the tar sand proposed for development. (See Section A for identification of zones.) Some shallower zones convey small quantities of water that are not enough to yield water to a well but are able to sustain small springs or seeps. As surface mines are opened, some of these zones may be interrupted. While the mine is open, ground water from these zones would then drain into the open mine and the outcrop seeps would stop flowing. When the spoils are replaced in the mine, most of the bedded-type seep zones would not be

replaced. However, spent sand that is put in the mine may develop new seepage paths. The previously tar-saturated sands would then transmit water more freely in its cleaned condition. The result would not be a loss of water but a permanent rearrangement of seepage paths in the local area of the plateaus. This would have no impact on any ground water aquifers or springs located in strata below the tar sands.

The spent sand containing some water and solvent (toluene) would be returned to the mines. The amount of solvent would be such that water seeping through the sand would have a concentration of 15 mg/l or less (Enercor 1983). Since no specific state water quality standards exist for toluene, the State of Utah would have to approve any discharges such as this. Impacts to the public water reserve would probably occur from the surface mining upstream. To avoid sedimentation, a sediment detention pond would be located above the reserve on Jacks Wagon Road Canyon. Although unlikely, if the detention pond could not hold the increased runoff, impacts to the reserve could still occur. Impacts described above for ground water could also permanently reduce spring flow or quality for the reserve's water source.

The applicant hopes to get 700 acre-feet of water from ground water sources, requiring a large well field. Lindskov and others (1983) report that 1,400 acre-feet of water could be supplied by the entire Douglas Creek aquifer, which is located mostly to the north of this area. A large withdrawal of ground water would lower water levels in the area, which would reduce or eliminate flow from an undetermined number of springs and seeps near the well field. This remote area contains very few water wells. If ground water could not supply the water requirement then surface water would have to be developed, either in the form of a reservoir on a local intermittent stream or by piping water from the White or Green River.

In any case, the operator would have to acquire a water appropriation from the State of Utah. Since surface water in the area is fully appropriated, water would have to be purchased from another user in the area.

SOCIOECONOMICS

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

No significant impacts would occur during the exploration and pilot phases (1985). However, significant impacts would occur during commercial development (1986 onward). Refer to Table B-22 for data relating to population impacts during the commercial development phases.

Population increases resulting from commercial construction would vary from 1 percent to 17 percent in small communities such as Gusher and Ouray. Impacts to the larger communities of Vernal and Roosevelt-Ballard would be 1 percent and 2 percent, respectively. Population impacts during commercial operation would range from 1 percent to 17 percent in the small communities, while Vernal would grow 2 percent and Roosevelt-Ballard would grow 4 percent. Population impacts exceeding the 5 percent significance criterion would occur in the small communities closer to the STSA. Impacts to small communities farther from the STSA and to large communities would remain below the significance criteria.

The Proposed Action is not expected to cause a significant increase in migration of Utes or other Native Americans to the Uintah and Ouray Indian Reservation. However, communities within the reservation boundary, particularly Gusher and Ouray, could receive significant non-Indian population impacts. Effects from such population growth would mainly occur to infrastructure and quality of life, which are discussed below. Commercial development would not have any significant effects on employment or per capita personal income. Employment would grow to 202 primary jobs and 143 secondary jobs. Increases in employment would range from 4 percent among the Northern Utes and other nontribal Indians to 2 percent in Duchesne County. Gains in per capita personal income would be 2 percent ($225) among the Northern Utes and other non-tribal Indians and 1 percent ($76 to $99) in both counties. All of these impacts would fall below the 5 percent significance criteria.

Population impacts to Gusher, Ouray, and other small communities on the Uintah and Ouray Indian Reservation would add to problems expected to result from in-migration of Indians to the reservation. At the average construction rate of 22 housing units per year, 5 years would be required to eliminate the present need for 100 additional or replacement units, even if population did not increase. Unless financing was provided from federal or private sources, a shortage of

TABLE B-22
ENERCOR
IMPACTS TO POPULATION

Jurisdiction	Baseline	Increase Over Baseline	Percent Increase Over Baseline
1986 (Commercial Development)			
Fort Duchesne	1,160	10	1
Gusher	30	5	17
Lapoint	120	5	4
Myton	720	5	1
Ouray	60	5	8
Randlett	460	5	1
Roosevelt-Ballard	6,330	145	2
Vernal	21,270	290	1
Other Roosevelt CCD	7,730	40	1
Total:	37,880	515	
1988 (Commercial Operation)			
Fort Duchesne	1,210	20	2
Gusher	30	5	17
Lapoint	120	5	4
Myton	750	10	1
Ouray	60	10	17
Randlett	480	10	2
Roosevelt-Ballard	6,630	260	4
Vernal	22,440	520	2
Other Roosevelt CCD	8,030	70	1
Total:	39,750	910	

See Appendix 3 for data sources and analysis methods.

Note: Communities within the boundary of the Uintah and Ouray Indian Reservation include both reservation and non-reservation land. Therefore, impacts to these communities would not entirely be impacts to the reservation, and impacts to the reservation alone cannot be estimated. The following communities and areas are within the reservation boundary: Fort Duchesne, Gusher, Lapoint, Myton, Ouray, Randlett, Roosevelt-Ballard, and the unincorporated part of Duchesne County.

CCD = Census County Division.

adequate housing would be likely. Further crowding in local public schools might also occur, especially temporary overcrowding if school district budgets did not allow for an influx of new students in mid-year. The Indian Health Service and the tribal police force may need additional personnel.

Both Gusher and Ouray obtain their water from the Tribe. Population growth would place an additional burden on the already strained water distribution system. The system of sewage lagoons would also have to be expanded since many of the lagoons are already at capacity. Trash pickup costs would increase, especially if settlement was scattered among several widely separated communities.

Population growth, both inside and outside the reservation, and possible impacts to the reservation's air quality would further reduce the Tribe's sense of isolation, making it more difficult to maintain the Ute's traditional life style. On the other hand, tribal members would have opportunities for additional employment and income. Trespass problems would increase, both on the northern reservation and the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation, and more cultural sites and burial locations could be disturbed. Infrastructure problems would also increase, although these could be controlled by limiting building permits and new utility service. Financing of additional costs may be difficult to obtain.

Because the population impacts to other communities outside the reservation would fall below the significance criterion, the impacts to housing, public services and facilities, and social conditions in those communities would also be insignificant.

AIR QUALITY

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

The impacts are presented for the commercial phase. Impacts during the exploration and pilot phases would be insignificant. Estimated air pollutant emission rates are shown in Table B-23. The results of air quality modeling for the Enercor Project are given in Tables B-24 and B-25. Total TSP levels are expected to exceed the significance criteria. The annual particulate impacts are illustrated in Figure B-6. SO_2 impacts are expected to be well below all significance criteria. (See the Air Quality technical report, Aerocomp 1985, for information on NO_2.)

TABLE B-23
ESTIMATED AIR POLLUTANT EMISSION RATES FOR THE ENERCOR PROJECT

Pollutant	Emission Rate* (kg/hr)
Total Suspended Particulates	214.9
Sulfur Dioxide	15.0
Nitrogen Dioxide	39.3
Carbon Monoxide	11.4
Hydrocarbons	7.3

Source: Aerocomp 1985.

*Long-term average; short-term emission rates may be higher; kg/hr = kilograms per hour.

Level 1 visibility impacts are given in Table B-26 and indicate that further analysis was required at the observer point in the Uintah and Ouray Reservation. Level 2 screening results showed no adverse visual impacts.

Table B-27 presents the acid deposition estimates for several areas of concern in the project area. The annual sulfur deposition rates do not exceed the safe threshold recommended by the Environmental Defense Fund (Oppenheimer 1982), and nitrogen deposition rates are near measured background values.

TABLE B-24
COMPARISON OF MAXIMUM SITE-SPECIFIC IMPACTS WITH NAAQS FOR THE ENERCOR PROJECT

Pollutant Avg. Time	SOURCE CATEGORY CONCENTRATION ($\mu g/m^3$) 2005 Baseline Sources	PROJECT SOURCES Secondary	Direct	Maximum Concentrations	NAAQS
SO_2					
3-hour	18	0	31	49	1,300
24-hour	7	0	14	21	365
Annual	1	0	4	5	80
TSP					
24-hour	69	0	144	213	150
Annual	21	0	48	69	60
NO_2					
Annual	2	0	18	20	100
CO					
1-hour	1,500	0	14	1,514	40,000
8-hour	900	0	10	910	10,000

Source: Aerocomp 1985.

Note: Secondary = emissions resulting from population growth; Direct = emissions from the Enercor project; $\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; SO_2 = sulfur dioxide; TSP = total suspended particulates; NO_2 = nitrogen dioxide; CO = carbon monoxide.

TABLE B-25
SUMMARY OF PSD INCREMENT CONSUMPTION FOR THE ENERCOR PROJECT

Areas of Special Concern	SO_2 ($\mu g/m^3$) 3-hour	24-hour	Annual	TSP ($\mu g/m^3$) 24-hour	Annual
Winter Ridge WSA	31	14	4	144	48
Uintah & Ouray Reservation	1	<1	<1	10	4
State of Colorado	<1	<1	<1	11	6
Maximum Impact	31	14	4	144	48
Class II Increment	512	91	20	37	19

Source: Aerocomp 1985.

Note: PSD = prevention of significant deterioration; SO_2 = sulfur dioxide; $\mu g/m^3$ = micrograms per cubic meter; TSP = total suspended particulates; WSA = Wilderness Study Area.

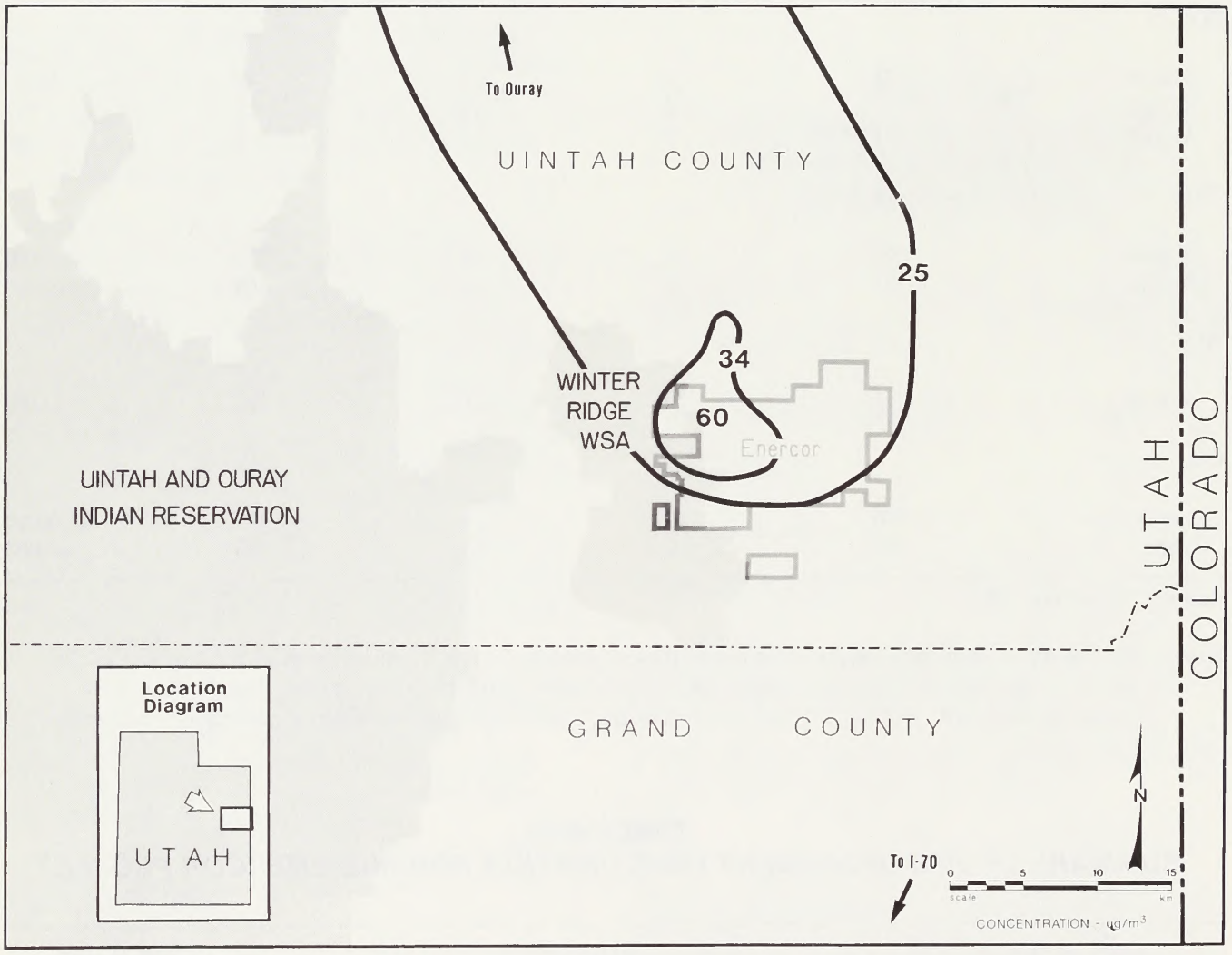


FIGURE B-6 ANNUAL TSP CONCENTRATIONS FOR THE ENERCOR PROJECT

TABLE B-26
LEVEL 1 VISIBILITY ANALYSIS FOR THE ENERCOR PROJECT

Observer Point	C1 Plume Contrast Against Sky	C2 Plume Contrast Against Dark Terrain	C3 Region Reduction Sky/Terrain Contrast
Delicate Arch, Arches National Park	0.004	0.086	0.004
Split Mountain, Dinosaur National Monument	0.004	0.077	0.004
Colorado National Monument	0.004	0.099	0.004
Flat Rock Mesa, Uintah & Ouray Reservation	0.017	0.496	0.004
EPA Recommended Guidelines	<0.100	<0.100	<0.100

Source: Aerocomp 1985.

TABLE B-27
ACID DEPOSITION ESTIMATES FOR THE ENERCOR PROJECT

Area of Concern	Annual Deposition Rate ($g/m^2/yr$) sulfur	nitrogen
Winter Ridge WSA	0.12	0.33
Uintah & Ouray Reservation	0.02	0.06
State of Colorado	0.03	0.09
Safe Threshold	0.22	unknown

Source: Aerocomp 1985.

Note: $g/m^2/yr$ = grams per meter squared per year; WSA = Wilderness Study Area.

SOILS AND VEGETATION

Affected Environment

The Enercor project is located on sloping to rolling broad and narrow plateaus bordered by strongly sloping to steep and very steep sideslopes. The area is dissected by a dendritic drainage pattern with narrow floodplains along the intermittent and perennial drainages. The average annual precipitation is 14 to 16 inches and the frost-free period is 90 to 125 days.

SOILS AND VEGETATION TYPES

Soils on the plateaus are mainly moderately deep, well-drained, loamy soils. Soils on the strongly sloping to steep sideslopes are well-drained, moderately deep, and shallow loams and clay loams, containing varying amounts of rock fragments (15 to 65 percent) ranging in size from gravel to stone and channers. The very

steep sideslopes consist of mainly shallow and moderately deep, rocky, loam and clay loam soils with large volumes of rock fragments (15 to 65 percent). The following general soil groups occur within the project area:

- Soil Group 1 - Soils of the floodplains and terraces
- Soil Group 2 - Soils of gently sloping to strongly sloping mesa and plateau tops
- Soil Group 3 - Soils of the moderately sloping to strongly sloping convex ridges and hills
- Soil Group 4 - Soils of the strongly sloping to steep plateaus, mountain sideslopes, and hills
- Soil Group 5 - Soils of the steep and very steep plateaus, mountain sideslopes, canyon walls and mesa escarpments

This project would affect five major vegetation types: grassland, pinyon-juniper, sagebrush-grass, mountain shrub, and mixed conifer. See Section A, Vegetation, for descriptions of vegetation types and their uses.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

This project is located within the threatened, endangered, or sensitive plant habitat area outlined in the Book Cliffs Resource Management Plan (BLM 1984b). See Section A, Vegetation, for discussion of threatened, endangered, and sensitive plant species.

Environmental Consequences

EXPLORATION AND PILOT PHASES

Land disturbance associated with the exploration phase would be 5¼ acres, consisting mainly of temporary roads, drill pads, and test pits. The pilot phase would disturb about 2 acres, primarily for the mine area. Land disturbance would be reclaimed in a manner similar to that identified for the commercial phase. Impacts to soils and vegetation caused by the exploration and pilot phase would be insignificant.

COMMERCIAL PHASE

Land disturbance associated with the Enercor project would consist of surface mining and additional road upgrading and construction. Surface mining activities would (1) remove all vegetation cover, (2) remove favorable plant growth materials (surface soils) and overburden, (3) stockpile these materials, (4) remove the tar sand ore, (5) replace the overburden, (6) bury any unfavorable plant growth materials, (7) regrade the surface, and (8) replace favorable plant growth materials on the surface.

Project activities would disturb 18,310 acres for the life of the project, with 40 acres removed for the plant site and access roads, and about 100 acres disturbed or in some phase of reclamation. During peak production, about 140 acres would be removed from predisturbance land use production at any one time. During stripping and stockpiling, the natural (genetic) soil profile, including soil horizons, structure, and horizon arrangement, would be completely altered and possibly mixed. During surface mining, soils and soil materials would be exposed to wind and water erosion.

The degree of impact to soils would depend on the effectiveness of restoring soil productivity. The original natural (genetic) soil profile cannot be completely restored. However, soil productivity is expected to be reclaimed to predisturbance levels and in some cases possibly enhanced when an intensive soil reconstruction and reclamation program is followed (McCormack 1974, 1976). Such reclamation would be possible within the project area because of (1) favorable annual precipitation, (2) reduction of steep and very steep slopes (30 to 70 percent) to slopes of 30 percent or less of the restored landscape, (3) low predisturbance soil productivity of the sensitive soils, and (4) good soil reconstruction potential of the large portion of soils within the project.

Project activities would disturb 1,707 acres of sensitive soils—those containing soils with low reconstruction potential. These areas would require more intensive application of soil reconstruction and erosion control measures. At a minimum, reclamation would ensure that an adequate cover would be reestablished over most disturbed areas. Some steep localized areas (less than 5 percent) resembling talus-like slopes of rock fragments could remain, but the size of these areas would be the same and would resemble the original rock outcrop areas (canyon walls and escarpments).

The Enercor project could disturb 4,970 acres of grassland; 6,043 acres of sagebrush-grass; 5,349 acres of pinyon-juniper; 1,300 acres of mountain shrub; and 648 acres of mixed conifer, over the life of the project.

Impacts to grassland-type vegetation would be short term and insignificant because grasses and forbs are expected to become established within 5 years. Overstory vegetation (trees and shrubs) would take longer to become established to near-predisturbance conditions. The mountain shrub vegetation type would take 20 to 30 years to return to near-predisturbance conditions. The pinyon-juniper and mixed conifer types would take 30 to 50 or more years to return to predisturbance conditions. The highly productive woodland sites would be returned to predisturbance conditions, while the less productive sites would be converted to grassland.

In surface-mined areas, changes in topography and aspect would change microclimates, which would change some plant communities. Surface mining and land restoration would change the steep and very steep predisturbance landscape to a rolling, hilly terrain, reducing elevation and, most importantly, aspect influence. Predisturbance plant diversity requiring specialized micro-environmental conditions, which could not be reestablished on the reclaimed areas, could cause a significant impact. However, this is expected to affect small localized areas to a limited extent. Shrubs and trees, especially aspen and conifer vegetation types, would be most significantly affected.

The loss of the natural intricate vegetation diversity from changes in soil, topography, and microclimate would not reduce production but would change the area's suitability for wildlife habitat and its aesthetic value. Competition with grasses and forbs would also delay the establishment or encroachment of woody plants. Grasses would be a significant part of the reclamation effort. The increased forage production expected from establishing a grass cover would benefit livestock, but would not be as desirable to big game browse species.

Surface runoff control structures would control sediment and protect surface water quality. Reclamation would be accomplished in stages concurrent with project mining operations.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

Threatened, endangered, or sensitive plant species could occur in the area. The project area must be surveyed and cleared as prescribed by law, before any surface disturbance began.

WILDLIFE

Affected Environment

HABITAT TYPES

This project would affect five major vegetation (habitat) types: grassland, pinyon-juniper, sagebrush-grass, mountain shrub, and mixed conifer. See Section A, Vegetation, for descriptions of vegetation types, their uses, and importance.

TERRESTRIAL WILDLIFE

About 600 acres of crucial mule deer and elk summer range are found on the project area (UDWR 1984). Mule deer generally occupy these ranges from about May 15 through October 15, while elk use the summer range from about May 15 to November 1. Within the project boundary, about 4,700 acres of crucial deer winter range and about 29,100 acres of elk winter range occur, of which about 16,560 acres would be directly disturbed by project operations. Deer usually occupy these ranges from about October 15 through May 15 and elk, from November 1 through May 15. No fawning or calving areas are located within the project boundary.

The Winter Ridge feral horse herd occupies approximately 950 acres of the southwestern portion of the project area.

Many raptors are common to the area, including red-tailed hawks, sharp-shinned hawks, American kestrels, Cooper's hawks, turkey vultures, and golden eagles. Habitat for both woodland and ground-nesting raptors occurs throughout the entire project area, and the whole area provides hunting habitat for all raptor species common to the area. At the present time, no raptor nests are known to occur on the project area.

The common species of nongame mammals and birds, reptiles, and amphibians that could be found on the project area are the same as those found throughout the Uinta Basin at these altitudes. See Section A, Wildlife, for a discussion of these species.

THREATENED OR ENDANGERED ANIMAL SPECIES

The Fish and Wildlife Service has indicated that several federally listed species could occur on the project area (Table A-12 and Appendix 4).

Environmental Consequences

HABITAT

Impacts during the exploration and pilot phases would be the same as discussed for the Beartooth A project. Therefore, the following analysis pertains to the commercial phase of the Enercor project.

Vegetation habitats would be disturbed at the rate of 60 acres the first year and then 20 acres per year after the first year of processing plant construction. However, since reclamation is predicted to take about 5 years before grasses become established, about 80 acres of wildlife habitat would be out of production at any one time during the commercial production phase.

About 0.4 percent of the 141,148 acres of crucial mule deer summer range in herd unit 28A would be disturbed (UDWR 1984). Also, of the 403,008 acres of crucial deer winter range in herd unit 28A, about 1.1 percent would be disturbed by this project. Elk herd unit 21 contains about 54,100 acres of crucial elk summer range (UDWR 1984), of which an estimated 34 percent would be disturbed. This would be considered a significant impact.

WILDLIFE POPULATIONS

Wildlife numbers on the project area would be lost or reduced with the advent of this project. Project development would occur on 60 acres the first year and 20 acres per year after that for a project life of 100 years. This development and the associated zone of influence around the project area could cause population reductions because of harassment and displacement. Construction and operation activities could displace mule deer into adjacent areas where essential habitat components are not found, causing stress and potentially reducing population (Geist 1974). Estimates of population losses from displacement-caused stress cannot be reliably estimated at present levels of knowledge. Harassment added to natural stresses could cause significant weight loss (Geist 1971).

The same types of impacts are expected to occur to elk, but the magnitude would be greater since elk are not as tolerant of human activities as mule deer. A reduction in reproductive success could occur and long-range population strategies for this elk population by the UDWR would be at least delayed.

Feral horse use in the Winter Ridge area would not be adversely affected by this project as long-range plans by BLM indicate that all feral horses in this area would be removed (BLM 1984b).

The sage grouse population would be adversely affected by this project, not so much from direct impacts as from a reduction in reproduction due to harassment during the strutting, nesting, and brooding seasons. Some harassment to strutting grouse could be expected from project personnel watching the grouse or trying to take pictures. If these harassment levels were high enough, adult grouse would abandon the strutting grounds, severely reducing the population in this area.

Losses of wildlife from vehicle/animal collisions during the commercial phase of this project are expected to be significantly greater than the number of animals presently hit by vehicles on roads and highways furnishing access to the project area. This is due to the increase in vehicle trips per day as a result of this project (Table B-21 and Transportation section). However, the impact to total wildlife populations would be insignificant.

THREATENED OR ENDANGERED ANIMAL SPECIES

Endangered peregrine falcons could overfly the area, but no impacts are anticipated. If prairie dog colonies are found on the project area, an approved Fish and Wildlife Service survey must be completed before the Notice to Proceed is issued.

TRANSPORTATION NETWORKS

Affected Environment

The vehicular traffic flow would enter and leave the project site from the center of the lease (Map B-5). The roadways include 3.2 miles of Park Ridge Road and 47.2 miles of Seep Ridge Road before reaching

State Highway 88, County Road 264, and U.S. Highway 40.

The Park Ridge road is packed dirt. Vehicular use includes high clearance vehicles and heavy drilling equipment vehicles. Accessibility in the winter months is discussed in Section A.

See Section A for traffic data on Seep Ridge Road, U.S. Highway 40, State Highway 88, and County Road 264.

Environmental Consequences

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project; therefore, the following analysis pertains to the commercial phase.

The construction phase, 1986 and 1987, involves a 200-person work force and the hauling of 4,000 tons of material. About 114 vehicle trips per day would be needed to carry the work force using vans, buses, and passenger cars. Most of the material could be shipped by railroad to terminals in Salt Lake City or Craig, Colorado and trucked to the site. This movement of material could involve about eight truck trips per day. Seep Ridge Road could not sustain the increased automobile and truck traffic without lowering the level of service. U.S. Highway 40 and State Highways 88 and 264 could sustain the increased traffic.

Downstream traffic flow at the end of each working day would cause short vehicle gaps and weaving, causing the traffic flow to fall below a safe operating level. This would be significant as stated in the significance criterion.

The increased project traffic on Seep Ridge Road would increase accidents, since traffic accidents increase directly in proportion to traffic volume increases. Traffic accidents would not be limited to construction traffic but could involve local and through traffic.

Other factors would contribute to the traffic accidents: time of year, weather conditions, summer tourist traffic, and recreational vehicles. Any increase in traffic accidents would be significant.

Roadway construction and maintenance is funded mainly from motor fuel taxes. Present funding formulas may not meet the needs of the construction and maintenance required for year-round, heavy-load traffic. The budget would be inadequate to pay for any additional road construction or an accelerated maintenance program.

Transporting a 202-person work force would involve about 158 vehicle trips per day using vans, buses, and passenger cars. Transporting 5,000 barrels of oil per day represents 50 truck trips per day at 200 barrels per load. The increased automobile and truck traffic would lower the level of service on 47.2 miles of Seep Ridge Road. U.S. Highway 40 and State Highways 88 and 264 could sustain the increase in traffic.

Downstream traffic flow at the end of each working day would cause short vehicle gaps and weaving. This traffic condition could cause the traffic flow to fall below a safe operating level, which would be significant as stated in the significance criterion.

Impacts associated with accidents, roadway construction, and maintenance are the same as identified under Construction.

VISUAL RESOURCES

Affected Environment

The Enercor project area consists of flat to gently rolling terrain; however, the interspersed and surrounding landscape is moderately to heavily dissected. Vegetation cover primarily includes sagebrush-grass, pinyon-juniper, and grassland, with smaller areas of mountain shrub and mixed conifer types.

The project would be located entirely within a VRM Class IV area, comprised of Class C (low diversity) scenery, which indicates the landscape character is common to view within the region. Viewer sensitivity is medium within the foreground/middleground view of Seep Ridge Road and within the background, or seldom seen for the remainder of the project area. Seep Ridge Road and other unimproved roads are the main alterations to the landscape.

Environmental Consequences

The characteristic landscape would be dominated by visible changes brought about during all lease phases. These changes would not meet the objective of the VRM Class where the actions would be located.

Significant impacts could occur during further exploration, when more holes are drilled or test pits are opened, causing changes in the landform, removing vegetation, and introducing structures such as drill rigs.

During the pilot phase, a short-term, insignificant impact would occur from the use and presence of mining equipment for up to 1 year while the 2-acre pilot phase was active. Of long-term significance would be the landform modification and vegetation removal at the site. The impact would remain until the landform was blended with the natural topography, and vegetation returned to similar forms, colors, and textures of the surrounding vegetation.

Long-term significant impacts would occur for the life of the project and beyond until landform modification, such as the mine and overburden areas, was blended with the natural topography, and vegetation returned to similar forms, colors, and textures with surrounding natural vegetation. About 18,310 acres would be affected. The buildings, equipment, and other required facilities would create an additional significant impact on the landscape depending on location, size, color, and configuration of these structures. Those areas viewed from Seep Ridge Road, where the landscape elements of form, line, color, and texture of the modifications would be evident to the road user, would not be compatible with the objectives of the VRM Class in which the activities would be located.

WILDERNESS

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

Although the Enercor project would directly overlay 4,206 acres of the Winter Ridge WSA, the lease could still be converted to combined hydrocarbon use (Office of the Solicitor 1983). Development of that lease, however, could be constrained by the wilderness nonimpairment criteria (Section C, Appendix 2), which would likely prohibit development of that portion of the lease in the WSA, unless a Congressional decision is made not to designate the WSA as a wilderness. If the Winter Ridge WSA was designated a wilderness, the portion of the Enercor project located in the WSA would likely not be developed. The analysis of the Enercor proposal is based on the assumption that the WSA would not be designated as a wilderness. No other WSAs would be within 10 miles of the project.

The project area would be over 5 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation. No significant direct impacts are anticipated although increased population associated with the Enercor project may account for increased use of the area.

RECREATION

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The exploration phase of the Enercor project would not cause any significant impacts to the recreation resource, since only 5¼ acres would be disturbed. Recreation demand for municipal recreation facilities or opportunities during the pilot phase could develop in one smaller community during the pilot phase. Population increases could be over 10 percent, making the increased demand significant for Gusher and Ouray (Socioeconomics section, Table B-22). However, less than 2 acres would be disturbed at the lease site, so no significant impacts would occur to recreation resources near the project area.

Population growth during the commercial phase may cause some significant impacts in the communities of Gusher and Ouray, where populations would increase by more than 10 percent. However, other communities are not expected to be significantly affected. Even though the regional population increase may rise to 910 people at the heighth of commercial development, the increase would be about 2 percent over the base

population. No significant impacts would occur to any recreation facilities or opportunities other than overcrowding, which may occur at some undeveloped campgrounds during hunting season. Although 18,310 acres are predicted to be disturbed over the life of the project, this acreage is not thought to be large enough to significantly affect the amount of recreation resource available at undeveloped sites. Only 140 acres would be disturbed at one time. The scenic quality would be somewhat affected when viewed from Seep Ridge Road (Visual Resource section), and some land would be temporarily lost for hunting, ORV use, and similar uses. Upon reclamation, the resource would again be made available. Little land, if any, is expected to be permanently altered or removed from possible use by recreationists.

An insignificant impact could occur as a result of increased trespass on recreational lands within the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation. Workers could conceivably venture onto the reservation and affect the quality of the resource through increased hunting, ORV use, and impacts to the natural and solitude qualities.

CULTURAL RESOURCES

Affected Environment

One BLM survey has been conducted in the northwestern portion of the project area (Uintah County). Additional surveys have been done for the construction of roads and drill pads. Twenty-three sites are known to exist in the Enercor project area. Some represent historic Euro-American and Fremont cultures, while many are lithic scatters of unknown cultural affiliation and age. These occur on state (11 sites), BLM-managed (8 sites), and private (4 sites) lands. All except one site are located on or near the canyon walls of the project area.

Three sites are considered to be potentially significant (36 CFR part 800) according to field investigation reports. Two sites are on land administered by the State of Utah, while one is located on land administered by BLM.

> One site is a petroglyph site. The mountain sheep, anthromorphs, quadrapedal zoomorphs, and wavy lines are representative of Fremont ideographic sites in the Book Cliffs area. The site type has a wide range of expression, and the particular site is a subset of the type's range.
>
> Another site is a Fremont petroglyph containing shield figures, semicircular motifs, concentric circle motifs, and wavy lines. In addition, Fremont ceramics and other artifacts were located in an adjacent alcove. The potsherds are Emory Gray (A.D. 700–200), and lithics are nondiagnostic.
>
> The third site is a campsite consisting of a rock shelter with a petroglyph representative of the Fremont culture. In addition, Emory Gray potsherds and lithics can be found there.

These three sites represent several aspects of the site type continuum for Fremont ideographic sites in the Book Cliffs area. They may represent the Uintah or the San Rafael variant of the Fremont culture or are a separate variant in their own right.

According to field investigation reports, about 20 insignificant sites may occur within the project area.

The predominant vegetation types within the Enercor project area are sagebrush-grass (6,043 acres) and pinyon-juniper (5,349 acres). The likelihood of other sites occurring in the project area is high given that medium site density is associated with sagebrush-grass and high site density, with pinyon-juniper. Mountain shrub (low site density) occurs on 1,300 acres. Fremont sites tend to concentrate in pinyon-juniper areas. See Section A for a discussion of site density associated with vegetation types. Archaeological and historical sites tend to cluster in the same landform types, such as plateaus and canyons as the development scenario suggests in the ***Utah Combined Hydrocarbon Leasing Regional Final EIS*** (BLM 1984a).

Plateaus tend to contain archaeological sites associated with tool manufacture and maintenance. These sites include lithic scatters, short-term camps associated with resource procurement and processing, quarry locations, and a few large camps or villages along the ridges. The latter are considered a rare type of site.

Historical sites that tend to be routinely located on plateaus are sheep and cattle camps, hunter camps, picnic areas, scenic views, fences, rock cairns, and cadastral survey markers.

Usually, canyons contain mostly prehistoric rock art sites, with rock shelters, alcoves, caves, and overhang

sites. Lithic scatters and camps occur on small terraces and benches near the canyon walls. Rare types of sites, like burials, storage cysts, and structures, are believed to be located in the canyons rather than on the plateaus, based on inventories of nearby areas. Exceptions, however, do occur and are known in Duchesne County, Utah and Rio Blanco County, Colorado.

Environmental Consequences

Impacts would be similar to those identified for the Beartooth A project, with the following exceptions:

The Enercor project would disturb about 5,349 acres with high site density probability, 6,043 acres with medium site density probability, and 1,300 acres with low-site density probability, over the life of the project. No significant direct impacts would occur to the sites in the area, when appropriate mitigation measures are used.

Surface mining would disturb 18,310 acres, primarily on plateaus. The three potentially significant sites would not be in probable areas of disturbance.

Since work force increases are expected to be large, significant indirect impacts are expected. The impacts from increased population in the area are particularly significant, because the types of data removed by human activities are important sources for dating and analyzing prehistoric lives and the cultural processes of change. Cultural resources are non-renewable; consequently, the loss of any information could have a significant impact on efforts to reconstruct the prehistory of the region. The total number of sites that could be affected is unknown.

MINERAL AND PALEONTOLOGICAL RESOURCES

Affected Environment

BLM has derived the area of probable tar sand occurrence shown on Map B5 as the area of potential disturbance.

The applicant plans to surface mine the upper two tar sand zones. A total of 1.05 billion tons of tar sand is expected to be mined from the project over the 101-year life of the mine. Generally, surface mining extracts 80 to 90 percent of the in-place ore body.

The Mahogany oil shale zone occurs stratigraphically above the tar sand in the northern portion of the project area. The oil shale beds, including the Mahogany oil shale bed, outcrop in the area and only occur in economical quantities in the north central part of the project area. A KOSLA covers 880 acres of the project area. This is an area where economically mineable oil shale deposits are known to exist. The 880-acre area would represent about 44 million barrels of oil recoverable from the oil shale (BLM 1984a). Other minerals are described in Section A.

No inventory exists for paleontological resources within the project area. In areas that have been inventoried, the Parachute Creek member has moderate potential and the Douglas Creek member, low potential for fossil occurrence. No known sites have been identified in the project area.

Environmental Consequences

EXPLORATION PHASE

No significant impacts to mineral or paleontological resources are expected to occur from exploration activities.

PILOT AND COMMERCIAL PHASES

A conflict between oil and gas and tar sand recovery could occur. While the tar sand mine was operating, oil and gas could not be developed where the mine and facilities were located. Oil and gas development would be delayed but after the tar sand was mined, the oil wells could be drilled. If an oil or gas well existed within the tar sand areas, it and an appropriate buffer zone would have to be avoided, bypassing a small island of tar sand. Depending on future economic conditions and the size of the tar sand island, it may not be economically feasible to go back and recover the tar sand. The leased right to develop oil and gas would be held by the same company that would hold the tar sand development rights under a combined hydrocarbon lease.

Oil shale occurs in this area above the tar sand bed. In the process of strip mining the tar sand, the oil shale beds would be mixed with other shale, siltstone, and sandstone overburden, making future recovery of the oil shale impractical. This conflict would only occur on the portion of the project area along Seep Ridge. Oil shale development rights are not conveyed under a combined hydrocarbon lease. Currently, 880 acres of this project area are covered by a KOSLA representing about 44 million barrels of oil. No significant impacts would occur to the building stone resource.

As the overburden was removed, any fossils occurring in the overburden could be destroyed or displaced from their depositional setting. Disturbances from road and other facility construction could also disrupt paleontological resources. In this project area, both the Parachute Creek and Douglas Creek members of the Green River formation would be stripped. No known sites would be affected but a potential exists for disruption of invertebrete fossils. Predisturbance inventory and monitoring during mining can lessen the potential for disturbances to paleontological resources; however, some fossils may be missed. If fossils were found during inventory and monitoring a positive impact from tar sand development would occur.

AGRICULTURE

Affected Environment

The Enercor project would affect grazing in seven pastures. Table B-28 shows the pastures, number of operations affected, and current status.

No cropland occurs within the project area. See Section A, Cropland, for a discussion of cropland areas potentially affected by urban expansion.

Environmental Consequences

EXPLORATION AND PILOT PHASES

Forage loss from land disturbance associated with the exploration phase (5¼ acres) and pilot phase (2 acres) would be less than I AUM annually. Impacts to grazing from the exploration and pilot phases would be insignificant.

COMMERCIAL PHASE

Grazing. Forage loss from land disturbance would be associated with surface mining and land occupied by the plant site and roads. Most of the grazing disturbance would result from surface mining. The total area would not be disturbed by surface mining during any period of the operation, but because of the variable terrain, the overburden placement process, and associated traffic, the mining sequence either would require excluding livestock grazing or would cause a loss of forage production for grazing for longer periods (10 years or more). Disturbed land would be reclaimed at the same rate mining progressed. About 140 acres would be disturbed at any one time or would be in various stages of reclamation and unable to support grazing.

Since the exact location and mining sequence are unknown, specific forage losses by pastures cannot be identified. An average of 18 AUMs of forage would be lost annually. Table B-28 shows the potential average annual loss of AUMs as compared to each pasture affected.

Forage loss from this project would range from 0.1 to 2.5 percent of the total forage within the affected pastures (Table B-28). This forage loss would be less than the 5 percent criterion and considered insignificant to ranch operations within the area. The invasion of unfavorable plants (poisonous and invader plants) is not expected to exceed the significance criteria and is, therefore, considered insignificant.

More AUMs could be lost by grazing areas becoming remote or inaccessible. This problem could arise from (1) disruption of livestock watering facilities and (2) disruption of grazing patterns. AUM loss cannot be quantified because specific details on the mining sequence and reclamation schedules are not known.

Cropland. No cropland would be affected by surface mining, but cropland loss is expected from population expansion. Project-related population increases would cause the conversion of about 66 acres of land to homesites and related urban development mainly in Vernal, Roosevelt-Ballard, and Fort Duchesne (0.13 acre per capita—ERS 1970). Although most land conversions would occur in existing subdivisions or on natural rangeland, about 16 acres of cropland, possibly including prime agricultural land, could be converted to urban uses along the Duchesne River, Pelican Lake, and Vernal areas.

The cropland loss would not be considered significant in that it would be much less than 5 percent of the total cropland in the project areas.

NO-ACTION ALTERNATIVE

Impacts from the No-Action Alternative would be the same as described for the Beartooth A project.

TABLE B-28
GRAZING ALLOTMENTS AFFECTED AND GRAZING LOSSES CAUSED BY THE ENERCOR PROJECT

	CURRENT STATUS					POTENTIAL GRAZING LOSSES (AUMS)		
Allotment and Pasture	Number of Operations	Livestock Class[1]	Season of Use[2]	Total AUMS	Total[3] Pasture Acreage	Acreage[4] Affected, Disturbed	AUM[5] Loss	Percent of Allotment or Pasture
Sunday School Canyon (8814)								
Pasture 1	2	C	F,W,S	1,617	25,708	1120	18	1.1
Pasture 2	2	C	F,W,S	1,626	25,861	980	18	1.1
Winter Ridge (8827)								
Pasture 3	2	C	S,F	705	12,064	180	18	2.5
Pasture 4	1	C	S,F	872	14,918	0	0	0.0
Pasture 5	1	C	W	247	1,930	0	0	0.0
Sweetwater (8822)								
Monument Pasture	1	C	S,SU,F	1,672	19,731	5440	18	1.1
Lower McCook Pasture	1	C	F,W,S	1,166	13,763	200	18	1.5
Pine Spring Pasture	1	C	S,SU,F	2,156	25,446	9700	18	0.1

Source: Livestock Grazing and Forage Carrying Capacity information presented in this table was gathered from the ***Book Cliffs Resource Area Management Plan Draft EIS*** (BLM 1984b) and from Range Conservationists at the Vernal BLM Office.

[1] Class of Livestock: C = Cattle, S = Sheep, and H = Horses
[2] Season of Use: S = Spring, SU = Summer, F = Fall, W = Winter, and Y = Yearlong
[3] Total acreage of pasture including private, state and federal land.
[4] Total acreage of land disturbance for project life within pasture.
[5] AUM figure is the annual forage loss caused by projct activities for land disturbed at any one time and is compared with each pasture affected in the table.

Note: AUM = animal unit month.

CHAPTER 3

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS; LONG-TERM ENVIRONMENTAL CONSEQUENCES; AND COMMITMENT OF RESOURCES

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS

Because no new mitigation measures or monitoring systems were proposed or committed to and the impacts analyzed in Chapter 2 considered the general measures and stipulations stated in Appendix 2, the unavoidable adverse impacts for each resource are the same as the impacts discussed in Chapter 2.

LONG-TERM ENVIRONMENTAL CONSEQUENCES

Trends Having Significant Impacts

The trends having significant impacts would be the same as identified for the Beartooth A project.

Benefits and Trade-Offs

Table B-29 shows an overview of the benefits and trade-offs of proposed tar sand development.

COMMITMENT OF RESOURCES

Table B-30 shows the irreversible and irretrievable commitment of resources that would result from implementing the Proposed Action, as well as short-term and long-term impacts.

Socioeconomics

Moderate increases would occur in employment, personal income, and local government revenues. Impacts to local prices and wages, infrastructure, local government expenditures, and quality of life would be significant in some of the small communities, particularly Gusher and Ouray, but only insignificant impacts would occur elsewhere.

Water Resources

The Proposed Action would commit 700 acre-feet of water to use each year for the bitumen removal process. For the long term, however, this water could be diverted to other uses, once tar sand development was completed. The mine would significantly alter the shallow ground water movement patterns in the immediate vicinity of the project area. This could reduce flow from an undetermined number of springs and seeps, including public water reserves. Although this flow pattern would be permanently disrupted, over the long term new springs and seeps could emerge from the new flow patterns.

Soils and Vegetation

Vegetation would be restored to a productive condition for grazing and long-term productivity.

Increased erosion would gradually return to normal rates, as revegetation and soil stabilization took place. Long-term productivity would not be impaired.

Wildlife

Short-term decreases in local populations of less mobile small birds and mammals could occur. Direct mortality to small mammals would occur during road and mine construction. Forage for wildlife species would be restored for long-term productivity.

Transportation Networks

The Enercor project would increase traffic congestion and accidents for the short term. These would also increase for the long term but to a lesser degree since traffic volume would be less.

Visual Resources

Some visual resource impacts would remain for the life of the projects or longer. Removal of physical structures and revegetation would return portions of the

TABLE B-29
BENEFITS AND TRADEOFFS FROM THE ENERCOR PROPOSAL

Resource/Item	Benefits	Trade-Offs	Variable
Oil Energy Production	X		
Tar Sand Resources[1]		X	
Tar Sand Reserves[2]			X[3]
Employment Opportunities	X		
Income Levels	X		
Local Prices and Wages		X	
Service Infrastructure			X[4]
Public Revenues[4]	X		
Quality of Life			X[5]
Air Quality			
Quality as related to NAAQS		X	
PSD Increment Availability		X	
Visibility		X	
Water Quality		X	
Water Quantity		X	
Vegetation Production			X[6]
Soil Productivity			X[6]
Wildlife Populations			X
Agriculture			X[6]
Transportation Network Use		X	
Road Quality			X[4]
Recreation Resource Use		X	
Recreation Resource Quality of Undeveloped Sites		X	
Wilderness Quality		X	
Cultural Resources		X	
Visual Resources		X	
Paleontological Resources		X[7]	

[1] Tar sand resources refers to the total quantity of minerals in the ground, as defined within specified limits.

[2] Tar sand reserves refers to the resources with known location, quantity, and quality which are economically recoverable through present technology.

[3] Knowledge of reserves could increase or decrease depending on information derived from mining and on-going exploration, and on the use of reserves through development.

[4] Most indicators commonly used to describe this resource/item would be likely to improve with proper planning and use of project-generated revenues, but likely would deteriorate in the absence of such measures.

[5] Quality of life is dependent on the viewers perspective and values. For example, while certain aspects of life quality could increase because of the increased income and infrastructure, other aspects would decrease because of decreased natural resource or increased population, all caused by the same development.

[6] Productivity could generally improve with successful soil reconstruction and reclamation. Adverse conditions such as severe climatic conditions and lack of successful reclamation would cause a decrease in productivity.

[7] Resources could decrease; however, the understanding of the depositional environment could increase.

Note: NAAQS = National Ambient Air Quality Standards; PSD = prevention of significant deterioration.

TABLE B-30
SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE ENERCOR PROPOSAL

Resource	Irreversible	Irretrievable	Short-Term	Long-Term
Water Resources			X	X
Socioeconomics			X	X
Air Quality			X	
Soils and Vegetation		X	X	
Wildlife		X	X	X
Transportation Networks	X	X	X	X
Visual Resources	X	X	X	X
Recreation			X	X
Cultural Resources	X	X		X

Wilderness would have no irreversible, irretrievable, short-term, or long-term impacts resulting from the Enercor proposal.

landscape to predisturbance conditions in the long term, but major landform modifications would remain.

Wilderness

No impacts would occur to the wilderness resource, other than possible increased use of the areas because of project-related population increases. The quality of the wilderness experience would be decreased in the short term, but through long-term restoration of vegetation and decreased presence of humans, wilderness values would be restored.

Recreation

Some recreation experiences would be forgone for the life of the project until lands were restored for recreation use. Those wanting informal recreation experiences would shift irretrievably to nearby BLM, National Forest, state, and private lands, and the Uintah and Ouray Indian Reservation, where similar experiences could be found.

Cultural Resources

Commitment of cultural resources would be the same as identified for the Beartooth A project.

Agriculture

Loss of forage production from land disturbance would be short term for four to five grazing seasons. However, mining could disrupt grazing patterns and block grazing access to adjoining areas, creating a long-term grazing impact in certain areas.

ENSERCH PROJECT

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ENSERCH PROJECT SUMMARY

WATER RESOURCES

The project would require about 0.3 acre-feet of water per year, which would be insignificant. The amount of sedimentation produced by the clearing required for the project would depend on the location of the drill pads for each well. With the use of the proper construction methods detailed in Appendix 2, no significant sedimentation impacts would occur. Since ground water in the area is mostly below the tar sand beds, no significant direct impacts would occur. Once the bitumen is removed, the remaining sand bed would have different hydrologic characteristics that could lead to a change in the flow or location of local springs and seeps.

SOCIOECONOMICS

None of the phases would cause any significant impacts to the local towns or communities. Total employment and per capita personnel income would increase by less than 1 percent in all jurisdictions in each of the phases of development. Effects on housing, public services and facilities, and social conditions in the area of influence would be insignificant.

AIR QUALITY

Increased SO_2 and TSP concentrations would only be a fraction of the PSD increments, and total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates were predicted to be well within the significance criteria. None of the air quality impacts are expected to be significant.

SOILS AND VEGETATION

Over the life of the project a total of 700 acres could be disturbed, with approximately 30 acres disturbed at any one time. Of that total, 195 acres of sensitive soil would be disturbed. No significant impacts would occur to soils or vegetation, and all disturbed land would be reclaimed through the use of the measures outlined in Appendix 2. Threatened, endangered, or sensitive plant species could occur within the project area; therefore, the area must be surveyed and cleared, as prescribed by law before any surface disturbance begins.

WILDLIFE

The project would disturb 700 acres of crucial elk winter range, which is 0.3 percent of the total in deer herd unit 21. This amount of disturbance would not be significant. Feral horses, sage grouse, and regional sport fisheries would not be significantly affected. Endangered peregrine falcons could overfly the area, but no impacts are anticipated.

TRANSPORTATION NETWORKS

Hauling the commercial product could significantly affect the condition of 4.4 miles of Winter Ridge Road and 9.5 miles of Divide Ridge Road. Local funding may not be sufficient to meet increased maintenance needs. No other roads would be significantly affected.

VISUAL RESOURCES

No significant visual impacts would occur to the VRM Class IV areas that make up the project area. *In situ* operations would be generally compatible with the VRM objectives for the area in which operations would occur.

WILDERNESS

Even though all but 60 acres of the 1,080-acre Enserch project lies within the Winter Ridge WSA, the lease could still be converted to combined hydrocarbon use (Office of the Solicitor 1983). Development of the lease, however, would be constrained by the wilderness nonimpairment criteria (Section C, Appendix 2), which would likely prohibit development of this lease until such time that a Congressional decision may be made not to designate the WSA as wilderness. If the Winter Ridge WSA was designated wilderness, the Enserch lease would likely not be developed. No other WSAs would be within 10 miles of the project. The project area is over 9 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation; no direct impacts are anticipated.

RECREATION

No significant long-term impacts would occur to the recreation resource. About 20 acres per year would be

removed from use for undeveloped recreation opportunities. The project is not expected to interfere with hunting, ORV activities, or other types of opportunities in the area.

CULTURAL RESOURCES

The project would disturb about 415 acres of high site density probability and about 55 acres of low site density probability over the life of the project. An important Archaic period campsite within the project area could be significantly affected. Since the site is too large to completely excavate for full data recovery, its removal from the local and regional site population would need to be assessed. Indirect impacts from unauthorized collection of artifacts would not be significant, given the small work force increases.

MINERAL AND PALEONTOLOGICAL RESOURCES

No significant impacts to mineral or paleontological resources would occur. *In situ* recovery would result in recovering 40 to 50 percent of the in-place oil. No oil and gas, oil shale, or other mineral development would be affected.

AGRICULTURE

Impacts to forage production would amount to 3.4 percent of the total forage, which is insignificant. Invader plants would occupy less than 10 percent of the disturbed area and poisonous plants, less than 2 percent. These impacts would also be insignificant. The forage that could be lost through disruption of watering facilities and grazing patterns is unknown; however, the probability of this occurring is expected to be very low. No cropland would be converted to urban uses from project-related population increases and no cropland occurs in the project area.

BLM PREFERRED ALTERNATIVE

Conversion of the three leases as proposed, including mitigation discussed in Appendix 2, is the BLM preferred alternative. BLM supports this alternative because it would lead to more efficient and orderly tar sand recovery consistent with the diligent development and reasonable environmental protection objectives of the Combined Hydrocarbon leasing Act.

CHAPTER 1

DETAILED DESCRIPTION OF THE ENSERCH PROPOSED ACTION

INTRODUCTION

The Purpose and Need for the Proposed Action, Authorizing Actions, and Alternatives Considered but Eliminated From Detailed Analysis sections can be reviewed in Section A of this document. The Interrelationships with Other Proposed or Existing Projects section appears at the end of Section B under the Cumulative Analysis.

Location of Project

The area proposed for lease conversion on the three existing oil and gas leases is located in the southern portion of Uintah County in east-central Utah. Map A-2 shows the general location of the project area (Section A). Map B-6 shows the detailed location of the project area.

History and Background

Enserch Exploration, Inc. (Enserch), holds three leases on 1,080 acres. Information from several core holes drilled in the vicinity of the lease property was used in selecting a pilot plant site. Preliminary biological data have been developed and project planning and design initiated.

OVERVIEW OF THE PROPOSED ACTION

Description

Enserch proposes to convert three leases on 1,080 acres. The Enserch proposed plan of operations (Averett Consultants 1983e) for *in situ* mining is summarized on Table B-31. Section A, General Development Techniques, describes the proposed plan of operations and typical *in situ* operations.

Land Status and Ownership

The three lease tracts are on federal surface and federal-mineral-estate managed by BLM. Map C-6, located in Section C, Appendix 5, shows the land status and ownership of the 1,080 acres proposed for lease conversion within the P R Spring STSA.

Project Schedule

Figure B-7 shows the proposed schedule for the Enserch *in situ* project.

PROPOSED ACTION

Exploration Phase

One pre-pilot exploration well (Map B-6) would be used to verify the previous data and site for the pilot operation. The operation is described in Section A, General Development Techniques. The roadways providing the main access to the project area include 4.4 miles of Winter Ridge Road, 9.5 miles of Divide Ridge Road, and 59.6 miles of Seep Ridge Road. A new road, about 2 miles long, would also be constructed from Winter Ridge Road to the project site.

Pilot Phase

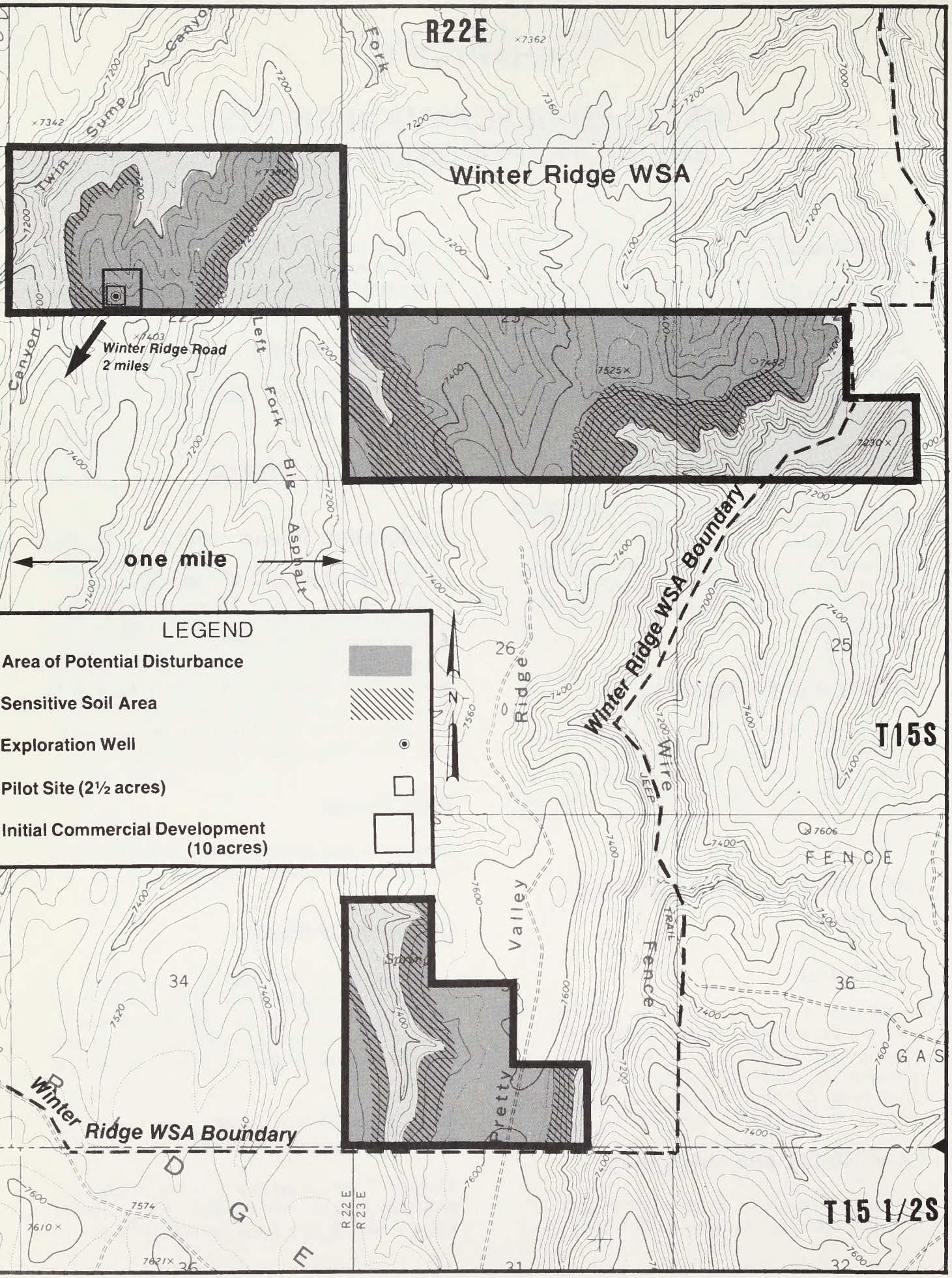
The Enserch pilot operation is as described in Section A, General Development Techniques.

Commercial Phase

Commercial development would be as described in Section A. The average production life of one 10-acre plot for the Enserch proposal would be 5 years, with only one or two tar sand zones mined. Over 100 years would be needed to develop the resource on the total conversion area.

Initially, a 2-mile-long access road would be needed, which would disturb about 10 acres.

Since only 5 years would be required to complete production from a 10-acre plot and 5 years to reclaim a 10-acre plot, 30 acres would be disturbed at one time



AP B-6 ENSERCH PROJECT

TABLE B-31
ENSERCH DATA SHEET

GENERAL

• Type of Operation	Small *In Situ*, progressing in 10-acre increments
• Leases to be Converted (3)	1,080 Acres
• Number of Acres to be Developed	700
• Percent of Lease to be Developed	65
• Production Life of one 10-acre Plot	5 years
• Number of Tar Sand Zones to be Mined	1 or 2

PHASE

Item	Exploration	Pilot	Commercial
Production bbl/day		30	150
Duration of Phase	15 days	1 year	100+ years
Acres Disturbed			
At One Time			
Core Drill Sites	0.25		
Drill Pads		2.5	
Roads		10.0	10
Production Plot			10
Plot Being Reclaimed			10
Total:	0.25	12.5	30
Acres Removed			
Life of Project (Roads)	—	—	10
Water Use			
ac-ft/year		0.1	0.3
Source		Ground Water	Ground Water
Peak Construction			
Year	1991	1991	1994
Personnel	3	4	4
Peak Operation			
Year		1991	1994
Personnel		4	4
Transportation			
Trips Per Day	4	—	
Construction	—	4	4
Operation	—	4	4

Note: bbl/day = barrels per day; ac-ft/year = acre feet per year.

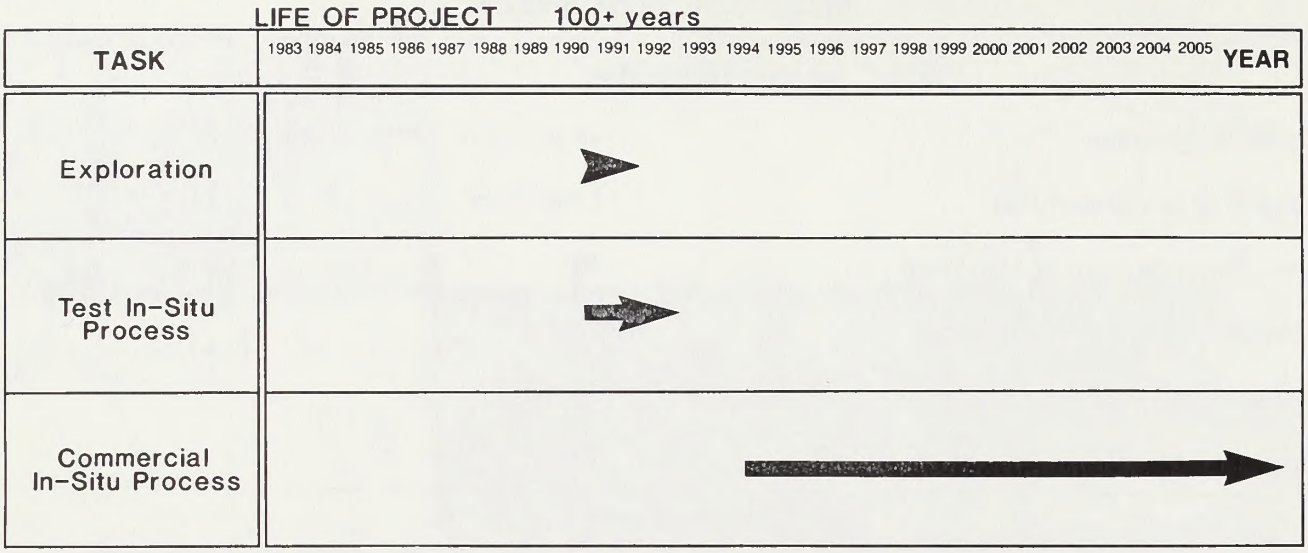


FIGURE B-7 ENSERCH PLAN OF OPERATIONS SCHEDULE

during production. Considering roads and production, 30 acres would be disturbed at any one time.

Reclamation

Land disturbance from project activities would be reclaimed. Details of the reclamation proposed by the applicant are provided in Section C, Appendix 2.

NO-ACTION ALTERNATIVE

The No-Action Alternative would be the denial of the conversion of the three existing oil and gas leases to combined hydrocarbon leases.

CHAPTER 2

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

WATER RESOURCES

Affected Environment

Surface runoff drains from this area through ephemeral stream channels for less than a mile to Main Canyon, Willow Creek, and then to the Green River. The project area consists mostly of upland plateaus and some steep-sloped areas.

Environmental Consequences

Impacts to water resources would be the same as discussed for the Beartooth A project.

SOCIOECONOMICS

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

None of the phases (exploration, pilot, or commercial) of the Proposed Action would cause any significant impacts. As a result of both the exploration and pilot phases in 1991 and the commercial phase from 1994 onward, population growth is expected to range from 2 percent in some of the small communities such as Ouray to less than 1 percent in all other communities. Total population growth would be 40 from the pilot phase and 30 from the commercial phase. Total employment and per capita personal income would increase by less than 1 percent in all jurisdictions during each of the phases. Employment would grow to 11 primary jobs and 7 secondary jobs from the pilot phase and 8 primary jobs and 5 secondary jobs from commercial operation. Since all of these impacts fall below the 5 percent significance criteria, the effects on housing, public services and facilities, and social conditions in the area of influence would be insignificant.

Impacts to local businesses and to the UDWR from loss of revenues are not predicted to be significant because of the few people involved in the project and the insignificant impacts to wildlife populations by the project.

AIR QUALITY

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The impacts are presented for the commercial phase. Impacts during the exploration and pilot phases would be insignificant. Estimated pollutant emission rates are shown in Table B-32. Projected impacts are compared to the NAAQS and PSD incremental limitations in Tables B-33 and B-34. Increased SO_2 and TSP concentrations would be a fraction of the PSD

TABLE B-32
ESTIMATED AIR POLLUTANT EMISSION RATES FOR THE ENSERCH PROJECT

Pollutant	Emission Rate* (kg/hr)
Total Suspended Particulates	14.1
Sulfur Dioxide	4.5
Nitrogen Dioxide	8.4
Carbon Monoxide	1.9
Hydrocarbons	1.0

Source: Aerocomp 1985.

*Long-term average; short-term emission rates may be higher; kg/hr = kilograms per hour.

TABLE B-33
COMPARISON OF MAXIMUM SITE-SPECIFIC IMPACTS WITH NAAQS FOR THE ENSERCH PROJECT

Pollutant Avg. Time	SOURCE CATEGORY CONCENTRATION ($\mu g/m^3$) 2005 Baseline Sources	PROJECT SOURCES Secondary	Direct	Maximum Concentrations	NAAQS
SO_2					
3-hour	18	0	4	22	1,300
24-hour	7	0	2	9	365
Annual	1	0	<1	1	80
TSP					
24-hour	69	0	5	74	150
Annual	21	0	4	25	60
NO_2					
Annual	2	0	2	4	100
CO					
1-hour	1,500	0	2	1,502	40,000
8-hour	900	0	1	901	10,000

Source: Aerocomp 1985.

Note: Secondary = emissions resulting from population growth; Direct = emissions from the Enserch project; $\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; SO_2 = sulfur dioxide; TSP = total suspended particulates; NO_2 = nitrogen dioxide; CO = carbon monoxide.

TABLE B-34
SUMMARY OF PSD INCREMENT CONSUMPTION FOR THE ENSERCH PROJECT

Areas of Special Concern	SO_2 ($\mu g/m^3$) 3-hour	24-hour	Annual	TSP ($\mu g/m^3$) 24-hour	Annual
Winter Ridge WSA	1	<1	<1	5	4
Uintah & Ouray Reservation	<1	<1	<1	<1	<1
State of Colorado	<1	<1	<1	<1	<1
Maximum Impact	4	2	<1	5	4
Class II Increment	512	91	20	37	19

Source: Aerocomp 1985.

Note: PSD = prevention of significant deterioration; SO_2 = sulfur dioxide; $\mu g/m^3$ = micrograms per cubic meter; TSP = total suspended particulates; WSA = Wilderness Study Area.

increments, and total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates are predicted to be well within the significance criteria; therefore, impacts are expected to be insignificant.

SOILS AND VEGETATION

Affected Environment

The Enserch project is located on narrow plateaus bordered by strongly sloping to steep and very steep sideslopes formed by a dendritic drainage pattern with narrow floodplains. Average annual precipitation is 16 to 20 inches and the average frost-free period is 90 to 125 days.

SOILS AND VEGETATION TYPES

Soils on the plateaus are mainly deep and moderately deep loam and clay loam soils. Soils on the strongly sloping to steep and very steep plateau sideslopes are shallow and moderately deep loamy soils with varying amounts of coarse fragments (10 to 65 percent). Soils on the narrow floodplains are very deep and well-drained loams. The following general soil groups occur within the project area:

Soil Group 1 - Soils of the floodplains and terraces
Soil Group 2 - Soils of gently sloping to strongly sloping mesa and plateau tops
Soil Group 4 - Soils of the strongly sloping to steep plateaus, and mountain sideslopes, and hills
Soil Group 5 - Soils of the steep and very steep plateaus, and mountain sideslopes, canyon walls, and mesa escarpments

This project would affect four major vegetation types: grassland, pinyon-juniper (sparse, moderate, and highly productive woodland), mountain shrub, and mixed conifer. See Section A, Vegetation, for description of vegetation types and their uses.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

This project is located within the threatened, endangered, and sensitive plant habitat area outlined in the Book Cliffs Resource Management Plan. See Section A, Vegetation, for discussion of threatened, endangered, or sensitive plant species.

Environmental Consequences

Land disturbance associated with the exploration phase would be ¼ acre and with the pilot phase, 12½ acres. Land disturbance would be reclaimed as discussed for the commercial phase. Impacts to soils and vegetation caused by the exploration and pilot phases would be insignificant.

The impacts during the commercial phase would be the same as described for the Beartooth A project, with the following exceptions.

Over the projected 100+ year life of the project, of the total 700 acres that could be disturbed, 195 acres of sensitive soil would be disturbed (Map B-6). The Enserch project could disturb 123 acres of grassland, 415 acres of pinyon-juniper, 55 acres of mountain shrub, and 107 acres of mixed conifer, over the life of the project.

Impacts to grassland type vegetation would be insignificant because grasses and forbs are expected to become established within 5 years. However, overstory vegetation (trees and shrubs) would take longer to become reestablished. Mountain shrub would take 20 to 30 years to return to near-predisturbance density and composition. The areas of pinyon-juniper and mixed conifer would take 30 to 50 or more years to return to predisturbance conditions.

WILDLIFE

Affected Environment

HABITAT TYPES

The primary wildlife habitat types (vegetation) found on the project area include grassland, pinyon-juniper, mountain shrub, and mixed conifer. See Section A, Vegetation and Soils, for descriptions of plant communities and species composition of the habitat (vegetation) types and also Section A, Wildlife, for a discussion of wildlife species found in these types.

TERRESTRIAL WILDLIFE

The entire project area is located on crucial elk winter range. The Winter Ridge feral horse herd year-round range is also found on portions of the project area.

High priority sage grouse summer range and substantial value blue grouse habitat are found throughout the entire Enserch project area (UDWR 1981).

Raptors common to the project area include red-tailed hawks, Cooper's hawks, goshawks (in winter), American kestrels, great horned and long-eared owls, sharp-shinned hawks, turkey vultures, and golden eagles. Nesting habitat for woodland nesting raptor species is found on the project area, but the entire area furnishes hunting habitat for all species of raptors common to the area.

The species of nongame mammals and birds, reptiles, and amphibians that could be found in the project area are similar to those found throughout the Uinta Basin. Refer to Section A, Wildlife, for a discussion of these species.

THREATENED OR ENDANGERED ANIMAL SPECIES

The Fish and Wildlife Service has indicated that several federally listed species could occur on the project area (Table A-12 and Appendix 4).

Environmental Consequences

HABITAT

Impacts from the exploration and pilot phases would be the same as described for the Beartooth A project. The impacts from the commercial phase would also be the same, with the following exceptions:

Once the project began, about 90 acres would be out of production for 15 years. Thereafter, a steady-state of disturbance/reclamation would be reached; 30 acres would constantly be out of big game forage production for the rest of the life of the project. The number of acres disturbed is not significant as it is far below the significance criteria.

Elk herd unit 21 contains about 192,300 acres of crucial elk winter range (UDWR 1984). This project would disturb an estimated 700 acres of crucial elk winter range, which is about 0.3 percent of the total crucial winter range in elk herd unit 21. This amount of disturbance would not be significant.

WILDLIFE POPULATIONS

Impacts during the exploration and pilot phases would be the same as those described for the Beartooth A project. Impacts during the commercial phase would also be the same with the following exceptions:

Feral horse use in the Winter Ridge area would not be adversely affected by this project as long-range plans by BLM indicate that all feral horses in this area would be removed (BLM 1984b).

Endangered peregrine falcons could overfly the area, but no impacts are expected.

TRANSPORTATION NETWORKS

Affected Environment

The vehicular traffic flow would enter and leave the project site at the south side of the north lease (see Map B-6). Traffic flow would cover 4.4 miles of Winter Ridge Road, 9.5 miles of Divide Ridge Road, and 59.6 miles of Seep Ridge Road before reaching State Highways 88 and 264 and U.S. Highway 40.

See Section A for traffic data on Seep Ridge Road, U.S. Highway 40, and State Highways 88 and 264.

Environmental Consequences

The impacts during all phases would be the same as Beartooth A except for the specific roads affected.

VISUAL RESOURCES

Affected Environment

The Enserch project area consists of flat to gently rolling landscape and is predominantly covered with pinyon-juniper, with lesser amounts of grassland,

mixed conifer, and mountain shrub (Vegetation section). The project would be located entirely within a VRM Class IV area comprised of Class C (low diversity) scenery, which indicates the landscape character is common to view within the region. Viewer sensitivity would be low and viewed either as background or seldom seen from distant roads. The grassland areas are a result of vegetation manipulation (chaining). Otherwise, modifications are generally unnoticeable.

Environmental Consequences

No significant impacts would occur to the visual resource. *In situ* operations were determined to be generally compatible with the VRM objectives for the area where the operations occurred. The landform and vegetation changes, as well as the addition of structures, would not create dominant features on the landscape in terms of scale as viewed by the casual observer.

WILDERNESS

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

Even though all but 60 acres of the 1,080-acre Enserch project lies within the Winter Ridge WSA, the lease could still be converted to combined hydrocarbon use (Office of the Solicitor 1983). Development of that lease, however, would be constrained by the wilderness nonimpairment criteria (Section C, Appendix 2), which would likely prohibit development of this lease unless a Congressional decision is made not to designate the WSA as a wilderness. If the Winter Ridge WSA was designated wilderness, the Enserch lease would likely not be developed. The analysis of the Enserch proposal is based on the assumption that the WSA would not be designated as a wilderness. No other WSAs would be within 10 miles of the project.

The project area is over 9 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation. No direct impacts are anticipated.

RECREATION

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

No significant long-term impacts would occur to the recreation resource during any of the three phases of development of the Enserch project. See Beartooth A for a further explanation.

CULTURAL RESOURCES

Affected Environment

Only one site is known to exist within the project area boundary. This potentially significant site is a large Archaic period campsite, covering several acres, and located on a ridge at the head of two draws. Several other sites are known to lie 5 miles northeast of the northern portion of the project area. No archaeological surveys have been done in or near the project area. However, other sites representing other cultural periods could exist within the project area. Since the vegetation type is predominantly pinyon-juniper (415 acres), which is of high site density, the likelihood of sites occurring in this project area is high (Jones and MacKay 1980). Fifty-five acres of mountain shrub, which is of low site density, occur in the area. No sagebrush-grass (medium site density) occurs. See Section A for discussion of site density associated with vegetation types.

Environmental Consequences

The Enserch project would disturb about 415 acres with high site density probability and about 55 acres with low site density probability, over the life of the project. The impacts to this site would be similar to those described for the Beartooth A project. However, direct and indirect impacts occurring from surface disturbance would have significant effects on the site. The site is too large to completely excavate for full data recovery. When impacts to the site are mitigated, removal of the site from the local and regional site population would need to be assessed.

Since the Archaic period site population of the entire project area is virtually unknown and because diagnostic artifacts and quantifiable data for that period are missing, this potentially significant site is important.

MINERAL AND PALEONTOLOGICAL RESOURCES

Affected Environment

The affected environment would be similar to that described for the Beartooth A project. BLM has derived the area of probable tar sand occurrence shown on Map B-6 as the area of potential disturbance. The applicant plans *in situ* development of one or two tar sand beds at each well. Over the entire project area, four different tar sand zones would be processed.

No inventory exists for paleontological resources within the project area. In areas that have been inventoried, the Douglas Creek member has shown a low potential for fossil occurrence. No known sites have been identified in the project area.

Environmental Consequences

Impacts to mineral and paleontological resources would be similar to those described for the Beartooth A project except that no oil shale development would be affected.

AGRICULTURE

Affected Environment

The Enserch project would affect grazing in Pasture 4, located within the Winter Ridge allotment. The project would affect one cattle operation during the spring, summer, and fall. Total acreage of the pasture is 14,918 acres with a total of 872 AUMs annually.

No cropland occurs within the project area. See Section A, Cropland, for discussion of cropland areas potentially affected by urban expansion.

Environmental Consequences

Impacts from the exploration and pilot phases would be the same as described for the Beartooth A project. Therefore, the following analysis pertains to the commercial phase of the Enserch proposal. Forage loss from the land disturbance would result from the *in situ* recovery process and land being occupied by roads. About 30 acres of vegetation would be disturbed or out of predisturbance land use at any one time. Since the location and exact sequence of blocks of disturbance are unknown at this time, specific amounts of forage losses cannot be identified. An average of 3 AUMs of forage could be lost to one operation annually.

The forage loss from this project represents about 3.4 percent of the total forage in the affected pasture, which is less than the 5 percent criterion and, therefore, insignificant. The potential for invasion of poisonous and invader plants would not be as great due to the higher annual precipitation (16 to 20 inches). Because of the time interval, nature of disturbance, and more favorable precipitation, invader plants are expected to occupy less than 10 percent of the disturbed area and poisonous plants less than 2 percent. Since these impacts would be below the significance criteria, they would be considered insignificant.

More AUMs could be lost by grazing areas becoming remote or inaccessible because of project activities. This problem could arise through (1) disruption of livestock watering facilities and (2) disruption of grazing patterns. AUM loss cannot be quantified because specific details on the mining sequence and reclamation schedules are not known. However, the probability of this occurring is expected to be very low.

No cropland would be affected by the *in situ* resource recovery operations. No cropland is expected to be converted to urban uses from project-related population increases.

NO-ACTION ALTERNATIVE

Impacts from the No-Action Alternative would be the same as described for the Beartooth A project.

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS; LONG-TERM ENVIRONMENTAL CONSEQUENCES; AND COMMITMENT OF RESOURCES

Mitigation, monitoring, and unavoidable adverse impacts; long-term environmental consequences; and commitment of resources would be similar to those identified for the Beartooth A project.

FARLEIGH PROJECT

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FARLEIGH PROJECT SUMMARY

WATER RESOURCES

The project would require about 0.3 acre-feet of water per year, which would be insignificant. The amount of sedimentation produced by the clearing required for the project would depend on the location of the drill pads for each well. With the use of the proper construction methods detailed in Appendix 2, no significant sedimentation impacts would occur. Since ground water in the area is mostly below the tar sand beds, no significant direct impacts would occur. Once the bitumen is removed, the remaining sand bed would have different hydrologic characteristics that could lead to a change in the flow or location of local springs and seeps.

SOCIOECONOMICS

None of the phases would cause any significant impacts to the local towns or communities. Total employment of per capita personnel income would increase by less than 1 percent in all jurisdictions in each of the phases of development. Effects on housing, public services and facilities, and social conditions in the area of influence would be insignificant.

AIR QUALITY

Increased SO_2 and TSP concentrations would be only a fraction of the PSD increments, and total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates were predicted to be well within the significance criteria. None of the air quality impacts are expected to be significant.

SOILS AND VEGETATION

Over the life of the project a total of 460 acres could be disturbed, with approximately 20 acres disturbed at any one time. Of that total, 325 acres of sensitive soil would be disturbed. No significant impacts would occur to soils or vegetation and all land disturbance would be reclaimed through the use of the measures outlined in Appendix 2. Threatened, endangered, or sensitive plant species would not be adversely affected since none are known to occur within the area of disturbance.

WILDLIFE

The project would disturb 0.2 percent of crucial elk winter range in herd unit 21 over the life of the project. This amount of disturbance would not be significant. Sage grouse would be adversely affected by harassment during the strutting, nesting, and brooding seasons. Regional sport fisheries would not be affected. The endangered peregrine falcon could overfly the area, but no impacts are anticipated.

TRANSPORTATION NETWORKS

Trucking of the product during the commercial operation phase could cause a significant impact on the condition of 55.2 miles of the Seep Ridge Road. Local funding may not be sufficient to meet increased maintenance needs. No other roads would be significantly affected.

VISUAL RESOURCES

No visual impacts would occur to the VRM Class IV areas outside the foreground/middleground viewing area from Seep Ridge Road. However, significant impacts would occur within this viewing area as a result of structural changes and vegetation clearings. These impacts would remain until physical structures were removed and revegetation returned portions of the landscape to predisturbance conditions. Of the total 460 acres that would be disturbed over the life of the project, about 15 percent of the area or 65 acres, would be significantly affected.

WILDERNESS

The Farleigh project area would not cross the boundary of an existing wilderness or WSA. The project would be located within 1½ miles of the Winter Ridge WSA. Significant impacts resulting from sights and sounds outside the WSA could occur during all phases of the project when equipment was present and operating. Impacts would not persist once equipment was removed, since landform and vegetation modification would not be visually evident from the WSA. The project area is over 13 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation; no direct impacts are anticipated.

RECREATION

No significant long-term impacts would occur to the recreation resource, other than to the sightseeing opportunity (see Visual Resources). About 20 acres per year would be removed from use for undeveloped recreation opportunities. The project is not expected to interfere with hunting, ORV activities, or other types of opportunities in the area.

CULTURAL RESOURCES

The project would disturb about 382 acres of high site density probability and about 2 acres of low site density probability over the life of the project. Indirect impacts from unauthorized collection of artifacts could result; some sites are located less than ½ mile from the project area.

MINERAL AND PALEONTOLOGICAL RESOURCES

No significant impacts to mineral or paleontological resources would occur. *In situ* recovery would result in recovering 40 to 50 percent of the in-place oil. No oil and gas, oil shale, or other mineral development would be significantly affected.

AGRICULTURE

Impacts to forage production would amount to less than 0.9 percent of the available forage, which is insignificant. Invader plants would occupy less than 10 percent of the disturbed area and poisonous plants, less than 2 percent. These impacts would also be insignificant. The forage that could be lost through disruption of watering facilities and grazing patterns is unknown; however, the probability of this occurring is expected to be very low. No cropland would be converted to urban uses from project-related population increases and no cropland occurs in the project area itself.

BLM PREFERRED ALTERNATIVE

Conversion of the lease as proposed, including mitigation discussed in Appendix 2, is the BLM preferred alternative. BLM supports this alternative because it would lead to more efficient and orderly tar sand recovery consistent with the diligent development and reasonable environmental protection objectives of the Combined Hydrocarbon Leasing Act.

CHAPTER 1

DETAILED DESCRIPTION OF THE FARLEIGH PROPOSED ACTION

INTRODUCTION

The Purpose and Need for the Proposed Action, Authorizing Actions, and Alternatives Considered but Eliminated From Detailed Analysis sections can be reviewed in Section A of this document. The Interrelationships with Other Proposed or Existing Projects section appears at the end of Section B under the Cumulative Analysis.

Location of Project

The area proposed for lease conversion on the one existing oil and gas lease is located in the southern portion of Uintah County in east-central Utah. Map A-2 shows the general location of the project area (Section A). Map B-7 shows the detailed location of the project area.

History and Background

B. D. Farleigh, et al. (Farleigh) proposes to convert one lease in the general vicinity of the lease property. The lease encompasses 640 acres and was issued on April 1, 1979. Nine core holes have been drilled in the general area. A pilot site has been selected on the basis of information from these cores. Preliminary biological data have been developed and project planning and design initiated.

OVERVIEW OF THE PROPOSED ACTION

Description

Farleigh's proposed plan of operations (Averett Consultants 1983f) for *in situ* mining is summarized in Table B-35. Section A, General Development Techniques, describes the proposed plan of operations and typical *in situ* operations.

Land Status and Ownership

The lease is on federal surface and federal minerals estate administered by BLM. Map C-7, located in Section C, Appendix 5, shows the land status and ownership of the 640 acres proposed for lease conversion within the P R Spring STSA.

Project Schedule

Figure B-8 shows the proposed schedule for the Farleigh *in situ* project.

PROPOSED ACTION

Exploration Phase

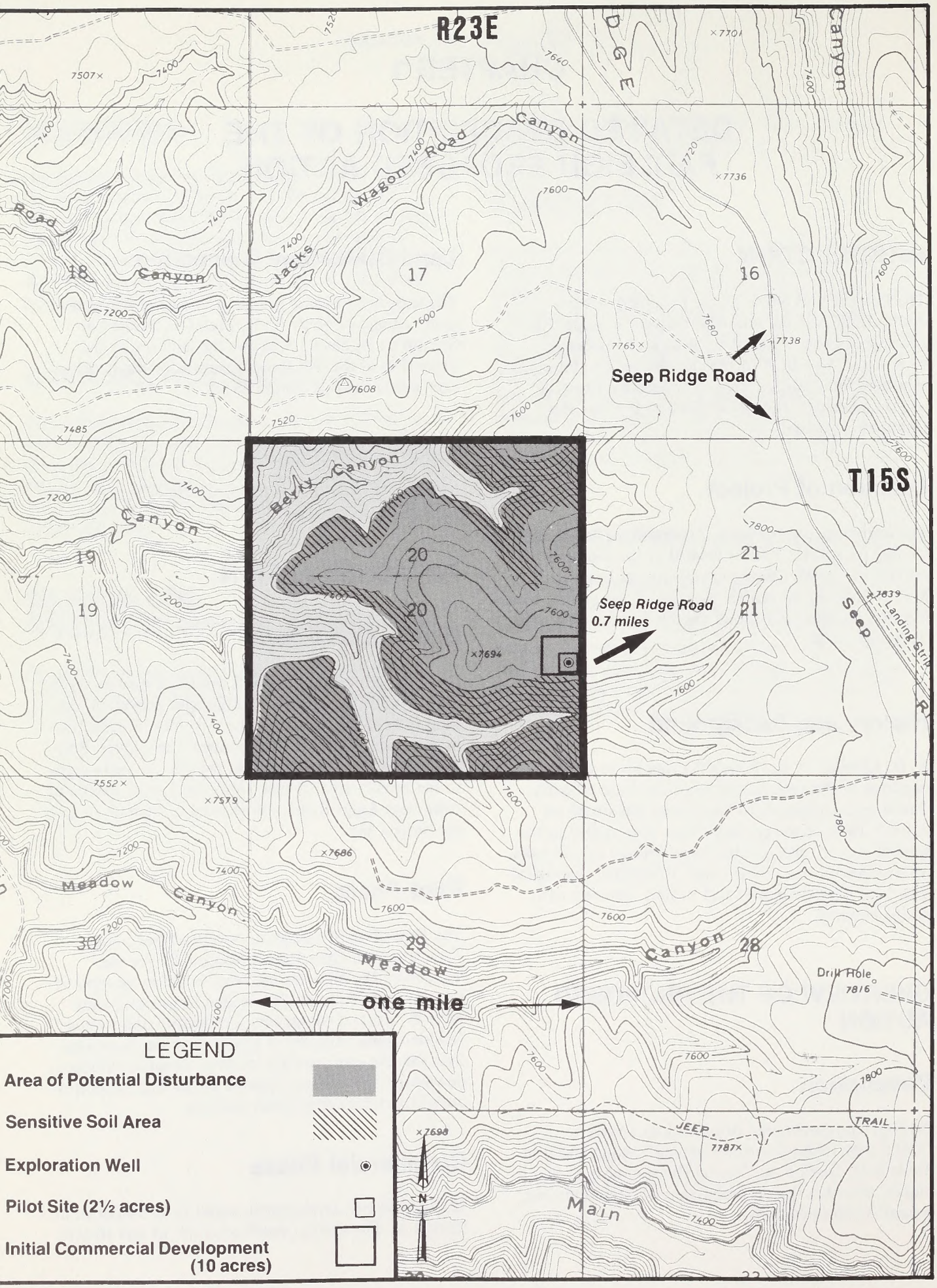
One pre-pilot exploration well would be used to verify the previous data and site for the pilot operation. See Map B-9 for this location. The operation is described in Section A, General Development Techniques. Seep Ridge Road (55.2 miles) would provide the main access to the project area. A new 1-mile-long road, extending from Seep Ridge Road, would need to be built to serve the project site.

Pilot Phase

The Farleigh pilot operation is as described under Typical *In Situ* Operation in Section A. For the location of the pilot site see Map B-7. Any portion of the site could be leveled as needed to accommodate specific pieces of equipment. Production and storage facilities could either be at higher or lower elevations than the five-spot well site to allow adequate drainage downslope to the water disposal pit for any water produced from the dehydration facilities.

Commercial Phase

The commercial development would be as described in Section A. The average production life of one 10-acre



AP B-7 FARLEIGH PROJECT

TABLE B-35
FARLEIGH DATA SHEET

GENERAL

• Type of Operation	Small *In Situ*, progressing in 10-acre increments
• Leases to be Converted (1)	640 Acres
• Number of Acres to be Developed	460
• Percent of Lease to be Developed	72
• Production Life of one 10-acre Plot	55 years
• Number of Tar Sand Zones to be Mined	1 or 2

PHASE

Item	Exploration	Pilot	Commercial
Production bbl/day		30	150
Duration of Phase	15 days	1 year	100+ years
Acres Disturbed			
At One Time			
Core Pad Sites	0.25	—	—
Drill Pads	—	2.5	—
Roads	—	—	5-10
Production Plot	—	—	10-20
Total:	0.25	2.5	15-30
Used For Analyses	0.25	2.5	20
Water Use			
ac-ft/year	—	0.1	0.3
Source	—	Ground Water	Ground Water
Peak Construction			
Year	1985	1985	1985
Personnel	7	20	4
Peak Operation			
Year	—	1984	1986
Personnel	—	4	4
Transportation			
Trips Per Day	4	—	—
Construction	—	4	4
Operation	—	4	4

Note: bbl/day = barrels per day; ac-ft/year = acre feet per year.

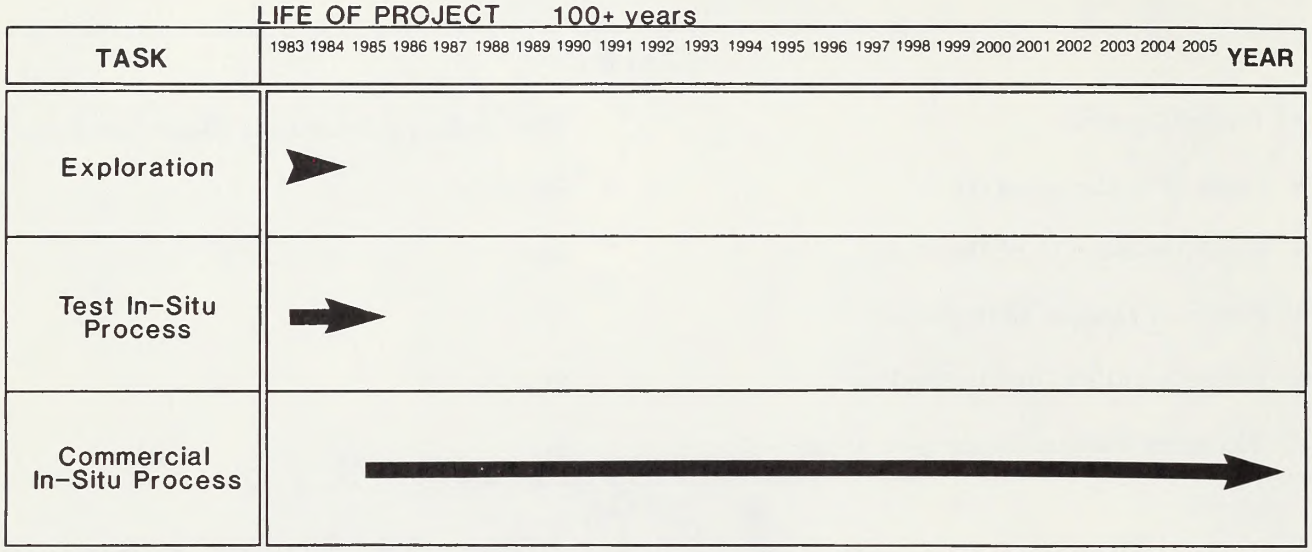


FIGURE B-8 FARLEIGH PLAN OF OPERATIONS SCHEDULE

plot for the Farleigh Proposed Action would be 55 years, with one or two tar sand zones mined. Over 100 years would be needed to develop the resource on the total conversion area.

Initially, about 1 mile of new road would be needed and, as the development moves away from existing roads, another mile of new road would be required. Over the life of the project, the acres disturbed by roads would gradually increase from 5 to 10.

On a 55-year cycle, as all of the bitumen is produced from the first 10 acres and the plot abandoned, a new 10-acre plot adjacent to the old plot, would be developed. For the next 5 years, as the initial 10 acres is being reclaimed and the new 10-acre plot is being developed, a total of 20 acres would be disturbed. Considering roads and production plots, 10 to 30 acres would be disturbed at any one time.

Since the fixed production disturbance time versus reclamation time is high (55 years versus 5 years), 20 acres disturbed at one time is used for analysis purposes.

Reclamation

Land disturbance for project activities would be reclaimed. Details of the reclamation proposed by the applicant are provided in Section C, Appendix 2.

NO-ACTION ALTERNATIVE

The No-Action Alternative would be the denial of the conversion of the existing oil and gas leases to a combined hydrocarbon lease.

CHAPTER 2

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

WATER RESOURCES

Affected Environment

Surface runoff drains from this area through ephemeral stream channels for about a mile to Main Canyon, Willow Creek, and then to the Green River. The project area consists mostly of upland plateaus and some steep-sloped areas.

Environmental Consequences

Impacts to water resources would be similar to those described for the Beartooth A project.

SOCIOECONOMICS

Affected Environment

The affected environment would be the same as described in Section A.

Enironmental Consequences

The impacts of the Farleigh project would be the same as those identified for the Beartooth A project.

AIR QUALITY

Affected Environment

The affected environment would be the same as identified in Section A.

Environmental Consequences

The impacts are presented for the commercial phase. Impacts during the exploration and pilot phases would be insignificant.

Estimated pollutant emission rates are shown in Table B-36. Projected impacts are compared to the NAAQS and PSD increment limitations in Tables B-37 and B-38. Increased SO_2 and TSP concentrations would be only a small fraction of the PSD increments and total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates were predicted to be well within the significance criteria; therefore, impacts are expected to be insignificant.

TABLE B-36
ESTIMATED AIR POLLUTANT EMISSION RATES FOR THE FARLEIGH PROJECT

Pollutant	Emission Rate* (kg/hr)
Total Suspended Particulates	12.6
Sulfur Dioxide	4.5
Nitrogen Dioxide	8.4
Carbon Monoxide	1.9
Hydrocarbons	0.9

Source: Aerocomp 1985.

*Long-term average; short-term emission rates may be higher; kg/hr = kilograms per hour.

SOILS AND VEGETATION

Affected Environment

The Farleigh project area is located on a narrow plateau and mesa with strongly sloping to steep and very steep sideslopes formed by a dendritic drainage pattern with narrow floodplains. Average annual precipitation is 16 to 20 inches and the average frost-free period is 90 to 110 days.

TABLE B-37
COMPARISON OF MAXIMUM SITE-SPECIFIC IMPACTS WITH NAAQS FOR THE FARLEIGH PROJECT

Pollutant Avg. Time	SOURCE CATEGORY CONCENTRATION ($\mu g/m^3$) 2005 Baseline Sources	PROJECT SOURCES Secondary	Direct	Maximum Concentrations	NAAQS
SO_2					
3-hour	18	0	4	22	1,300
24-hour	7	0	2	9	365
Annual	1	0	1	2	80
TSP					
24-hour	69	0	9	78	150
Annual	21	0	4	25	60
NO_2					
Annual	2	0	4	6	100
CO					
1-hour	1,500	0	2	1,502	40,000
8-hour	900	0	1	910	10,000

Source: Aerocomp 1985.

Note: Secondary = emissions resulting from population growth; Direct = emissions from the Farleigh project; $\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; SO_2 = sulfur dioxide; TSP = total suspended particulates; NO_2 = nitrogen dioxide; CO = carbon monoxide.

TABLE B-38
SUMMARY OF PSD INCREMENT CONSUMPTION FOR THE FARLEIGH PROJECT

Areas of Special Concern	SO_2 ($\mu g/m^3$) 3-hour	24-hour	Annual	TSP ($\mu g/m^3$) 24-hour	Annual
Winter Ridge WSA	1	1	<1	2	1
Uintah & Ouray Reservation	<1	<1	<1	<1	<1
State of Colorado	<1	<1	<1	<1	<1
Maximum Impact	4	2	1	9	4
Class II Increment	512	91	20	37	19

Source: Aerocomp 1985.

Note: PSD = prevention of significant deterioration; SO_2 = sulfur dioxide; $\mu g/m^3$ = micrograms per cubic meter; TSP = total suspended particulates; WSA = Wilderness Study Area.

SOILS AND VEGETATION TYPES

Soils on the plateau and mesa-like areas are predominantly deep and moderately deep loams. The soils on the strongly sloping hills and sideslopes are shallow to deep loamy soils with varying amounts of coarse fragments (10 to 65 percent) ranging in size from gravel to stone. The following general soils groups occur within the project area:

Soil Group 3 - Soils of the moderately sloping to strongly sloping convex ridges and hills

Soil Group 4 - Soils of the strongly sloping to steep plateaus, mountain sideslopes, and hills

Soil Group 5 - Soils of the steep and very steep plateaus, mountain sideslopes, canyon walls, and mesa escarpments

This project would affect three major vegetation types: grassland, pinyon-juniper (moderate and high woodland productivity areas), and mountain shrub. See Section A, Vegetation, for descriptions of vegetation types and their uses.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

This project is located outside the threatened, endangered, and sensitive plant habitat area outlined in the Book Cliffs Resource Management Plan (BLM 1984b). See Section A, Vegetation, for discussion of threatened, endangered, or sensitive plant species. No threatened, endangered, or sensitive plant species are known to occur within the project area.

Environmental Consequences

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. Impacts during the commercial phase would be the same as described for the Beartooth A project, with the following exceptions:

About 20 acres of soil and its related vegetation would be disturbed at any one time. Disturbance of the 10-acre blocks would continue over the project life with approximately 55 years between each period of disturbance. Based on the significance criteria for soils and vegetation (Section A), the impacts associated with disturbance from the Farleigh project would not be significant.

Over the projected 100+ year life of the project, of the total 460 acres that could be disturbed, 325 acres of sensitive soil would be disturbed (Map B-7). The Farleigh project could disturb 76 acres of grassland, 382 acres of pinyon-juniper (rated as low woodland productivity), and 2 acres of mountain shrub over the life of the project. Impacts to grassland vegetation would be insignificant because grasses and forbs are expected to become established within 5 years. Overstory vegetation (trees and shrubs) would take longer to become reestablished. The mountain shrub vegetation type would take 20 to 30 years to return to disturbance density and composition. The areas of pinyon-juniper would take 30 to 50 years or more to return to predisturbance conditions. The highly productive woodland sites would be returned to predisturbance conditions, while the less productive sites would be converted to grassland.

Threatened, endangered, or sensitive plant species would not be adversely affected, since none are known to occur within the area of disturbance.

WILDLIFE

Affected Environment

HABITAT TYPES

Three primary wildlife habitat types are found on the project area: grassland, pinyon-juniper, and mountain shrub. See Section A, Vegetation and Soils, for a description of plant communities and species composition of these types and Section A, Wildlife, for a discussion of wildlife species occurring in these types.

TERRESTRIAL WILDLIFE

Crucial elk winter range is found on 640 acres of the project area and is used by the elk from about May 15 to November 1.

High priority sage grouse summer range is found throughout the project area and one identified strutting ground and its associated nesting and brooding habitat are located about 2 miles southeast of the project area.

The entire project area is also classified as substantial value blue grouse habitat by UDWR.

Raptors common to the project area include red-tailed hawks, Cooper's hawks, goshawks (in winter), American kestrels, sharp-shinned hawks, turkey vultures, great horned and long-eared owls, and golden eagles. At the present time, no raptor nests are known to occur on the project area. The species of nongame mammals and birds, reptiles, and amphibians that could be found on the project area are similar to those found throughout the Uinta Basin. See Section A, Wildlife, for a discussion of these species.

THREATENED OR ENDANGERED ANIMAL SPECIES

The Fish and Wildlife Service has indicated that several federally listed species could occur on the project area (Table A-12 and Appendix 4).

Environmental Consequences

HABITAT

The impacts during the exploration and pilot phases would be the same as described for Beartooth A. Impacts during the commercial phase would also be the same with the following exceptions.

Once the project is initiated, 20 acres would be out of big game forage production for 55 years. For the next 15 years, 40 acres would be out of predisturbance production. From then on only 20 acres would be disturbed at one time because the first area would have been reclaimed to browse. This 70-year cycle would be repeated for the life of the project.

Since reclamation could take about 5 years before grasses become established, about 10 to 30 acres of wildlife habitat (vegetation) would be out of predisturbance production at any one time during the commercial phase. About 192,300 acres of crucial elk winter range are found in herd unit 21. The project would disturb an estimated 0.2 percent of this type of habitat, which is not considered significant.

WILDLIFE POPULATIONS

Impacts would be the same as described for the Beartooth A project, with the following exceptions.

Project development on 640 acres of crucial elk winter range and the associated zone of influence around the project area could reduce population because of harassment and displacement.

The sage grouse population would be adversely affected by this project, not so much because of direct impacts as because of a reduction in reproduction from harassment during the strutting, nesting, and brooding seasons. Some harassment to strutting grouse could be expected from project personnel watching the grouse or trying to take pictures. If these harassment levels were high enough, adult grouse would abandon the strutting grounds, severely reducing the population found in this area.

Endangered peregrine falcon could overfly the area, but impacts are not anticipated.

TRANSPORTATION NETWORKS

Affected Environment

The vehicular traffic flow would enter and leave from the east side of the lease (Map B-7). The roadway carrying the traffic flow includes 55.2 miles of Seep Ridge Road before reaching State Highway 88, County Road 264, and U.S. Highway 40.

See Section A for the traffic data on Seep Ridge Road, U.S. Highway 40, State Highway 88, and County Road 264 and for accessibility in the winter months.

Environmental Consequences

The impacts from this project would be the same as described for the Beartooth A project.

VISUAL RESOURCES

Affected Environment

The Farleigh project area contains flat to gently rolling landscape that is predominantly covered with pinyon-juniper, with some grassland established following chaining. The project would be located entirely within a VRM Class IV area comprised of Class C (low diversity) scenery, which indicates the landscape character is common to view within the region. Viewer

sensitivity would be medium where seen as foreground/middleground from Seep Ridge Road, with the remaining and majority of the area classified as seldom seen.

Environmental Consequences

Impacts would be similar to those described for the Beartooth A project, except that they would occur as viewed from Seep Ridge Road. In those areas viewed from Seep Ridge Road, the characteristic landscape would be dominated by changes brought about by mineral extraction.

No significant landform modification is anticipated. Of the 460 acres that would be disturbed over the life of the project, about 15 percent of the area that would be viewed from Seep Ridge Road (65 acres), would be significantly affected.

WILDERNESS

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The impacts would be the same as described for the Beartooth A project. The project would be located within 1½ miles of the southeast boundary of the Winter Ridge WSA. Significant impacts resulting from sights and sounds outside the WSA could occur during all phases of the project when equipment was present and operating. However, when the equipment was removed, the impacts would be removed, since landform or vegetation modification is not expected to be visually evident from the WSA. No other WSAs are within 10 miles of the project.

The project area would be over 13 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation. No direct impacts are anticipated.

RECREATION

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

No significant long-term impacts would occur to the recreation resources, other than sightseeing, during any of the three phases of development of the Farleigh project. See Beartooth A for a further explanation.

CULTURAL RESOURCES

Affected Environment

No sites are known to exist in this project area; however, some sites are located less than ½ mile north of the project area. Areas where well pads and roads are located have been surveyed along with a few individual BLM projects, but no statistically valid surveys have been done. The likelihood of sites occurring in this project area is high given that pinyon-juniper predominates (382 acres). No sagebrush-grass (medium site density) occurs in the project area, and only 2 acres of mountain shrub (low site density) occur. See Section A for a discussion of site density associated with vegetation types.

Environmental Consequences

The Farleigh project would disturb about 382 acres with high site density probability and about 2 acres of low site density probability over the life of the project. Potential impacts to any unknown sites would be the same as discussed for the Beartooth A project. However, indirect impacts could result from unauthorized collectors removing or displacing artifacts or features located on or near the project area. Since the work force increases are expected to be small for all the project phases, no significant impacts are expected. The total number of sites that could be affected is unknown.

MINERAL AND PALEONTOLOGICAL RESOURCES

Affected Environment

The affected environment would be similar to that described for the Beartooth A project. BLM has derived the area of probable tar sand occurrence shown on Map B-7 as the area of potential disturbance. The applicant plans *in situ* development of one or two tar sand beds at each well. Over the entire project area, four different tar sand zones would be processed. No inventory exists for paleontological resources within the project area. In areas that have been inventoried, the Douglas Creek member has shown a low potential for fossil occurrence. No known sites have been identified in the project area.

Environmental Consequences

Impacts to mineral and paleontological resources would be the same as discussed for the Beartooth A project, except no oil shale development would be affected.

AGRICULTURE

Affected Environment

The Farleigh project would affect grazing in the Pine Spring pasture located within the Sweetwater grazing allotment. The project would affect one cattle operation during the spring, summer, and fall. The pasture contains 25,466 acres with a total of 1,197 AUMs.

No cropland occurs within the project area. See Section A, Cropland, for discussion of cropland areas potentially affected by urban expansion.

Environmental Consequences

The impacts during the exploration and pilot phases would be the same as described for the Beartooth A project; therefore, the following analysis pertains to the commercial phase of the Farleigh proposal.

Forage loss would result from land disturbance caused by the *in situ* recovery process and land being occupied by roads. About 20 acres of vegetation would be disturbed or out of predisturbance use at any one time. Since the location and exact sequence of the plots of land disturbance are unknown, specific forage losses by range site (ecological site) cannot be identified. An average of 2 AUMs of forage could be lost annually to one operator.

The forage loss from this project represents about 0.9 percent of the available forage within the affected pasture, which is less than the 5 percent criterion and therefore insignificant. The potential for invasion of poisonous and invader plants would not be as great because of the higher annual precipitation (16 to 20 inches). Because of the nature of disturbance and more favorable precipitation, invader plants are expected to occupy less than 10 percent of the disturbed area and poisonous plants less than 2 percent. Impacts from invader and poisonous plants would, therefore, be considered insignificant.

More AUMs could be lost by grazing areas becoming remote or inaccessible. This problem could arise through (1) disruption of livestock watering facilities and (2) disruption of grazing patterns. AUM loss cannot be quantified because specific details on the *in situ* recovery sequence are not known. However, the probability of this occurring is expected to be low.

No cropland would be affected by the *in situ* resource recovery operations. No cropland is expected to be converted to urban uses because of project-related population increases.

NO-ACTION ALTERNATIVE

Impacts from the No-Action Alternative would be the same as described for the Beartooth A project.

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS; LONG-TERM ENVIRONMENTAL CONSEQUENCES; AND COMMITMENT OF RESOURCES

Mitigation, monitoring, and unavoidable adverse impacts; longterm environmental consequences; and commitment of resources would be similar to those identified for the Beartooth A project.

KIRKWOOD PROJECT

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KIRKWOOD PROJECT SUMMARY

WATER RESOURCES

The project could require 6 acre-feet of ground water per year, which would be insignificant. The amount of sedimentation produced by the clearing required for the project would depend on the location of the drill pads for each well. With the use of the proper construction methods detailed in Appendix 2, no significant sedimentation impacts would occur. Since ground water in the area is mostly below the tar sand beds, no significant direct impacts would occur. Once the bitumen is removed the remaining sand bed would have different hydrologic characteristics that may lead to a change in the flow or location of local springs and seeps.

SOCIOECONOMICS

Commercial development from 1992 onward could result in population increases from 1 percent to 17 percent in small communities. Project-related population growth would mainly affect infrastructure and quality of life. Inadequate housing, further crowding of local public schools, inadequate Indian health services, and additional personnel for tribal police are likely to affect smaller communities within the reservation. However, the project would provide additional employment and income opportunities for tribal members and non-tribal members. No major impacts would occur to the larger communities in the area, such as Vernal and Roosevelt, Utah, nor to small communities farther from the project area. None of the phases of the Proposed Action would significantly affect per capita personal income or employment.

AIR QUALITY

Total TSP concentrations are expected to exceed the 24-hour and annual significance criteria during the commercial phase. Level I visibility screening could be significant, but no adverse impacts are anticipated for Level 2 screening. Increased SO_2, NO_2, and TSP would be within PSD increments and NAAQS.

SOILS AND VEGETATION

Over the 50-year life of the project, a total of 3,760 acres could be disturbed, with approximately 370 acres disturbed at any one time. Of that total, 613 acres of sensitive soil would be disturbed. All disturbed land would be reclaimed through the use of the measures outlined in Appendix 2. Threatened, endangered or sensitive plant species could occur on the project area; therefore, the area must be surveyed and cleared as prescribed by law before any surface disturbance begins.

WILDLIFE

The project would disturb about 0.4 percent of crucial mule deer winter range in herd unit 28A and 1.9 percent of crucial elk winter range in herd unit 21. These impacts would not be significant. No significant impacts would occur to sage grouse, feral horses, or regional sport fisheries.

Although peregrine falcons could overfly the area, no impacts are anticipated. If prairie dog colonies are found, the project area must be surveyed for black-footed ferrets.

Because crucial vegetation habitat disturbance would be below the significance criteria, no significant population loss is expected to occur.

TRANSPORTATION NETWORKS

Transporting the commercial product would significantly affect 8.5 miles of the Chimney Rock, 2 miles of the Willow Creek, and 4 miles of the Buck Canyon roads. Local funding may not be sufficient to meet increased maintenance need. The trips would also significantly affect State Highway 88, County Road 264, and U.S. Highway 40 because of an increased rate of deterioration of the paved surface. No other roads would be significantly affected.

VISUAL RESOURCES

No significant impacts to visual resources would occur from this project. *In situ* operations were determined to be generally compatible with the VRM objectives for the project area.

WILDERNESS

The project would not cross the boundary of any existing wilderness or WSA. Portions of the Winter

Range WSA would be within 1 mile of the project area, and sights and sounds from the project could be significant through all the project phases. Landform and vegetation changes would be evident beyond the project life. Also, the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation is adjacent to the project area. Sights and sounds from the project area and trespass by workers and project visitors is expected to be significant.

RECREATION

Population increases during the commercial phase could cause significant impacts. During peak production, 670 people would not affect most communities but would exceed present use in Gusher and Ouray by more than 10 percent, causing municipal facilities to become overcrowded. Regionally, the population increase would be less than 2 percent and have little impact on recreation facilities or opportunities. Significant impacts from increased trespass could occur on the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation.

CULTURAL RESOURCES

The project would disturb about 1,863 acres with high site density probability and about 1,147 acres with medium site density probability over the life of the project. Indirect impacts from unauthorized collection of artifacts would not be significant.

MINERAL AND PALEONTOLOGICAL RESOURCES

No significant impacts to mineral or paleontological resources would occur. No oil and gas, oil shale, or other mineral development would be significantly affected.

AGRICULTURE

Impacts to forage would amount to about 4.2 percent of the Agency Draw pasture, which is insignificant. About 7.3 percent of the total forage in the Horse Point allotment would be affected, which is significant. Invader plants would occupy less than 10 percent of the disturbed area and poisonous plants, less than 2 percent. No cropland occurs in the project area itself; however, about 87 acres of cropland would be converted to homesites in Vernal, Roosevelt-Ballard, and Fort Duchesne. This impact is insignificant.

BLM PREFERRED ALTERNATIVE

Conversion of the two leases as proposed, including mitigation discussed in Appendix 2, is the BLM preferred alternative. BLM supports this alternative because it would lead to more efficient and orderly tar sand recovery consistent with the diligent development and reasonable environmental protection objectives of the Combined Hydrocarbon Leasing Act.

CHAPTER 1

DETAILED DESCRIPTION OF KIRKWOOD PROPOSED ACTION

INTRODUCTION

The Purpose and Need for the Proposed Action, Authorizing Actions, and Alternatives Considered but Eliminated From Detailed Analysis sections can be reviewed in Section A of this document. The Interrelationships with Other Proposed or Existing Projects section appears at the end of Section B under the Cumulative Analysis.

Location of Project

The area proposed for lease conversion on two existing oil and gas leases is located in southern Uintah County in east-central Utah. Map A-2 shows the general location of the project area (Section A). Map B-8 shows the detailed location of the project area.

History and Background

The W. C. Kirkwood Oil and Gas, Exploration and Production (Kirkwood) proposal is to convert two leases on 3,907.51 acres. No test or core drilling has occurred.

OVERVIEW OF PROPOSED ACTION

Description

Kirkwood's proposed plan of operations (1983) for *in situ* mining is summarized in Table B-39.

Land Status and Ownership

The two lease tracts have federal and private surface ownership. Approximately 3,427.51 acres are administered by the BLM with the remaining 480 acres under private ownership. Both leases involve federal-mineral-estate within the Hill Creek STSA. (See Map C-8, Section C, Appendix 5, for land status and ownership.)

Project Schedule

Figure B-9 shows the proposed schedule for the Kirkwood *in situ* project.

PROPOSED ACTION

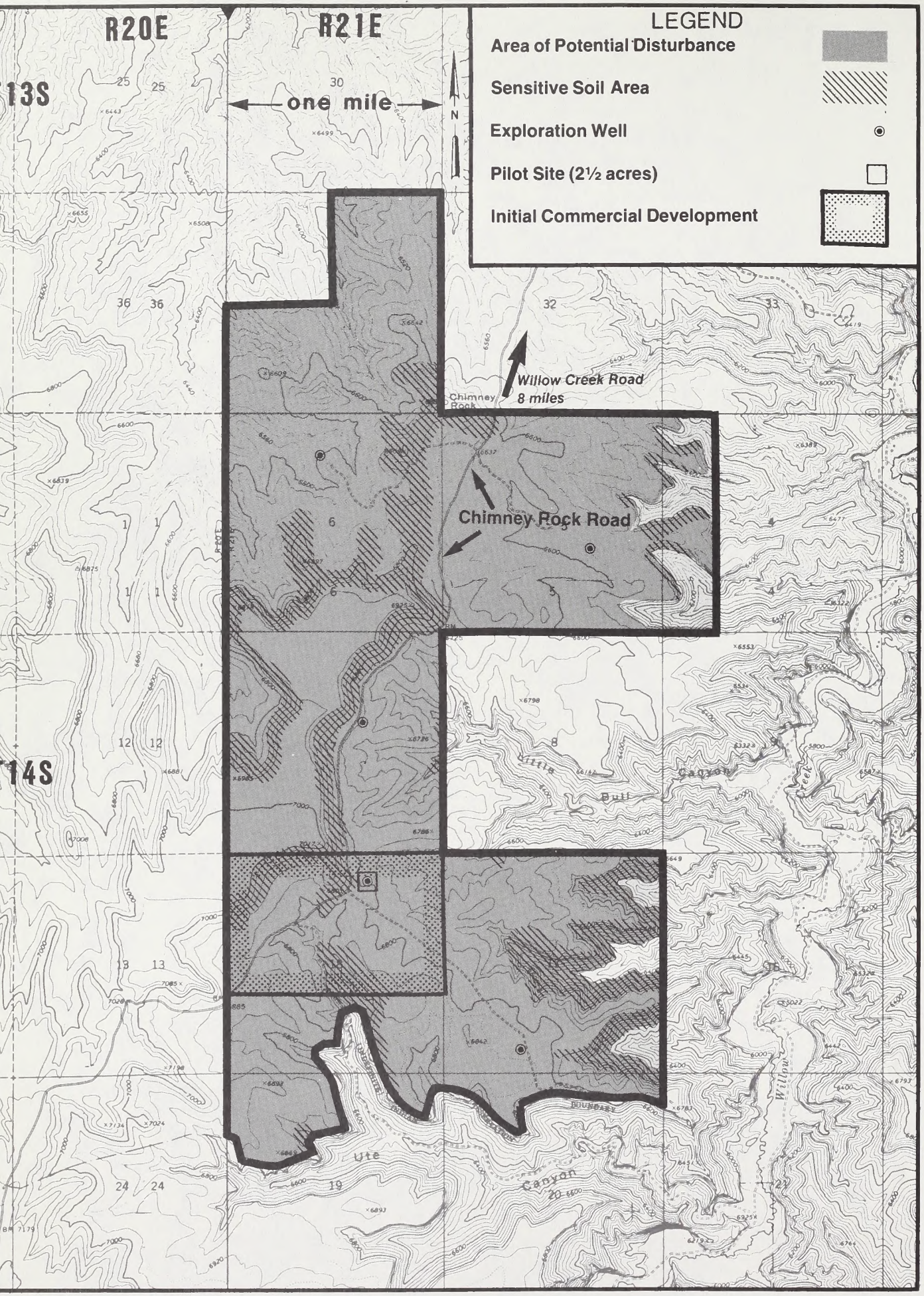
Exploration Phase

The exploration phase, after appropriate permit approval from BLM and the State of Utah, would include the drilling and coring of up to five exploration wells to further define the tar sand resource within the lease boundaries. The thickness and extent of the tar sand, as well as quality and reservoir characteristics, would be determined by these tests. A program of core hole logging and analytical laboratory tests on the recovered core would be used to help determine the appropriate extraction technology and possible upgrading requirements.

At the end of the exploration phase, an extraction technology would be selected from the analysis of data gathered during this phase. A form of subsurface thermal recovery would probably be selected because of the lack of economic technology to produce the tar sand reservoir by mining and surface extraction processes. A type of *in situ* combustion would most likely be used because the scarcity of water in the area would result in partial upgrading of the bitumen within the reservoir by this process. In addition to extraction technology, techniques for upgrading the produced hydrocarbons would be studied.

If technology developed that allowed for possible economic development of the tar sand resource using surface extraction methods, an amended plan of operations would be submitted for these operations. Kirkwood's proposal would be modified according to the information obtained during this phase.

The lease area would be drilled using a truck- or trailer-mounted, air-equipped rig. The on-site equipment would consist of the drilling rig, a trailer to house personnel, a 100-barrel-capacity water tank



AP B-8 KIRKWOOD PROJECT

TABLE B-39
KIRKWOOD DATA SHEET

GENERAL

• Type of Operation	*In Situ*
• Leases to be Converted (2)	3,907.51 Acres
• Number of Acres to be Developed	3,760
• Percent of Leases to be Developed	96
• Production of one 160-acre Plot	3 to 5 years
• Number of Tar Sand Zones to be Mined	1 or more

PHASE

Item	Exploration	Pilot	Commercial
Production bbl/day		400	16,000
Duration	15 days	1.5 years	50 years
Acres Disturbed & Reclaimed			
Temp Roads & Drill Pads	2	5	
Road's New & Upgraded	—	—	
on Lease	—	—	50
Production Well Pattern			1,880
Acres Disturbed One Time			
Core Drill Sites	2		
Drill Pads		5	
Active Production Unit	—	—	160
Unit in Process of Being Reclaimed	—	—	160
Roads			50
Total:	2	5	370

TABLE B-39 (Continued)

Item	PHASE Exploration	Pilot	Commercial
Acres Removed (Roads)			50
Transportation			
Trips Per Day	8		
Construction		4	4
Operation		4	166
Water Use			
ac-ft/year	0.04	0.26	6
Source	Local	Local	Ground Water
Peak Construction			
Year	1985	1987	1991
Personnel	14	20	10
Peak Operation			
Year	—	1987	1992
Personnel	—	10	188

Note: bbl/day = barrels per day; ac-ft/year = acre feet per year.

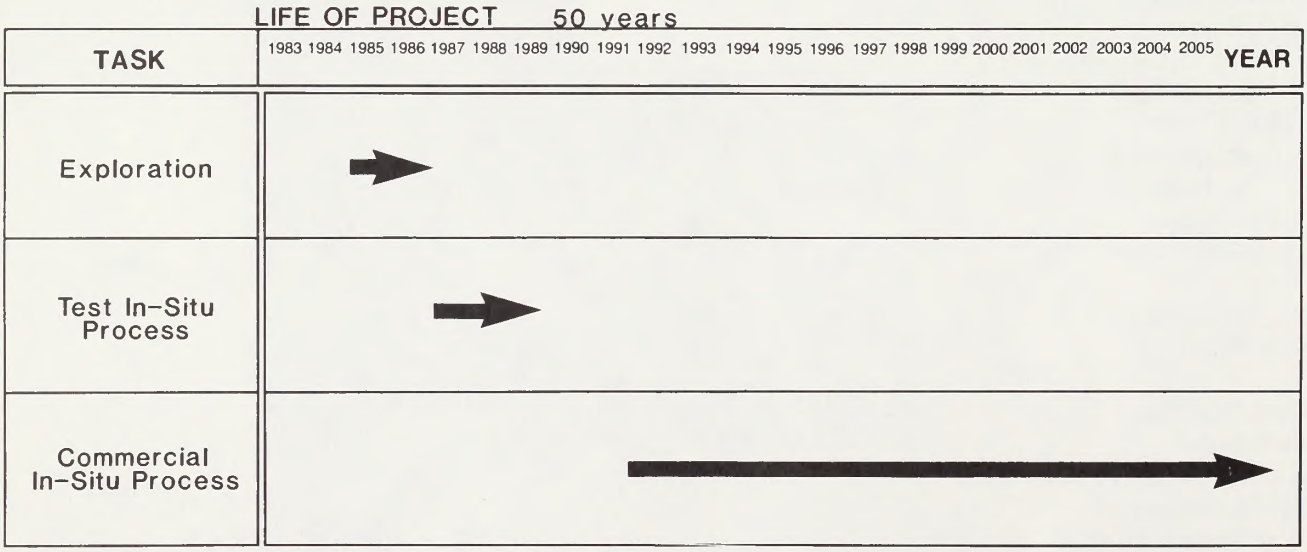


FIGURE B-9 KIRKWOOD PLAN OF OPERATIONS SCHEDULE

truck, a pipe truck, and cementing trucks as needed, to cement the casing strings. All of the equipment would be contained in a 100 foot by 100 foot area around the well site. This area would be graded as needed only to the extent of leveling and removing brush. Any disturbed topsoil would be stockpiled and replaced after the activity was completed. A small 20 foot by 20 foot by 6 foot deep pit would be needed to contain the well cuttings and any water found during drilling. All water required for drilling would be hauled to the area or taken from a source approved by the State of Utah and BLM. Approximately 100 barrels of water acquired locally would be required for drilling each hole.

For the most part, each rig would consist of four workers: three to do the drilling and one to serve as company representative. More people would be needed on location only for casing-cementing operations or for special testing. The trailer would have a pit-type toilet, which would be chemically treated every few days. All trash would be kept in covered containers. No utility connections would be required, and fresh water, which would be hauled in, would only be needed for drinking and cooking. Only two or three vehicle trips per day to each drilling site would be required, with an average of eight trips per day. The vehicles would supply water; would be used for cementing operations; or would deliver drilling supplies, equipment, and personnel to the rig. Two rigs could be operating at the same time. The exploration phase is expected to last about a year (1986), with a peak work force of 14 workers.

The roadways providing main access to the project site include 8.5 miles of Chimney Rock Road, 2 miles of Willow Creek Road, 4 miles of Buck Canyon Road, and 30 miles of Seep Ridge Road. Parts of certain roads would be initially graded to allow access of the rig and support equipment and then maintained as needed.

Support facilities for the exploration phase may include a temporary camp, centrally located within the lease area, to house drilling and support personnel during drilling activity. Because of the remoteness of the area, daily commuting to nearby towns may be impractical. The camp would consist of several self-contained trailers and a generator. Sewage would be disposed in a manner approved by the State. All water would be hauled to the camp.

Other facilities in the camp would include a communication system and first-aid equipment. Another support facility may be an airstrip to facilitate the carrying of equipment and personnel to and from the area during drilling. Any construction or modification of an airstrip would need to be approved by the appropriate agencies. Approximately two flights per day may be required into and out of an airstrip.

For further details concerning a typical *in situ* operation, see Section A, General Development Techniques.

Pilot Phase

At the end of the exploration phase, an extraction technology would be selected using data gathered during that phase. Because of the lack of knowledge of the subsurface resource, most of the pilot phase is conjectural; the figures and operations attributed to the pilot phase are only estimates of what may actually occur. Since basic exploration work has not been completed on the subsurface tar sand resource, the pilot and development phases cannot be perfected.

Operations would consist of the drilling, completing, and testing the pilot pattern(s), along with building pilot facilities and access roads to the pilot sites. The operation, equipment, material, and personnel requirements would be the same as described in the exploration section except as detailed in this section.

About 200 barrels of water would be needed for quench fluid. This water would be recycled and replaced as needed. Each pilot test may last as long as 5 months, with production ranging from 0 to an extreme of 400 barrels per day. The pilot phase of the project is expected to last 1½ years (1987 to 1988). As many as 20 workers could be needed during peak construction. (About 10 people would be employed as operators during the pilot test.) Because of the area's remoteness, these operators may live on location.

For further details concerning a typical *in situ* operation, see Section A, General Development Techniques.

Commercial Phase

The commercial phase would implement appropriate technologies, determined during the exploration and pilot phases, into a full-scale commercial operation for *in situ* production of hydrocarbons from the tar sand reservoir within the lease area. If commercial production is found to be economical, commercial development would start on July 1, 1992.

The development phase would consist of (1) designing and permitting of the operations and (2) building of facilities and commercial operations within the lease area.

The commercial development would progress from the previously detailed exploration and pilot phases. The operation, material, and personnel requirements would be the same as detailed in previous sections unless otherwise stated.

A 20 foot by 20 foot by 6 foot deep pit would be needed to contain the well cuttings and any water found during drilling. All water required for drilling would be hauled into the area or taken from a BLM-approved source. About 200 barrels of water would be needed for drilling and completing each hole. Six acre-feet per year of ground water would be used for the entire commercial development phase.

As many as four rigs, including a completion rig, may be operating simultaneously, drilling wells in a pattern. The drilling and completion program for these wells would be designed at the end of testing to determine extraction technology. Four vehicle trips per day would be required.

Housing, tank batteries, pipelines, compressors, generators, and office-control-room facilities would be built during this phase. These facilities would be semi-portable so that they may be moved to a new development site at the end of commercial production. Some of these facilities could be shared by adjacent development patterns. In conjunction with housing, a water supply well may be drilled and a septic system installed. Housing may be centrally located within the project to eliminate the need to move the facilities.

When the facilities are moved, a new pattern may be established adjacent to the existing pattern; some facilities would be located so they would not have to be moved. Moving to an adjacent location would include using exterior production wells for more than one pattern.

Operation, scheduled to begin on January 1, 1992, would consist of the commercial production of hydrocarbons from the tar sand resource. From one to eight patterns may be in operation at the same time. Commercial operations may last 3 to 5 years at each pattern, with production ranging from 0 to a maximum of 2,000 barrels per day. If eight patterns are operated simultaneously, 16,000 barrels of oil per day for up to 50 years could be produced.

With eight patterns in operation, 500 acres of surface would be occupied at any one time, including drilling of advance core holes for future patterns and reclamation of abandoned patterns.

Development would move in a sweep across the lease tract, expanding to the boundaries of commercial production. The first development pattern would probably be located near or include the pilot location. Development would start with one pattern and be expanded to a high level of production with more patterns and facilities.

During operation, if the maximum number of patterns are in operation, 188 workers could be employed as operators or in support capacities. Many of these workers would probably commute to nearby towns. A total of 166 trips per day would be required—160 trips for hauling the product and 6 for workers and supplies, since most workers would stay at the work camp.

NO-ACTION ALTERNATIVE

The No-Action Alternative would be the denial of the conversion of the two existing oil and gas leases to combined hydrocarbon leases.

CHAPTER 2

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

WATER RESOURCES

Affected Environment

Surface runoff drains from this area through ephemeral stream channels to Willow Creek, less than 1 mile east of the project area, and then to the Green River. The project area consists mostly of upland plateaus but has some steeply sloping areas. Along the southern edge of the project area, surface runoff would go through Ute Canyon on the Uintah and Ouray Indian Reservation as it moves toward Willow Creek.

Environmental Consequences

Impacts to water resources during the exploration phase would be similar to those discussed for the Beartooth A project.

Tar sand ore underlies a large area with steeply sloped watershed conditions, a short distance from Willow Creek. Surface disturbance from drill site or road construction in this steep-sloped area has the potential to significantly increase sedimentation in Willow Creek. With no surface occupancy and with extra care in selecting or designing drill pads and road sites, these significant increases in sedimentation could be avoided.

The applicant proposes to use from 0.04 to 6 acre-feet of water per year from ground water sources. Water is available to meet this requirement without affecting other uses.

SOCIOECONOMICS

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The exploration phase in 1985 and the pilot phase in 1987-1988 would not cause any significant impacts. However, commercial development from 1992 onward could cause significant impacts. See Table B-40 for data relating to the impacts of commercial development.

Commercial development from 1992 onward would cause population increases ranging from 1 percent to 17 percent in the small communities, while Roosevelt-Ballard and Vernal would grow by 3 percent and 2 percent, respectively.

Impacts to population would exceed the 5 percent significance criterion in Gusher and Ouray, which are closer to the project area. Impacts to small communities, farther from the STSA, and large communities would remain below the significance criterion (Table B-40).

The Proposed Action is not expected to significantly increase the migration of Ute or other Native Americans to the Uintah and Ouray Indian Reservation. However, communities within the reservation boundary, particularly Ouray and Gusher, could receive significant population impacts. Such population growth would mainly affect infrastructure and quality of life. (See discussion for the Enercor project since the impacts would be the same.)

None of the phases of the Proposed Action would have any significant effects on employment or per capita personal income. Commercial development from 1992 onward would cause employment increases of 2 percent (15 to 210 jobs) in Uintah County and among the Northern Utes and other nontribal Indians and 1 percent (90 jobs) in Duchesne County. Employment would grow to 188 primary jobs and 112 secondary jobs. Per capita personal income would rise 2 percent among the Northern Utes and other nontribal Indians and less than 1 percent in both counties. All of these impacts fall below the 5 percent significance criteria.

Impacts to infrastructure and quality of life would be the same as described for the Enercor project.

TABLE B-40
KIRKWOOD
IMPACTS TO POPULATION

1998 (Commercial Development)	Baseline	Increase Over Baseline	Percent Increase Over Baseline
Fort Duchesne	1,260	10	1
Gusher	30	5	17
Lapoint	120	5	4
Myton	780	10	1
Ouray	60	10	17
Randlett	500	5	1
Roosevelt-Ballard	6,920	185	3
Vernal	23,810	390	2
Other Roosevelt CCD	8,330	50	1
Total:	41,810	670	N/A

See Appendix 3 for data sources and analysis methods.

AIR QUALITY

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The impacts are presented for the commercial phase. Impacts during the exploration and pilot phases would be insignificant.

Estimated pollutant emission rates are shown in Table B-41. The predicted annual TSP isopleths are illustrated in Figure B-10 The areal extent of the TSP impact is overestimated because deposition was not considered in the modeling analysis. Peak particulate impacts would be caused by wind erosion of disturbed land and from vehicle travel on dirt roads in the area. The peak annual average SO_2 impacts (less than 1 $\mu g/m^3$) are expected to result from point source emissions near the facility. Maximum annual average NO_2 impacts would be below 10 $\mu g/m^3$, resulting mainly from operation of compressors in the injection wells.

Tables B-42 and B-43 summarize the maximum impacts expected for the Kirkwood project. As shown on Table B-42, total TSP concentrations are expected to exceed the 24-hour and annual significance criteria. Increased TSP concentrations would exceed the sig-

TABLE B-41
ESTIMATED AIR POLLUTANT EMISSION RATES FOR THE KIRKWOOD PROJECT

Pollutant	Emission Rate* (kg/hr)
Total Suspended Particulates	610.1
Sulfur Dioxide	77.4
Nitrogen Dioxide	170.1
Carbon Monoxide	26.7
Hydrocarbons	11.5

Source: Aerocomp 1985.

*Long-term average; short-term emission rates may be higher; kg/hr = kilograms per hour.

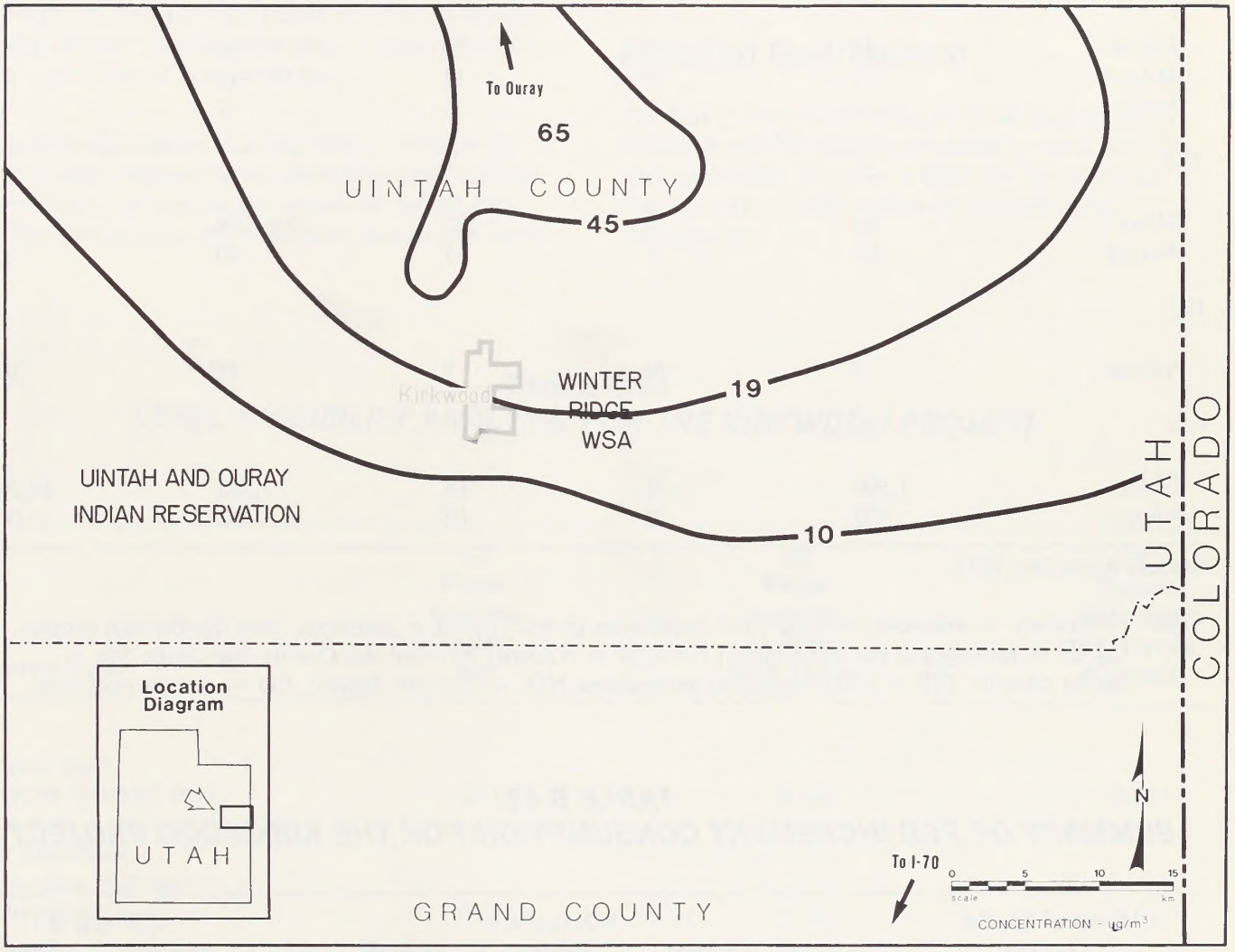


FIGURE B-10 ANNUAL TSP CONCENTRATIONS FOR THE KIRKWOOD PROJECT

TABLE B-42
COMPARISON OF MAXIMUM SITE-SPECIFIC IMPACTS WITH NAAQS FOR THE KIRKWOOD PROJECT

Pollutant Avg. Time	SOURCE CATEGORY CONCENTRATION ($\mu g/m^3$) 2005 Baseline Sources	PROJECT SOURCES Secondary	Direct	Maximum Concentrations	NAAQS
SO_2					
3-hour	18	0	26	44	1,300
24-hour	7	0	12	19	365
Annual	1	0	1	2	80
TSP					
24-hour	86	0	120	206	150
Annual	25	0	65	90	60
NO_2					
Annual	2	0	9	11	100
CO					
1-hour	1,500	0	88	1,588	40,000
8-hour	900	0	62	962	10,000

Source: Aerocomp 1985.

Note: Secondary = emissions resulting from population growth; Direct = emissions from the Farleigh project; $\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; SO_2 = sulfur dioxide; TSP = total suspended particulates; NO_2 = nitrogen dioxide; CO = carbon monoxide.

TABLE B-43
SUMMARY OF PSD INCREMENT CONSUMPTION FOR THE KIRKWOOD PROJECT

Areas of Special Concern	SO_2 ($\mu g/m^3$) 3-hour	24-hour	Annual	TSP ($\mu g/m^3$) 24-hour	Annual
Winter Ridge WSA	4	2	< 1	75	31
Uintah & Ouray Reservation	15	7	< 1	60	21
State of Colorado	< 1	< 1	< 1	29	15
Maximum Impact	26	12	1	120	65
Class II Increment	512	91	20	37	19

Source: Aerocomp 1985.

Note: PSD = prevention of significant deterioration; SO_2 = sulfur dioxide; $\mu g/m^3$ = micrograms per cubic meter; TSP = total suspended particulates; WSA = Wilderness Study Area.

nificance criteria as shown on Table B-43 and Figure B-10. Sulfur dioxide impacts would be well within the Class II increments and NAAQS.

Perceptible visual impacts could not be ruled out at Arches National Park, Dinosaur National Monument, Colorado National Monument, and the Uintah and Ouray Indian Reservation as a result of Level 1 visibility screening (summarized in Table B-44). However, the Level 2 results given in Table B-45 show that no adverse visibility impairment is expected at the Class I and Class II areas analyzed.

Table B-46 summarizes acid deposition estimates for the Kirkwood project. Sulfur deposition rates are not expected to be above the safe threshold for the area, and the nitrogen flux would be near background levels. SO_2 increases to the Colorado Category I areas of Dinosaur and Colorado National Monuments would be less than 1 $\mu g/m^3$; therefore, the impacts would be insignificant.

SOILS AND VEGETATION

Affected Environment

The Kirkwood project is located in an area of gently sloping to sloping plateaus bordered by steep and very steep sideslopes. The area is dissected by a dendritic drainage pattern with narrow floodplains along drainageways.

TABLE B-44
LEVEL 1 VISIBILITY ANALYSIS FOR THE KIRKWOOD PROJECT

Observer Point	C1 Plume Contrast Against Sky	C2 Plume Contrast Against Dark Terrain	C3 Region Reduction Sky/Terrain Contrast
Delicate Arch, Arches National Park	0.013	0.185	0.011
Split Mountain, Dinosaur National Monument	0.013	0.188	0.011
Colorado National Monument	0.013	0.179	0.011
Flat Rock Mesa, Uintah & Ouray Reservation	0.043	0.903	0.011
EPA Recommended Guidelines	<0.100	<0.100	<0.100

Source: Aerocomp 1985.

TABLE B-45
LEVEL 2 VISIBILITY ANALYSIS FOR THE KIRKWOOD PROJECT

Observer Point	C1 Wave Length (μm)	C2 Plume Contrast*	C3 Contrast Reduction*
Delicate Arch, Arches National Park	0.40	−0.002	0.001
	0.55	−0.003	0.004
	0.70	−0.003	0.005
Split Mountain, Dinosaur National Monument	0.40	−0.009	0.001
	0.55	−0.012	0.005
	0.70	−0.013	0.007
Colorado National Monument	0.40	−0.004	0.001
	0.55	−0.003	0.004
	0.70	−0.002	0.005
Flat Rock Mesa, Uintah & Ouray Reservation	0.40	−0.002	0.004
	0.55	−0.019	0.023
	0.70	−0.021	0.029
EPA Recommended Guidelines		<0.100	<0.100

Source: Aerocomp 1985.

*The absolute value of plume contrast and contrast reduction should be compared to the EPA recommended guidelines.

Note: μm = one-millionth of a meter.

TABLE B-46
ACID DEPOSITION ESTIMATES FOR THE KIRKWOOD PROJECT

Area of Concern	Annual Deposition Rate ($g/m^2/yr$) sulfur	nitrogen
Winter Ridge WSA	0.04	0.26
Uintah & Ouray Reservation	0.03	0.12
State of Colorado	0.01	0.08
Safe Threshold	0.22	unknown

Source: Aerocomp 1985.

Note: $g/m^2/yr$ = grams per meter squared per year; WSA = Wilderness Study Area.

Included are areas of terraces and convex ridges. Average annual precipitation ranges from 8 to 12 inches in the northern (drier) portions to 12 to 16 inches in the southern portion. The average annual frost-free period ranges from 90 to 140 days.

SOILS AND VEGETATION TYPES

The project area consists of a wide range of soils. Soils on the sloping plateaus and high terraces are predominantly moderately deep and deep loam and clay loam soils. Soils on the convex ridges, rolling hills, and steep and very steep sideslopes are predominantly shallow and moderately deep loamy and sandy loam soils with varying amounts of coarse fragments (10 to 65 percent) ranging in size from gravel to rock. The following general soil groups occur within the project area:

Soil Group 1 - Soils of the floodplains and terraces
Soil Group 2 - Soils of gently sloping to strongly sloping mesas and plateau tops
Soil Group 3 - Soils of the moderately sloping to strongly sloping convex ridges and hills
Soil Group 4 - Soils of the strongly sloping to steep plateaus, mountain sideslopes, and hills
Soil Group 5 - Soils of the steep and very steep plateaus, mountain sideslopes, canyon walls, and mesa escarpments

This project would affect five major vegetation types: grassland, pinyon-juniper, mountain shrub, sagebrush-grass, and saltbush-greasewood. See Section A, Vegetation, for descriptions of vegetation types and their uses.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

This project is located within the threatened, endangered, and sensitive plant habitat area outlined in the Book Cliffs Resource Management Plan (BLM 1984b). See Section A, Vegetation, for discussion of threatened, endangered and sensitive plant species.

Environmental Consequences

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. Impacts during the commercial phase would also be similar, with the following exceptions.

Project activities would result in the physical disturbance of soil, some soil compaction, removal of vegetation, as well as crushing of vegetation on the project area. Approximately 370 acres of soil and its related vegetation would be disturbed at any one time. Disturbance of the 160-acre plot would continue over the project life with approximately 3 to 5 years between each period of disturbance. Reclamation on the previously disturbed acreage would be completed within 5 years after the disturbance of the new tract. Based on the significance criteria for soils and vegetation (Section A), the impacts associated with the disturbance caused by the Kirkwood project would not be significant.

Since the locations and exact sequence of the blocks of disturbance are unknown, the amount of sensitive soil or associated vegetation types to be disturbed at any one time cannot be identified. However, over the projected 50-year life of the project, of the total 3,760 acres that could be disturbed, 613 acres of sensitive soil would be disturbed (Map B-8). The Kirkwood project could disturb 1,147 acres of sagebrush-grass (including some grassland); 1,863 acres of pinyon-juniper; 615 acres of saltbush-greasewood; 75 acres of mountain shrub; and 64 acres of mixed conifer, over the life of the project. Impacts to grassland-type vegetation would be insignificant because grasses and forbs are expected to become established within 5 years. However, overstory vegetation (trees and shrubs) would take longer to become reestablished. Mountain shrub would take 20 to 30 years to return to predisturbance density and composition. The areas of pinyon-juniper and mixed conifer would take 30 to 50 or more years to return to predisturbance conditions. The highly productive woodland sites would be returned to premining conditions, while the less productive sites would be converted to grassland.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

Threatened, endangered, or sensitive plant species could occur within the project area. The project area would need to be surveyed and cleared as prescribed by law before any surface disturbance began.

WILDLIFE

Affected Environment

HABITAT TYPES

Five primary wildlife habitat types are found on the project area: grassland, sagebrush-greasewood, sagebrush-grass, pinyon-juniper, and mountain shrub. Refer to Section A, Soils and Vegetation, for descriptions of plant communities and species composition of these habitat types. Also refer to Section A, Wildlife, for a description of wildlife species found in these types.

TERRESTRIAL WILDLIFE

The entire project area is classified as crucial elk and mule deer winter range and is occupied by deer from about October 15 through May 15 and by elk from about November 1 through May 15.

The only game bird of importance found on the project area is the mourning dove, which nests and feeds in the area.

The species of nongame mammals and birds, reptiles, and amphibians that could occur on the project area are similar to those found throughout the Uinta Basin. Refer to Section A, Wildlife, for a discussion of these species. Raptors common to the project area include red-tailed hawks, prairie falcons, sharp-shinned hawks, marsh hawks, American kestrels, turkey vultures, and golden eagles. The shallow, sage-covered draws in this area furnish habitat for ground nesting raptors such as marsh hawks. The entire area, however, furnishes hunting habitat for all species of raptors. No raptor nests are known to occur on the project area.

About 158 feral horses are found on the Kirkwood project area. The BLM population objective for this herd is 195 animals (BLM 1984b).

THREATENED OR ENDANGERED ANIMAL SPECIES

The Fish and Wildlife Service has indicated that several federally listed species could occur on the project area (Table A-12 and Appendix 4).

Environmental Consequences

HABITAT

Impacts to wildlife during the exploration and pilot phases would be the same as described for the Beartooth A project. Impacts during the commercial phase would also be the same with the following exceptions.

All direct impacts to deer and elk by this project would be to wintering animals.

About 403,008 acres of crucial mule deer winter range occur in herd unit 28A (UDWR 1984). The project would disturb about 0.4 percent of this type of range. About 192,300 acres of crucial elk winter range occur in elk herd unit 21; 1.9 percent would be disturbed. None of these disturbances would be significant.

Once the project is initiated, 210 acres would be out of big game predisturbance forage production for 5 years (50 acres for roads and 160 acres for the production unit). The second and third 5-year period would each have 160 acres disturbed for a total of 530 acres for 15 years. Thereafter, a steady state of disturbance and reclamation would be reached, with 530 acres constantly out of big game forage production for the rest of the project life.

Development of the Kirkwood tar sand project would result in both direct and indirect impacts to wildlife resources on and adjacent to the project area through habitat losses and modification. While impacts to deer wintering areas are important, these amounts of habitat disturbance are below the significance criteria.

WILDLIFE POPULATIONS

Impacts to wildlife during the exploration and pilot phases would be the same as described for the Beartooth A project. Impacts during the commercial phase would also be the same, with the following exceptions:

Impacts to wildlife populations in the project area, particularly to wintering mule deer, would be associated with harassment and displacement in addition to vegetation habitat alterations. The number of acres disturbed at any one time would not exceed the significance criteria, so no significant impacts to deer are anticipated from vegetation removal. However, project development on crucial mule deer winter range and the associated zone of influence around the project area would reduce the deer population because of harassment and displacement.

Because of the small number of elk wintering in the project area, this project is not expected to directly affect elk. However, an increase in poaching and illegal killing of elk is expected because of the number of people required for operation of the project. These increases, while they cannot be quantified at present levels of knowledge, are expected to be significant.

Generally, only secondary impacts to the Uintah and Ouray Indian Reservation would occur as a result of

implementing the Kirkwood tar sand project. Because of project-related increases in human population near the reservation, poaching and wanton killing by non-Indians could increase over current levels on the reservation.

Impacts to feral horses during commercial operation of this project are not expected to be significant because of the large amount of horse range available.

THREATENED OR ENDANGERED ANIMAL SPECIES

Endangered peregrine falcons and bald eagles could overfly the area, but impacts are not anticipated. If any prairie dog towns or colonies were found on the project area, an approved Fish and Wildlife Service survey must be completed before the Notice to Proceed was issued.

TRANSPORTATION NETWORKS

Affected Environment

The vehicular traffic flow would enter and leave from the northeast side of the lease (see Map B-8). The roadways starting at the project site include 8.5 miles of Chimney Rock Road, 2 miles of Willow Creek Road, 4 miles of Buck Canyon Road, and 30 miles of Seep Ridge Road before reaching State Highway 88, County Road 264, and U.S. Highway 40.

Three miles of Chimney Rock Road is packed dirt and gravel. The vehicular road use ranges from passenger cars to heavy drilling equipment vehicles. See Section A for traffic data on Seep Ridge Road, U.S. Highway 40, State Highway 88, and County Road 264.

Environmental Consequences

EXPLORATION PHASE

The 1985 exploration phase would involve a 14-person work force, requiring 8 vehicle trips per day for 1 year. This projected traffic volume would not cause any significant transportation impacts to the roadways.

PILOT PHASE

The 18-month construction and operation phase, starting in 1986, involves a 20-person work force. This projected traffic volume would not cause any significant transportation impacts to the roadway as stated in the significance criterion.

Production of 400 barrels of oil per day represents two trucks per day or four truck trips. This projected truck traffic would not cause any significant transportation impacts to the roadways as supported by the significance criterion.

COMMERCIAL PHASE

Construction would start in 1991 and would involve a 10-person work force and 4 truck trips per month for 1 year. This projected traffic volume would not cause any significant impacts to the roadways as stated in the significance criterion.

Production of 16,000 barrels of oil per day would require a 188-person work force, resulting in 6 trips per day. Transporting products would require 80 trucks per day or 160 truck trips. This increase in traffic would have a significant impact on 14.5 miles of the Uintah County secondary road system: Chimney Rock, Willow Creek, and Buck Canyon roads. The impacts are directly related to poor road design, lack of a good sub-base, and lack of a good maintenance program. The roads would have be redesigned, the sub-base upgraded, and an accelerated maintenance program implemented. The same impacts would occur on Seep Ridge Road but to a lesser degree.

Increased truck traffic would have a significant impact on State Highway 88, County Road 264, and U.S. Highway 40 by accelerating the rate of deterioration of the paved surface.

Since roadway construction and maintenance is mainly funded from motor fuel taxes, present funding formulas may not meet the needs of an accelerated maintenance program. The State and Uintah County budgets may be inadequate to pay for any additional construction or for an accelerated maintenance program. Funding to maintain roadways would significantly strain the local maintenance budget.

The increased traffic for the construction phase would increase traffic accidents, since traffic accidents

increase directly in proportion to traffic volume. The traffic accidents would not be limited to project-related traffic, but could involve local and through traffic. Factors other than road conditions could contribute to traffic accidents: time of year, weather conditions, summer tourists, recreational vehicles, and oversized and overweight loads. Any increase in traffic accidents would be significant.

Seep Ridge Road could not sustain increased traffic without lowering the level of service. This would be a significant impact as stated in the significance criterion. State Highway 88, County Road 264, and U.S. Highway 40 could sustain the increased traffic without significantly lowering the level of service.

VISUAL RESOURCES

Affected Environment

The Kirkwood project area consists of flat to gently rolling terrain and is predominantly covered with pinyon-juniper and sagebrush-grass, with areas of saltbush-greasewood and pockets of mixed conifer and mountain shrub vegetation. The project would be located entirely within a VRM Class IV area comprised of Class C (low diversity) scenery, which indicates the landscape character is common to view within the region. Viewer sensitivity is medium in the northernmost section of the project and low in the remaining portion. The whole area is seldom seen. An unimproved road bisects the area, providing the only noticeable modification in the area.

Environmental Consequences

No significant impacts would occur to the visual resource. The landform and vegetation changes, as well as the addition of structures, would not create dominant features on the landscape in terms of scale as viewed by the casual observer.

WILDERNESS

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The Kirkwood project area would not cross the boundary of any existing wilderness or WSA. However, the project would be adjacent to the east-central portion of the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation. All three phases of the project development would be visible from the designated area and sounds would be evident. Landform and vegetation modification scars would remain for the long term. Of greater potential impact to the designated area would be the increased trespass of project workers and others visiting the project. The exact impacts cannot be determined, but effects upon the cultural values, wildlife and naturalness, solitude, and spiritual characteristics of the area could be significant. All such impacts would be unwanted and unacceptable to members of the Uintah and Ouray Indian Reservation.

Portions of the Winter Range WSA would be within 1 mile east of the Kirkwood project area. Impacts arising from outside sights and sounds perceived from within the WSA could be significant throughout all three phases of project development. Although the view and sounds of the equipment would cause the greatest impacts, vegetation scars would be evident for the long term beyond the project life. No other WSAs are within 10 miles of the project boundary.

RECREATION

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The exploration and pilot phases of the Kirkwood project would not cause any significant impacts to the recreation resource, either near the project site or within the secondary zone of influence. Population growth for both phases is expected to be less than 3 percent for all communities and very little land would be disturbed or removed from the recreation base as a result of the *in situ* processes.

Population increases from the commercial phase, however, could cause significant impacts to the recreation resource and opportunities. During peak production, the 670-person population increase would not affect most communities, but the increase would be well over 10 percent in the communities of Gusher and Ouray. Any available municipal facilities or opportunities would be overcrowded. Within the Uinta Basin, population increases would be less than 2 percent over the projected base, showing little impact on recreation facilities and opportunities within the secondary zone of influence.

The primary significant impact would occur from increased trespass on recreational lands within the adjacent Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation. Workers could conceivably venture onto reservation lands and affect the quality of the resource through increased hunting and ORV use and degrade the natural and solitude qualities of the Indian lands.

CULTURAL RESOURCES

Affected Environment

Although the Kirkwood project area falls within a statistically surveyed area, no known sites occur within a 180-acre survey area. Sites are located within 1 mile east of the lease area. The vegetation zones referred to in the cultural resource studies are similar to those described in Section A, Soils and Vegetation. As with the Beartooth A project, the vegetation type is predominantly pinyon-juniper (1,863 acres) and sagebrush-grass (1,147 acres). The pinyon-juniper zone would have the highest site density and the sagebrush-grass, a medium site density. Only 75 acres of mountain shrub (low site density) occur. See Section A for a discussion of site density associated with vegetation.

Environmental Consequences

The Kirkwood project would disturb about 1,863 acres with high site density probability and 1,147 acres with medium site density probability, over the life of the project. Potential impacts to any unknown sites would be similar to those described for Beartooth A. However, since the work force is expected to be large for the commercial phase, some indirect impacts are expected. The total number of sites that could be affected is unknown.

MINERAL AND PALEONTOLOGICAL RESOURCES

Affected Environment

Data describing the tar sand ore body in this project area are limited. Based on Dana and Sinks (1981) and information supplied by the applicant, BLM has derived the area of probable tar sand occurrence shown on Map B-8 as the area of potential disturbance.

No inventory exists for paleontological resources within the project area. In areas that have been inventoried, the Douglas Creek member has shown a low potential for fossil occurrence. No known sites have been identified in the project area.

Environmental Consequences

Impacts to mineral and paleontological resources would be similar to those discussed for the Beartooth A project, except no oil shale development would be affected.

AGRICULTURE

Affected Environment

The Kirkwood project would affect grazing in two pastures. Table B-47 shows the pastures, number of operations affected, and current status.

No cropland occurs within the project area. See Section A, Cropland, for discussion of cropland areas potentially affected by urban expansion.

Environmental Consequences

The impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. Therefore, the following analysis pertains to the commercial phase of the Kirkwood proposal.

GRAZING

About 370 acres of vegetation would be disturbed or out of predisturbance use at any one time. Since the location and exact sequence of the block of disturbance are unknown, specific amounts of forage loss by ecological unit (range site) or by pasture cannot be identified. An average of 31 AUMs could be lost annually. Table B-47 shows the potential 31-AUM forage loss compared to each pasture affected, number of operators, and the percentage of each affected pasture's carrying capacity.

Forage loss from this project represents about 4.2 percent of the total forage in the Agency Draw pasture and about 7.3 percent in Pasture 1 of the Horse Point allotment. Even though the well area would be located entirely within the Agency Draw pasture, the loss of forage would be below the 5 percent criterion and therefore considered insignificant. Generally, the project would involve both pastures and would cause a significant loss of forage in Pasture 1 of the Horse Point allotment. The potential for invader plants is greater in the northern portion due to the 8- to 12-inch annual precipitation. However, because of the nature of disturbance and interval of disturbance, poisonous plants are expected to be less than 2 percent of the disturbed area and other invader plants less than 10 percent. Impacts from these plants, therefore, would be insignificant.

More AUMs could be lost by grazing areas becoming remote or inaccessible. This problem could arise through (1) disruption of livestock watering facilities and (2) disruption of grazing patterns. AUM loss cannot be quantified because specific details on the *in situ* recovery sequence is unknown. However, the probability of this occurring is expected to be low.

CROPLAND

No cropland would be affected by the *in situ* resource recovery operations. Some cropland loss, however, may be expected from population expansion. Project-related population increases could cause the conversion of about 87 acres of land to homesites and other related urban development mainly in the areas of Vernal, Roosevelt-Ballard, and Fort Duchesne (0.13 acres per capita—ERS 1970). The amount of conversion would depend on the housing vacancies at the time the population increased.

Although most land conversion would occur in existing subdivisions or on native rangeland, 21 acres of cropland including prime agricultural land, could be converted to urban uses along the Duchesne River, Pelican Lake, and Vernal areas. This cropland loss would be considered insignificant in that it would be much less than 5 percent of the total cropland in the area of influence.

NO-ACTION ALTERNATIVE

Impacts from the No-Action Alternative would be the same as described for the Beartooth A project.

TABLE B-47
GRAZING ALLOTMENTS AFFECTED AND GRAZING LOSSES CAUSED BY THE KIRKWOOD PROJECT

	CURRENT STATUS					POTENTIAL GRAZING LOSSES (AUMS)		
Allotment and Pasture	Number of Operations	Livestock Class[1]	Season of Use[2]	Total AUMS	Total[3] Pasture Acreage	Acreage[4] Affected, Disturbed	AUM[5] Loss	Percent of Allotment or Pasture
Horse Point (8822)								
Agency Draw Pasture	1	C	W	738	10,399	1206	31	4.2
Pasture 1	1	C	W	420	5,929	2555	31	7.5

Source: Livestock grazing and Forage Carrying Capacity information presented in this table was gathered from the Book Cliffs Resource Area Management Plan Draft EIS (BLM 1984b) and from Range Conservationists at the Vernal BLM Office.

[1] Class of Livestock: C = Cattle, S = Sheep, and H = Horses
[2] Season of Use: S = Spring, SU = Summer, F = Fall, W = Winter, and Y = Yearlong
[3] Total acreage of pasture including private, state and federal land.
[4] Total acreage of land disturbance for project life within pasture.
[5] AUM figure is the annual forage loss caused by projct activities for land disturbed at any one time and is compared with each pasture affected in the table.

Note: AUM = animal unit month.

CHAPTER 3

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS; LONG-TERM ENVIRONMENTAL CONSEQUENCES; AND COMMITMENT OF RESOURCES

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS

Since no new mitigation measures or monitoring systems were proposed or committed to, and the impacts analyzed in Chapter 2 considered the general measures and stipulations stated in Section C, Appendix 2, the unavoidable adverse impacts for each resource are the same as discussed in Chapter 2.

LONG-TERM ENVIRONMENTAL CONSEQUENCES

Trends Having Significant Impacts

Trends having significant impacts would be the same as identified for the Beartooth A project.

Benefits and Trade-Offs

Table B-48 shows an overview of the benefits and tradeoffs of the proposed tar sand development.

COMMITMENT OF RESOURCES

Table B-49 shows the irreversible and irretrievable commitment of resources that would result from implementing the Proposed Action, as well as short-term and long-term impacts.

Water Resources

The *in situ* tar sand process would not commit a significant amount of water to use nor have a significant effect on water resources.

Socioeconomics

Impacts and commitment of resources would be the same as identified for the Enercor project.

Soils and Vegetation

Vegetation would be restored to a productive condition for grazing and long-term productivity. Increased erosion would gradually return to normal rates, as revegetation and soil stabilization occurred. Long-term productivity would not be impaired.

Wildlife

Impacts and commitment of resources would be the same as described for the Beartooth A project.

Transportation Networks

The Kirkwood project would increase traffic congestion and accidents for the short term. These would also increase for the long term but to a lesser degree since traffic volume would be less.

Visual Resources

No impacts would occur to the visual resource.

Wilderness

The quality of the experience on the Wildlife and Cultural Resource Protection Area could be decreased in the short term but through decreased presence of humans, wilderness values would be restored.

Recreation

No impacts are anticipated for the recreation resource.

Cultural Resources

Commitment of cultural resources would be the same as described for the Beartooth A project.

Agriculture

Loss of forage production from land disturbance would be a short-term impact for four to five grazing seasons, with an annual loss of 31 AUMs for the life of the project. However, mining operations could cause disruption of grazing patterns and grazing access to adjoining areas creating a long-term grazing impact in certain areas.

TABLE B-48
BENEFITS AND TRADEOFFS FROM THE KIRKWOOD PROPOSAL

Resource/Item	Benefits	Trade-Offs	Variable
Oil Energy Production	X		
Tar Sand Resources[1]		X	
Tar Sand Reserves[2]			X[3]
Employment Opportunities	X		
Income Levels	X		
Local Prices and Wages		X	
Service Infrastructure			X[4]
Public Revenues[4]	X		
Quality of Life			X[5]
Air Quality			
Quality as related to NAAQS		X	
PSD Increment Availability		X	
Visibility		X	
Water Quality		X	
Water Quantity		X	
Vegetation Production			X[6]
Soil Productivity			X[6]
Wildlife Populations			X
Agriculture			X[6]
Transportation Network Use		X	
Road Quality			X[4]
Recreation Resource Quality of Undeveloped Sites		X	
Wilderness Quality		X	
Cultural Resources		X	
Paleontological Resources		X[7]	

[1] Tar sand resources refers to the total quantity of minerals in the ground, as defined within specified limits.

[2] Tar sand reserves refers to the resources with known location, quantity, and quality which are economically recoverable through present technology.

[3] Knowledge of reserves could increase or decrease depending on information derived from mining and ongoing exploration, and on the use of reserves through development.

[4] Most indicators commonly used to describe this resource/item would be likely to improve with proper planning and use of project-generated revenues, but likely would deteriorate in the absence of such measures.

[5] Quality of life is dependent on the viewers perspective and values. For example, while certain aspects of life quality could increase because of the increased income and infrastructure, other aspects would decrease because of decreased natural resource or increased population, all caused by the same development.

[6] Productivity could generally improve with successful soil reconstruction and reclamation. Adverse conditions such as severe climatic conditions and lack of successful reclamation would cause a decrease in productivity.

[7] Resources could decrease; however, the understanding of the depositional environment could increase.

TABLE B-49
SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE KIRKWOOD PROJECT

Resource	Irreversible	Irretrievable	Short-Term	Long-Term
Water Resources			X	
Socioeconomics			X	X
Air Quality			X	
Soils and Vegetation		X	X	
Wildlife		X	X	X
Transportation Networks	X	X	X	X
Wilderness			X	
Recreation			X	
Cultural Resources	X	X		X
Agriculture		X	X	

The Kirkwood proposal would not cause any irreversible, irretrievable, short-term, or long-term impacts to the visual resource.

MOBIL PROJECT

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PROPOSED ACTION

Water Resources

Mine construction, overburden and topsoil stockpiling, road construction, and facility construction could affect surface water on the project site during the pilot and commercial phases. With the use of the various required mitigation measures outlined in Appendix 2, impacts to water quality would be insignificant. Also, since the disturbance would occur on the upland plateaus, changes in sediment levels for streams outside the project area would be insignificant. As the surface mine is opened, some shallow ground water zones may be interrupted, affecting an undetermined number of springs and seeps. Impacts to ground water flow and quality near the project site would probably cause permanent changes in the flow and quality of an undetermined number of springs and seeps. The project would require about 13 acre-feet annually from the Vernal water supply during the pilot phase, which would be insignificant. During commercial operation, 11,000 acre-feet per year from the White River and an additional 3,500 acre-feet would be needed to accommodate population increases. This would further increase water use on the Colorado River system but would not produce significant changes in salinity. Impacts to the two public water reserves would be significant. Protection of these would require no mining in areas upstream from the two public water reserves.

Socioeconomics

The pilot phase (1991–1995) could result in population increases of slightly under 10 percent in Ouray and other small communities. Project-related population growth would mainly affect infrastructure and quality of life.

Commercial development from 1998 onward would cause more population growth than the pilot phase, particularly during the construction period (1998–1999). Increases in the small communities could vary from 12 percent to more than 100 percent, while Vernal and Roosevelt-Ballard would grow by 19 percent and 28 percent respectively. Vernal, and the Roosevelt-Ballard areas would experience a temporary shortfall in most public services and facilities. Smaller communities such as Fort Duchesne, Ouray, Gusher, and Randlett would need more housing; expanded water and sewer systems; and increased health services, police force, classrooms, and other public facilities and services.

A significant increase in migration of Utes and other Indians to the Uintah and Ouray Indian Reservation could occur. The quality of life in both affected communities would decrease on a temporary basis. However, commercial construction would have a positive effect by raising employment opportunities among Northern Utes and other non-tribal Indians by more than 20 percent, and operation would cause an employment increase of 4 percent.

Impacts during commercial development would also be significant but to a lesser degree than commercial construction.

Air Quality

During the commercial phase, all TSP and annual NO_2 significance criteria would be exceeded. Increased SO_2 would be within PSD increments and NAAQS. The air quality impacts to Class II areas of Colorado and the Uintah and Ouray Indian Reservation are not expected to exceed any PSD Class II increments. No significant air quality impacts would be anticipated to the Colorado Category I areas of Dinosaur and Colorado National Monuments. Impacts to Arches National Park would be within the Class I increment limitation. No adverse visual impacts would be expected for level 2 recovery. Acidic sulfur deposition impacts to Colorado may be insignificant, while nitrogen deposition impacts may be significant.

Soils and Vegetation

Over the life of the project a total of 8,360 acres would be disturbed with 40 acres removed for the plant site and about 1,600 acres disturbed or in some phase of reclamation at any one time. Of that total, 2,304 acres of sensitive soil would be disturbed. All disturbed land would be reclaimed through the use of the measures outlined in Appendix 2. Threatened, endangered, or sensitive plant species could occur on the project area, therefore, the area would need to be surveyed and cleared as prescribed by law before any surface disturbance began.

Wildlife

During the commercial phase, the project would disturb 6.1 percent or 8,360 acres of crucial mule deer summer range and 15.4 percent of crucial mule deer fawning habitat in herd unit 28A. The project would also disturb 15.4 percent of crucial elk summer and calving ranges, and 1.3 percent of crucial elk winter range in herd unit 21. Impacts to mule deer fawning habitat and elk summer and calving ranges would be significant.

Poaching, wanton killing, and illegal hunting could increase on the project area and Uintah and Ouray Indian Reservation. Legal hunting and fishing would also increase. Regional sport fisheries would be indirectly affected because of the increased demand for fishing permits and the cost of increasing stocking levels.

Impacts to total wildlife populations from vehicle/ animal collisions would be insignificant.

If Mobil purchased 11,000 acre-feet of water from the White River Dam Project, this amount of removal would not adversely affect the endangered fish species (Colorado squawfish, humpback chub, bonytail chub) in the White River because of agreed upon conservation measures detailed in the Section 7 Biological Opinion from the Fish and Wildlife Service and the signed Fish and Wildlife Mitigation Plan for that project.

Transportation Networks

Transporting the commercial product would significantly affect 2.6 miles of the Divide Ridge and 59.6 miles of the Seep Ridge roads, State Highway 88, County Road 264, and U.S. Highway 40. About 1,485 vehicle trips per day would be needed to haul workers and equipment to the project site. The increased traffic volume would cause traffic flow to fall below a safe operating level. After the construction work force leveled in the year 2002, the Divide Ridge and Seep Ridge roads would still have auto and truck traffic flow over safe operating levels because production of 80,000 tons of tar sand over 15 years would represent 941 truck trips per day. Local funding may not be sufficient to meet increased maintenance needs.

Visual Resources

Significant impacts would occur to the visual resource during all three phases. Landform modification, removal of vegetation, and the introduction of structures such as drill rigs, test pits, surface mining activity and other project facilities would not meet the VRM Class objectives of the project area. About 3,340 acres of VRM Class II areas and 5,020 acres of VRM Class III areas would be disturbed over the life of the project. Impacts would remain until landform modifications were blended with the natural topography, and vegetation returned to similar forms, colors, and textures with surrounding natural vegetation.

Wilderness

The project area would directly overlay 404 acres of the Winter Ridge Wilderness Study Area (WSA). Development of that lease would be constrained by the nonimpairment criteria which would likely prohibit development of that portion of the lease in the WSA, unless a Congressional decision is made not to designate it a wilderness. If the Winter Ridge WSA was designated as a wilderness, the Mobil project located on the WSA would likely not be developed. Flume Canyon WSA, 7 miles from the project area, would not be affected because of the intervening topography. The Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation would be over 5 miles from the project; no significant direct impacts are anticipated.

Recreation

During the commercial phase, increased population growth within the region would be significant, especially for the communities of Gusher and Ouray. Because of this increase, significant demands on recreation facilities and opportunities of all types would occur. In addition, impacts would be significant at Dinosaur National Monument, Ashley National Forest, and state parks and other use areas during construction (1 to 2 years).

About 1,640 acres would be disturbed at one time; thus the land would be lost to many recreational pursuits.

Visual impacts would be evident to the sightseer as viewed from Seep Ridge Road, especially in areas of high scenic quality along the edge of the Book Cliffs. This would be a significant impact to the western edge of the Grand Valley Overlook Corridor.

Population growth could also have unquantifiable, significant impacts on the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation because of increased trespass and increased demand for recreation experiences by new residents of the reservation. Positive impacts would occur to Bottle Hollow resort.

Cultural Resources

The project would disturb about 1,773 acres with high site density probability and about 1,397 acres with medium site density probability over the life of the project. Impacts to the PR Spring C.C.C. campsite from unauthorized collection of artifacts or site disturbance would be significant, given the large work force increases.

Mineral and Paleontological Resources

No significant impacts to mineral or paleontological resources are expected to occur from exploration activities. During the pilot and commercial phases, a conflict between oil and gas activity and tar sand recovery could occur. While the tar sand mine was operating, oil and gas could not be developed where the mine and facilities were located. Oil and gas development would be delayed until after the tar sand was mined. No conflicts with oil shale or other mineral development would occur.

As the overburden was removed, any fossils occurring in the overburden could be destroyed or displaced from their depositional setting. If any fossils were found during predisturbance inventory and monitoring during mining, new information would be gained about the paleontological past of the area, causing a positive effect.

Agriculture

Impacts to forage production would amount to 7.4 to 18.3 percent of the total forage, which would be significant to ranch operations within the area. No cropland would be affected by surface mining, but cropland loss would be expected from population expansion. Although most land conversion would occur in existing subdivisions or on natural rangeland, about 148 acres of cropland could be converted to urban uses along the Duchesne River, Pelican Lake, and Vernal areas. This would be an insignificant impact on the total cropland in the area.

NO-ACTION ALTERNATIVE

The No-Action Alternative would disturb about 6,440 acres of state land over a 22 1/2-year project life. No federally managed land would be affected by the alternative, but impacts would be similar to those identified for the Proposed Action.

— Because less area would be disturbed, fewer springs and seeps would be affected. The two public water reserves could still be adversely affected from surface mining upstream.

— Planning for potential socioeconomic impacts would have to begin earlier because of the shorter project life.

— The Winter Ridge WSA would not be directly affected.

— No cultural resource surveys have been conducted on state land; therefore, the applicant would have to comply with the Utah Antiquities Act of 1973, as amended, before any disturbance occurred.

— Impacts to Soils and Vegetation, Wildlife, and Grazing would be the same as the Proposed Action except for magnitude.

— Impacts to Air Quality, Transportation Networks, Visual Resources, Recreation, Mineral and Paleontological Resources, and Cropland would be the same as identified for the Proposed Action.

BLM PREFERRED ALTERNATIVE

Conversion of the leases as proposed, including mitigation discussed in Appendix 2, is the BLM preferred alternative. BLM supports this alternative because it would lead to more efficient and orderly tar sand recovery consistent with the diligent development and reasonable environmental protection objectives of the Combined Hydrocarbon Leasing Act.

CHAPTER 1

DETAILED DESCRIPTION OF THE MOBIL PROPOSED ACTION

INTRODUCTION

The Purpose and Need for the Proposed Action, Authorizing Actions, and Alternatives Considered but Eliminated from Detailed Analysis sections can be reviewed in Section A of this document. The Interrelationships with Other Proposed or Existing Projects section appears at the end of Section B under the Cumulative Analysis.

Location of Project

The area proposed for lease conversion on six existing oil and gas leases is located in southern Uintah County and northern Grand County in east-central Utah. Map A-2 shows the general location of the project areas (Section A). Map B-9 shows the detailed location of the project.

History and Background

Texaco Inc., Getty Oil Company, and Mobil Oil Corporation (Mobil) propose to convert six leases on 3,337.6 acres (federal land). By virtue of legal agreements referred to as the *Option and Earning Agreement,* Mobil proposes to explore and develop the tar sand resource on the leases (if warranted by exploration results), which are found in the 17,157-acre (federal, state, and private land) Prospect area (Prospect) as delineated by Mobil within the P R Spring STSA. The tar sand resource contained on the six lease tracts should be sufficient to allow the pilot processing facility to produce in paying quantities before the leases expire, but not sufficient to support the capital investment required for the commercial operation. Anticipating the joint operation and development of a block of leases to support a commercial facility, Mobil has negotiated and executed three separate *Option and Earning Agreements* with Getty Oil Company; Texaco, Inc.; and Kerr-McGee Corporation. (The Kerr-McGee Corporation controls state leases on Prospect.) During the summer of 1983, Mobil drilled 17 core holes and analyzed the quality and quantity of bitumen from the tar sand ore.

Prospect contains 17,157.44 acres, of which 8,360 acres are considered mineable. The mineable acreage excludes 640 acres for the central facility site, 679 acres because of low bitumen content or high cost of extraction, and 7,478.44 acres because they lie in valleys and do not contain tar sand. The six existing oil and gas leases on federal mineral estate are proposed for lease conversion and would be under the provisions of the Combined Hydrocarbon Lease Conversion Act.

OVERVIEW OF PROPOSED ACTION

Description

Mobil's proposed plan of operations (1984) for surface mining and an extraction plant are summarized in Table B-50. Section A, General Development Techniques, describes a typical commercial surface mining operation.

Land Status and Ownership

The "Option and Earning Agreements" coupled with Mobil's acreage involve 16,439 acres and cover 96 percent of the total acreage included within Prospect (17,157.44 acres). Approximately 76 percent of the total Prospect acreage (13,101 acres) is covered by state leases subject to the *Option and Earning Agreements.*

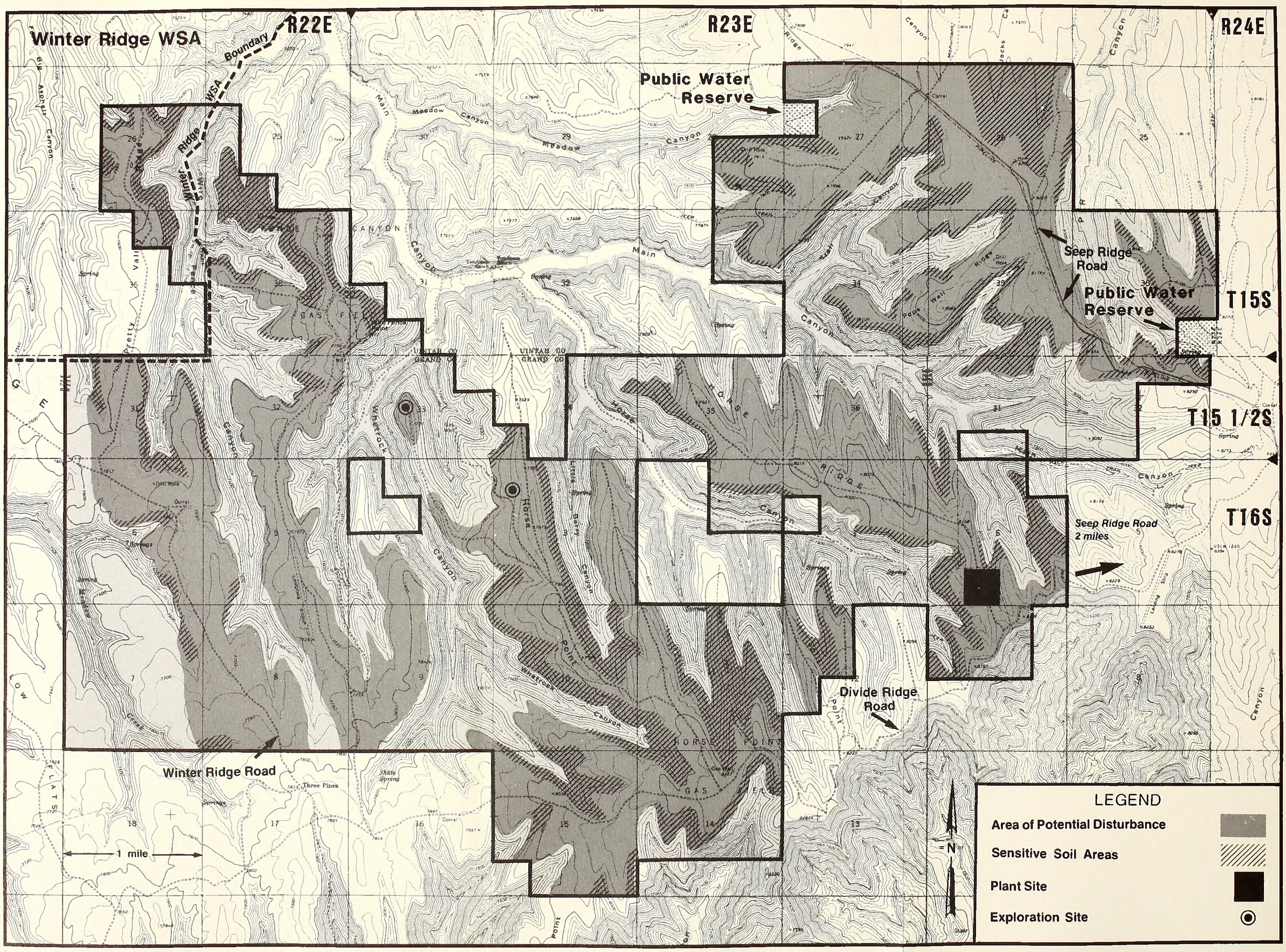
Project Schedule

Figure B-11 shows the proposed schedule for the Mobil surface mining and extraction processing plant.

PROPOSED ACTION

Exploration Phase

The exploration program for Prospect would take place over 5 to 9 years and, if successful, would lead to the development of a pilot mine. During exploration, the drilling program would be designed to yield an initial drilling density of one hole per 640 acres of



MAP B-9 MOBIL PROJECT

TABLE B-50
MOBIL DATA SHEET

GENERAL

• Type of Operation	Surface Mine and Extraction Plant
• Leases to be Converted (6)	3,337.6 Acres
• Project Area	16,438.97 acres
• Number of Acres to be Developed	8,360
• Percent of Projects to be Developed	51

PHASE

Item	Exploration	Pilot	Commercial
Production bbl/day		50	40,000
Duration	5 years	5 years	28 years
Acres Disturbed & Reclaimed			
Temporary Roads & Drill Pads	25	—	—
Work Roads (on or near leases— Undetermined Locations)	—	1	300
Mine	—	17.5	8,360
Acres Removed for the Duration of the Project			
Plant Site	—	—	40
Acres Disturbed One Time			
Temporary Roads & Core Drill Pads	10	—	—
Mine Active	—	18.5	300
Mine Areas Being Reclaimed	—	—	1,200
Work Roads	—	—	100

TABLE B-50 (Continued)

Item	Exploration	Pilot	Commercial
	PHASE		
Plant Site	—	—	40
Total	10	18.5	1,640
Water Use			
ac-ft/year	0.36	13	11,000
Source	Local	Vernal City Supply	White River
Peak Construction			
Year	1985	1990	1997
Personnel	20	35	2,800
Peak Operation			
Year	—	1991	2025
Personnel		32	415
Tar Sand Mined			
Tons/Year	—	12,000	20.1 million
Total Tons for the Life of Project	—	60,000	535 million
Transportation			
Trips Per Day	6	—	—
Construction	—	—	1,500
Operation	—	14	227

Note: bbl/day = barrels per day; ac-ft/year = acre feet per year.

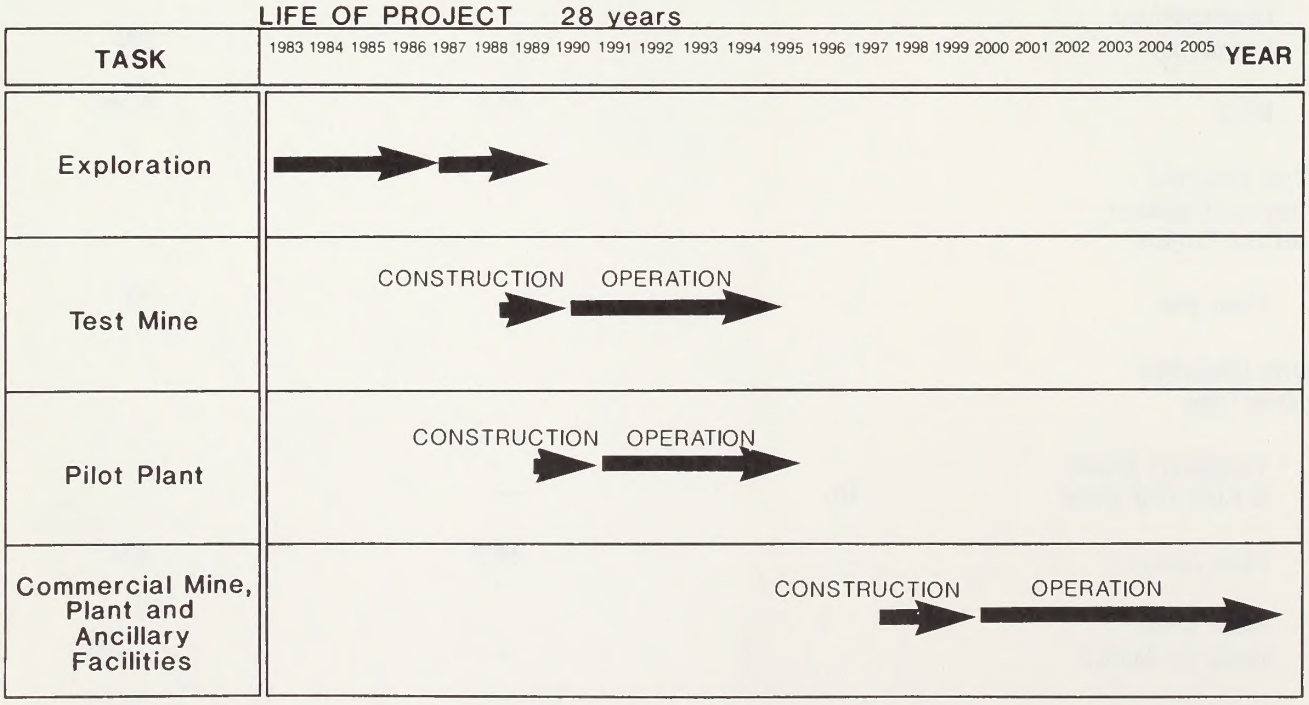


FIGURE B-11 MOBIL PLAN OF OPERATIONS SCHEDULE

the total potentially mineable area (8,360 acres). The density would eventually increase to one hole per 320 acres. If exploration indicated that tar sand deposits were not economical, Mobil would terminate tar sand activity. If information on the deposits indicated a need to change the next phase work scope or schedule, Mobil would submit a modified plan of operations.

Pilot Phase

Mobil would operate the two pilot mines for 5 years and would supervise all independent contractors on site. If mining occurred within 100 feet of any light-traffic road, Mobil would obtain a mining variance from the appropriate agencies. About 6,000 tons of tar sand would be removed per year from each mine; therefore, the total annual volume mined could be 12,000 tons per year. One central mine facility complex would support maintenance and personnel requirements on site.

The pilot extraction process plant would probably be centrally located, perhaps in Vernal, and used to test the quality of the tar sand ore for the technical and economic feasibility of commercial operation. About 14 vehicle trips per day would be required for this operation.

Initially, topsoil would be identified by sampling. The topsoil would be pushed by a dozer/ripper to the border of the disturbed road and parking and pit areas. The topsoil would be shaped into windrows and stabilized before overburden was removed. All access roads and parking and pit entrance areas would use cut and fill construction, which uses both overburden and tar sand materials near the surface. The tar sand materials are expected to form a competent roadbed base. Exposed overburden would then be drilled and blasted using approved procedures and either stockpiled by a front-end loader outside of the final pit area or spoiled by the tractor-dozer downslope from the pit limit in stable, compacted layers. Any downslope spoiling of material would be limited to areas where the topography dips at less than 22 degrees. All disturbed overburden would be stabilized to prevent slope deterioration during the pilot mining phase.

Tar sand would be removed in one benchcut. The mine site would be drilled and blasted to loosen the overburden, interburden, and tar sand materials before excavation. During the life of the mine, almost all the laws and regulations pertaining to the storage, handling, preparation, and use of explosives.

After being loosened by blasting, the material would be loaded using a 5-cubic yard, front-end loader, which would then load the material onto 20-ton, highway-acceptable, rear dump haul trucks. A bulldozer would push highwall material down the slope toward the loader at the pit bottom. The haul trucks would then transport the tar sand material out of the pit by way of the pit access road, linked to 2.6 miles of Divide Ridge Road, 59.6 miles of Seep Ridge Road, State Highway 88, to U.S. Highway 40, and on to the pilot extraction process plant (assuming the plant is located in Vernal). The tar sand would be crushed, conveyed to an open storage pile, and sampled before processing. Waste sands from processing would be disposed of near the pilot extraction process plant site. No sands would be carried back to the P R Spring pilot mine areas.

A total of 32 workers (17 at the pilot mines and 15 at the Vernal pilot extraction plant) would be required for the pilot phase starting in 1990, 1991, or 1992, depending on completion of the exploration phase. Reclamation, consisting of seedbed preparation, seeding, mulching, and vegetation maintenance, are seasonal duties and would be performed by an independent reclamation contractor. The contractor's personnel requirements would vary and are not included in the work force estimates. Mobil would supervise all contractor operations. The mine work force duties would take place at the pilot mine pits and central support facilities areas.

The central pilot mine support facilities would consist of an administration-changehouse trailer; spare parts shed; and diesel fuel, lubricants, and potable water storage tanks. Radio communications would be maintained between the pits and the facilities area and the nearest hospital/ambulance service in case of a medical emergency.

One side of the access road would be used only for haul truck parking and minor maintenance work. The remainder of the facilities, including light vehicle parking and open storage areas, would be located on the other side of the road. Approximately 1.5 acres would be disturbed. No temporary storage or crushing of tar sand at the central facility site is planned as the production would be hauled directly to the pilot processing plant (Vernal). No power lines would be

built to the facilities area during the pilot phase since all necessary electrical power would be generated by an on-site diesel unit.

The pilot mines would be developed during the 5-year pilot period. The mines would produce 60,000 tons of tar sand material. Equal portions (12,000 tons) would be mined during each year of the 5-year pilot phase. Initial pilot mine development would be restricted from mid-June through October to avoid wet and freezing conditions, but restrictions may vary slightly because of climatic conditions and increased operating experience.

The pilot mines would be maintained by building a diversion ditch network around the upslope side of the pit to prevent water inflow. Where appropriate, the diversion ditch would be riprap-lined to prevent erosion. Drainage structures would also be provided at required points near access roads and work areas to prevent erosion. Should water collect in the pits, the water would be allowed to evaporate as stated in Mobil's procedures (Section C, Appendix 2). Appropriate, approved flow velocity reduction structures would also be used to prevent significant water quality deterioration and bank erosion. A sedimentation pond would be used only if suspended particulates increased beyond present expectations.

During the inactive periods of the pilot mine program, November through May, the pit areas would not be pumped, and water would be drained only through a diversion system. Any water trapped in the inactive pits would collect at the base of the highwalls and then allowed to evaporate. Fencing would be placed around the immediate mine areas to prevent any livestock or wildlife from entering the pit areas.

Commercial Phase

If during the pilot phase, Prospect was found to be economically feasible, commercial development would occur. The plans for development would be subject to substantial revision—as data from earlier phases of the plan of operations became available.

The permanent work force needed to operate the Mobil commercial mine and extraction plant would increase from 175 (145 mine and 30 extraction plant) in the initial production year to 347 (317 mine and 30 extraction plant) at full production in 2003. Almost 415 personnel would be needed during the commercial operations (385 for the mine and 30 for the extraction plant). This buildup in personnel during the project life would mainly result from the increasing extraction of tar sand needed to maintain production. During the construction phase of the project, peak employment would be about 2,800 (500 for the mine and 2,300 for the extraction facilities).

Mine

Mining methods and development strategies were evaluated for the commercial tar sand mine and used to develop a mine plan that would achieve the desired objectives. A truck-and-shovel mining operation was selected as most suitable for tar sand recovery because of the geologic conditions in the project area.

Commercial mine support facilities would replace temporary facilities consisting of an administration building, a warehouse-shop-changehouse complex, explosives storage, lube-wash building, haul truck ready-line, utilities building area, and a reclamation building. Because the project area has no power or telephone lines, electrical power would be obtained by building a power line from the nearest main trunk utility line.

Mine facilities would encompass 40 acres of the 640-acre central processing plant/mine facilities site. The crushing and conveying capacity of the preparation plant, designed to approximate that of the mine during a 330-day operating year, would equal 80,500 tons per day—an amount that would support a bitumen production level of 40,000 barrels per stream day.

Both the F-Bed and E-Bed tar sand would be developed simultaneously from outcrop to outcrop along the ridge. Thus, the pit length would vary with the ridge width. Mining would begin with construction of two cross-ridge box cuts—one on Seep Ridge northeast of the central facilities site, the other next to the central facilities site on Horse Ridge. Initially, removed overburden would be placed in a stabilized head-of-valley fill north of the central facilities area. The operation would advance the Seep Ridge pit in a northerly direction for 28 years. Mining in the Horse Ridge area would be developed within the first 5 years, progressing northwest from the central facilities site.

overburden, interburden, and tar sand would be blasted. The frequency of blasts would depend on the planned stripping and production requirements. All blasting would occur at the end of the shift. Blasting procedures will comply with all federal, state, and local

By the ninth year, a cross-ridge box cut would be developed at the southeast border of Prospect, across Horse Ridge. Concurrently, a smaller box cut would begin at the southern border of Split Point Ridge, since the overburden is thin in this area. Mining would then progress west and north (including another box cut on Pretty Valley Ridge) until the property boundary was reached, sometime during the 28th year.

The commercial mine and associated disturbed areas would be maintained by incorporating various drainage structures into the mine plan, which would prevent significant water quality deterioration and stream bank erosion. Each overburden/interburden stockpile or valley fill would be drained by a riprap-lined diversion ditch network flowing to a sedimentation structure before discharging the water into an existing watercourse. Drainage structures would also be provided at required points along access roads, pit roads, and work areas to control runoff and erosion.

A diversion ditch network would be built around the top of the highwall along the pit ends at the ridge/tar sand outcrop and at the crest of the backfill benches, to prevent water inflow. Water that collects in the pit area would be drained and moved to a sedimentation structure before being introduced into the closest naturally existing water course. Also, fencing would be built around all long-life sedimentation structures and at all area access points to prevent livestock from entering the area. Sedimentation ponds would be located in the reclaimed backfill or in neighboring valleys as appropriate. Approved flow velocity reduction devices would be used wherever mine water has been introduced into existing drainages. These structures would help prevent the significant water quality deterioration, excessive particulate matter increase, and stream area erosion.

The White River would be the preferred main source of water supply for the Proposed Action. Water would be obtained either through a water service purchase contract for water from the proposed White River Dam or by acquiring existing water rights to the White River. The water could be diverted from the river and carried by pipeline to the proposed tar sand facility. This conveyance system would require a 24-inch-diameter pipeline, 40 miles long, and three pumping stations. A small terminal reservoir for storing several days' supply probably would be provided near the facilities area. (The location of this pipeline is undetermined and, therefore, is not analyzed.)

Ground water supplies in the project area appear to have limited production capability. Aquifers or geohydrologic units have been considered and evaluated for water supply potential. Some of the tar sand facility requirements may be met using ground water sources in conjunction with a surface water system. However, ground water by itself would not yield enough water to meet all facility needs.

The selected aquifer in the project area is the Douglas Creek member of the lower-most Green River formation. Computer simulations based on conservative estimates found that the most yield could be derived from a field of 16 wells, 2,000 feet deep. Since water seems limited, ground water would only be used as a supplement to surface water or as a smaller scale supply during early construction and pilot operations.

Processing Plant

Mobil plans to use a solvent-assisted hot water extraction process. This process is similar to the hot water extraction process except a hydrocarbon solvent is added to the hot water to help dissolve the bitumen. Crushed ore would be processed in closed conditioning vessels with recycled hydrocarbon and recycled hot water mixed with small amounts of soda ash. In these vessels, the bitumen would be separated from the sand, creating a solvent-bitumen-sand-water slurry. The slurry would be separated into a solvent-bitumen layer and a sand-water slurry.

No on-site upgrading of bitumen is anticipated. A diluent stock would be added to the bitumen so it can be pumped and then transported to a Mobil refinery for processing. The product could be transported by pipeline to Mobil's Beaumont, Texas or Joliet, Illinois refineries using existing crude oil pipelines to the extent possible. Should these pipelines lack capacity or not pass near the plant, Mobil could use existing pipeline rights-of-way or utility corridors and build missing pipeline segments.

The commercial extraction plant would occupy about 40 acres of the central facilities site. The plant is expected to produce 40,000 barrels of bitumen extract per stream day, and operate 330 days per year.

Transportation

Based on the assumption that about 25 percent of the construction work force would drive their own vehicles to and from the job site, and the remainder would ride in buses carrying 50 workers, 1,485 trips per day would be needed. An additional 15 trips per day could be needed for supplies and construction material. Therefore, the average daily trips would be 1,500 during the peak construction phase of the project, which would start in 1997 and end in 2000. Operation would follow the same routine but only require about 227 trips per day.

Section A, General Development Techniques, provides an overview of a typical commercial surface mining operation.

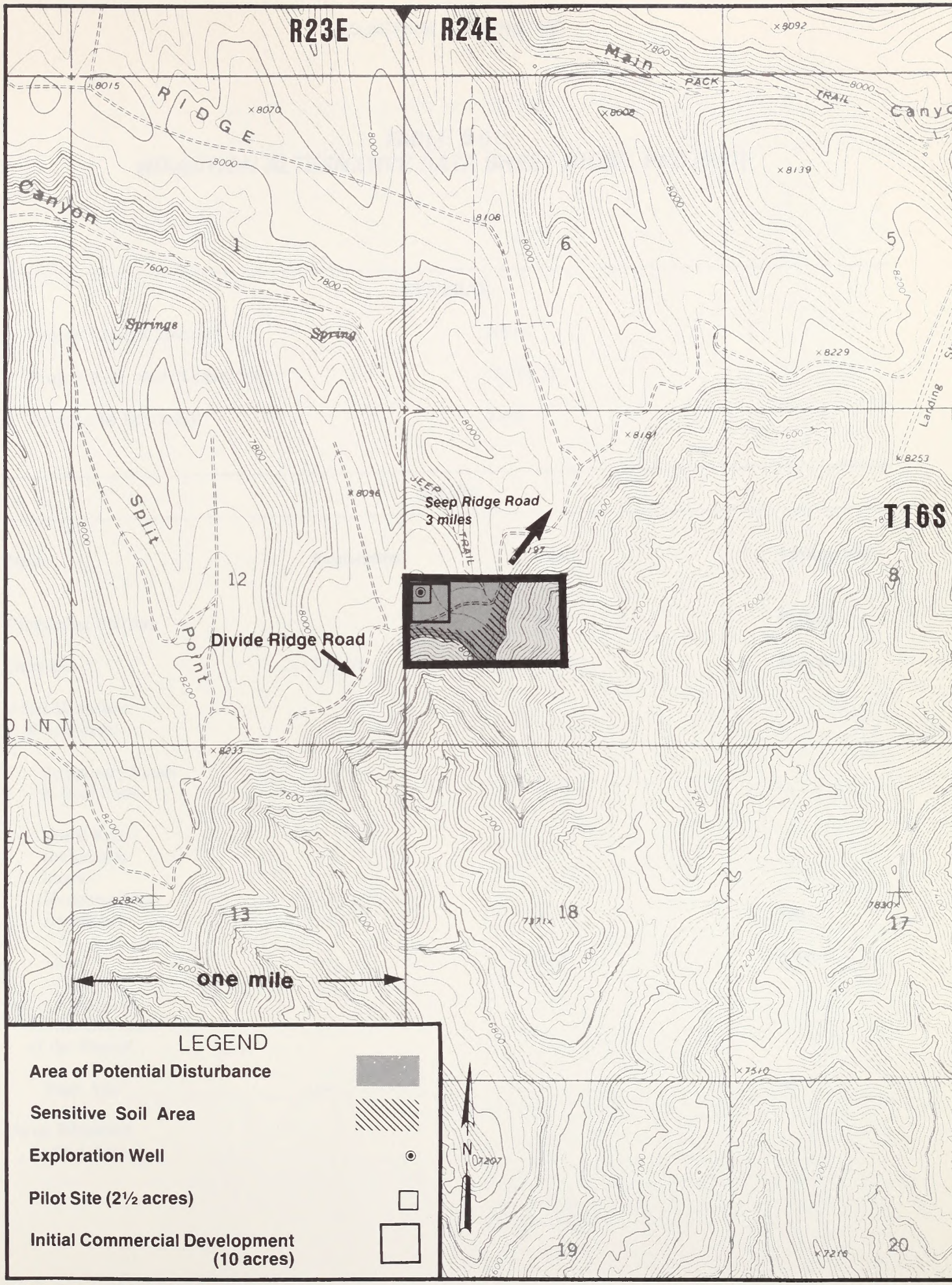
NO-ACTION ALTERNATIVE

The No-Action Alternative would involve denying all six requested lease conversions. The six leases, totaling 3,337.6 acres, would remain in effect as normal oil and gas leases and, therefore, would be subject to the same stipulations and terms now required.

The No-Action Alternative is the assumption that the tar sand would not be developed on federal land, but that state leases within the project area would be developed as now envisioned. See Map B-10 for locations of State land proposed for conversion.

The exploration and pilot phases are assumed to be the same as the Proposed Action in size and scope, except that the test mines would be located on state leases only. The total acres disturbed and acres disturbed at one time would be the same. The commercial operation would be the same but have a shorter project life.

Total project size would be 13,101.37 acres with probable development of 6,440 acres. Expected project life, based on this acreage and 40,000 barrels per day production, is about 22½ years. See Table B-51 for complete data summary.



MAP B-10 THOMPSON PROJECT

TABLE B-51
NO-ACTION ALTERNATIVE DATA SHEET (MOBIL PROJECT)

GENERAL

• Federal Leases Converted	None
• Project Area, State Leases Only	13,101.37
• Acres to be Developed	8,440

PHASE

Item	Exploration	Pilot	Commercial
Production bbl/day		50	40,000
Duration	5 years	5 years	22½ years
Acres Disturbed & Reclaimed			
Temporary Roads & Drill Pads	25	—	—
Work Roads (on or near leases—Undetermined Locations)	—	1	300
Mine	—	17.5	6,440
Acres Removed for the Duration of the Project			
Plant Site	—	—	40
Acres Disturbed At One Time			

TABLE B-51 (Continued)

Item	PHASE		
	Exploration	Pilot	Commercial
Temporary Roads & Core Drill Pads	10	—	—
Mine Active	—	18.5	300
Mine Areas Being Reclaimed	—	—	1,200
Work Roads	—	—	100
Plant Site	—	—	40
Total	10	18.5	1,640
Water Use			
ac-ft/year	0.36	13	11,000
Source	Local	Vernal City Supply	White River
Peak Construction			
Year	1985	1990	1997
Personnel	20	35	2,800
Peak Operation			
Year	—	1991	2025
Personnel	—	32	415
Tar Sand Mined			
Tons/Year	—	12,000	20.1 million
Total Tons for the Life of Project	—	60,000	452 million
Transportation			
Trips Per Day	6	—	—
Construction	—	—	1,500
Operation	—	14	227

Note: bbl/day = barrels per day; ac-ft/year = acre feet per year.

CHAPTER 2

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

WATER RESOURCES

Affected Environment

This project area lies along the plateau formed by the Roan Cliffs. Surface runoff drains from most of the area through ephemeral and intermittent streams to Main Canyon, which is within the project area, and then to Willow Creek and the Green River. A small area northeast of Seep Ridge Road drains less than a mile to PR Canyon and then to Bitter Creek, the White River, and the Green River. The area consists mostly of upland plateau-type watershed areas, with some steeply sloping areas and bottomland areas along tributaries to Main Canyon. The ore body that the applicant proposes to mine, however, underlies only the upland watershed areas.

Just downstream from the project area on Main Canyon is a reservoir. This private water source is used for livestock and supports a small trout fishery. A public water reserve is located outside the project boundary and downstream from the ore body (Map B-9). The water sources for this reserve are two springs located along the drainages at the east and south edges of the 40-acre reserve area. The springs yield up to 5 gallons per minute and flow most of the year. This water is used for wildlife and livestock. A second public water reserve, also located outside the project boundary, is downstream from proposed mine areas (Map B-9). The water source for this reserve is a flowing spring along the south edge of the 40-acre reserve area. The spring has been developed and is used for wildlife and livestock watering.

Environmental Consequences

Impacts to water resources during the exploration phase would be similar to those described for the Enercor project. Exploration activities would have no impact on the public water reserve or the reservoir on Main Canyon.

Impacts to surface and ground water resources, except those associated with water use from pilot or commercial phase activities, would be similar to those discussed for the Enercor project.

Impacts to the public water reserve would occur from surface mining upstream. To avoid sedimentation, a detention pond would have to be located above the springs on Meadow and P R canyons. Since there is not enough room below the mineable ore body and above the springs, a buffer zone of no disturbance would have to be created to alleviate sediment increases in the spring flow. Although unlikely, if the sediment pond and buffer zone could not hold the increased runoff during a major storm event, impacts to the reserve could still occur. In addition, the impacts to ground water flow and quality would probably cause a permanent change in the flow or quality of the springs.

The applicant proposes to use 13 acre-feet annually from the Vernal water supply during the pilot phase and 11,000 acre-feet annually from the White River for commercial operation. The pilot phase supply can be handled easily by the Vernal water supply (Green River) with no significant impacts.

Withdrawal of water from the Colorado River system has the effect of concentrating dissolved solids. A tar sand industry that withdraws 83,000 acre-feet from the Colorado River system would probably increase the average salinity of the Colorado River at Imperial Dam by less than 1 milligram per liter, with a peak increase of 2 milligrams per liter (Lindskov and others 1983). The impact of this project would be much less. Since water is fully appropriated, the 11,000 acre-feet would be purchased or leased from another water use. This means that use may not be increased but substituted, one type of use for another. The impact would depend upon how and to what degree the previous water use was being used. If fully developed irrigation water was purchased, a decrease in salinity may result because there may be less irrigation return flow. On the other hand, if a water right that was not being exercised was purchased, it would appear as an increase in water use and would increase salinity.

In addition to the facility and mine needs of 11,000 acre-feet, the population increase associated with the operation could result in the withdrawal of an additional 3,500 acre-feet in 1998 through public water supply systems. This would further increase the strain on a stressed river system but would not produce significant changes in salinity.

SOCIOECONOMICS

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

EXPLORATION PHASE

The exploration phase (1985–1987) would not cause any significant impacts. However, the pilot phase (1991–1995) and commercial development (1998 onward) would cause significant impacts. Refer to Tables B-52 and B-53 for data relating to population, employment, and per capita personal income impacts of the pilot and commercial phases.

PILOT PHASE

Population increases resulting from the pilot phase could reach levels of slightly under 10 percent in Ouray and other small communities. Impacts to the larger communities of Vernal and Roosevelt-Ballard would be 1 percent. Population impacts exceeding the 5 percent significance criterion would occur only in the small communities.

The pilot phase is not expected to significantly increase migration of Ute or other Indians onto the Uintah and Ouray Indian Reservation. However, communities within the reservation boundary, particularly Ouray, could receive significant population impacts. The main effects of such population growth would be to infrastructure and quality of life; these are discussed in the Commercial Phase section.

The pilot phase would not significantly affect employment or per capita personal income. Employment would grow to 67 primary jobs and 43 secondary jobs. Increases would be 1 percent or less in both counties and, among the Northern Utes and other nontribal Indians, well below the 5 percent significance criteria.

Population impacts to the small communities on the Uintah and Ouray Indian Reservation would add to problems resulting from inmigration of Indians to the reservation. However, the impacts of the pilot phase would be minor to communities on the reservation and insignificant elsewhere. Therefore, the discussion of impacts to infrastructure and quality of life is included in the section on commercial development, because the impacts to communities both on and off the reservation would be much greater during that period.

COMMERCIAL PHASE

Commercial development would cause more population growth than the pilot phase, particularly during the construction period (1998–1999). Increases in the small communities during construction would vary from 12 percent to more than 100 percent, while Vernal and Roosevelt-Ballard would grow by 19 percent and 28 percent, respectively. Impacts during operation, although less than construction, would still be considerable, ranging from 2 percent to more than 50 percent in the small communities and from 3 percent to 6 percent in Vernal and Roosevelt-Ballard. Population impacts exceeding the 5 percent significance criterion would occur in both the large and small communities as a result of commercial development. The unincorporated part of Duchesne County contains numerous small communities and the impacts to that area, while relatively small in overall percent, could be significant if they were concentrated in a few places.

Commercial development could significantly increase migration of Utes and other Indians to the Uintah and Ouray Indian Reservation. Because no recent development of similar scale has occurred in the area, such a migration impact cannot be quantified. Nevertheless, numerous communities within the reservation boundary would receive significant population impacts. The main effects of such population growth would be to infrastructure and quality of life.

Employment would grow to 2,800 primary jobs and 1,180 secondary jobs from commercial construction and 329 primary jobs and 241 secondary jobs from commercial operation. The operation figures are given for 2002 in order to show the early operating work force growth, although operation employment does not peak at 415 until 2025. Employment would increase 24 percent (2,870 jobs) in Uintah County and 16 percent (1,110 jobs) in Duchesne County as a result of commercial phase construction. During commercial operation, employment impacts would be 3 percent (410 jobs) in Uintah County and 2 percent (160 jobs) in Duchesne County. Commercial construction would

TABLE B-52
MOBIL
IMPACTS TO POPULATION

Community or County	Baseline	Increase Over Baseline	Percent Increase Over Baseline
1991 (Pilot)			
Fort Duchesne	1,260	5	*
Myton	780	5	1
Ouray	60	5	8
Roosevelt-Ballard	6,920	60	1
Vernal	23,710	130	1
Other Roosevelt CCD	8,330	20	*
Other Uintah and Ouray CCD	4,740	5	*
Total:	45,800	230	
1998 (Commercial Construction)			
Fort Duchesne	1,250	150	12
Gusher	30	60	200
Lapoint	120	50	42
Myton	770	110	14
Ouray	60	90	150
Randlett	500	70	14
Roosevelt-Ballard	6,800	1,990	29
Vernal	23,680	4,560	19
Other Roosevelt CCD	8,230	670	8
Total	41,440	7,750	
2002 (Commercial Operation)			
Fort Duchesne	1,225	20	2
Gusher	30	10	33
Lapoint	120	10	8
Myton	750	20	3
Ouray	60	20	33
Randlett	490	10	2
Roosevelt-Ballard	6,670	390	6
Vernal	23,150	750	3
Other Roosevelt CCD	8,080	110	1
Total:	40,575	1,340	

See Appendix 3 for data sources and analysis methods.

*Less than 0.5 percent.

Note: CCD = Census County Division.

TABLE B-53
MOBIL
IMPACTS TO EMPLOYMENT AND PER CAPITA PERSONAL INCOME

Jurisdiction	Baseline	Increase Over Baseline	Percent Increase Over Baseline
Total Employment			
Duchesne County			
1985	7,220	10	*
1991	7,130	30	*
1998	7,100	1,110	16
2002	7,100	160	2
Uintah County			
1985	10,620	20	*
1991	11,790	80	1
1998	11,860	2,870	24
2002	11,780	410	3
Uintah and Ouray Reservation**			
1985	500	1	*
1991	620	5	1
1998	760	200	26
2002	820	30	4
Per Capita Personal Income			
Duchesne County			
1985	8,485	8,495	*
1991	9,416	9,431	*
1998	10,626	11,518	8
2002	11,368	11,410	*
Uintah County			
1985	8,929	8,937	*
1991	9,918	9,937	*
1998	11,186	12,499	12
2002	11,966	12,011	*
Uintah and Ouray Reservation**			
1985	8,842	8,859	*
1991	9,473	9,526	1
1998	10,072	12,282	22
2002	10,222	10,472	2

See Appendix 3 for data sources and analysis methods.

*Less than 0.5 percent.

**Figures for the Uintah and Ouray Indian Reservation are shown separately, but are also included in the county totals.

Note: Relationship of years and development phases:
1985: Exploration
1991: Pilot
1998: Commercial Construction
2002: Commercial Operation

raise employment among Northern Utes and other non-tribal Indians by more than 20 percent (200 jobs), and operation would cause an employment increase of 4 percent (30 jobsbased on an estimated 5 percent of project jobs obtained by Native Americans—Appendix 3). Employment impacts equaling or exceeding the 5 percent significance criterion would occur in both counties during commercial construction, but in neither county during operation. The same pattern would prevail among Northern Utes and other non-tribal members.

As a result of commercial construction, per capita personal income would rise 12 percent ($1,313) in Uintah County and 8 percent ($892) in Duchesne County. During commercial operation, increases over baseline would be less than 1 percent in both counties.

Based on the employment estimates, commercial construction would cause an increase of 22 percent in per capita personal income among Northern Utes and other nontribal Indians, and a rise of 2 percent would result from operation.

Thus, impacts exceeding the 5 percent significance criterion would occur in both counties during construction, in neither county during operation, and among Northern Utes and other nontribal Indians only during construction.

Significant impacts would occur to housing and public services and facilities in all communities during commercial construction. However, significant impacts would occur during commercial operation only in Roosevelt-Ballard and some of the small communities. Therefore, Vernal and the other small communities would face a temporary population influx that would remain in the area for too short a period to justify major infrastructure expansions.

A housing surplus presently exists in Vernal and Roosevelt-Ballard because of the economic slowdown. That surplus would reduce but not eliminate the temporary housing shortage resulting from the large influx of construction workers. The proposed work camp on the project area would provide lodging during the week, but workers would have to maintain weekend quarters in the communities. The short construction period would not allow for building additional housing; therefore, additional trailer spaces and motel rooms would be needed for workers.

Vernal would experience a temporary shortfall in most public services and facilities. Any children who accompany the construction workers would cause overcrowding in classrooms and high student-teacher ratios. Temporary classroom space would probably be needed. Health services would be strained, and the Ashley Valley Medical Center may not have the capacity to meet the need. Additional law enforcement, emergency-medical, and fire protection personnel would be needed, and shortages of equipment would be likely. Sewage treatment capacity would be adequate, but water supply and treatment would be a problem. Solid waste collection and disposal services would also have to be expanded.

Roosevelt-Ballard would experience fewer problems than Vernal because its facilities currently have some excess capacity. Some school overcrowding would occur and temporary classrooms may be needed. The Duchesne County Hospital would probably have the capacity to meet the need. Additional law enforcement, emergency-medical, and fire protection personnel would be needed. Water and sewer facility capacities would be adequate. Solid waste collection and disposal services would have to be expanded.

Population impacts to the small communities on the Uintah and Ouray Indian Reservation would add to the problems expected from in-migration of Indians to the reservation. At the average construction rate of 22 housing units per year, 5 years would be required to eliminate the present need for 100 additional or replacement units, even if population did not increase. Unless financing was provided from federal or private sources, a shortage of adequate housing would be likely. Further crowding in local public schools would also occur, especially temporary overcrowding, if school district budgets did not allow for an influx of new students during mid-year. The Indian Health Service and the tribal police force would need additional personnel.

Fort Duchesne, Gusher, Ouray, and Randlett obtain their water and sewer services from the Tribe. Population growth would place an additional burden on the already strained water distribution system. The Tribe's system of sewage lagoons would also have to be expanded, since many of the lagoons are already at capacity. Lapoint and Myton have their own water and sewer systems. The water system in Lapoint has quality problems and would likely need major improvements. The systems in Myton would be adequate to meet the need. Trash pickup costs would increase, especially since settlement would be scattered among several widely separated communities.

Social impacts in Vernal and Roosevelt-Ballard would not be as significant, since the communities have previously experienced growth from energy development and additional employment would be welcomed in order to offset the recurrent slumps that affect energy development. Impacts from commercial operation would, therefore, be fairly easily absorbed.

Significant social impacts would occur during the commercial construction period. As explained, the short construction period would preclude investment in permanent housing and infrastructure, and shortages would occur in housing and public facilities and services. Other typical impacts of a temporary construction *boom* would also occur. Mobile home parks would expand. Retail expansion could enhance employment opportunities but could also attract young people into leaving local high schools. Residents, particularly women and the elderly, would have less feelings of security as more young men entered the area. Stress from living in a rapid-growth area would also occur, and crime would likely increase at or above increases in population levels. All of these effects would be temporary; as construction was completed, the local social environment would become more stable and predictable.

Population growth, both inside and outside the Uintah and Ouray Indian Reservation, and possible impacts to the reservation's air and water quality would further reduce the Tribe's sense of isolation and make it more difficult to maintain the Ute's traditional life style. On the other hand, tribal members would have opportunities for additional employment and income. Trespass problems would increase on the northern reservation and the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation, and more cultural sites and burial locations would be disturbed. Infrastructure problems would also increase, although these could be controlled by limiting building permits and new utility service. Additional financing may be difficult to obtain.

AIR QUALITY

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The impacts are presented for the commercial phase. Impacts during the exploration and pilot phases would be insignificant.

Estimated pollutant emission rates are shown in Table B-54. The results of air quality modeling for the proposed Mobil development are given in Tables B-55 and B-56. As shown on Table B-55, all significance criteria for TSP and the annual significance criteria for NO_2 would be exceeded. The predicted annual TSP and NO_2 concentration fields are illustrated by a series of isopleth maps (Figures B-12 through B-13). Peak particulate impacts (Figure B-13) would occur near the commercial mine and would be caused by handling the overburden, tar sand, and spent tar sand. TSP impacts in other areas would be due mainly to travel on dirt roads.

TABLE B-54
ESTIMATED AIR POLLUTANT EMISSION RATE FOR THE MOBIL PROJECT

Pollutant	Emission Rate* (kg/hr)
Total Suspended Particulates	274.7
Sulfur Dioxide	26.9
Nitrogen Dioxide	657.1
Carbon Monoxide	93.7
Hydrocarbons	26.9

Source: Aerocomp 1985.

*Long-term average; short-term emission rates may be higher; kg/hr = kilograms per hour.

The areal extent of the particulate impacts is conservative because most of the particulates would be large and settle quickly—a factor not considered in the modeling analysis.

The peak NO_2 impacts shown in Figure B-12 would result from exhaust emissions of the heavy-duty mining equipment. The SO_2 impacts would be within the

TABLE B-55
COMPARISON OF MAXIMUM SITE-SPECIFIC IMPACTS WITH NAAQS FOR THE MOBIL PROJECT

Pollutant Avg. Time	SOURCE CATEGORY CONCENTRATION ($\mu g/m^3$) 2005 Baseline Sources	PROJECT SOURCES Secondary	Direct	Maximum Concentrations	NAAQS
SO_2					
3-hour	18	0	101	119	1,300
24-hour	7	0	45	52	365
Annual	1	0	15	16	80
TSP					
24-hour	69	0	243	312	150
Annual	21	0	84	105	60
NO_2					
Annual	2	0	248	250	100
CO					
1-hour	1,500	0	92	1,592	40,000
8-hour	900	0	65	965	10,000

Source: Aerocomp 1985.

Note: Secondary = emissions resulting from population growth; Direct = emissions from the Mobil project; $\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; SO_2 = sulfur dioxide; TSP = total suspended particulates; NO_2 = nitrogen dioxide; CO = carbon monoxide.

TABLE B-56
SUMMARY OF PSD INCREMENT CONSUMPTION FOR THE MOBIL PROJECT

Areas of Special Concern	SO_2 ($\mu g/m^3$) 3-hour	24-hour	Annual	TSP ($\mu g/m^3$) 24-hour	Annual
Winter Ridge WSA	12	5	3	36	21
Uintah & Ouray Reservation	2	1	1	10	7
State of Colorado	3	1	1	21	10
Maximum Impact	101	45	15	243	84
Class II Increment	512	91	20	37	19

Source: Aerocomp 1985.

Note: PSD = prevention of significant deterioration; SO_2 = sulfur dioxide; $\mu g/m^3$ = micrograms per cubic meter; TSP = total suspended particulates; WSA = Wilderness Study Area.

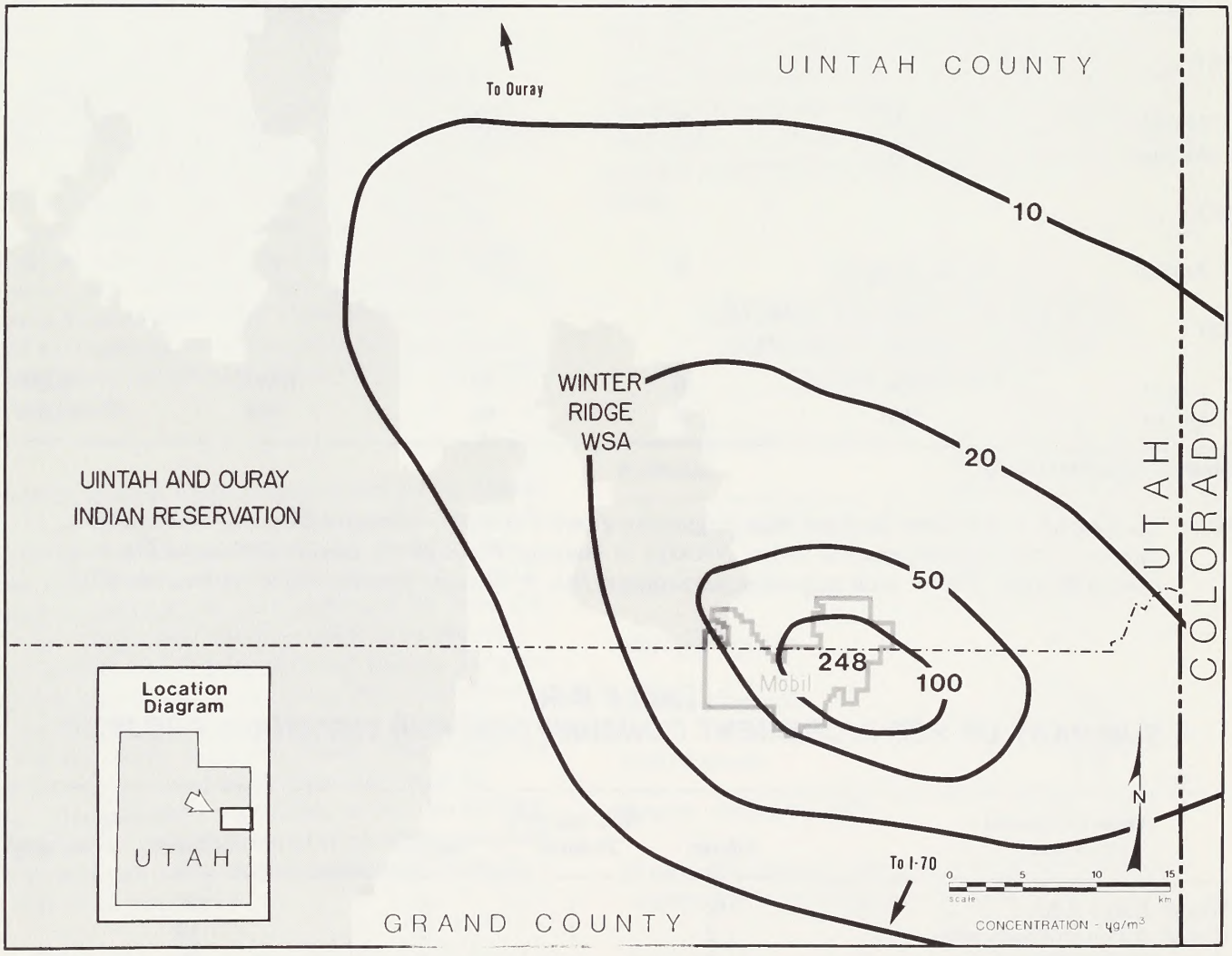


FIGURE B-12 ANNUAL NO_2 CONCENTRATIONS FOR THE MOBIL PROJECT

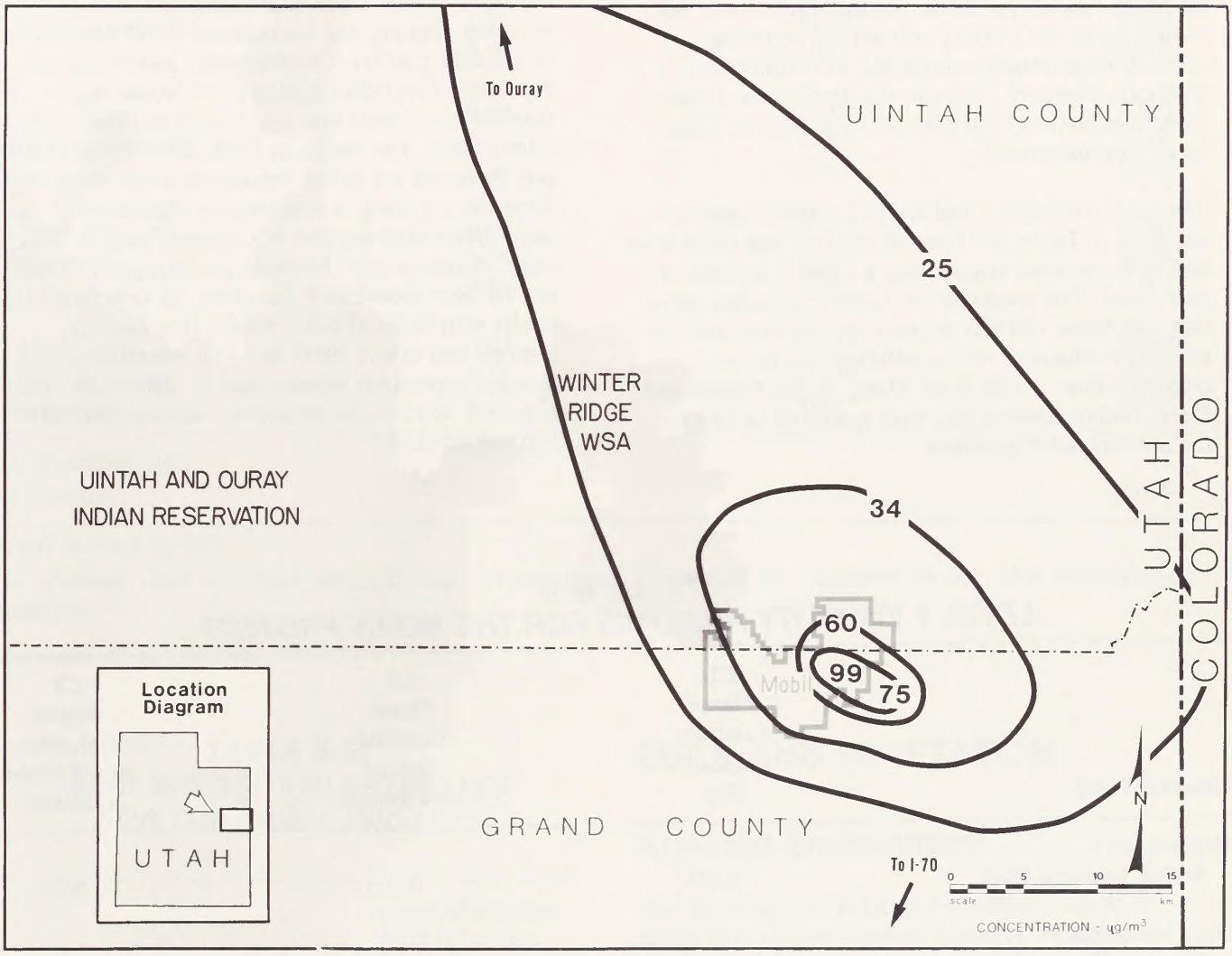


FIGURE B-13 ANNUAL TSP CONCENTRATIONS FOR THE MOBIL PROJECT

NAAQS and PSD significance criteria (Aerocomp 1985). The air quality impacts to the Class II areas of Colorado and the Uintah and Ouray Indian Reservation are not expected to exceed any PSD Class II increment.

SO_2 impacts to the Colorado Category 1 areas of Dinosaur and Colorado National Monuments would be less than 3 $\mu g/m^3$ for 3-hour concentrations and less than 1 $\mu g/m^3$ for 24-hour and annual averaging periods; these concentrations are well within the Colorado Category 1 incremental limitations. Impacts to Arches National Park would be within the Class 1 increment limitations.

The results of Level 1 and Level 2 visibility analyses are given in Tables B-57 and B-58. The high particulate and NO_2 emissions require that a Level 2 analysis be performed. The results of the Level 2 screening show that significant visibility impacts are not expected for any of the observer points, although the plume contrast values at Flat Rock Mesa, on the Uintah and Ouray Indian Reservation, were predicted to be near the recommended guideline.

Table B-59 presents the acid deposition estimates for certain areas of concern in the project area. In testimony before the Colorado Air Quality Control Commission, the Environmental Defense Fund (Oppenheimer 1982) suggested that sulfur deposition rates below 0.5 $g/m^2/yr$ would not lead to acidification of sensitive lakes. Based on the existing sulfur deposition values from monitoring sites in the mountain regions, the background sulfur deposition flux is 0.28 $g/m^2/yr$. Consequently, additional sulfur deposition flux below 0.22 $g/m^2/yr$ would suggest that sensitive ecosystems may not be affected (Dietrich and others 1983). The results in Table B-59 shown that the safe threshold for sulfur deposition would be exceeded. Since the approach is conservative (Appendix 3), acidic sulfur deposition impacts to Colorado may be insignificant. A similar safe threshold for nitrogen flux has not yet been established. However, by comparing these results with those of other studies (for instance, Dietrich and others 1983) and with monitoring data, nitrogen deposition impacts may be significant. The approach adopted for estimating nitrogen deposition is also conservative.

TABLE B-57
LEVEL 1 VISIBILITY ANALYSIS FOR THE MOBIL PROJECT

Observer Point	C1 Plume Contrast Against Sky	C2 Plume Contrast Against Dark Terrain	C3 Region Reduction Sky/Terrain Contrast
Delicate Arch, Arches National Park	0.075	0.203	0.005
Split Mountain, Dinosaur National Monument	0.046	0.104	0.005
Colorado National Monument	0.088	0.248	0.005
Flat Rock Mesa, Uintah & Ouray Reservation	0.163	0.515	0.005
EPA Recommended Guidelines	<0.100	<0.100	<0.100

Source: Aerocomp 1985.

TABLE B-58
LEVEL 2 VISIBILITY ANALYSIS FOR THE MOBIL PROJECT

Observer Point	Wave Length (μm)	Plume Contrast*	Contrast Reduction*
Delicate Arch, Arches National Park	0.40	−0.010	0.004
	0.55	−0.004	0.004
	0.70	−0.001	0.003
Split Mountain, Dinosaur National Monument	0.40	−0.009	0.001
	0.55	−0.007	0.003
	0.70	−0.005	0.003
Colorado National Monument	0.40	−0.022	0.001
	0.55	−0.008	0.002
	0.70	−0.002	0.003
Flat Rock Mesa, Uintah & Ouray Reservation	0.40	−0.083	0.003
	0.55	−0.034	0.005
	0.70	−0.015	0.007
EPA Recommended Guidelines		<0.100	<0.100

Source: Aerocomp 1985.

*The absolute value of plume contrast and contrast reduction should be compared to the EPA recommended guidelines.

Note: μm = one-millionth of a meter.

TABLE B-59
ACID DEPOSITION ESTIMATES FOR THE MOBIL PROJECT

Area of Concern	Annual Deposition Rate ($g/m^2/yr$) sulfur	nitrogen
Winter Ridge WSA	0.43	>2.0
Uintah & Ouray Reservation	0.12	1.3
State of Colorado	0.26	>2.0
Safe Threshold	0.22	unknown

Source: Aerocomp 1985.

Note: $g/m^2/yr$ = grams per meter squared per year; WSA = Wilderness Study Area.

SOILS AND VEGETATION

Affected Environment

The Mobil project is located on gently sloping to moderately sloping plateaus bordered by strongly sloping to steep and very steep sideslopes. The area is dissected by a dendritic drainage pattern with narrow floodplains along intermittent and perennial streams. The average annual precipitation is 16 to 20 inches, and the frost-free period is 60 to 110 days.

SOILS AND VEGETATION TYPES

Deep and moderately deep, well-drained, loam and clay loam soils occupy the plateau areas. Soils on the strongly sloping to steep sideslopes are mostly moderately deep and shallow, well-drained loams and

clay loams containing varying amounts of rock fragments (10 to 65 percent) ranging in size from gravel to stone. The very steep sideslopes consist of moderately deep and shallow, rocky, loam and clay loam soils. The following general soil groups occur within the project area:

Soil Group 2 - Soils of gently sloping to strongly sloping mesa and plateau tops
Soil Group 3 - Soils of the moderately sloping to strongly sloping convex ridges and hills
Soil Group 4 - Soils of the strongly sloping to steep plateaus, mountain sideslopes, and hills
Soil Group 5 - Soils of the steep and very steep plateaus, mountain sideslopes, canyon walls, and mesa escarpments

This project would affect four major vegetation types: grassland, sagebrush-grass, pinyon-juniper, mountain shrub, and mixed conifer. See Section A, Vegetation, for description of vegetation types and their use.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

This project is located outside of the threatened, endangered, and sensitive plant habitat area outlined in the Book Cliffs Resource Management Plan (BLM 1984b). See Section A, Vegetation, for discussion of threatened, endangered, and sensitive plant species (BLM 1984b). No threatened, endangered, or sensitive plant species are known to occur within the area.

Environmental Consequences

EXPLORATION AND PILOT PHASES

Land disturbance associated with the exploration phase would be 25 acres consisting mainly of temporary roads and drill pads. The pilot phase would disturb about 18 acres consisting mainly of the pilot mine area. Land disturbance would be reclaimed in a manner similar to that for the commercial phase. Impacts to soils and vegetation from the exploration and pilot phases would be insignificant.

COMMERCIAL PHASE

The impacts would be the same type as described for the Enercor project, with the following exceptions.

Project activities would disturb 8,360 acres over the life of the project, with 40 acres removed for the plant site and about 1,600 acres disturbed or in some phase of reclamation at any one time. During peak production, about 1,640 acres would be removed from predisturbance land use production at any one time.

Project activities would disturb 2,304 acres of sensitive soils (Map B-9). These sensitive areas contain soils with low reconstruction potential and would require more intensive application of soil reconstruction and erosion control measures. At a minimum, reclamation would ensure an adequate cover be reestablished over most disturbed areas. Some steep localized areas (less than 5 percent) resembling talus-like slopes of rock fragments could remain, but the size of these areas would be the same as well as resemble predisturbance rock outcrop areas (canyon walls and escarpments).

The Mobil project could disturb 1,560 acres of grassland; 1,397 acres of sagebrush-grass; 1,773 acres of pinyon-juniper; 3,054 acres of mountain shrub; and 576 acres of mixed conifer, over the life of the project. Impacts to grassland-type vegetation would be short term and insignificant because grasses and forbs are expected to become established within 5 years. However, overstory vegetation (trees and shrubs) would take longer to become reestablished to near-predisturbance conditions. The mountain shrub vegetation type would take 20 to 30 years to return to near-predisturbance conditions, and pinyon-juniper and mixed conifer types, 30 to 50 or more years. The highly productive woodland sites would be returned to premining conditions, while the less productive sites would be converted to grassland.

Surface runoff control structures would control sediment and protect surface water quality. The area would be reclaimed in stages concurrent with project mining operations.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

Threatened, endangered, or sensitive plant species could occur in the area. The project area must be surveyed and cleared as prescribed by law, before any surface disturbance began.

WILDLIFE

Affected Environment

HABITAT TYPES

This project would disturb five major vegetation (habitat) types: grassland, sagebrush-grass, pinyon-juniper, mountain shrub, and mixed conifer.

TERRESTRIAL WILDLIFE

About 13,000 acres of crucial mule deer and 13,800 acres of crucial elk summer range are found on the project area (BLM 1984b). These two species generally occupy these ranges from about May 15 through October 15. The project area contains about 13,000 acres of crucial mule deer fawning and elk calving habitat. Additionally, about 1,600 acres of crucial elk winter range are found on the project area. In addition, the eastern ⅓ of the project area lies in the Monument Ridge deer migration corridor, which is used by deer for 2 to 3 weeks each spring and fall. About 1,960 acres of high priority summer habitat for sage grouse is found on the project area and the entire project area is classified as substantial value, year-round blue grouse habitat (UDWR 1981).

Many raptors are common to the area and include red-tailed hawks, Cooper's hawks, American kestrels goshawks (in the winter), sharp-shinned hawks, turkey vultures, great horned and long-eared owls, and golden eagles. Habitat for woodland nesting species of raptors occurs over the entire project area, and the whole area furnishes hunting habitat for all raptor species common to the area. At the present time, no raptor nests are known to occur on the project area.

The common species of nongame mammals and birds, reptiles, and amphibians that could be found on the project area are the same as those found throughout the Uinta Basin at these altitudes. Refer to Section A, Wildlife, for a discussion of these species.

THREATENED OR ENDANGERED ANIMAL SPECIES

No threatened or endangered species are known to occur in the Mobil project area.

Three federally listed endangered fish species have been found in the White and Green rivers—the Colorado squawfish (***Ptychocheilus lucius***), the humpback chub (***Gila cypha***), and the bonytail chub (***Gila elegans***).

The Colorado squawfish has been reported in small populations in the White River (FWS 1982). These fish apparently gain access to the White River from the Green River (Lanigan and Berry 1979). They have been known to travel considerable distances up tributary streams and could be encountered in the White River. Although documentation does not exist for Colorado squawfish spawning in the White River, a potential spawning site exists about 15 miles west (downstream) of the proposed White River Dam at river milepost 34. This area has been monitored by the UDWR.

The humpback chub is native to the Colorado River system and is adapted to swift water habitats. The only major populations of this fish known conclusively to exist in the upper Colorado River Basin are located in the Westwater Canyon and Black Rocks area on the main Colorado River. Incidental collections of these species occur within the Cataract, Gray, and Desolation canyons on the Green River (FWS 1982). Since this fish has occurred in the Green River, it could occur in the White River.

Bonytail chubs have apparently not been collected from the White River, as their habitat preferences are for larger rivers and fairly swift currents. However, since this fish has definitely been collected from the Green River, it could migrate and, therefore, occur in the White River.

The razorback sucker (***Xyrauchen texanus***) is a sensitive species with potential for threatened or endangered status. Since this fish has been collected from the Green River in the vicinity of its confluence with the White, it could also occur in the White River.

Environmental Consequences

HABITAT

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. Therefore, the following analysis pertains only to the commercial phase.

Since the Mobil project is a surface mine operation, habitats would be disturbed at the rate of 440 acres the

first year and then 300 acres per year for the rest of the project life. However, since reclamation is predicted to take about 5 years before grasses and browse are established, about 1,640 acres of wildlife habitat would be out of predisturbance forage production at any one time during the commercial production phase. Therefore, the reclaimed areas would not support predisturbance populations of deer and elk on about 1,640 acres, because the character of the summering and birthing habitat has been changed. Based on the significance criteria for summer range disturbance, no significant impacts to vegetation habitats from this amount of disturbance are anticipated.

About 141,148 acres of crucial mule deer summer range occur in herd unit 28A. This project would disturb an estimated 6.1 percent (8,360 acres) of this type of habitat. Also an estimated 54,100 acres of crucial mule deer fawning habitat occur in herd unit 28A, of which this project would disturb 15.4 percent. This would be a significant impact to crucial fawning habitat. About 54,100 acres of crucial elk summer range occur in herd unit 21; the project would disturb 15.4 percent of this type of habitat. There are also about 54,100 acres of crucial elk calving range in elk herd unit 21 of which this project would disturb 15.4 percent. Of the 192,300 acres of crucial elk winter range in herd unit 21, this project would disturb 2,600 acres (1.3 percent). Disturbances in crucial elk summer ranges and crucial elk calving ranges are expected to be significant.

WILDLIFE POPULATIONS

Wildlife numbers on the project area would be reduced with the advent of this project. Project development on about 13,000 acres of crucial mule deer fawning and elk calving habitat, and 13,800 acres of crucial elk summer range and the associated zone of influence around the project area, could reduce deer and elk populations because of harassment and displacement.

Crucial mule deer fawning areas near the project would also be affected by harassment and displacement. Stresses to female mule deer could also result in population reductions (Geist 1971).

The same types of impacts are expected to occur to elk, but the magnitude would be greater as elk are not as tolerant of human activities as mule deer. Therefore, a reduction in reproductive success could occur, and long-range population strategies for this elk population by the UDWR would be at least delayed.

Implementation of this project is anticipated to increase the human population in and around Uintah County during commercial development. Development from 1998 onward would cause most of the population growth, especially between 1998 and 1999. The human population is estimated to increase about 18.6 percent because of construction workers moving into the area. Poaching, wanton killing, and illegal hunting are estimated to increase during this period by at least 18.6 percent. Also, applications for any limited hunting permits could increase at the same rate, thus reducing the chances of local, long-time residents obtaining these permits at the same rate they now enjoy. Of the estimated 7,750 construction workers moving into the area by 1998 (Table B-52) an estimated 40 percent would fish and 25 percent would hunt (Allred 1976). This indicates that about 3,100 additional anglers and 1,937 new hunters would fish and hunt in the Uintah County area. By 2002, there would be an additional (over baseline) 536 anglers and 335 hunters in the area due to population increases caused by commercial operation of the Mobil project.

All the impacts to wildlife on the Uintah and Ouray Indian Reservation as a result of implementing the Mobil tar sand project would be secondary. Increases in the human population near the reservation would approach 7,750 by 1998 from construction (an 18.6 percent increase over baseline) and by 1,340 by 2002 from commercial operation (a 3.3 percent increase over baseline). These population increases could significantly increase poaching and wanton killing by non-Indians over current levels on the reservation. In addition to anticipated poaching and illegal hunting increases on the reservation, demand for small game hunting permits by non-tribal members could increase to the point where restrictions on numbers of non-tribal hunters would have to be established.

Losses of wildlife from vehicle/animal collisions caused by extra trips during the commercial phase of this project are projected to be significantly greater than current numbers of vehicle/animal collisions, which occur on roads and highways furnishing access to the project area. This is due to an estimated 1,500 extra trips per day during construction and 227 extra trips during operation (Table B-50 and the Transportation section). However, the impact to total wildlife populations would be insignificant.

FISHERIES

The proposed project is not anticipated to cause direct impacts to regional sport fisheries. However, human

population increases from the Mobil project could increase the demand for fishing permits by non-tribal members on the Uintah and Ouray Indian Reservation to the point where restrictions on numbers of non-tribal fishermen would have to be established. If the quality of fishing on the reservation is to be maintained at present levels, increased stocking may be required from the Jones Hole fish hatchery at additional cost to the Fish and Wildlife Service who operate the hatchery and furnish fish to the Tribe.

THREATENED OR ENDANGERED ANIMAL SPECIES

Mobil proposes to use 11,000 acre-feet of water per year and their preferred source is the White River. Water would be obtained either through a water service purchase contract from the proposed White River Dam or by acquiring existing water rights from the White River.

Adverse impacts to the three federally listed endangered fish species and one state-designated species of concern (Table A-12 and Appendix 4) are possible for any project that takes water from the White or Green rivers. The magnitude of these losses from the project cannot be reliably estimated at the present time, but any reductions in population size would be significant due to the currently low population levels. If water was diverted from either of these rivers via a diversion structure, entrainment of endangered fish species could occur unless the structure was properly constructed.

If Mobil purchased water from the White River Dam Project, this amount would not adversely affect the endangered fish species in the White River because of agreed upon conservation measures detailed in the Section 7, Biological Opinion from the Fish and Wildlife Service (1982) and the signed Fish and Wildlife Mitigation Plan for that project.

TRANSPORTATION NETWORKS

Affected Environment

The vehicular traffic flow would enter and leave from the southeast corner of the lease (Map B-9). The roadway begins at the project site and includes 2.6 miles of Divide Ridge Road and 59.6 miles of Seep Ridge Road before reaching State Highway 88, County Road 264, and U.S. Highway 40.

The Divide Ridge Road is packed dirt with some gravel, and vehicular use includes high clearance and heavy equipment vehicles. See Section A for traffic data on Seep Ridge Road, U.S. Highway 40, State Highway 88, and County Road 264 and for accessibility in the winter months.

Environmental Consequences

EXPLORATION PHASE

The exploration phase, 1985 through 1989, involves a 20-person work force and would require 12 truck trips per day for 5 summers. The projected traffic volume would not cause any significant transportation impacts to the project-related roadways as stated in the significance criterion.

PILOT PHASE

The projected traffic volume of 14 trips per day (Table B-50) would not cause any significant transportation impacts to the project-related roadways because the significance criterion would not be exceeded.

COMMERCIAL PHASE

Construction. The construction phase, 1998 through 1999, would employ 2,800 people and would require 15 truck trips per day to haul 40,000 tons of equipment and supplies to the plant and mine site. About 1,485 vehicle trips per day, including truck trips, would be required to haul workers and equipment to the site. The 1,484 passenger vehicles including buses would have a significant impact to 2.6 miles of Divide Ridge Road; 59.6 miles of Seep Ridge Road; and State Highway 88, County Road 264, and U.S. Highway 40.

Operation. The operation phase would begin to level in 2002 and would employ 329, with a peak work force of 415 in 2025. Five truck trips per day would be required during the same years. Project-related passenger vehicles and trucks would involve 227 vehicle trips per day. Divide Ridge and Seep Ridge roads

could not sustain the increased auto and truck traffic without lowering the level of service. The road impacts would be related to the movement of 227 vehicles per day over roads that have poor design, lack of a good sub-base, and a poor maintenance program, plus severe weather conditions from December to late May. These roads would have to be redesigned, the sub-base upgraded, and an accelerated maintenance program implemented. U.S. Highway 40 and State Highways 88 and 264 could sustain the increased traffic. Downstream traffic flow at the end of each working day would cause short vehicle gaps and weaving. This traffic condition would cause the traffic flow to fall below a safe operating level, which would be significant as stated in the significance criterion.

During the first 5 years, a small percentage of the tar sand would be hauled to the plant on roadways outside the lease area. After 6 years and up to 15 years, a total of 80,000 tons of tar sand would be hauled over Divide Ridge Road. The 80,000 tons of tar sand per day represents 941 truck trips per day using 170-ton trucks. This truck traffic would cause significant impacts to the Divide Ridge Road by (1) slowing through-traffic by 15 minutes or longer, (2) causing short vehicle gaps and weaving, and (3) causing traffic flow to fall below a safe operating level, thereby increasing accidents.

Since traffic accidents increase directly in proportion to increases in traffic volume, the increased project traffic on the Seep Ridge Road would increase accidents. Traffic accidents would not be limited to construction traffic, but could involve local and through-traffic. Other factors would contribute to the traffic accidents: time of year, weather conditions, summer tourist traffic, and recreational vehicles. Any increase in traffic accidents would be significant.

Since roadway construction and maintenance is funded mainly from motor fuel taxes, present funding formulas may not meet the needs of the construction and maintenance required for year-round traffic flow of heavy loads. The budget would be inadequate to pay for any more road construction on an accelerated maintenance program. Funding to maintain roadways would significantly strain local maintenance budgets.

VISUAL RESOURCES

Affected Environment

The Mobil project area is on flat to gently rolling terrain, surrounded by interspersed and surrounding moderate to heavily dissected landscape. Vegetation cover includes mountain shrub, pinyon-juniper, grass, sagebrush-grass, and some mixed conifer.

The project would be located in two VRM classes, affecting about 40 percent of the area for the life of the project. About 3,340 acres would be located in VRM Class II areas, with the remaining 60 percent (about 5,020 acres), located in VRM Class IV areas. The VRM Class II areas consist of Class A scenery (high diversity) because of a combination of outstanding landscape characteristics. The VRM Class IV areas are comprised of Class C scenery (low diversity), which indicates the landscape character is common to view in the region. Viewer sensitivity would be medium when viewed as foreground/middleground from Seep Ridge Road, with the remainder classified as background or seldom seen.

Environmental Consequences

The exploration phase is expected to last 5 years and would, therefore, create significant long-term impacts because the equipment would be visible. The impacts would end when the equipment was removed. Vegetation disturbance would be evident on the 25 acres where the exploration work was conducted. Vegetation of similar form, color, and texture as the surrounding vegetation would need time to establish before impacts were neutralized. Exploration sites would affect both VRM classes.

During the pilot phase, a short-term insignificant impact would occur from the use and presence of mining equipment for up to 1.5 years while the 18.5-acre pilot phase was active. Of long-term significance would be the landform modification and vegetation removal at the site, including the 1-acre disturbance for work roads. The impact would remain until the landform was blended with the natural topography and vegetation returned to a similar form, color, and texture of the surrounding vegetation. One test site would occur in each VRM class affected.

Buildings, equipment, and other facilities required during the commercial phase would create an additional significant impact upon the landscape, depending on their location, size, color, and configuration. Of major concern would be those areas viewed from Seep Ridge Road where the landscape elements of form, line, color, and texture of the modifications would be evident to the road users and, therefore, not compatible with the objectives of the VRM classes

where the activities would be located. About 3,340 acres of VRM Class II areas and 5,020 acres of VRM Class IV areas would be significantly affected.

WILDERNESS

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

Although the Mobil project area would directly overlay 404 acres of the Winter Ridge WSA, the lease could still be converted to combined hydrocarbon use (Office of the Solicitor 1983). Development of that lease, however, would be constrained by the wilderness nonimpairment criteria (Section C, Appendix 2), which would likely prohibit development of that portion of the lease in the WSA unless a Congressional decision was made not to designate the WSA as a wilderness. If the Winter Ridge WSA was designated a wilderness, the portion of the Mobil project located in the WSA would likely not be developed. The analysis of the Mobil proposal is based on the assumption that the WSA would not be designated as a wilderness and the conversion area would be developed.

The Flume Canyon WSA would be 7 miles south of the project area, but because of the topography, little if any of the project development work would be heard or seen within the WSA. No other WSAs are within 10 miles of the project.

The project area is over 5 miles (farther by road) from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation. No significant direct impacts are anticipated. However, workers could venture onto the reservation lands and affect the quality of the resource through increased hunting, ORV use, and impacts to the natural and solitude qualities.

RECREATION

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The exploration and pilot phases of the Mobil project would not cause any significant impacts to the recreation resource, either near the project site or within the secondary zone of influence. Population growth for both phases is expected to be less than 8 percent for all communities, which is less than the 10 percent significance criteria, and little land would be disturbed or removed from the recreation base.

The anticipated population increase associated with the commercial construction phase in 1998 would be 7,750 people. This increase represents more than a 10 percent increase in population and recreation demands in all of the communities. Municipal facilities and recreational opportunities would be used well beyond present use to a significant extent. After the 1998 peak year, the demand and associated impacts on the resource would taper, with a population increase of 1,340 people expected in 2002. The population increase would still be significant for the communities of Gusher and Ouray for the life of the project. Since increases of 33 percent are anticipated in these two communities, the significance criteria of 10 percent would be exceeded.

The increased population within the region during the commercial construction phase would be nearly 19 percent. Although the increase would be short term (only a couple of years), such an increase would probably place significant demands on recreation facilities and opportunities of all types (including unconfined and undeveloped rural recreation) within the secondary zone of influence. Throughout northeast Utah, significant impacts would be placed on activities such as hunting, fishing, driving for pleasure, camping, swimming, floatboating, and ORV use. In addition, impacts from facilities would be significant at Dinosaur National Monument, Ashley National Forest, state parks, and other use areas. As with municipal facilities, the impact should only occur for a couple of years, then taper off and stabilize for the remaining life of the project. The increase in population for the commercial operation phase would be long term but would only represent a regional increase of 3 percent.

Impacts would occur to the recreation resources in the vicinity of the project itself. A total of 8,360 acres would be disturbed over the life of the project, with about 1,640 acres being disturbed at one time. Land would be lost to recreational pursuits, such as ORV activities, hunting, and hiking. Visual impacts would be evident to the sightseer as viewed from Seep Ridge

Road, especially in the areas of high scenic quality along the edge of the Book Cliffs. In addition, the area acts as a threshold to the scenic corridor designated for a 20-mile stretch of road to the Grand Valley overlook near the Colorado border, making this a significant impact along the western edge of the corridor. Quality of local camping areas, as perceived by the users, would be diminished through overcrowding and experience. Some unimproved campgrounds may be overcrowded during hunting season.

The population growth could have unquantifiable significant impacts to the recreation resources and opportunities in the Uintah and Ouray Indian Reservation. Increased trespass by ORV users and hunters could occur, as could the increased demand for recreation experiences by new residents of the reservation. The Bottle Hollow resort complex could experience a positive significant increase in use that would help the economic return of the lodge and help absorb the increased demand for camping in the region.

CULTURAL RESOURCES

Affected Environment

A known historical site occurs on the eastern boundary of the Mobil project area on private land. According to field investigation reports, this is the only known potentially significant site. This site, commonly known as the P R Spring C.C.C. Camp, has only fireplace remains.

Areas for well pads and roads and a few individual BLM projects have been surveyed, but no statistically valid surveys have been done. The predominant vegetation types in the project area are mountain shrub (3,054 acres), pinyon-juniper (1,773 acres), and sagebrush-grass (1,397 acres). Pinyon-juniper would probably have the highest site density, while sagebrush-grass, a medium site density (Jones and MacKay 1980). Mountain shrub would have a low site density. See Section A for a discussion of site density associated with vegetation types.

Because the Mobil project area lies immediately south of the Enercor project area, the setting is similar in terms of vegetation, landform, and topography. Archaeological and historical sites tend to cluster in the same landform types (such as plateaus and canyons) as suggested in the *Utah Combined Hydrocarbon Leasing Regional Final EIS* (BLM 1984a). See Affected Environment section for the Enercor project.

Environmental Consequences

The Mobil project would disturb about 1,773 acres with high site density probability and about 1,397 acres with medium site density probability, over the life of the project. No significant direct or indirect impacts would occur to sites in the area during any of the phases, when appropriate mitigation measures were taken.

A total of 8,360 acres would be disturbed primarily through surface mining occurring on the plateaus where some sites may be found. Other disturbance would result from waste and sand disposal, overburden, roads, and operation facilities. The historical site would most likely have indirect impacts from increased population in the area resulting in unauthorized artifact collecting and site disturbance. Because the site is not located on a probable area of disturbance (plateau), no direct impacts are expected.

Since an archaeological survey and appropriate mitigation will be done, direct impacts resulting from implementation of the three phases of ore development would not be significant, because little information would be lost that would impede efforts to explain cultural processes or to reconstruct the prehistory of the region. In addition, impacts would not occur to any cultural resource on or eligible for inclusion on the National Register of Historic Places. However, indirect impacts could result from unauthorized collectors removing or displacing artifacts or features located on or near the project area. Since the work force increases are expected to be large for the commerical phase, indirect impacts could result from unauthorized collectors displacing artifacts or features located on or near the project area.

MINERAL AND PALEONTOLOGICAL RESOURCES

Affected Environment

Data describing the tar sand ore body in this project area are limited. Based on Dana and Sinks (1981) and information supplied by the applicant, BLM has derived the area of probable tar sand occurrence shown on Map B-9 as the area of potential disturbance.

The applicant plans to surface mine the upper two tar sand zones. A total of 804 million tons of tar sand is expected to be mined from the project over the 45-year life of the mine. Generally, surface mining extracts 80 to 90 percent of the in-place ore body.

No inventory exists for paleontological resources within the project area. In areas that have been inventoried, the Douglas Creek member has shown a low potential for fossil occurrence. No known sites have been identified in the project area.

Environmental Consequences

Impacts to mineral and paleontological resources would be the same as discussed for the Enercor project, except no conflicts with oil shale development would occur. Also, the potential for disturbing fossils would be lower because the Parachute Creek member of the Green River formation is not present.

AGRICULTURE

Affected Environment

The Mobil project would affect grazing in four pastures located in three allotments. Table B-60 shows the pastures, numbers of operations, and current status.

No cropland occurs within the project area. See Section A, Cropland, for discussion of cropland areas potentially affected by urban expansion.

Environmental Consequences

EXPLORATION AND PILOT PHASES

Forage lost from land disturbance associated with the exploration phase (25 acres) would be about 3 AUMs annually, and from the pilot phase (18 acres), 2 AUMs annually. Impacts to grazing during the exploration and pilot phases would be insignificant.

COMMERCIAL PHASE

Forage loss would result from land disturbance associated with surface mining and land occupied by the plant site and roads. Most of the grazing disturbance would result from surface mining. The total area would not be disturbed by surface mining at any one time during the mining operation. Because of the variable terrain, the overburden placement process, and associated traffic, the mining sequence would exclude livestock grazing or would cause a loss of forage production for grazing for longer periods (10 years or more). Disturbed land would be reclaimed at the same rate that mining progressed. During peak operation, about 1,640 acres would be disturbed at any one time or would be in various stages of reclamation and unable to support grazing.

Since the exact location and mining sequence are unknown, specific forage losses by pasture cannot be identified. An average of 160 AUMs of forage could be lost annually. Table B-61 shows the potential average annual loss of AUMs as compared to each pasture affected.

The forage loss caused by this project would range from 7.4 percent to 18.3 percent of the total forage within the affected pastures. This forage loss exceeds the 5 percent criterion and would be significant to ranch operations within the area. The invasion of unfavorable plants (poisonous and invader plants) is not expected to exceed the 2 and 10 percent criteria; therefore, this impact would be considered insignificant.

An additional unknown number of AUMs could be lost by grazing areas becoming remote or inaccessible. This problem could arise through (1) disruption of livestock watering facilities and (2) disruption of grazing patterns. AUM loss cannot be quantified because specific details on the mining sequence and reclamation schedules are not known.

No cropland would be affected by surface mining operations. Cropland loss, however, is expected to occur from population expansion. Project-related population increases would cause the conversion of about 591 acres of land to homesites and other related urban developments mainly in the areas of Vernal, Roosevelt-Ballard, and Fort Duchesne (0.13 acres per capita—ERS 1970). Although most land conversions would occur in existing subdivisions or on native rangeland, 148 acres of cropland, possibly including prime agricultural land, could be converted to urban uses along the Duchesne River, Pelican Lake, and Vernal areas. The actual amount of land conversions would depend on the housing vacancies at the time population increased. This cropland loss would not be

TABLE B-60
GRAZING ALLOTMENTS AFFECTED AND GRAZING LOSSES CAUSED BY THE MOBIL PROJECT

	CURRENT STATUS					POTENTIAL GRAZING LOSSES (AUMS)		
Allotment and Pasture	Number of Operations	Livestock Class[1]	Season of Use[2]	Total AUMS	Total[3] Pasture Acreage	Acreage[4] Affected, Disturbed	AUM[5] Loss	Percent of Allotment or Pasture
Sweetwater (8822)								
P R Spring Pasture	1	C	SU	1,671	19,716	1,990	160	9.5
Pine Spring Pasture	1	C	S,SU,F	2,556	25,446	1,360	160	7.4
Winter Ridge (8827)								
Pasture 4	1	C	S,F	872	14,918	780	160	18.3
Book Cliffs Pasture (8828)	1	C	S	1,414	24,313	4,530	160	11.3

Source: Livestock grazing and Forage Carrying Capacity information presented in this table was gathered from the ***Book Cliffs Resource Area Management Plan Draft EIS*** (BLM 1984b) and from Range Conservationists at the Vernal BLM Office.

[1] Class of Livestock: C = Cattle, S = Sheep, and H = Horses
[2] Season of Use: S = Spring, SU = Summer, F = Fall, W = Winter, and Y = Yearlong
[3] Total acreage of pasture including private, state and federal land.
[4] Total acreage of land disturbance for project life within pasture.
[5] AUM figure is the annual forage loss caused by projct activities for land disturbed at any one time and is compared with each pasture affected in the table.

Note: AUM = animal unit month.

considered significant because it would be much less than 5 percent of the total cropland in the project area.

NO-ACTION ALTERNATIVE

The impacts for the No-Action Alternative would basically be the same as identified for the Proposed Action. The major difference would be the amount of area disturbed (Map B-10) and the life of the project. The No-Action Alternative would disturb approximately 6,440 acres over the assumed 22½-year project life.

Water Resources

Impacts to water resources would be the same as discussed for the Mobil Proposed Action. Because less area would be disturbed, fewer springs and seeps would be potentially affected. The total water use and associated impacts would be the same and the two public water reserves could still be adversely affected.

Socioeconomics

Impacts from the No-Action Alternative would be the same as described for the Proposed Action. Planning for the impacts, associated with project completion project, would have to begin earlier because of the shorter project life.

Air Quality

Since the acres disturbed at any one time and the production per day would remain the same, the

impacts would be the same as identified for the Mobil Proposed Action.

Soils and Vegetation

The types of impacts would be the same as described for the Proposed Action; only the magnitude of the impacts would be different. Project activities would disturb 6,440 acres over the 22½-year life of the project. About 1,640 acres of the area would be disturbed or removed from predisturbance land use at any one time. Over the life of the project, approximately 1,768 acres of sensitive soils would be disturbed. The No-Action Alternative would disturb 1,240 acres of grassland; 1,330 acres of pinyon-juniper; 2,290 acres of mountain shrub; 1,120 acres of sagebrush-grass; and 460 acres of mixed conifer, over the life of the project.

Wildlife

Transportation Networks

Since the No-Action Alternative would have the same size plant and production per day, the impacts would be the same as identified for the Proposed Action.

Impacts to wildlife would be the same as the Mobil Proposed Action, except they would occur over a shorter period. Fewer acres of wildlife habitat would be disturbed over the life of the project. (See acres of vegetation type disturbed in the Soils and Vegetation section.)

Visual Resources

Impacts would be the same as described for the Proposed Action.

Wilderness

No direct impacts would occur to the Winter Ridge WSA from the No-Action Alternative. Indirect impacts would be the same as described for the Proposed Action.

Recreation

Impacts would be the same as described for the Proposed Action.

Cultural Resources

Since no surveys have been conducted on state land, the numbers and types of sites are unknown. Before any surface disturbance occurred, the applicant would conduct surveys in accordance with the Utah Antiquities Act of 1973, as amended in 1977 and 1983. The impacts are expected to be the same as identified for the Proposed Action.

Mineral and Paleontological Resources

The impacts would be the same as described for the Proposed Action.

Agriculture

The same allotments and pastures described for the Proposed Action would be affected by this alternative. An average of 160 AUMs would be lost annually. The impact in the Sweetwater allotment would be exactly the same as for the Proposed Action. The No-Action Alternative would disturb 420 acres of Pasture 4 of the Winter Ridge allotment and 2,970 acres of Pasture 1 of the Book Cliffs, over the life of the project. Based on the significance criteria, these impacts would be significant. All other impacts would be the same as identified for the Proposed Action.

Impacts to cropland would be the same as identified for the Proposed Action.

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS; LONG-TERM ENVIRONMENTAL CONSEQUENCES; AND COMMITMENT OF RESOURCES

Mitigation, monitoring, and unavoidable adverse impacts; long-term environmental consequences; and commitment of resources would be similar to those identified for the Enercor project, except for water resources and transportation networks.

Water Resources

The Mobil Proposed Action would commit 11,000 acrefeet of water to use each year for the bitumen removal process. In the long term, however, this water could be diverted to other uses after the tar sand was developed. The mine would significantly alter the shallow ground water movement patterns in the immediate vicinity of the project area, reducing flows from an undetermined number of springs and seeps, including public water reserves. This flow pattern would be permanently disrupted; however, in the long term, new springs and seeps could emerge from new flow patterns.

Transportation Networks

The Mobil project would increase traffic congestion and accidents for the short term. Those impacts would also occur over the long term, but to a lesser degree since traffic volume would be less.

THOMPSON PROJECT

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THOMPSON PROJECT SUMMARY

WATER RESOURCES

The project would require about 0.3 acre-feet of water per year, which would be insignificant. The amount of sedimentation produced by the clearing required for the project would depend on the location of the drill pads for each well. With the use of the proper construction methods detailed in Appendix 2, no significant sedimentation impacts would occur. Since ground water in the area is mostly below the tar sand beds, no significant direct impacts would occur. Once the bitumen was removed, the remaining sand bed would have different hydrologic characteristics that could lead to a change in the flow or location of local springs and seeps.

SOCIOECONOMICS

None of the phases would cause any significant impacts to the local towns or communities. Total employment and per capita personnel income would increase by less than 1 percent in all jurisdictions in each of the phases of development. Effects on housing, public services and facilities, and social conditions in the area of influence would be insignificant.

AIR QUALITY

Increased SO_2 and TSP concentrations would only be a fraction of the PSD increments, and total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates were predicted to be well within the significance criteria. None of the air quality impacts are expected to be significant.

SOILS AND VEGETATION

All land disturbance would be reclaimed by following the guidelines presented in Appendix 2. Over the life of the project a total of 45 acres could be disturbed, with approximately 20 acres disturbed at any one time. Of that total, 12 acres of sensitive soil would be disturbed. No significant impacts would occur to soils or vegetation and all disturbed land would be reclaimed through the use of the measures outlined in Appendix 2. Threatened, endangered, or sensitive plant species would not be adversely affected since none are known to occur within the area of disturbance.

WILDLIFE

The project would disturb an estimated 0.01 percent of the 141,148 acres of crucial mule deer summer range in herd unit 28A and less than 1 percent of crucial fawning habitat, crucial elk calving habitat, and crucial elk summer range. Impacts to summering mule deer and elk would be much greater than the acres disturbed would indicate, because summer range is critical to the Book Cliffs deer and elk herds. Sage grouse, blue grouse, and regional sport fisheries would not be adversely affected. Endangered peregrine falcons could overfly the project, but no impacts are anticipated.

TRANSPORTATION NETWORKS

Hauling the commercial product could significantly affect 3.2 miles of Divide Ridge Road. Local funding may not be sufficient to meet increased maintenance needs. No other roads would be significantly affected.

VISUAL RESOURCES

Significant impacts would occur because *in situ* operations would not be generally compatible with the VRM Class II objectives for the project area. Structural and vegetation changes would create dominant features in the landscape as viewed by the casual observer. Impacts would persist for the life of the project and continue until revegetation was completed.

WILDERNESS

The Thompson project area would not cross the boundary of an existing wilderness or WSA. The project would be located within 6 miles of the Winter Ridge WSA and 9 miles from the Flume Canyon WSA; no significant impacts are anticipated. The project area would be 15 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation; no direct impacts would occur.

RECREATION

No significant long-term impacts would occur to the recreation resource, other than to the sightseeing

opportunity. About 20 acres per year would be removed from use for undeveloped recreation opportunities. The project is not expected to interfere with hunting, ORV activities, or other types of opportunities in the area.

CULTURAL RESOURCES

The project would disturb about 38 acres of low site density probability. One potentially significant site, a Fremont petroglyph, occurs within the project area. Indirect impacts from unauthorized collection of artifacts would not be significant, given the small work force increases.

MINERAL AND PALEONTOLOGICAL RESOURCES

No significant impacts to mineral or paleontological resources would occur. *In situ* recovery would result in recovering of 40 to 50 percent of the in-place oil. No oil and gas, oil shale, or other mineral development would be affected.

AGRICULTURE

Impacts to forage production would amount to less than 0.6 percent of the total forage, which would be insignificant. The forage that could be lost through disruption of watering facilities and grazing patterns is unknown; however, the probability of this occurring is expected to be low. Little or no cropland would be converted to urban uses from project-related population increases; no cropland occurs in the project area itself.

BLM PREFERRED ALTERNATIVE

Conversion of the lease as proposed, including mitigation discussed in Appendix 2, is the BLM preferred alternative. BLM supports this alternative because it would lead to more efficient and orderly tar sand recovery consistent with the diligent development and reasonable environmental protection objectives of the Combined Hydrocarbon Leasing Act.

CHAPTER 1

DETAILED DESCRIPTION OF THE THOMPSON PROPOSED ACTION

INTRODUCTION

The Purpose and Need for the Proposed Action, Authorizing Actions, and Alternatives Considered but Eliminated From Detailed Analysis sections can be reviewed in Section A of this document. The Interrelationships with Other Proposed or Existing Projects section appears at the end of Section B under the Cumulative Analysis.

Location of Project

The area proposed for lease conversion on the existing oil and gas lease is located in the northern portion of Grand County in east-central Utah. Map A-2 shows the general location of the project area (Section A). Map B-11 shows the detail location of the project area.

History and Background

J.C. Thompson (Thompson) proposes to convert one lease on 74.48 acres, issued on September 1, 1971. Four core holes have been drilled in the general vicinity of the lease property. A pilot site has been selected based on information from these cores. Preliminary biological data have been developed, and project planning and design initiated.

OVERVIEW OF PROPOSED ACTION

Description

Thompson proposed plan of operations (Averett Consultants 1983g) for *in situ* mining is summarized in Table B-61. Section A, General Development Techniques, describes the proposed plan of operations and typical *in situ* operations.

Land Status and Ownership

The lease tract is on federal-surface and federal-mineral-estate administered by BLM. Map C-10, located in Section C, Appendix 5, shows the land status and ownership of the 74.48 acres proposed for lease conversion within the P R Spring STSA.

Project Schedule

Figure B-14 shows the proposed schedule for the Thompson *in situ* project.

PROPOSED ACTION

Exploration Phase

One pre-pilot exploration well (Map B-11) would be used to verify the previous data and site for the pilot operation. The operation is described in Section A, General Development Techniques. The roadways providing the main access to the project site include 3.2 miles of Divide Ridge Road and 59.6 miles of Seep Ridge Road.

Pilot Phase

The Thompson pilot operation is described in Section A and shown on Map B-11. Any portion of the site could be leveled as needed to accommodate specific pieces of equipment. Production and storage facilities could either be at higher or lower elevations than the five-spot well site to allow adequate drainage downslope to the water disposal pit for any water produced from the dehydration facilities.

No new roads would be built for the pilot site location because existing roadways would be used. The roads would be used slightly more because only a few workers would be needed to maintain this operation.

Commercial Phase

Commercial development would be as described in Section A. The average production life of one 10-acre plot for the Thompson Proposed Action would be 20 years with only the upper tar sand zone planned for development. Over 100 years would be needed to develop the resource on the total conversion area.

TABLE B-61
THOMPSON DATA SHEET

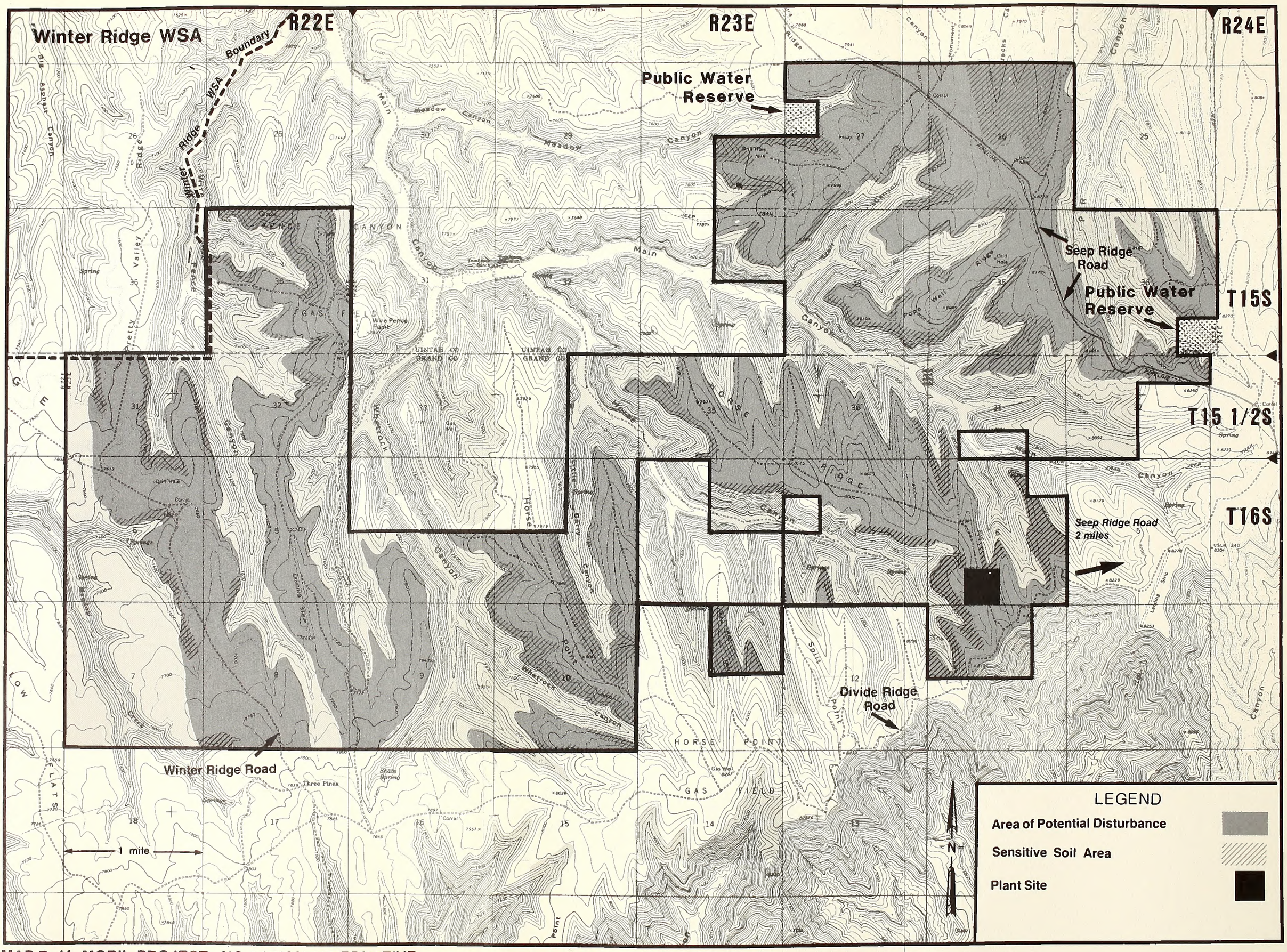
GENERAL

• Type of Operation	Small *In Situ*, progressing in 10-acre units
• Leases to be Converted (1)	74.48 Acres
• Number of Acres to be Developed	45
• Percent of Lease to be Developed	60
• Production Life of One 10-acre Plot	20 years
• Number of Tar Sand Zones to be Mined	1

PHASE

Item	Exploration	Pilot	Commercial
Production bbl/day		30	150
Duration of Phase	15 days	1 year	90 years
Acres Disturbed			
At-One-Time	0.25	2.5	20
Core Drill Sites	0.25	—	—
Drill Pads	—	2.5	—
Production Plot	—	—	10–20
Total:	0.25	2.5	10–20
Used For Analyses	0.25	2.5	20
Water Use			
ac-ft/Year		0.1	0.3
Source		Ground Water	Ground Water
Peak Construction			
Year	1985	1985	1987
Personnel	7	20	4
Peak Operation			
Year	—	1985	1988
Personnel	—	4	4
Transportation			
Trips Per Day	4	—	—
Construction	—	4	4
Operation	—	4	4

Note: bbl/day = barrels per day; ac-ft/year = acre feet per year.



MAP B-11 MOBIL PROJECT - NO ACTION ALTERNATIVE

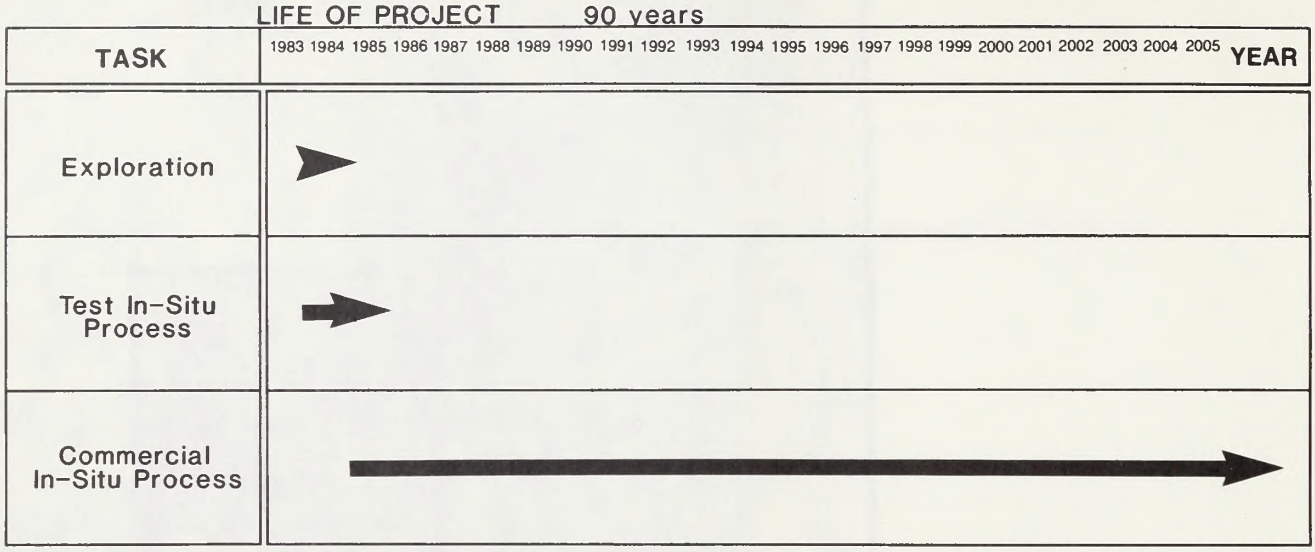


FIGURE B-14 THOMPSON PLAN OF OPERATIONS SCHEDULE

No new roads would be needed for development of this project. On a 20-year cycle, as all of the bitumen is produced from the first 10 acres and the plot abandoned, a new 10-acre plot would be developed adjacent to the old plot.

For the 5 years required for reclamation (following the first 20 years of production), as the initial 10 acres is being reclaimed and the new 10-acre plot is being developed, 20 acres would be disturbed.

Since the fixed production disturbance time versus reclamation time is low (20 years versus 5 years), 20 acres disturbed at one time is used for analysis purposes.

Reclamation

Land disturbance from project activities would be reclaimed. Details of the reclamation proposed by the applicant are provided in Section C, Appendix 2.

NO-ACTION ALTERNATIVE

The No-Action Alternative would be the denial of the conversion of the existing oil and gas lease to a combined hydrocarbon lease.

CHAPTER 2

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

WATER RESOURCES

Affected Environment

Surface runoff drains from this area through ephemeral stream channels for about 2 miles to Horse Canyon, Main Canyon, Willow Creek, and then to the Green River. The southern portion of the project area drains to Middle Canyon, Westwater Creek, and then to the Colorado River. The project area consists mostly of upland plateaus and some steep-sloped areas.

Environmental Consequences

Impacts to water resources would be similar to those discussed for the Beartooth A project.

SOCIOECONOMICS

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The impacts from the Thompson project would be the same as those discussed for the Beartooth A project.

AIR QUALITY

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The impacts are presented for the commercial phase. Impacts during the exploration and pilot phases would be insignificant.

Estimated pollutant emission rates are shown in Table B-62. Projected impacts are compared to the NAAQS and PSD increment limitations in Tables B-63 and B-64. Increased SO_2 and TSP concentrations would be a fraction of the PSD increments; total concentrations of all criteria pollutants would be within the NAAQS. Visibility impacts and acid deposition rates are predicted to be well within the significance criteria; therefore, impacts are expected to be insignificant.

TABLE B-62
ESTIMATED AIR POLLUTANT EMISSION RATES FOR THE THOMPSON PROJECT

Pollutant	Emission Rate* (kg/hr)
Total Suspended Particulates	13.9
Sulfur Dioxide	4.5
Nitrogen Dioxide	8.4
Carbon Monoxide	1.9
Hydrocarbons	0.9

Source: Aerocomp 1985.

*Long-term average; short-term emission rates may be higher; kg/hr = kilograms per hour.

SOILS AND VEGETATION

Affected Environment

The Thompson project is located on a narrow sloping plateau bordered by steep and very steep mountain sideslopes. Average annual precipitation is 16 to 20 inches and the average frost-free period is 60 to 90 days.

SOILS AND VEGETATION TYPES

Soils on the gently sloping to sloping narrow plateau are mainly deep to moderately deep loams and clay

TABLE B-63
COMPARISON OF MAXIMUM SITE-SPECIFIC IMPACTS WITH NAAQS FOR THE THOMPSON PROJECT

Pollutant Avg. Time	SOURCE CATEGORY CONCENTRATION ($\mu g/m^3$) 2005 Baseline Sources	PROJECT SOURCES Secondary	Direct	Maximum Concentrations	NAAQS
SO_2					
3-hour	18	0	5	23	1,300
24-hour	7	0	2	9	365
Annual	1	0	1	1	80
TSP					
24-hour	69	0	17	86	150
Annual	21	0	4	25	60
NO_2					
Annual	2	0	2	4	100
CO					
1-hour	1,500	0	2	1,502	40,000
8-hour	900	0	1	901	10,000

Source: Aerocomp 1985.

Note: Secondary = emissions resulting from population growth; Direct = emissions from the Thompson project; $\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; SO_2 = sulfur dioxide; TSP = total suspended particulates; NO_2 = nitrogen dioxide; CO = carbon monoxide.

TABLE B-64
SUMMARY OF PSD INCREMENT CONSUMPTION FOR THE THOMPSON PROJECT

Areas of Special Concern	SO_2 ($\mu g/m^3$) 3-hour	24-hour	Annual	TSP ($\mu g/m^3$) 24-hour	Annual
Winter Ridge WSA	<1	<1	<1	1	<1
Uintah & Ouray Reservation	<1	<1	<1	<1	<1
State of Colorado	<1	<1	<1	<1	<1
Maximum Impact	5	2	<1	17	4
Class II Increment	512	91	20	37	19

Source: Aerocomp 1985.

Note: PSD = prevention of significant deterioration; SO_2 = sulfur dioxide; $\mu g/m^3$ = micrograms per cubic meter; TSP = total suspended particulates; WSA = Wilderness Study Area.

loams. The steep and very steep sideslopes have shallow and moderately deep loam and sandy loam soils containing coarse fragments (10 to 65 percent) ranging in size from gravel to stone. The following general soil groups occur within the project area:

Soil Group 3 - Soils of the moderately sloping to strongly sloping convex ridges and hills
Soil Group 4 - Soils of the strongly sloping to steep plateau, mountain sideslopes and hills
Soil Group 5 - Soils of the steep and very steep plateau, mountain sideslopes, canyon walls and mesa escarpments

This project would mainly affect mountain shrub and mixed conifer. See Section A, Vegetation, for descriptions of vegetation types and their uses.

THREATENED, ENDANGERED, OR SENSITIVE PLANT SPECIES

This project is located outside the threatened, endangered, and sensitive plant habitat area outlined in the Book Cliffs Resource Management Plan (BLM 1984b). See Section A, Vegetation, for discussion of threatened, endangered, and sensitive plant species. No endangered or threatened plant species are known to occur in the project area.

Environmental Consequences

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. Impacts during the commercial phase would also be the same, with the following exceptions.

About 20 acres of soil and its related vegetation would be disturbed at any one time. Disturbance of the 10-acre plots would continue over the project life, with approximately 20 years between each period of disturbance. Based on the significance criteria (Section A), impacts associated with disturbance from the Thompson project would not be significant.

Over the projected 90-year life of the project, of the total 45 acres that could be disturbed, 12 acres of sensitive soil would be disturbed (Map B-10). The Thompson project could disturb 38 acres of mountain shrub and 7 acres of mixed conifer, over the life of the project.

Impacts to grassland-type vegetation (understory vegetation) would be insignificant because grasses and forbs are expected to become established within 5 years, overstory vegetation would take longer. Mountain shrub vegetation type would take 20 to 30 years to return to predisturbance density and composition. The areas of mixed conifer would take 30 to 50 or more years to return to predisturbance conditions. The highly productive woodland sites would be returned to predisturbance conditions, while the less productive sites would be converted to grassland.

Threatened, endangered, or sensitive plant species would not be adversely affected, since none are known to occur within the area of disturbance.

WILDLIFE

Affected Environment

HABITAT TYPES

Two primary wildlife habitat types are found on the project area: mountain shrub and mixed conifer. Refer to Section A, Soils and Vegetation, for discussions of plant communities and species composition found in these habitat types. Also refer to Section A, Wildlife, for a description of wildlife species occurring in these types.

Terrestrial Wildlife

The entire project area is located on lands classified by the UDWR as crucial mule deer summer range. The range is used by deer from about May 15 to October 15. The area is also classified as crucial mule deer fawning habitat, which is used by deer from May 15 to June 30, and crucial elk summer range, used by elk from about May 15 to November 1. The project area is also classified as crucial elk calving habitat, used by elk from about May 15 to June 30.

High priority sage grouse summer range is found throughout the project area and the entire project area is classified as substantial value blue grouse habitat (UDWR 1981).

Raptors common to the project area include red-tailed hawks, goshawks (during winter), American kestrels, Cooper's hawks, sharp-shinned hawks, turkey vultures,

great-horned and long-eared owls and golden eagles. Nesting habitat for woodland nesting species of raptors is found on portions of the project area, but the entire area furnishes hunting habitat for all species of raptors common to this part of Utah. At the present time, no raptors nests are known to occur in the project area.

The various species of nongame mammals and birds, reptiles, and amphibians that could be found on the project area are similar to those found throughout the Uinta Basin. Refer to Section A, Wildlife, for a discussion of these species.

THREATENED OR ENDANGERED ANIMAL SPECIES

The Fish and Wildlife Service has indicated that several federally listed species could occur on the project area (Table A-12 and Appendix 4).

Environmental Consequences

HABITAT

Impacts during the exploration and pilot phases would be the same as described for the Beartooth A project. Impacts during the commercial phase would also be the same, with the following exceptions. The project site is located on habitat that is classified as both crucial deer and elk summer range and deer and elk fawning/calving range (Karpowitz 1984). All direct project impacts would be to fawning/calving and summering animals.

About 141,148 acres of crucial mule deer summer range occur in herd unit 28A, of which 0.01 percent would be disturbed. This project would also disturb less than 1 percent of the crucial fawning habitat in unit 28A, less than 1 percent of the crucial elk calving habitat, and less than 1 percent of the crucial elk summer range.

Once the project began, 20 acres would be out of big game predisturbance forage production for 20 years. For the next 15 years, 40 acres would be disturbed (including the original 20 acres). There would then be a 5-year period with only 20 acres of disturbance (40 years after project start-up). This 40-year cycle would be repeated for the life of the project. While impacts to deer summering areas are important, these amounts of habitat disturbance are below the significance criteria level.

Impacts to summering mule deer and elk would be much greater than the acres disturbed would indicate, because summer range is critical to the survival of the Book Cliffs deer and elk herds (Karpowitz 1984). Impacts to elk would be the same as described in Beartooth A.

WILDLIFE POPULATIONS

Impacts during the exploration and pilot phases would be the same as discussed for the Beartooth A project. Impacts during the commercial phase would also be the same, with the following exceptions.

Impacts to wildlife populations in the project area, particularly to summering mule deer and elk, would be associated with harassment and displacement rather than vegetation habitat alterations. The small amount of acres disturbed at any one time do not exceed the significance criteria, so no significant impacts to deer or elk are anticipated from vegetation removal. However, project development on crucial mule deer summer and elk range and the associated zone of influence around the project area could reduce populations through harassment and displacement.

Construction and operation activities for 90 years or more could displace deer and elk into adjacent areas where essential habitat components are not found or into areas where these animals are already at carrying capacity, causing stress and a potential population reduction (Geist 1974). Estimates of population losses based upon displacement-caused stress cannot be reliably estimated at present levels of knowledge.

The sage grouse and blue grouse populations would not be adversely affected by this project.

Endangered peregrine falcons could overfly the area, but impacts are not anticipated.

TRANSPORTATION NETWORKS

Affected Environment

The vehicular traffic flow would enter and leave from the north side of the lease (see Map B-11). The roadways starting at the project site include 3.2 miles of Divide Ridge Road and 59.6 miles of Seep Ridge Road

before reaching State Highway 88, County Road 264, and U.S. Highway 40.

The Divide Ridge Road ranges from packed dirt to some gravel. Vehicle use ranges from high clearance to heavy equipment vehicles. See Section A for traffic data on Seep Ridge Road, U.S. Highway 40, State Highway 88, and County Road 264 and for accessibility in the winter months.

Environmental Consequences

The exploration and pilot phases would be the same as described for the Beartooth B project except impacts would occur to Divide Ridge Road. During the commercial phase, the type and magnitude of impacts to the Divide Ridge Road would be the same as described for Beartooth B.

VISUAL RESOURCES

Affected Environment

The Thompson project area is flat to gently rolling and bounded on the east and south by steep, heavily eroded terrain. Vegetation cover consists primarily of mountain shrub, with pockets of mixed conifer. The project would be located entirely within a VRM Class II area comprised of Class A scenery (high diversity) because of a combination of outstanding landscape characteristics. Viewer sensitivity would be medium when seen as foreground/middleground from the Divide Ridge Road, with the remainder classified as background or seldom seem.

Environmental Consequences

Significant impacts would occur to the visual resource. *In situ* operations would not be generally compatible with the VRM objective for the area where the operations occurred. The vegetation changes, as well as the addition of structures, would create dominant features in the landscape in terms of scale as viewed by the casual observer. Contrasts in form, line, color, and texture of the area where vegetation was cleared and where the facility was placed would not be compatible with the present landscape character.

Structural impacts would be moved around the lease area. No significant landform modification is anticipated. About 20 acres would appear to be disturbed at one time over the 90-year life of the project. This acreage would be significantly affected because the disturbance would not meet the objectives for the VRM Class II area where the project was located.

WILDERNESS

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

The Thompson project area would not cross the boundary of any existing wilderness or WSA. The project would be located within 6 miles southeast of the Winter Ridge WSA, but no significant impacts to outside sights and sounds from the WSA are anticipated, since the project area would not likely be viewed or heard from the WSA. The only other WSA within 10 miles of the project would be the Flume Canyon WSA, 9 miles southwest of the project area. Because of topography, little if any of the project development work would be heard or seen from within the WSA.

The project area is over 15 miles from the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation. No direct impacts are anticipated.

RECREATION

Affected Environment

The affected environment would be the same as described in Section A.

Environmental Consequences

No significant long-term impacts would occur to the recreation resource during any of the three phases of development of the Thompson project, except to the scenic quality (sightseeing). See Beartooth A project for a further explanation.

CULTURAL RESOURCES

Affected Environment

Only one site, potentially eligible for inclusion on the National Register of Historic Places, is known to exist within the project area boundary according to investigative field reports. This is a Fremont petroglyph that is a good example of one portion of the range of variables for this type of site. BLM administers the property.

No other sites are known to exist near this site, and no archaeological surveys have been done in or near the project area. The likelihood of other sites occurring in this project area is low given that mountain shrub is the predominant vegetation type, occupying 38 acres (Jones and MacKay 1980).

Shadscale, oakbrush, and mountain shrub have the lowest site densities and Fremont sites tend to be concentrated in pinyon-juniper vegetation zones. No pinyon-juniper (high site density) or sagebrush-grass (medium site density) would be disturbed. See Section A for a discussion of site density associated with vegetation types.

Environmental Consequences

The Thompson project would disturb about 38 acres with low site density probability, over the life of the project. No sites with high or medium density probabilities would be affected.

Potential impacts to the Fremont site, as well as any unknown sites, would be similar to those discussed for the Beartooth A project.

MINERAL AND PALEONTOLOGICAL RESOURCES

Affected Environment

BLM has derived the area of probable tar sand occurrences shown on Map B-11 as the area of potential disturbance. The applicant plans *in situ* development of one tar sand bed at each well. Over the entire project area, only the uppermost tar sand zone would be developed. About 1 million barrels of the 2.6 million barrels of in-place oil would be recovered.

No inventory exists for paleontological resources within the project area. In areas that have been inventoried, the Douglas Creek member has shown a low potential for fossil occurrence. No known sites have been identified in the project area.

Environmental Consequences

The impact would be the same as described for Beartooth A except no oil shale development would be affected.

AGRICULTURE

Affected Environment

The Thompson project would affect grazing in the Book Cliffs pasture located within the Book Cliff grazing allotment. The project would affect one cattle operation during the spring. Total acreage of the pasture is 24,313 acres with a total of 301 AUMs.

No cropland occurs within the project area. See Section A, Cropland, for discussion of cropland areas potentially affected by urban expansion.

Environmental Consequences

Forage lost from land disturbance associated with the exploration phase (1/4 acre) and pilot phase (2 1/2 acres) would be less than 1 AUM and considered insignificant based on the significance criteria.

Forage loss during the commercial phase would result from land disturbance caused by the *in situ* recovery process and land being occupied by roads. About 20 acres of vegetation would be disturbed or out of use at any one time. Since the location and exact sequence of plots of land disturbance are unknown, specific forage losses by ecological site cannot be identified. An average of 2 AUMs of forage would be lost annually to one operation.

Forage loss from this project represents about 0.6 percent of the total forage within the affected pasture. This is much less than the 5 percent criterion and would therefore be insignificant. The potential for invasion of poisonous and invader plants would not be

as great because of the higher annual precipitation (16 to 20 inches). Because of the time between disturbance and reclamation, nature of disturbance, and more favorable precipitation, invader plants are expected to occupy less than 10 percent of the disturbed area and poisonous plants less than 2 percent. Therefore, these impacts would be insignificant. No cropland would be affected by the in situ resource recovery operations. Cropland loss from population expansion would cause less than 1 acre of cropland to be converted to urban uses. This cropland loss would be insignificant in that it is much less than 5 percent of the total cropland within the area.

NO-ACTION ALTERNATIVE

Impacts for the No-Action Alternative would be the same as described for the Beartooth A project.

MITIGATION, MONITORING, AND UNAVOIDABLE ADVERSE IMPACTS; LONG-TERM ENVIRONMENTAL CONSEQUENCES; AND COMMITMENT OF RESOURCES

Mitigation, monitoring, and unavoidable adverse impacts; long-term environmental consequences; and commitment of resources would be similar to those identified for the Beartooth A project. Visual resources would be significantly affected during all three phases of the project and into the long term until equipment was removed and similar vegetation reestablished.

CUMULATIVE ANALYSIS

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CUMULATIVE ANALYSIS

INTRODUCTION

The 10 proposed projects analyzed in this EIS occur within the same general area of influence that was analyzed by the ***Uintah Basin Synfuels (UBS) Development EIS*** (BLM 1983c). Although the current projects were not analyzed specifically in the UBS EIS, the cumulative analysis contained in that EIS is sufficient to cover the cumulative impacts that may occur in the region. As explained in this section, there has been a shift in projects with some being deleted, delayed, or added. The use figures for the various resources used in the UBS cumulative analysis still encompass the maximum amount of resource use even with the 10 new P R Spring projects. Therefore, the cumulative impact analysis presented in the UBS EIS is incorporated into this EIS by reference. The following presents an explanation of the changes in interrelated projects, a summary of the resource use data, and the summary tables from the UBS EIS.

The following Colorado projects were included in UBS but had no resource use figures and, therefore, had no influence on projected impacts. Likewise, they will have no influence on impacts in this EIS and are only shown to complete the cumulative analysis.

Name	Type of Development
Northern 1/Reinau 2	coal mine
Danforth Hills 3	coal mine
Danforth Hills 1 and 2	coal mine
Empire Energy Eagle 5 and 9	coal mine
Trapper	coal mine
Colorado/Wyoming	coal mine
Utah International	coal mine
Energy-West/Sugar Loaf	coal mine
Craig	coal-fired power plant
Cameo 1 and 2/Roadside GEX	coal mine
Coal Canyon	coal mine
Cottonwood Creek	coal mine
Southwest	coal-fired power plant
Colony	oil shale
Union	oil shale
Cathedral Buffs	oil shale
Chevron	oil shale
Rio Blanco (federal tract C-a)	oil shale
Mobil (Parachute)	oil shale
Exxon	oil shale
Superior	oil shale
Getty	oil shale
Multimineral	oil shale
Naval Oil Shale	oil shale

NEW INTERRELATED PROJECTS

Rangely CO_2 Pipeline - from northwest of Rock Springs, WY, to Rangely, CO, will be constructed in 1985.

Raven Ridge/Rim Rock Tar Sand Projects - southeast of Vernal.

Paritte Draw Tar Sand - Lease conversions no activity planned at this time.

SUMMARY

Ten projects have either been dropped or are on indefinite hold and, therefore, no longer counted in the cumulative totals.

Ten projects are active but on a 3- to 5-year delay and therefore, the impacts would be the same, only delayed.

Three new projects have been added and are included as part of the P R Spring Combined Hydrocarbon Lease Conversion cumulative analysis.

With the uncertainty of the synfuels industry, the cumulative impact analysis given for the UBS EIS low scenario may be more realistic. However, the impacts from UBS for both the high and low scenarios have been summarized for the readers' information.

CUMULATIVE USE FIGURES

Table B-66 summarizes the production and use figures from the UBS EIS. (For more details see pages R-1-1 through R-1-24 of the final UBS EIS.)

To show how these additions or deletions would affect the cumulative use totals, the following example on operational water use is offered. The use of surface water dropped by 24,250 acre-feet per year (ac-ft/yr) from deleted or modified projects (including some projects which are doubtful), while new projects added 11,042 ac-ft/yr of use. This gives a cumulative surface water use for operation of 163,832 ac-ft/yr, of which 11,000 ac-ft/year would be used for the proposed projects in this EIS.

The high scenario from the UBS EIS projected surface water use at 177,310 ac-ft/yr and the low scenario projected 108,428 ac-ft/yr. The new total of 163,832 is

about 15 percent lower than previously analyzed in the high scenario, which means that the UBS EIS analysis is still valid, having a good high and low summary of impacts.

The mining of oil shale and tar sand is now predicted to be about 15 percent lower. Correspondingly, oil production is also lower. The UBS EIS predicted 95,600 barrels per day (bpd) of tar sand oil, and new estimate is 81,250 bpd of which 62,050 bpd would be from the proposed projects in this EIS.

Peak work force for construction is now anticipated to be 7,765 workers of which 3,050 would be for proposed projects. The operational work force is now 13,843, with only 930 employed by the P R Spring projects.

Acres disturbed and removed would now be 37,500 and 7,800 with P R Spring's share being about 13,800 and 175 within the same time frame as UBS.

TABLE B-65
INTERRELATED PROJECTS

Name	Current Status
UBS Projects (Table R-1-1 UBS Final)	
Enercor (Rainbow)	Inactive - dropped
Enercor/Mono Power (P R Spring)	Part of new P R Spring
Geokinetics (Agency Draw)	Active - delayed 3 years
Geokinetics (Lofreco)	Active - delayed 3 years
Magic Circle	Active - delayed 3 years
Paraho	Inactive - Indefinitely on hold
Sohio	Inactive - on hold
Syntana - Utah	Active - delayed 5 years
Tosco	Inactive - indefinite delay
Utah Interrelated projects (Table R-1-2 UBS Final)	
Baker Associates, Inc.—Humate Mine	On hold; indefinite delay
Portions of Central Utah Project	Active
Chevron Resources Co.—Vernal Phosphate Rock Operation	Scheduled for completion 1986
Plateau Refinery	Inactive; dropped
Ramex	Inactive; dropped
Western Tar Sand Inc.	Inactive; dropped
White River Shale Project	On hold; 3 to 5 year delay
White River Dam Project	On hold; 3 to 5 year delay
Bonanza Power Plant Project (Unit 2)	Active; on hold
Gary Energy Corp.	Inactive; dropped
C and A Tar Sand	Inactive; dropped
Colorado Interrelated Projects—Employment Only (Table R-1-3 UBS Final)	
Deserado Coal Company Mine	Active - near completion - would now be included in baseline
Dorchester Coal Company (Fruita Mines 1 and 2)	Active
Gary Energy Corp. Oil Refinery	Active
Mack-Ute Power Plant Project (Southwest Units 1 and 2)	Inactive; dropped
Sheridan Enterprises Coal Mine	Active
Taylor Draw Reservoir Project	Completed; now baseline
Choke Cherry Coal Gasification Project	Inactive - indefinite - in future

Source: BLM 1983c.

Note: UBS = Uintah Basin Synfuels.

TABLE B-66
CUMULATIVE USE SUMMARY

Item	High Scenario (Tables R-1-4 through R-1-10 UBS)	Low Scenario (Tables R-1-11 through R-1-17, UBS)
Oil Production		
Shale Oil	115,174,500 bpy	65,594,535
Tar Sand Oil	30,728,820 bpy	16,469,000
Shale Oil	348,453 bpd	198,400
Tar Sand Oil	95,600 bpd	50,000
Peak Work force		
Construction	11,475 (1985)	8,870 (1985)
Operation	17,060 (1995)	10,735 (1993)
Combined	19,350 (1989)	13,590 (1986)
Acres Disturbed	52,631	46,089
Acres Removed	11,310	8,250
Water Consumption (ac-ft/yr)		
Construction		
Ground Water	120	Unknown
White River	2,163	833
Green River	700	Unknown
Operation		
Ground Water	3,800	3,800
Surface Water	177,310	108,428
Oil Shale Mined		
Tons per stream day	496,000	395,367
Tons per year	180,536,925	107,082,450
Tar Sand Mined		
Tons per stream day	283,600	139,480
Tons per year	92,839,750	45,718,750
Energy Use (Operation)		
Electricity (Megawatts)	430.1	156.55
Natural Gas (MMcfd)	86.0	15.00

Source: BLM 1983c.

Note: UBS = Uintah Basin Synfuels; bpy = barrels per year; bpd = barrels per day; ac-ft/yr = acre feet per year; MMCfd = thousand thousands (million) cubic feet per day.

TABLE B-67
SUMMARY OF HIGH-LEVEL AND LOW-LEVEL SCENARIO IMPACT

Environmental Element	High-Level Scenario Cumulative Impacts	Low-Level Scenario Cumulative Impacts
Oil Production (barrels per day)	145,903,320	82,063,535
Socioeconomics		
Population		
Construction	29,804	19,818
Operation	65,222	36,371
Employment		
Construction	18,115	11,577
Operation	28,745	16,150
Per Capita Personal Income Increase		
Construction	2,263	1,790
Operation	1,115	366
Household Demand		
Construction	7,231	5,777
Operation	17,604	10,810
Teacher Demand		
Construction	163	133
Operation	615	343
Hospital Bed Demand		
Construction	40	33
Operation	121	72
Medical Personnel Demand		
Construction	61	47
Operation	175	105
Mental Health Personnel Demand		
Construction	5	4
Operation	14	8
Police Officer Demand		
Construction	21	17
Operation	63	38
Sewage Increase (gallons)		
Construction	1,094,000	812,500
Operation	3,158,300	1,669,700
Water Connection Demand		
Construction	3,284	2,435
Operation	9,427	4,987

TABLE B-67 (Continued)

Environmental Element	High-Level Scenario Cumulative Impacts	Low-Level Scenario Cumulative Impacts
Air Quality		
Total emissions (kg/hr)		
Sulfur dioxide	6,881	3,210
Total suspended particulates	17,436	9,936
Nitrogen oxides	18,747	10,218
Hydrocarbons	3,958	1,681
Carbon monoxide	6,675	4,738
PSD Increments		
Class I		
Sulfur dioxide	May be exceeded[1]	May be exceeded
Total suspended particulates	Exceeded[2]	Exceeded
Class II		
Sulfur dioxide	Not exceeded	Not exceeded
Total suspended particulates	Exceeded	Exceeded
Colorado Category I	May be exceeded	May be exceeded
NAAQS		
Sulfur dioxide	Not exceeded	Not exceeded
Total suspended particulates	Exceeded	Exceeded
Nitrogen oxides	Not exceeded	Not exceeded
Hydrocarbons	Not exceeded	Not exceeded
Carbon monoxide	Not exceeded	Not exceeded
Ozone	Not exceeded	Not exceeded
Water Consumption		
White River		
Construction (ac-ft/yr)	2,163*	833*
Operation (ac-ft/yr)	83,000	65,018
Green River		
Construction (ac-ft/yr)	700*	Unknown
Operation (ac-ft/yr)	47,210	43,410
Ground Water		
Construction (ac-ft/yr)	0	0
Operation (ac-ft/yr)	3,800	3,800
Vegetation and Soils		
Distured (acres)[3]	52,631	46,089
Reclaimed (acres)[4]	41,321	37,839
Removed (acres)[5]	11,310	8,250

TABLE B-67 (Continued)

Environmental Element	High-Level Scenario Cumulative Impacts	Low-Level Scenario Cumulative Impacts
Wildlife Habitat		
Total disturbed (acres)	52,631	46,089
Long-term (30+ years) disturbed (acres)	37,717	37,717
Agriculture		
Cropland lost (acres)		
Construction	6,557	5,537
Operation	14,349	8,690
AUMs lost		
Construction	1,289	853
Operation	2,829	2,393
Transportation Networks		
Level of Unacceptable Service[6]		
Construction	9	8
Operation	24	19
Recreation		
Recreation land affected (acres)	52,631	46,089
Mineral and Energy Resources		
Electric power used (MW)	275.1*	156.6*
Natural gas used (MMcfd)	86	15
Oil shale mined (tpy)	180,536,925	107,082,450
Tar Sand mined (tpy)	92,839,750	45,718,750

Source: BLM 1983c

Note: Figures given are the projected increase to baseline due to the proposed level of development.

ac-ft/yr = acre-feet per year; AUMs = animal unit months; kg/hr = kilograms per hour; MMcfd = million cubic feet per day; MW = megawatts; NAAQS = National Ambient Air Quality Standards; PSD = Prevention of Significant Deterioration; tpy = tons per year.

[1] May be exceeded—analysis indicates exceedence of applicable standards at upper end of estimate range but not at lower end based on assumed emission control efficiencies.

[2] Exceeded—analysis indicates exceedence of applicable standards even at lower end of estimate range based on assumed emission control efficiencies.

[3] Disturbed refers to total acres of vegetation that would be disturbed during construction and operation.

[4] Reclaimed refers to total acres of vegetation that would be reclaimed during the project life, including rights-of-way disturbance and spent shale disposal areas.

TABLE B-67 (Continued)

[5] Removed refers to total acres of vegetation that would be occupied by surface facilities for the life of a project. Prior to project abandonment, the surface facilities would be removed and the disturbed acres reclaimed (with the possible exception of some roads that would be retained within the county network).

[6] Figure given is number of level of service categories below C multiplied by number of highway links (or segments of road). For example, if 2 links would be reduced to Level D, 2 to Level E, and 2 to Level F, the following calculations would be made: $(2 \times 1) + (2 \times 2) + (2 \times 3) = 12$. (Refer to Section R-4.A.7, Transportation Networks, for definition of terms.)

* Because of unknown quantities, these are minimum figures.

Section C

Appendices, References Cited, Acronyms, and Glossary

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APPENDICES

APPENDIX 1

CONSULTATION AND COORDINATION

SUMMARY OF PROJECT SCOPING

The first step in preparing an environmental impact statement (EIS) is called "scoping." The scope of an EIS is the range of actions, alternatives, and impacts to be included in the document. The purpose of scoping is to determine the significant issues related to a proposed action that should be included in the EIS. The basic goal of scoping is to make EISs more concise and worthwhile for those who must make decisions on the proposals, those in state and local government, and those who may be affected by approval or disapproval of the proposals.

Method of Scoping

The scoping process for the P R Spring Combined Hydrocarbon Lease Conversion EIS consisted of agency meetings, mailouts to solicit written comments from the public, and informative conversations with interested parties within the affected area. The following individuals and government entities provided written responses to the mailout scoping:

GENERAL PUBLIC

Rodney Greeno, Camp Douglas, Wisconsin
Jon D. Hill, Rangely, Colorado
Robert J. Krumenaker, Beaumont, Texas
W.R. Rozier, Vernal, Utah
Synfuels Engineering and Development, Inc., Golden, Colorado
Jerran T. Flinders, Provo, Utah

CITIZEN GROUPS

Utah Wilderness Association

FEDERAL AGENCIES

Advisory Council On Historic Preservation
U.S. Department of Agriculture
Forest Service, Ashley National Forest
U.S. Department of the Interior
Bureau of Indian Affairs, Uintah and Ouray Agency
Bureau of Reclamation, Upper Colorado Regional Office
Forest Service, Ashley National Forest
Geological Survey
National Park Service, Rocky Mountain Regional Office
U.S. Environmental Protection Agency, Rocky Mountain Region

UTAH STATE AGENCIES

Division of State Lands and Forestry
Division of Wildlife Resources
Office of the Governor

COUNTY/LOCAL GOVERNMENTS

Mesa County, Colorado, Policy and Research Office

With the assistance of federal and state agencies, local entities, and private individuals, the significant issues were identified for analysis in the EIS. Insignificant issues were also identified so that they could be eliminated from the scope of the EIS. Project information and information on the scoping process were published in the ***Federal Register*** on April 27, 1984.

Results of Scoping

The results of the scoping process and contributions from agency specialists and managers identified the most significant issues associated with the project. The extent to which each resource is analyzed was partially determined by the concerns raised during scoping. The items and concepts suggested for inclusion in the analysis were consolidated and grouped by resource topic. From these results, the most significant issues within the following resource topics were determined (listed in order of overall significance):

SOCIOECONOMICS

- Increased population levels and impacts on (1) infrastructure of local communities, particularly health care, police, and fire protection, and (2) the quality of life in Uintah and Grand counties, Utah;
- Economic impacts to farming and ranching industries;
- Potential losses of state revenues from reduction of hunting and fishing;
- Effects to local business;
- Economic impacts to river runners and outfitters; and
- Effects of increased population on the Uintah and Ouray Indian Reservation, impacts to the tribe's social values, and impacts to the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation, which is considered a private and sacred area.

SOILS AND VEGETATION

- Reclamation and revegetation potential of areas disturbed by projects;
- Disposal, stabilization, and potential for reclaiming spent sand;
- The need to control erosion;
- Effects on threatened or endangered plant species; and
- The effects of topographic and microclimatic changes on vegetation.

TRANSPORTATION NETWORKS

- Capacity and condition of the existing transportation system;
- Adequacy of the existing system to meet project needs;
- Expected level-of-service changes along the existing routes from project construction and operation and related people movement; and
- Possible impacts to the internal road system of the Uintah and Ouray Indian Reservation.

RECREATION

- Impacts of increased population growth on developed or undeveloped recreation facilities and opportunities within and near the project areas, including those within the national forest and park systems; and
- Decreased quality of user experiences.

WATER RESOURCES

- Effects on local surface and ground water resources;
- Potential contamination of ground water;
- Subsidence around *in situ* retort areas;
- Dewatering of aquifers caused by *in situ* retorting;
- Possible changes to water quality in the Colorado River drainage from leaching of waste materials;
- Potential for increased sedimentation;
- Water ownership and availability, and institutional constraints on water allocation; and
- Disturbances to seeps and springs and the effects of flow reduction.

PALEONTOLOGICAL RESOURCES

- Disturbance of any paleontological resources.

MINERAL RESOURCES

- The amount and quality of tar sand that could be used by the applicants;
- The probable recovery of tar sand resources; and
- The impact of tar sand development on the potential development of mineral resources such as coal, oil and gas, and oil shale.

AIR QUALITY

- Air quality changes from ground disturbance during construction;
- Air quality changes from emissions from project facilities;
- Degradation of existing air quality;
- Changes in air quality Class I and Class II areas, downwind in Colorado; and
- Air quality changes in the Class II Uintah and Ouray Indian Reservation.

WILDLIFE

- Potential effects on critical and crucial habitats such as calving/fawning areas, strutting grounds, migration routes, and identified summer and winter deer and elk range;
- Effects on wildlife of high state and federal interest, including threatened and endangered species;
- Effects on aquatic habitats in and near the STSAs;
- Effects on wildlife from disturbances to seeps and springs and possible flow reduction; and
- Secondary impacts caused by population increases (poaching, harassment, increased hunting pressure, and air quality degradation).

AGRICULTURE

- Effects on livestock grazing carrying capacity (forage loss).
- Effects of project activities on grazing distribution and livestock operations, and
- Cropland acreage conversion to other uses as a result of associated population growth.

CULTURAL RESOURCES

- Damages to cultural resources in areas.
- Direct and indirect impacts to cultural resources from increased use of areas from population increases associated with the Proposed Actions and interrelated projects.

VISUAL RESOURCES

- The change in visual character of the regional landscape when viewed as a whole and the resulting impact to human visitors.

WILDERNESS

- Impacts to Winter Ridge, Flume Canyon, Floyd Canyon, Spruce Canyon, Coal Canyon, and Desolation Canyon wilderness study areas (WSAs) resulting in irreparable harm to wilderness characteristics.
- Impacts to the Wildlife and Cultural Resource Protection Area of the Uintah and Ouray Indian Reservation.

The following concerns were identified but are not addressed in the EIS because they are not within the scope or jurisdiction of the BLM:

- Cost of reclamation and salary structure of employees.
- Cost of government subsidies.

PUBLIC INVOLVEMENT

While preparing the draft EIS, BLM consulted with many federal, state, and local agencies; elected representatives; environmental and citizens groups; industry; and individuals. Many of these people participated during scoping. The following agencies, groups, and individuals will receive a copy of the draft EIS for formal review.

FEDERAL GOVERNMENT AGENCIES

Department of the Interior
- Bureau of Indian Affairs
- Bureau of Mines
- Bureau of Reclamation
- Fish and Wildlife Service

Geological Survey
National Park Service
Office of Environmental Project Review
Office of Surface Mining

Department of Agriculture
Forest Service
Soil Conservation Service

Advisory Council on Historic Preservation

Department of the Army
Corps of Engineers

Department of Commerce

Department of Energy

Department of Housing and Urban Development

Department of Labor

Department of Transportation

Environmental Protection Agency

Federal Highway Administration

Synthetic Fuels Corporation

STATE GOVERNMENTS AND AGENCIES

Colorado State Clearinghouse
Utah State Clearinghouse
Department of Community and Economic Development
Department of Health
Department of Natural Resources and Energy
Department of Social Services
Department of Transportation
Geological and Mineral Survey
Governor's Office
Library Commission
State Agriculture Stabilization Conservation Service Office

LOCAL GOVERNMENTS

Utah
Duchesne County Commission
Grand County Commission
Uintah County Commission

Ute Indian Tribe

Colorado
Mesa County Commission
Rio Blanco County Commission

ENVIRONMENTAL GROUPS

Defenders of the Outdoor Heritage

Friends of the Earth

National Audubon Society

National Wildlife Federation

Sierra Club

Trout Unlimited - Utah Chapter

Utah Wilderness Association

Women's Conservation Council of Utah

INDUSTRIES AND INDIVIDUALS

A detailed list may be obtained upon request from Robert Pizel, Bureau of Land Management, Division of EIS Services, Denver, Colorado and Bureau of Land Management, Vernal District Office, Utah.

Copies of the draft EIS may be obtained from:
Bureau of Land Management
Division of EIS Services
555 Zang Street, First Floor East
Denver, Colorado 80228

Bureau of Land Management
Vernal District Office
170 South 500 East
Vernal, Utah 84078

Bureau of Land Management
Utah State Office
CFS Financial Center
324 South State, Suite 301
Salt Lake City, Utah 84111-2303

In addition, the document can be reviewed at the following Bureau of Land Management (BLM) Offices:

Washington Office
Office of Public Affairs
18th & C Streets, NW, Room 5614
Washington, D.C. 20240

Moab District Office
125 West Second South
Post Office Box 970
Moab, Utah 84532

APPENDIX 2

PROVISIONS AND MEASURES DESIGNED TO REDUCE IMPACTS

The impact analysis presented in this EIS assumed compliance with mitigation measures that likely would be rewritten as stipulations and attached to federal or state authorizations. These agency-committed mitigation measures fall into two categories: (1) provisions of the existing oil and gas leases that could be carried forward in some form as part of a new combined hydrocarbon lease and (2) general measures typically included in agency authorizations for projects similar to the ones studied in this EIS.

EXISTING OIL AND GAS STIPULATIONS

Under the conversion regulations (43 CFR 3140.4-2 and 43 CFR 3500), a combined hydrocarbon lease will contain all terms and conditions needed to ensure compliance with the plans of operations, including any needed stipulations that were part of the original oil and gas lease being converted. Some of these stipulations were identified and modified from the Utah Combined Hydrocarbon Regional EIS (BLM 1983b). General provisions of an oil and gas lease, which could be carried forward should a lease be converted, are identified below. Actual stipulations that would be included for a specific combined hydrocarbon lease, however, would be determined on a case-by-case basis.

1. Each lessee will submit in writing to the BLM District Manager for advance written approval, a detailed plan of operations, which will discuss any operation that could cause property damage or land disturbance or induce erosion, including any planned use of earth-moving or similar mobile equipment. Operations that will be discussed in the plan include exploratory drilling, building of access roads, and seismographic explorations.

2. Any drilling, construction, or other operation on leased lands that will disturb the land surface or otherwise affect the environment will be subject to prior BLM approval.

3. Activities on the lease will be conducted in accordance with applicable regulations, including such requirements as the BLM may prescribe as needed to prevent environmental damage.

COMBINED HYDROCARBON LEASE STIPULATIONS

The following special stipulations will be applied to the new leases if they are converted. The maps contained in Appendix 10 show the locations, within 40-acre legal descriptions, where the stipulations would apply. Implementation of the stipulations will reduce or prevent the targeted impacts.

Exploration Phase

Exploration stipulations apply to the development of conventional oil and gas resources and to the exploration of tar sand resources.

1. In order to protect crucial winter elk habitat, surface disturbing activities will be allowed only from April 1 to November 1.

   This limitation does not apply to maintaining and operating producing wells. This stipulation may be waived by the authorized officer if either the resource values changed or the lessee/operator demonstrated that adverse impacts could be mitigated.

2. In order to protect crucial elk calving and deer fawning habitat, exploration, drilling, and other development will be allowed only from June 30 to May 15.

   This limitation does not apply to maintaining and operating producing wells. This stipulation may be waived by the authorized officer if either the resource values changed or the lessee/operator demonstrated that adverse impacts could be mitigated.

3. In order to protect the biannual migration of deer along Monument Ridge, surface disturbing activities will be allowed only from June 1 to October 1 and again from October 20 to May 10.

   This limitation does not apply to maintaining and operating producing wells. This stipulation may be

waived by the authorized officer if either the resource values changed or the lessee/operator demonstrated that adverse impacts could be mitigated.

4. No surface disturbance or occupancy will be allowed within the 100-year floodplains of the Bitter, Cub, Evacuation, Hill, Sweetwater, and Willow creeks and the Green and White rivers.

   This limitation does not apply to maintaining and operating producing wells. This stipulation may be waived by the authorized officer if either the resource values changed or the lessee/operator demonstrated that adverse impacts could be mitigated.

5. To protect the visual resources, no occupancy or other surface disturbance will be allowed on slopes exceeding 40 percent without written permission of the authorized officer of the Federal Surface Management Agency.

6. No occupancy or other activity on the surface of the following described lands within the Hideout campground are allowed under this lease. Location: SW 1/4 SE 1/4, section 30, T. 14 S., R. 23 S.

Information Notices

7. The lessee/operator is given notice that the area is known to have severe winter conditions. Modifications to the applicants' surface use plans may be required to protect the environment during severe winter conditions.

8. In order to minimize watershed damage on areas with critical erosion conditions during muddy and wet periods, the authorized officer of the Federal Surface Management Agency may prohibit surface disturbing activities. This limitation does not apply to maintaining and operating on-going operations.

Pilot and Commercial Phases

9. All or portions of this lease area contain crucial deer and elk winter range. Prior to undertaking any activity that would disturb the habitat area, the lessee shall develop and submit a habitat mitigation plan to the authorized officer. This plan must be acceptable to and approved by the authorized officer prior to use or occupancy of the area. The lessee may not occupy all or any part of the habitat area if impacts cannot be mitigated to the satisfaction of the authorized officer.

10. All or portions of this lease area contain crucial deer fawning and elk calving habitat. Prior to undertaking any activity that would disturb the habitat area, the lessee shall develop and submit to the authorized officer a habitat mitigation plan. This plan must be acceptable to and approved by the authorized officer prior to use or occupancy of the area. The lessee may not occupy all or any part of the habitat area if impacts cannot be mitigated to the satisfaction of the authorized officer.

11. All or portions of this lease area contain a crucial deer migration corridor. Prior to undertaking any activity that would disturb the habitat area, the lessee shall develop and submit a habitat mitigation plan to the authorized officer. This plan must be acceptable to and approved by the authorized officer prior to use or occupancy of the area. The lessee may not occupy all or any part of the habitat area if impacts cannot be mitigated to the satisfaction of the authorized officer.

12. No surface disturbance or occupancy will be allowed within the 100-year floodplain of Sweetwater Creek.

    This limitation does not apply to maintaining and operating producing wells. This stipulation may be waived by the authorized officer if either the resource values changed or the lessee/operator demonstrated that adverse impacts can be mitigated.

13. All or portions of this lease area contain Visual Resource Management Class II areas. Prior to undertaking any activity that would disturb this area, the lessee shall develop and submit a visual resource mitigation plan to the authorized officer. This plan must be acceptable to and approved by the authorized officer prior to use or occupancy of the area. The lessee may not occupy all or any part of this area if impacts cannot be mitigated to the satisfaction of the authorized officer.

14. All or portions of this lease area contain a designated recreation site. Prior to undertaking any activity that would disturb the habitat area, the lessee shall develop and submit a habitat

mitigation plan to the authorized officer. This plan must be acceptable to and approved by the authorized officer prior to use or occupancy of the area. The lessee may not occupy all or any part of the habitat area if impacts cannot be mitigated to the satisfaction of the authorized officer.

REQUIRED GENERAL MEASURES DESIGNED TO REDUCE IMPACTS

As a condition of granting any lease conversions or other authorizations, the various agencies require that certain terms and conditions be met. Some of these general measures are presented in this appendix. As project plans are completed and before specific authorizations are given, more specific requirements will be added by the authorizing agencies, including a wildlife mitigation plan developed jointly by BLM, the Utah Division of Wildlife Resources, the Fish and Wildlife Service, and the applicants. In addition, a livestock mitigation plan will be developed jointly by BLM and the applicant(s).

The Federal Government mandates protection of (1) threatened and endangered species and their critical habitats; (2) historical, archaeological, and paleontological resources; and (3) wild horses and burros. Moreover, some areas have the potential to be classified as wilderness. Other areas have special designations that must also be protected. This EIS assumes that enough funding would be provided to properly enforce required mitigation measures.

The following acts grant authority for mitigating the loss of vegetation, livestock, forage, wildlife habitat, and archaeological and paleontological values and the decline in water and air quality, aesthetics, and recreation on federal lands:

Organic Administration Act of 1897
Reclamation Act of 1902
Preservation of American Antiquities Act of 1906
Wilderness Act of 1964
Historic Preservation Act of 1966
Executive Order 11593 of 1971 (Protection and Enhancement of the Cultural Environment)
Archaeological and Historical Data Preservation Act of 1974
Federal Land Policy and Management Act of 1976
Clean Air Act, as amended, 1977
Federal Clean Water Act of 1977
Endangered Species Act, as amended, 1978
Executive Order 12088

Federal regulatory agencies would also require compliance with safety and noise level regulations imposed by the Occupational Safety and Health (OSHA) Act of 1970; with Federal Aviation Administration clearance standards, granted under authority of the Federal Aviation Act of 1958; and with grounding and clearance requirements of the National Electric Safety Code.

As future conditions may result in project plan refinement or adjustment, all stipulations or mitigation measures outlined here could be changed as needed to conform with the new conditions. Should a future off-lease right-of-way be needed on federal lands, further environmental analysis would be conducted prior to a decision on the right-of-way grant. A construction, operation, and maintenance (COM) plan or similar document would be prepared covering the construction of all project facilities on federal land. This plan would be submitted for approval to the authorizing agency before work begins on the ground. The COM plan would contain the following sections on site-specific stipulations:

- Fire Protection
- Clearing
- Visual Resources
- Erosion Control, Revegetation, and Restoration (specific guidelines for the Erosion Control, Revegetation, and Restoration section of the COM plan are included in this EIS as Appendix 7, Reclamation and Erosion Control Programs)
- Transportation
- Communications
- Cultural Resources
- Threatened and Endangered Studies and Mitigation (including a wildlife mitigation plan developed jointly by the UDWR, BLM, Fish and Wildlife Service, and the applicant)
- Studies of non-endangered or non-threatened wildlife species (including a wildlife mitigation plan developed jointly by the UDWR, BLM, and the applicant(s))
- Blasting
- Pesticide and Herbicide Use
- Health and Safety
  a. Solid Waste
  b. Emergency Response
  c. Air Quality
  d. Transportation
- Site Prescription
- Right-of-Way Maintenance and Monitoring

Because the actions would involve many types of terrain, soils, vegetation, land uses, and climatic conditions, the sections within the COM plan would include sets of techniques and measures tailored to each condition found.

Technical assistance and approval of written plans for federal lands would be obtained from BLM before construction.

Bureau of Land Management

GENERAL

1. The projects will be built, operated, maintained, and abandoned in accordance with permits issued under applicable laws, including the Clean Air Act, as amended (42 USE 1321), and the Clean Water Act (USCA 1251).

2. Permittees and other regular users of public lands affected by project construction will be notified in advance of any construction that may affect their businesses or operations, including the signing of temporary road closures. Permittees and other regular users will also be notified in advance of any proposed removal or cutting of fences or any proposed disturbances to range improvements or other structures.

CULTURAL RESOURCES AND PALEONTOLOGY

1. Before project construction, the company in consultation with the authorized officer and the Utah State Historic Preservation Officer, will use existing cultural resource data to develop a plan to locate cultural resources that would be directly or indirectly affected by the proposed project through use of a BLM Class III field survey.

   The inventory plan will define the extent and intensity of the site-specific cultural resource surveys. Resources identified during the field surveys will be evaluated in terms of eligibility for nomination to the National Register of Historic Places.

2. The company will provide an approved archaeologist to execute or monitor the survey for cultural resources during construction of all project facilities.

3. All significant cultural resources identified within the project area will be avoided wherever possible. For significant cultural resources that cannot be avoided, a Memorandum of Agreement with the Advisory Council on Historic Preservation and the Utah Department of Development Services, Division of State History, the BLM, and the applicant(s) will be developed that details specific mitigation measures in accordance with 36 CFR 800. All cultural resources discovered during construction that were not previously identified will be left undisturbed until they can be evaluated for significance.

4. The archaeologist will notify the BLM authorized officer by telephone or Form 8100-2 before beginning site monitoring. Construction methods will allow the archaeologist to identify buried cultural resources without endangering the workers who are monitoring the surface disturbance. If any potentially significant, buried resources are found and the archaeologist decides that further operations would seriously disturb cultural resources, work will be suspended and BLM will evaluate the resource and develop more stipulations as needed.

   The company will bear the cost of avoiding or salvaging any cultural resources found by the archaeologist. A report of all activities of the archaeologist will be submitted to BLM within 30 days after monitoring is completed.

5. The authorized officer(s) may require the company to relocate the proposed project components to avoid destruction of archaeological, paleontological, or historical values or to delay construction until salvage operations are completed. All archaeological and historical materials will remain the property of the United States and will be turned over to the BLM. Arrangements will be made for the proper care and maintenance of these resources with the BLM.

6. The company will provide a qualified paleontologist approved by the authorized officer to conduct an intensive survey of all areas to be disturbed according to significance and mitigation needs specified by BLM. The paleontologist will be on call during surface disturbance. If the paleontologist finds that paleontological values specified by BLM would be disturbed, construction will be halted until appropriate action can be taken.

LAND USE

1. Disturbance of improvements such as fences, roads, and watering facilities during construction or maintenance will be kept to a minimum. Any damaged facilities will immediately be restored to at least their former states. Functional use of these improvements will be maintained at all times.

2. When a fence line must be crossed, the fence will be braced on both sides of the passageway before being cut. A gate acceptable to the authorized officer will be installed in the gate opening and kept closed when not in use. Where a new road is being constructed, a cattle guard may be installed instead of a gate.

3. If a natural barrier used for livestock is broken during construction, the applicant(s) will adequately fence the area to prevent drift of livestock. Fence specifications will be determined on a case-by-case basis.

SOILS AND VEGETATION

1. Disturbed areas, which the authorizing agency believes to be unsuitable for successful revegetation, will be protected under the erosion control, revegetation, and reclamation provisions of the COM plan. This plan will state the method of protection to be used and the provisions for preventing site deterioration and introduction of noxious weeds. At a minimum, the COM plan will include the items described in the Reclamation Procedures section of this appendix for use on all on federally managed lands.

2. Prior to any proposed surface disturbing actions, a survey and clearance would be required to reduce the potential for significant endangered and threatened plant or habit loss. In some areas, resource development may not occur because of the presence of endangered or threatened plant species (BLM 1984b).

3. All trees will be cut so that stumps are no more than 6 inches high. The trees will be limbed and stacked adjacent to the construction area, and all slash (clearing and grubbing debris) will be spread over the reclaimed area during cleanup.

4. Mountain brush and tree-covered areas will be precleared and removed to designated areas before dozer blade work.

5. Fire control provisions will be included in the COM plan. The company will do everything reasonably possible, both independently and upon request of the authorized officer, to prevent and suppress fires on or near the lease area. The company will provide construction and maintenance crews as may be reasonably obtained for fire suppression.

6. The riparian zone of stream crossings will be rehabilitated immediately after construction is completed. Until vegetation is established, the disturbed area will be protected 300 feet back on each side of the stream to prevent sediment contamination to the stream and bank erosion.

7. Where the soil surface has been modified or natural vegetation removed, noxious weeds will be controlled.

8. Watering or other approved dust abatement procedures will be used to prevent severe wind erosion and soil loss during construction.

TRANSPORTATION NETWORKS

1. A transportation plan will be submitted as part of the COM plan. This plan will cover approval of temporary, reconstructed, and newly constructed roads and will include clearing work, signing, rehabilitation, and uses associated with transportation needs. Overland access could be specified in lieu of road construction or reconstruction.

2. Access roads needed for operating and maintaining the projects will be clearly identified. Some of these access roads may be designated by the authorizing agency as open for public use, including off-road vehicle (ORV) travel, and some roads may be closed to public use, with the approval of the authorizing agency, to protect public safety.

3. Portions of the lease conversion and other areas authorized for use will be used as access roads only when necessary and only during the construction period. The temporary access roads will be closed and vegetation cover reestablished after construction is completed. No continuous maintenance roads along linear facilities will be permitted.

4. The applicants will control ORV use within the lease conversion areas. Such specified control could include use of physical barriers, replanting trees, or other reasonable means of ORV control.

5. Gates or cattle guards on established roads on public land will not be locked or closed by the applicants, without the concurrence of the authorizing officer.

VISUAL RESOURCES

1. A plan to minimize visual impacts from the addition of structures will be required as part of the COM plan. The company will design and locate all facilities to blend into the existing environment where possible so as not to exceed the maximum degree of contrast acceptable for the Visual Resource Management classes for the areas in which the structures or construction disturbance would be located. The authorized officer will evaluate and approve measures before construction begins.

2. The edges of vegetation clearings in selected areas of dense shrubs and trees will be thinned or irregularly corrugated, or both, to avoid straight-line visual effects.

3. The company will paint all permanent structures (those on site for more than 90 days after construction) a flat, noncontrasting color that is in harmony with the adjacent landscape. Exceptions to this requirement would be small structures that are not readily visible from a distance of 0.25 mile (such as a wire or small pipe structures) that require safety coloration in accordance with OSHA requirements.

WILDERNESS

If a lease is converted that falls within a WSA, the lessee will acknowledge that the following described lands are being studied and evaluated for their wilderness potential by BLM under Section 603 of the Federal Land Policy and Management Act of 1976, 90 Stat. 2743 (43 USC 1782), and that exploration or production activities that are not in conformity with Section 603, may never be permitted. Expenditures in leases on which exploration drilling or production are not allowed will create no additional rights in the lease, and such leases will expire in accordance with law.

Activities will be permitted under the lease so long as the BLM determines they will not impair wilderness suitability, unless Congress has decided not to designate the wilderness study areas included within this lease as wilderness. Activities will be considered nonimpairing if the BLM determined that they met each of the following three criteria:

1. Activity must be temporary. This means that the use or activity may continue until the time when it must be terminated in order to meet the reclamation requirements of paragraphs 2 and 3 below. A temporary use that creates no new surface disturbance may continue unless Congress designates the area as wilderness, so long as it can easily and immediately be terminated at that time if necessary to manage the area as wilderness.

2. Any temporary impacts caused by the activity must, at a minimum, be capable of being reclaimed to a condition of being substantially unnoticeable in the WSA (or inventory unit) as a whole by the time the Secretary of the Interior is scheduled to send his recommendations on that area to the President, and the operator will be required to reclaim the impacts to that standard by that date. The Secretary's schedule for transmitting his recommendations to the President will not be changed as a result of any unexpected inability to complete the reclamation by the specified date, and such inability will not constrain the Secretary's recommendation with respect to the area's suitability or non-suitability for preservation as wilderness.

   The reclamation will, to the extent practicable, be done while the activity is in progress. Reclamation will include the complete recontouring of all cuts and fills to blend with the natural topography, the replacement of topsoil, and the restoration of plant cover at least to the point where natural succession is occurring. Plant cover will be restored by means of reseeding or replanting, using species previously occurring in the area. If necessary, irrigation will be required. The reclamation schedule will be based on conservative assumptions with regard to growing conditions, so as to ensure that the reclamation will be complete, and the impacts will be substantially unnoticeable in the area as a whole, by the time the Secretary is scheduled to send his recommendations to the President. (*Substantially unnoticeable* is defined in Appendix F of the Interim Management Policy and Guidelines for Lands under Wilderness Review.)

3. When the activity is terminated and after any needed reclamation is completed, the area's wilderness values must not have been degraded so far, compared with the area's values for other

purposes, as to significantly constrain the Secretary's recommendation with respect to the area's suitability or nonsuitability for preservation as wilderness. The wilderness values to be considered are those mentioned in Section 2(c) of the Wilderness Act, including naturalness, outstanding opportunities for solitude, or for primitive and unconfined recreation, and ecological, geological, or other features of scientific, educational, scenic, or historic value. If all or any part of the area included within the leasehold estate was formally designated by Congress as wilderness, exploration and development operations taking place or to take place on that part of the lease will remain subject to the requirements of this stipulation, except as modified by the Act of Congress designating the land as wilderness. If Congress does not specify in such Act how existing leases like this one will be managed, then the provisions of the Wilderness Act of 1964 will apply, as implemented by rules and regulations promulgated by the Department of the Interior.

WASTE DISPOSAL

1. Garbage and other refuse will be stored in containers at all times and disposed of at least once a week in an authorized, county-approved, sanitary site or landfill. Used engine oil changed on federally-managed lands will be stored in suitable containers and disposed of as refuse; no fuel, oil, or other hydrocarbon spills will be permitted. If such a spill accidentally occurs, the authorized officer will be notified immediately and corrective measures taken as directed.

2. Within 30 days after construction, all construction materials and related litter and debris will be disposed of in accordance with instructions from the authorized officer.

3. Materials capable of causing water pollution that would substantially harm fish, wildlife, or human water supplies, will be stored in facilities that will be located so as to prevent any accidental spills into waters or channels leading into water.

4. No wastes or by-products will be discharged if they contained any substances in concentrations that will substantially harm fish, wildlife, or human water supplies.

WATER RESOURCES

1. When rivers, streams, and washes need to be crossed for access to project facilities, existing roads or bridges will be used unless otherwise designated by the authorized officer. Culverts or bridges will be installed at points where new permanent access roads cross permanent streams to allow fish unobstructed passage. Where temporary roads cross drainages or dirt fills, culverts will be installed during construction and removed upon completion of the project. Construction will not be permitted in a perennial stream unless specifically allowed by the authorized officer. All stream channels and washes will be returned to their natural state.

2. Construction equipment will be refueled and maintained outside stream channels.

3. Construction will not block or change the natural course of any stream, except as provided by the authorizing officer.

WILDLIFE

1. The company will allocate enough funds and time before construction of any project element or related facility to perform Fish and Wildlife Service-approved surveys on any listed threatened or endangered species as required by the Fish and Wildlife Service Biological Opinion. No activities will be authorized until consultation is completed as specified by Section 7(c) of the Endangered Species Act. The Biological Opinion issued by the Fish and Wildlife Service as a result of the consultation process will specify the mitigation measures to be carried out by the company.

2. The company will comply with existing county, state, and federal laws involving the protection and preservation of feral horses, feral burros, raptors, and game and non-game wildlife.

3. No construction, disturbances, or permanent facilities will be permitted within the prescribed distance or during the breeding/nesting period of the following raptors unless approved by the authorized officer after consultation with the Fish and Wildlife Service and the Utah Division of Wildlife Resources.

Raptor	Distance	Dates
Golden Eagle	0.6 mile	March 1 - July 15
Red-Tailed Hawk	0.3 mile	April 1 - July 15
Swainson's Hawk	0.6 mile	April 1 - July 15
Prairie Falcon	0.6 mile	April 1 - July 15
Merlin	0.6 mile	May 1 - August 15
Harrier	0.6 mile	April 1 - July 15
Kestrel	0.6 mile	April 15 - July 15
Great-horned Owl	1.5 miles	February 1 - June 15
Long-eared Owl	0.5 mile	April 1 - July 1

State of Utah

1. Each applicant is required by Utah Code Annotated Section 63-51-10 (Supp. 1981) to submit a financial impact statement and plan to alleviate socioeconomic impacts. Approval of each applicant's plan will be required before issuance of any state permits required to start construction.

2. The Utah Division of Oil, Gas, and Mining (UDOGM), Department of Natural Resources and Energy, has responsibility for issuing permits or approval letters for the intention to commence mining operations for non-coal minerals, excluding sand and gravel operations, under the authority of the Utah Mined Land Reclamation Act, 1975. The purpose of this permit is to ensure protection of the environment before, during, and following mining.

   Operation requirements:

   — mine development and reclamation must proceed in accordance with the approved plan;
   — an annual report (Form MR3) must be filed.

3. The Utah Division of State Lands and Forestry (UDSLF), within the Department of Natural Resources and Energy, has responsibility for issuing right-of-way/right-of-entry permits under the authority of Utah Code Annotated, 1953, Title 65. The purpose of this permit is to protect the environment and prevent illegal entry to state lands.

   Operation requirements:

   — Following approval, permittee must fully comply with all stipulations;
   — Federal specifications will apply to the state lands where federal lands are also involved and a federal right-of-way permit has been granted.

4. The Utah Division of Environmental Health (UDEH), Bureau of Air Quality, Department of Health, has responsibility for approving air pollution sources, under the authority of the Utah Air Conservation Act. The purpose of this permit is to prevent air pollution by any air pollution source except comfort heating.

   Operation requirements:

   — No operating permit is required;
   — Periodic inspection must be completed to ensure compliance with permit requirements;
   — Periodic source testing must be conducted at the source's expense.

5. The UDEH, Bureau of Hazardous Wastes and Radiation, Department of Health, has responsibility for approving plans for hazardous waste management, treatment, storage and disposal facilities, under the authority of the Utah Solid and Hazardous Waste Act. The purpose of the permit is to prevent faulty construction of facilities that may constitute hazardous conditions.

6. The Department has responsibility for the National Pollutant Discharge Elimination System program.

7. Utah Wastewater Disposal Regulations, 1978. Part II, Standards of quality for waters of the state protected designated beneficial uses of state waters against controllable pollution.

RECLAMATION PROCEDURES

The following guidelines will be included as stipulations in the right-of-way grants and mineral leases issued to the applicants.

As part of their standard procedures, the applicants will implement erosion control and revegetation measures to assure that lands disturbed by construction and operation would be restored to a stable, productive, and aesthetically acceptable condition.

A detailed, site-specific reclamation plan will be developed and become part of the COM plan. Because the proposed leases and project component sites consist of many types of terrain, soils, vegetation, land uses, and climatic conditions, the detailed plan would include sets of techniques and measures tailored to each condition found. Local expertise and locally effective reclamation methods will be followed when

developing the site-specific procedures for the detailed reclamation plan. The erosion control, revegetation, and restoration guidelines and COM plan will be implemented under the direction of the appropriate agency.

Detailed information on applicable techniques and technical assistance for private landowners concerning erosion control measures and reclamation procedures will be obtained from the Soil Conservation Service (SCS) through local soil conservation districts. Technical assistance and approval of written plans for use on federally-managed lands would be obtained from BLM before any construction.

During construction of applicant projects, an on-site reclamation specialist will be employed by the applicants to provide (1) liaison with private landowners, federal agency officials, and local governments; (2) expertise to direct restoration procedures to avoid construction delay when special conditions are encountered; and (3) favorable public relations. General erosion control and restoration measures have been developed for the following areas and will be included as part of the COM plan:

Right-of-Way and Site Clearing

The following measures would be used during right-of-way and site clearing:

— Land would be graded only on the area required for construction.

— Sidehill cuts would be kept to a minimum to ensure resource protection and a safe and stable plane for efficient equipment use. The authorizing agency would provide assistance and approve sidehill cuts for construction.

— Existing ground cover such as grasses, leaves, roots, brush, and tree trimmings would be cleared and piled only as needed. Slash would be piled and later shredded and chipped for use in restoration or disposed of at the discretion of the authorizing agency.

— Trees and shrubs on the right-of-way and surface mine areas that are not cleared would be protected from damage during construction, operation, and maintenance.

— Where the right-of-way crossed streams and other water bodies, the banks would be stabilized to prevent erosion. Construction techniques would lessen damage to shorelines, recreational areas, and fish and wildlife habitat.

— Care would be taken to avoid oil spills and other types of pollution in all areas, including streams and other water bodies and their immediate drainage areas. All spills would be immediately cleaned up.

— Design and construction of all temporary roads would be based on an approved transportation plan and would ensure proper drainage, reduce soil erosion, and preserve topsoil. After abandonment, these roads would be closed and the area restored without delay or maintained at the discretion of the landowner. Restoration, including redistribution of topsoil, would be to the satisfaction of the landowner, authorizing agency, or both.

— During adverse weather, as determined by the on-site reclamation specialist, the authorizing agency would issue stop and start orders to prevent rutting or excessive tracking of soil and deterioration of vegetation in the rights-of-way.

— Construction would immediately follow clearing, especially where soils are subject to high wind or water erosion and in other special areas.

Trenching, Surface Mining, Preservation of Topsoil (Favorable Plant Growth Material), and Overburden Handling

— For right-of-way facilities, mining areas, and spent sand disposal areas, topsoil and favorable plant growth material would be removed as specified by the authorizing agency. (These materials would be stored separately, protected, and replaced last during backfilling.)

— Remaining unearthed materials would be removed and stored to facilitate backfilling procedures, to use the least possible area, and to protect from erosion and vehicle and equipment traffic.

— Cofferdams or other diversionary techniques would be used, where needed, to permit flow in one part of a stream while construction occurs in another.

— An excavated material stockpile procedure, developed by both the authorizing agency and applicants, would be used on steep-sloping and rough, broken terrain to lessen disturbance.

Backfilling and Grading

— Backfill would be replaced in a sequence and density similar to the predisturbance soil condition.

— Backfilling would be done to minimize more vegetation disturbance.

— The contour of the ground would be restored to permit favorable surface drainage.

— In strongly sloping and steep terrain, erosion control structures such as water bars, diversion channels, and terraces would be built to divert water from the pipeline trench and reduce soil erosion along the right-of-way and other adjoining areas that would be disturbed during construction.

— Surface mining and spent sand disposal areas would be graded and shaped to allow adequate slope stability, soil erosion control, and establishment of vegetation cover.

— The surface would be graded to conform to the existing surface of the adjoining areas except for a slight crown over the trench to compensate for natural subsidence. In cropland areas, especially border-and-furrow-irrigated cropland, the soils (backfill) within the trench would be compacted, and the crown smoothed to match the bordering area and to allow surface irrigation.

— Topsoil would be replaced evenly over the trench fill and other disturbed areas to restore productivity to the predisturbance condition.

— Materials that cannot be used for backfilling and excess backfill material would be disposed of as arranged by the authorizing agency.

— Temporary work space areas used at stream and highway crossings and other special sites would be restored to near-predisturbance conditions and to the satisfaction of the authorizing agency.

— The right-of-way at stream crossings would be restored to a predisturbance state. The upland area and banks would be revegetated to predisturbance conditions, where possible, or mulched with rock. The rock mulch would have a larger diameter than materials excavated from the trench. The streambed would be returned to its original contours with sediments like those excavated.

Land Preparation for Seeding and Cultivation

Construction, backfilling, and grading often cause compaction and alter soil conditions that affect soil productivity and seeding success. The following techniques would be used to improve soil conditions, protect soil from erosion, and provide a favorable seedbed:

— In cropland areas, as required by the authorizing agency or landowner, subsoiling or chiseling would be used to ensure that soil compaction is reduced and predisturbance soil permeability is restored.

— Chiseling would be used in rangeland areas to reduce compaction and improve soil permeability unless the landowner or authorizing agency objects. Pitting and contour furrowing, as directed by the authorizing agency or landowner, would be done on steeper slopes of disturbed areas to increase infiltration and reduce runoff and erosion.

— Suitable mulches and other soil stabilizing practices would be used on all regraded and topsoiled areas to protect unvegetated soil from wind and water erosion and to improve absorption.

— In critical areas where wind and water are serious erosion hazards, special mulching practices or matting would be needed to protect seeding, seedlings after germination, and plantings.

— Commercial fertilizers would be applied to soil areas with low inherent fertility to maintain crop yields and establish grass seedings. Fertilizer would be applied according to annual precipitation and amount of irrigation water.

— Seedbeds for areas seeded to grass would be prepared to provide a firm and friable condition suitable for establishing grass stands.

— Rock mulches would be used in steep-sloping rock outcrop areas and low precipitation areas to reduce erosion and promote vegetation growth.

— Land would be prepared and cultivated on the contour in steeply sloping areas to lessen erosion.

— Soil areas with rock fragments, such as very coarse gravel, cobble, or scattered stone, would be restored to the near-predisturbance surface condition to blend with the adjoining areas, to avoid a smooth surface areas, and to control accelerated erosion.

Revegetation (Reseeding and Planting)

To ensure successful revegetation, reseeding and planting procedures would be consistent with local climate and soil conditions and would follow the recommendations and directions of local experts. Revegetation efforts would be continued until a satisfactory vegetation cover is established. The following practices and techniques would be used in areas where reseeding is suitable as determined by the authorizing agency:

— A firm seedbed would be prepared before seeding and would include a mulch of plant residues or other suitable materials. A cover crop may be needed in larger disturbed areas.

— Seed would be planted by drilling, broadcasting, or hydroseeding. Drilling is the preferred method because it is usually successful. Drill seeding with a grass drill equipped with depth bands would be used where topography and soil allow operation of equipment to meet the seeding requirements of the species being planted. Broadcast seeding would be used for inaccessible or small areas. Seed would be covered by raking or harrowing. Critical areas would be hydroseeded as determined by the reclamation specialist or authorizing agency.

— Only species adaptable to local soil and climatic conditions would be used. Generally, these would be native species, but introduced species may be considered for specific conditions when approved by the landowner and authorizing agency. Seeding rates in critical areas would be increased by 100 percent over regular seeding rates, which would compensate for seed mortality from adverse growing conditions.

— Seeds would be tested to meet state, federal, and authorizing agency seed requirements.

— Areas would be seeded when seasonal or weather conditions are most favorable and as determined by the landowner or authorizing agency.

— Grazing or mowing would be delayed at least two seasons after seeding to provide time for vegetation to become established, especially in highly erodible areas. Protective fencing may be needed in special areas and would be built, maintained, and removed according to authorizing agency specifications.

— In areas with low annual precipitation (generally less than 8 to 10 inches) where reseeding is not suitable or as successful as in higher precipitation areas, erosion control structures and measures would be applied on sloping areas to reduce accelerated erosion and allow reestablishment of surface soils to predisturbance conditions and natural revegetation.

— Trees and shrubs would be reestablished in areas as specified in the revegetation plan.

Maintenance and Monitoring

The applicant and authorizing agency would jointly inspect reclaimed areas to monitor the success and maintenance of erosion control measures and revegetation programs on native grazing land for two growing seasons or for a period determined by the landowner on private land or by the authorizing agency on state or federal land. The monitoring program would identify problem areas and corrective measures to ensure vegetation cover and erosion control. The success of revegetation and erosion control would be determined by the landowner or authorizing agency.

Use of Biochemicals

Biochemicals such as herbicides, fungicides, and fertilizers would be used according to state and federal laws, regulations, and policies. State and federal wildlife agencies would be contacted if any biochemicals were to be applied on or near sensitive wildlife areas. These biochemicals would be applied using ground methods. Before using such substances on or near the permit or grant area, the applicant would obtain approval of a written plan for such use from the authorizing agency, landowner, and appropriate wildlife agency. The plan would outline the kind of

chemical, method of application, purpose of application, and other information as required, and would be considered as the authorized procedures for all applications until revoked by the authorizing agency. This plan would become part of the COM plan.

APPLICANTS' STANDARD CONSTRUCTION AND OPERATION PROCEDURES

Beartooth, Bradshaw, Duncan, Farleigh, and Thompson

Beartooth, Bradshaw, Duncan, Farleigh, and Thompson have committed to the following measures:

1. **Clearing.** Before topsoil is removed, the area to be disturbed must be cleared of brush that may interfere with operations. Areas having only grass will not be cleared unless leveling is necessary. Grading and contouring will be done in accordance with good soil conservation and erosion practices. The vegetation will be incorporated into the topsoil to provide a natural seed source and additional organic matter.

2. **Topsoil Stripping and Storage.** Topsoil from access roads will be dozed to the side and placed into a windrow for storage while the road is being constructed. Following completion of the road surface and contouring of the roadsides and ditches, the topsoil will be respread along the roadsides.

   Because exploration would last 15 days or less, topsoil stockpiles will not be seeded. Vegetation would not become established before the topsoil is redistributed. In the case of the pilot site and the commercial facility site, the stockpiles would be seeded.

3. **Topsoil Replacement.** Topsoil will be dozed from the windrows and storage areas and used for the regraded surfaces. Topsoil will be respread to a relatively uniform depth over the disturbed areas. Handling and rehandling of topsoil will be kept to a minimum to prevent compaction and contamination.

4. **Addition of Soil Properties.** The topsoil will be sampled to determine the need for soil amendments. Analysis will include a survey for phosphorus, pH, sulfate sulfur, extractable potassium, organic matter, and nitrate nitrogen.

   If testing indicates a need for additions, appropriate levels of fertilizer will be broadcast prior to discing.

5. **Seeding.** Seed mixtures will be used as recommended by the BLM at the time of reclamation. Steeper areas will be broadcast seeded at twice the seed weight per acre.

6. **Mulching.** Grass, hay, or straw will be applied to the surface at a rate of 2 to 2.5 tons per acre. The mulch will then be crimped into the sod surface to prevent it from being blown away.

7. **Maintenance.** The revegetated areas will be inspected periodically and maintained as necessary. Maintenance could include mowing weeds, using herbicides, controlling rodents, controlling grazing, or reseeding.

8. **Soil Erosion Control.** The amount of vegetation to be removed and of the ground to be displaced to accommodate both the pilot and commercial project is expected to be minimal. This area is basically arid; because of the small amount of grading and vegetation displacement that would occur, soil erosion from surface runoff is expected to be minimal.

9. **Reclamation Timetable.** The first 10-acre site would be reclaimed after potential reserves have been extracted. Afterwards, a stage-by-stage reclamation process would be instituted with each passage of the commercial phase. Basically, this amounts to "covering the tracks" of the project as it is relocated on the next adjacent 10 acres.

10. **Pollution Control.**

    a. The *in situ* process planned for these leases is a self-contained system in which produced water will be re-used. Therefore, no waste water from the production system that could damage surface or ground water will be disposed of. As an added precaution, however, water quality assessments should be performed before water

is reinjected for the pilot and commercial phases.

b. Some noise pollution from equipment could occur, but all engines will be equipped with approved mufflers.

Enercor

Enercor has committed to the following measures:

1. **Predevelopment Control.** Environmental control features will be constructed before work begins. Dams and ditches for water control will be constructed first.

   Settlement ponds for runoff water will be constructed so that water can be collected.

   Natural vegetation will be retained whenever possible. Where areas must be disturbed, topsoil will be retained, replaced after completion of construction, and planted with local species to limit crown.

   Unpaved roadways will be sprinkled to limit dust.

2. **Plant Construction Protection Measures.** Facilities will be constructed in such a manner that environmental impacts are minimized as much as possible during the operating phase. The following measures will be taken:

   a. Building exteriors will be designed to complement the natural environment.

   b. Ponds will be lined to prevent seepage in order to conserve water or prevent ground water contamination.

   c. Plant roads will be paved early in the construction program to minimize dust.

   d. All tanks and facilities holding oil liquids will be bermed or properly drained to provide for containment of oil products. Floating roofs or vapor recovery will be used for all volatile hydrocarbon storage tanks.

   e. Adequate fire protection facilities will be provided to contain possible fires on site.

   f. Waste water will be recycled for construction requirements to minimize water consumption. Ultimately, all construction waste water will evaporate.

   g. All emissions (such as from open burning) will be controlled and approval obtained from the State EPA and the Utah Bureau of Air Quality.

   h. Techniques to suppress dust may be required on earthen storage piles.

3. **Mine Land Restoration.** Reclamation of spoil piles will proceed concurrently with mining as soon as adequate space is available to safely proceed with reclamation operations. This safety requirement will probably require one spoil pile ridge between the ongoing mining operations and the reclamation operations.

   During mining operations, any acid or toxic spoil will be identified prior to mining, and special efforts will be made to place those materials in the spoil pile at depths that will reduce the possibility of this material causing water pollution or interfering with revegetation efforts.

   Following the shaping of the spoil piles during reclamation, the previously stockpiled topsoil or lower horizon capable of supporting plant growth will be spread to a suitable depth consistent with the requirements of the plant species being planted.

   Plant species, spoil requirements, soil amendments, mulching and planting time requirements will be determined during the premining baseline studies. Seedbed preparation, planting, and subsequent monitoring to assess reclamation efforts will be under the supervision of qualified specialists.

   Monitoring of reclaimed areas will be required to assess restoration success and to ensure that the reclamation goals are met according to regulatory requirements.

Sedimentation ponds will be reclaimed when specific sedimentation ponds are determined to be no longer required. Generally, this will happen when the disturbed lands, upgraded from the sedimentation ponds, have been reclaimed and revege-

tated to the point where sediment runoff is at or below baseline conditions.

During reclamation of sediment ponds, any accumulated sediment will be removed from the pond area and returned to the mine spoil area. Depending on the manner in which the sediment ponds were constructed, the depression will be filled with suitable, non-eroding material and any embankment removed to return the area to the original topographic configuration. The disturbed area will be revegetated with approved plant species as appropriate.

Roads will be reclaimed by removing surfacing materials and returning and burying them in the spoil pile. The roads will be backfilled and regraded to blend with the post-mining contours and revegetated. Regulatory authorities may want certain main haul roads left for access into the area. In such instances, arrangements will be made to transfer control of these roads to the appropriate authorities.

Mine surface facilities (such as the shopwarehouse, office building, electrical distribution lines connected with the mining operation) will be removed and disposed off site. Paved areas will also be removed and disposed off site. The surface of compacted areas will be ripped to loosen the surface and then revegetated.

4. **Reclamation.** After the tar sand resource has been exhausted and operations ended, the land occupied by the plant will be reclaimed to predisturbance conditions. The plant and all buildings will be removed and the disturbed areas reseeded or replanted with native vegetation.

   This will include salvaging and removing all equipment, stores, and aboveground structures, and destroying foundations. Underground pipe galleries and manholes will be collapsed and plugged. All disposal sites for sewage and solid waste will be filled, sealed, and covered.

   Plant facility areas will be covered with waste earth, as needed or required, to conform with adjacent undisturbed land. Power lines and pipelines will be removed; haulage roads, access roads, and conveyor corridors will be regraded and contoured. Dump and tailings pond areas will be reclaimed according to the mine reclamation plan.

   All areas will be fertilized and seeded with appropriate seed mixtures. Revegetation, irrigation, and monitoring will be maintained in accordance with permit requirements until restored and release of bonding requirements are authorized by the appropriate agencies. At that time, monitoring equipment will be removed or left in place at the discretion of the regulatory agencies.

   Some of the project components, such as water lines, power lines, or roads, may have a use beyond the life of the project. The company may choose to sell or grant such facilities to interested parties. When submitted and approved by the regulatory authority, the tar sand reclamation plan will become a binding legal contract and the provisions will be followed throughout the duration of the permit. A number of considerations and contingencies must also be included in the complete mine plan to cover problems such as equipment breakdowns or seasonal weather conditions. All possible problems, within reason, will be addressed in the final reclamation plan.

Enserch

Enserch has committed to the following measures:

1. **Wildlife Protection.** Presently only the first step in protecting wildlife has been taken: inventories. Based on these inventories, site-specific mitigation will be proposed.

   To date, mammals, birds, reptiles and amphibians, and fish have been inventoried.

2. **Vegetation.** Plant life on the lease and in the general area has been inventoried. Areas disturbed during construction would be revegetated with native species identified in the plant inventory. Vegetation regrowth may be slow and difficult due to typically low precipitation levels. Because it would be genetically desirable to revegetate with seed material similar to that found within a 20 to 30 mile radius of the project, that approach would be attempted.

3. **Health and Safety.** Health-related issues will focus on environmental health and occupational considerations. Because of the remoteness of the project area and the fact that the anticipated production

activities of the tar sands will be self-contained, the potential for significant environmental health impacts is considered low. However, this assessment must be closely coordinated with water and air quality assessments throughout the pilot and commercial phases to ensure that toxic chemicals are not released into the environment, thereby causing adverse environmental health effects.

Occupational health considerations would focus on the same production and handling of the bitumen and residual by-products. OSHA standards would be followed to ensure worker safety. An assessment must be made to determine whether any of the hydrocarbons are carcinogenic and procedures developed to ensure their safe handling. In addition, the type and composition of air emissions from the project must be assessed to determine whether workers will be exposed to toxic levels of substances.

Because of the remoteness of the project site, the primary safety concern is the effect of equipment failure on workers. Additional safety considerations will be developed relating to the transportation of the product, depending on the actual mode of transportation used.

Based on the operating history of the proposed *in situ* production equipment, a high level of safety is anticipated. However, with the use of any equipment, failures could occur. Therefore, a risk management assessment is needed to determine the probability of occurrence of system component failures and the consequences of such failure. The most cost-effective approach to risk management can be developed once the risks are known.

OSHA regulations will be followed to ensure worker safety during all project phases.

4. **Fire Prevention Measures.** To reduce the possibility of fire, a vegetation-free area would be established in the area immediately surrounding the proposed pilot and commercial well site. Mobile fire equipment, such as fire extinguishers, would also be available on site as well as water, although in limited quantities. Any fire that might occur is expected to be localized due to the relative absence of vegetation in this area.

5. **Soil Erosion Control.** The amount of vegetation to be removed and the ground to be displaced to accommodate both the pilot and commercial project would be minimized.

6. **Surface and Ground Water Pollution Control.** The planned *in situ* process is self-contained. Since produced water will be reused, no waste water from the production system will be disposed of that could damage surface or ground water. As an added precaution, however, water quality assessments would be performed prior to reinjection throughout the pilot and commercial phases.

7. **Pollution Control.** Air pollutant emissions from production are not expected. However, the type and composition of air emissions from the pilot and commercial project must be assessed. Some noise pollution from equipment could occur, but all engines will be equipped with approved mufflers.

8. **Reclamation.** All disturbed areas will be reclaimed. The disturbed areas include the pilot site area after the mobile support facilities have been relocated and the road after it is no longer needed to reach the pilot and commercial project. The sides of the access road will be reclaimed as will the surface of the road. Reclamation will include the following:

   a. *Clearing.* Prior to removing topsoil, the area to be disturbed would be cleared of any brush that may interfere with operations. Areas having only grass would not be cleared unless leveling is necessary. Areas would be graded and contoured, as needed, in accordance with approved soil conservation and erosion practices. Vegetation would be incorporated into the topsoil to provide a natural seed source and additional organic matter.

   b. *Topsoil Stripping and Storage.* Topsoil from access roads to be upgraded will be dozed to the side and placed into a windrow for storage while the road is being constructed. After road surfacing and contouring of the roadsides and ditches are completed, the topsoil would be respread on the roadsides.

      Topsoil stockpiles will be needed only during the pilot phase. Stockpiles would not be seeded until the commercial phase begins because vegetation could not become established until the topsoil is redistributed. If the pilot site is used as the commercial facility site, or if

vegetation reestablished itself during the pilot phase, topsoil stockpiles would be reseeded.

c. *Topsoil Replacement.* When the equipment from a particular 10-acre tract has been relocated, topsoil will be dozed from the windrows and storage areas back into the regraded surfaces. Topsoil will be spread to a relatively uniform depth over the disturbed areas. Handling and rehandling of topsoil will be kept to a minimum to prevent compaction, contamination, and fugitive dust emissions.

d. *Addition of Soil Properties.* The topsoil will be sampled to determine the need for soil amendments. Analysis will include a survey for phosphorus, pH, sulfate sulphur, extractable potassium, organic matter, and nitrate nitrogen.

If testing indicates a need for additions, appropriate levels of fertilizer will be broadcast prior to discing.

e. *Seeding.* Seed mixtures will be used as recommended by the BLM at the time of reclamation. Steeper areas will be broadcast seeded at twice the seed weight per acre.

f. *Mulching.* Grass, hay, or straw will be applied to the surface at a rate of 2 to 2.5 tons per acre. The mulch will then be crimped into the soil surface to prevent it from being blown away.

g. *Maintenance.* The revegetated areas will be inspected periodically and maintained as necessary. Maintenance could include mowing weeds, using herbicides, controlling rodents, controlling grazing, or reseeding.

9. **Timetable for Reclamation.** The first 10-acre site would be reclaimed in 4.6 years, after potential reserves have been extracted. Afterwards, a stage-by-stage reclamation process would be instituted every 4.6 years. Basically, this amounts to *covering the tracks* of the project as it is relocated on the adjacent 10 acres.

Kirkwood

Kirkwood has committed to the following measures:

1. **Soil Erosion Control.** Soil erosion is not expected to be a major concern. The sites will be constructed to route any storm water into natural drainage channels. Roads that may be constructed for access to the sites will be designed so that erosion will be prevented or controlled. Roads frequently traveled will be maintained to control erosion.

2. **Surface and Ground Water Pollution Control.** No pollution of either surface or ground water is expected as the result of any activity. During drilling, surface waters such as storm waters will be diverted around the drilling pads and produced water will be contained in a pit or disposed of in an approved manner. Since no major aquifers are expected to be encountered during the drilling of wells, pollution of ground water should not be a problem. During the development phase, surface waters will be diverted around each site and within areas, such as the fuel storage area; water will be contained within the fire walls and will be disposed of in an approved manner.

3. **Pollution Control.** Air pollution during drilling activities will primarily be limited to exhaust from the rig and vehicles associated with the drilling activities. Air drilling operation, however, can produce significant quantities of dust that, depending on wind conditions, could lightly blanket a wide area. To eliminate this problem, dust suppression methods will be used during drilling and any produced dust will be limited to the pit area. Minor noise pollution could also occur in the vicinity of drilling operations.

Air pollution from development sites will be primarily limited to exhaust from equipment and gases produced during the test. After production, most of the gases will be used in the equipment with the rest flared in an approved manner or shipped out of the area. Composition and rates of projection of these gases will be determined more conclusively during tests conducted during the exploration and pilot phases. Some minor noise pollution from the equipment could occur, but all engines will be equipped with approved mufflers.

Approved dust control methods will be instituted during the development phase to control the problem of dust caused by heavy truck traffic on access roads.

4. **Public Health and Safety.** During construction, only authorized personnel will be allowed at the site. During operations, only authorized personnel will be allowed on the sites. Roads from Highway 88 into the development site will be marked to warn motorists of heavy truck traffic and other hazards that may exist during the development phase. Markings will be coordinated with Uintah County and BLM.

5. **Fire Prevention and Control.** During the development phase, if a fire developed, it is expected to remain localized due to the absence of dense vegetation in the lease area. In addition, brush will be removed from the drilling pads and each development site as necessary. The American Petroleum Institute and OSHA safety procedures will be observed at all times on locations. Fire extinguishers will be available at all times and normally over 100 barrels of water will be stored at each site. Operators will be trained in proper fire safety and firefighting techniques. Fire walls will be built surrounding the fuel storage tanks, the product storage tanks, and each production well. Housing will be located away from equipment and flammable materials.

6. **Abandonment and Reclamation Procedures.** As it becomes necessary, the wells drilled during the development phase will be abandoned using procedures approved by the appropriate controlling agency. After abandonment, restoration of the development site, access roads, and other lands affected by development operations will be undertaken. Restoration procedures will consist of measures approved by the surface management agency including recontouring the development site and roads, replacing the topsoil and revegetating the affected area. In the case of *in-situ* processes and because the wells would be closely spaced, it may be preferable to abandon the wells so that no evidence of the well remains visible.

Mobil

Mobil has committed to the following measures and procedures:

EXPLORATION PHASE

All work will be performed in accordance with approvals to explore received from the Utah Division of Oil, Gas, and Mining; Utah Division of State Lands and Forestry; and the BLM. Disturbed areas will be reclaimed in accordance with the requirements of the permits.

1. **Soil Erosion Control.** To the extent practical, vehicle activity will be limited to existing roads. As many holes as possible will be drilled in roads. The reconnaissance program will be conducted, on foot, from existing roads.

   When holes cannot be drilled on existing roads, it is expected that the surface disturbed at drill sites will be less than 500 square feet.

   After drill holes have been plugged, surface disturbance associated with the holes will be reclaimed as required by the Division of Oil, Gas, and Mining and BLM.

2. **Surface Water and Ground Water Pollution Control.** Portable mud pits will be used to prevent contamination of surface waters. Steps to limit erosion will also limit increased sedimentation drainages. All vehicle oil and other waste will be controlled and properly disposed. Wet holes will be plugged in accordance with *Guidelines for Plugging Mineral Test Holes* (1955). Drill holes that do not encounter fluids will probably be backfilled with drill cuttings and contain a 5-foot plug of cement. All plugging procedures will be approved by the Division of Oil, Gas, and Mining and BLM. These steps and use of portable mud pits should prevent ground water pollution.

3. **Pollution Control.** Combustion emissions from vehicles and the field camp will be minimized through routine maintenance of equipment. Fugitive dust will be minimized by limiting surface disturbance and by responsible handling of vehicles on roads.

4. **Protection of Other Natural Resources.** Prior to exploration, a cultural resource field inventory will be conducted. Any significant sites will be avoided during exploration to allow sufficient time for documentation of the sites and for development of mitigation measures for those that would be affected by mining.

5. **Reclamation.** Reclamation and grading will be accomplished as soon as possible after drilling is completed, preferably in September and October.

Any drill sites located off existing roads will have the topsoil scraped to one side prior to drilling. Following drilling, each hole will be plugged and the remaining cuttings will be spread evenly over the site. Topsoil will then be replaced and the site will be seeded with the seed mixture shown on Table C-1. Following seeding, the site will be mulched with 1.5 to 2 tons of straw per acre.

If any other off-road areas are disturbed or any new roads are created in the exploration program, they will also be seeded and mulched. Reclamation procedures will be approved by the Division of Oil, Gas, and Mining and BLM.

PILOT PHASE

Since the tar sand is exposed or near the surface of the pilot mine location, little or no overburden or topsoil should be encountered. If amounts are sufficient, topsoil will be stockpiled when practical. The following summarizes general steps to minimize environmental impacts:

1. **Soil Erosion Control.** To the extent practical, vehicle activity will be limited to existing roads. Pit walls will be maintained at slopes to minimize erosion.

2. **Surface Water Pollution Control.** A stabilized and lined diversion ditch network will be maintained upslope of each pilot pit. Any flow into the pit will be allowed to evaporate. Good housekeeping practices will be employed to prevent any oil or chemical spills associated with vehicles or pilot mine facilities.

3. **Pollution Control.** Combustion emissions from vehicles and the pilot mine facilities will be minimized through routine maintenance of equipment. Fugitive dust will be minimized by watering, limiting surface disturbance, and by responsible handling of vehicles on roads.

4. **Protection of Other Natural Resources.** Prior to mining activities, a cultural resource field survey will be conducted. Any significant sites will be avoided during mining to allow documentation of the sites and for development of mitigation measures for those that would be affected by mining.

5. **Reclamation Procedures.** No interim reclamation of the pits will take place, although the areas will be fenced after initial development to prevent livestock and wildlife from entering the pit area. Descriptions of the pits will be incorporated into the commercial mine plan, and final reclamation of the pilot mines will be accomplished along with the overall reclamation plan.

COMMERCIAL OPERATION

An extensive field data collection program is planned that would provide the necessary detail to define environmental impacts and, therefore, environmental controls. Until environmental baseline data is available and until project design is developed further, this discussion must be general. Current data indicate that efforts to decrease environmental impacts will be required.

1. **Surface Water Pollution Control.** All rainfall, snow melt, or other runoff sources will be diverted around facilities to avoid any impairment of surface water flows unless a water right is obtained to use the water. Pipelines, reservoirs, or other water supply structures will be constructed to minimize any local and regional environmental degradation or disturbances. If any impairment of surface water rights occurred, the program will be augmented to mitigate or otherwise correct the impairment. Measures for locating or developing alternative sources of supply will be provided to any party who is impaired.

   The plant facilities will be designed as a zero-discharge operation and thus should have no impact on surface water quality. To ensure this, protective berms, dikes, or other overflow control measures will be instituted to assure that contaminants do not migrate off site. Any spills or overflow of fluids will be contained, treated, and recycled within the facilities.

2. **Ground Water Pollution Control.** If ground water is used to supplement surface water supplies, an extensive monitoring system will be developed and constructed to measure any potential disruption or impairment of the geohydrologic regime or other water rights. Best engineering or hydrogeologic practice and design will be used in designing and operating ground water supply facilities.

   If ground water is encountered during mining operations, a suitable mitigation program will be undertaken (such as off-site reinjection) to minimize potential hydrologic impacts.

TABLE C-1
SEED MIXTURE FOR DRILL SITES

Scientific Name	Common Name	Seeding Rate (Pounds/acre)
Agropyron desertorum	Standard Crested Wheatgrass	6
Agropyron smithii	Western Wheatgrass	6
Bromus inermis	Smooth Brome	3
Poa ampla	Sherman Big Bluegrass	2
Onobrychis viciaefolia	Sainfoin	1
Atriplex canescens	Four Wing Saltbush	1
	Total:	19

Containment on site will use construction of impervious surfaces or sealers to preclude seepage into the local ground water system.

3. **Fish and Wildlife Protection.** Disturbed habitat areas will be reclaimed so they support resident wildlife populations. Mined areas will be regraded to topography which is consistent with adjacent landscape and topsoil replaced to facilitate vegetation. Plant species will be established which have known forage and cover value to wildlife. Particular attention will be given to establishing a diverse complex of woodland, shrub, and grassland areas.

   In compliance with the Endangered Species Act and before commercial development, Mobil expects to perform a threatened and endangered species survey as a part of baseline monitoring.

4. **Protection of Other Natural Resources.** Cultural resource surveys will be conducted prior to any disturbance. Appropriate clearances will be obtained from regulatory agencies before operations begin. In some instances, sites will be fenced or otherwise marked to aid in avoiding them. Mobil will initiate procedures to ensure its personnel are familiar with the location of identified sites and will instruct them to avoid disturbing these sites. If a site would be involved in the mining process, the operator will, in consultation with appropriate regulatory agencies, obtain a determination of the significance of such a site and follow the established procedures to mitigate impacts, as appropriate. If buried cultural resources are unearthed during mining and construction activities, the operator will notify archaeologists from the appropriate regulatory agencies prior to proceeding. Required clearance procedures will continue to be followed for any associated mining activities not previously cleared.

5. **Reclamation Procedures.** All areas disturbed during mining of the tar sands resource will be reclaimed in accordance with state and federal regulations and acceptable technical procedures. The final reclaimed area will be designed to be compatible with the surrounding natural communities, will provide soil stabilization and protective ground cover, and will be restored to a land use and productivity comparable to the premining condition.

   The revegetation plan will focus on the return of productive communities of grassland and shrubland appropriate for the post-mining uses of the area. Reclamation will directly follow mining to minimize the total acreage disturbed and exposed to erosion at any one time.

   a. *Topsoil Handling and Replacement.* Topsoil materials or subsoil substitute materials, where available, will be removed before any drilling, mining, or other surface disturbance occurs, unless prior approval for other techniques has been obtained from regulatory authorities. Soil tests and surveys conducted prior to mining will determine those soil horizons which are to be

segregated as productive topsoil. Soil tests and surveys also will be used to identify any harmful soil or overburden materials. Such materials will be appropriately treated to alleviate their harmful effects or will be buried to prevent effects on plant growth or development of conditions toxic to livestock and wildlife.

Redistribution of soils will be conducted in such a manner as to achieve a uniform stable thickness consistent with post-mining land uses, slopes, and surface drainages. Excessive compaction of the topsoil may be eased by ripping the area prior to seeding to break up any compacted areas and create a seedbed suitable for revegetation. Soils will be appropriately handled to prevent any potential contamination of ground and surface waters from debris, acid-forming substances, toxic materials, or materials constituting a fire hazard.

Erosion control techniques, such as terracing, contouring, and sediment ponds may be used, if necessary, to minimize erosion from disturbed areas. Berms may be placed around the reclaimed area to prevent eroding sediments from affecting undisturbed areas.

Except for the initial cut, all available topsoil and subsoil material will be redistributed over a graded backfill surface. For the initial cut, a small valley fill adjacent to the mining site will be developed for overburden placement. The material will be graded, mulched, and seeded with a fast-growing cover that provides soil stabilization.

Slopes will be no greater than 3:1 and will be shaped to conform to the surrounding landscape and to allow access for wildlife.

As mining proceeds, overburden and topsoil materials from additional mined areas will be backfilled into the area to be reclaimed. The areas will be regraded and contours and topography will be compatible with the surrounding land formations. After topsoil replacement, the site will be prepared for seeding as described in the following section.

b. *Seed Mixes and Species Selection.* The permanent revegetation mixture proposed by Mobil is shown in Table C-2. This seed mixture is composed of grasses, forbs, and shrubs that were selected for their ability to provide a permanent and protective vegetation cover for soil stabilization and for their ability to support the post-mining land use. Consideration has also been given to seed availability, germination requirements, and adaptability to site-specific conditions.

Revegetation will be greatly enhanced by the direct hauling of topsoil. The topsoil will provide an excellent source of adapted native seed as well as soil microorganisms. Shrubs and trees will be established using transplants of mature shrubs and small trees, and shrub pads, when feasible. Only small shrubs and trees can be used, otherwise the disturbance to the root system would be too great. Shrub pads provide an excellent source for seed dispersal of shrubs and other native seed and have been successful in areas with physical conditions similar to those found in the project area.

Native species are emphasized in the revegetation plan because they are considered to be the best plant cover in terms of long-term community stability and adaptability to regional climatic conditions. Some introduced species are included in the temporary reclamation mix (Table C-3) as they are often aggressive, fast-growing plants, grow well on disturbed areas, and provide an immediate, protective cover for soil stabilization.

c. *Planting Methods.* A drill seeder appropriate for the soil and site conditions will be used for revegetation. A disc or chisel plow equipped with a drag or harrow will be used during seedbed preparation. The action of the harrow or drag will reduce the soil clod size and spread any material that could clog the drill. The basic mix will be seeded at a rate of 17.2 pounds of pure live seed per acre. Drilling depths will range from 0.3 to 1.3 cm. On steep, rocky, and inaccessible terrain, broadcast seeding will be used. Seeding rates for this method will be double those for drilling. The site will be prepared for seeding using a chisel plow to create a rough, cloddy surface. A cyclone or other appropriate broadcast seeder will be used to sow the seed. Seeds will be covered by culti packing or dragging after broadcasting to cover seed and encourage germination. Shrub trans-

TABLE C-2
PERMANENT REVEGETATION MIXTURE

Scientific Name	Common Name	Seeding Rate (Pounds/Acre)
Grasses:		
Agropyron inerme	Whitmar Beardless Bluebunch Wheatgrass	4.0
Agropyron smithii	Western Wheatgrass	5.0
Agropyron trachycaulum	Slender Wheatgrass	4.0
Oryzopsis hymenoides	Indian Ricegrass	1.0
Poa ampla	Sherman Big Bluegrass	2.0
Forbs:		
Linum lewisii	Lewis Flax	0.25
Penstemon strictus	Rocky Mountain Penstemon	0.10
Petalostemon candidum	White Prairie Clover	0.10
Shrubs:		
Artemisia tridentata	Big Sagebrush	0.25
Atriplex canescens	Fourwing Saltbush	0.25
Ceratoides lanata	Common Winterfat	0.25
	Total:	17.20

TABLE C-3
SEED MIXTURE FOR TEMPORARY RECLAMATION

Scientific Name	Common Name	Seeding Rate (Pounds/acre)
Agropyron desertorum	Standard Crested Wheatgrass	6
Agropyron smithii	Western Wheatgrass	6
Bromus inermis	Smooth Brome	3
Poa ampla	Sherman Big Bluegrass	2
Onobrychis viciaefolia	Sainfoin	1
Atriplex canescens	Four Wing Saltbush	1
	Total:	19

plants from areas to be mined to areas undergoing revegetation will be planted by hand or with the appropriate transplanting equipment. Shrub pads will be transported in a front-end loader and placed in a previously designated location. Any containerized stock which may be used will be planted by hand.

Mulch: All areas to be revegetated will be mulched with straw to stabilize and protect the soil. The mulch will be applied at a rate of 2 tons per acre and crimped into the ground with a flat blade disc crimper. In areas with steeper than 3:1 slopes, a cellulose wood fiber mulch will be applied with a conventional hydromulch/seeding machine at a rate of 1 ton per acre. All mulch will be applied directly after seeding unless field or climatic conditions prohibit the operation. In those instances, mulch will be applied at the first available opportunity after seeding.

Fertilizer: Soil tests will be conducted and used to evaluate any nutrient deficiencies prior to seeding. Fertilizer will be used to supplement soil nutrients. Phosphorus will be applied before seeding because it is essential for root growth and development and, therefore, must be present at the time of germination. Nitrogen will be applied as topdressing either just prior to or after seeding. If seeding is being conducted in the fall, nitrogen is best applied in the spring; for spring seeding, nitrogen can be applied at the time of seeding. Since nitrogen is water soluble, it is best applied before expected moisture. Application rates for phosphorus and nitrogen will depend on the soil test results.

Fertilizer will be applied only prior to and at the time of seeding. Additional applications are not anticipated.

Irrigation: It is anticipated that irrigation will not be required for establishing effective grassland or shrubland. In the event of an extreme drought year, supplemental water for irrigation may be made available. Some supplemental irrigation or hand watering of containerized stock may be used to assist establishment of these plants in the first year. Otherwise, to prevent an artificial dependence on supplemental water, no irrigation will be used.

Weed Control: Control of noxious weeds on reclaimed lands may be accomplished applying post-emergence herbicides such as 2,4-D or 2,4,5-T, if necessary. Extreme stands of annual weeds, if present, will be controlled by mowing. Noxious weed control will be accomplished using methods developed in consultation with the regulatory authorities and state and/or county agricultural extension personnel.

Management of Revegetated Areas: Newly seeded areas will be marked with signs stating that the area is being reclaimed and is not to be disturbed. Livestock will not be allowed on the reclaimed areas until the vegetation is capable of being grazed. Once the vegetation is well-established, grazing at the premining stocking rate will be allowed to reduce litter accumulation and stimulate plant growth.

No vehicular traffic will be allowed unless access is necessary. Reclaimed areas will be managed for livestock grazing and wildlife habitat at predisturbance levels to assure revegetation success and demonstrate the ability of the land to support post-mining land uses.

Reclaimed areas will be periodically monitored to ensure that erosion problems have not developed and that adequate vegetation is established. In the event that revegetation does not appear to be successful, the areas will be examined to determine the source of the problem, and appropriate corrective steps will be taken. Any reseeding or other corrective measures will be consistent with the techniques described above.

6. **Socioeconomic Mitigation.** Since a number of socioeconomic changes and impacts could occur as a result of a major project work force buildup, the applicant intends to work with state and local governments and community leaders to find mutually agreeable solutions to socioeconomic problems that may result from project development.

Specific mitigation techniques will depend on actual needs of the communities at the time of project development. Mitigation measures depend on actual community impacts that cannot be completely determined until they occur. Specific needs will be determined when they become known.

Worker housing, local government finances, and provision of local public services will be reviewed through an impact assessment program before the commercial project commences to determine the net impact from both positive and adverse effects. If applicable, the operator will comply with Section 62-51 of the Utah Code, informally referred to as Utah Senate Bill 170, and submit an impact and mitigation plan for review and approval by the State Department of Community and Economic Development and the affected local governments.

The company's operation will be consistent with all local land use regulations and ordinances. The applicant also intends to work in a cooperative manner with communities and counties toward a positive growth management situation. To that end, the operator will emphasize quality and safety in its own operations and policy, as well as in those mitigation measures it supports.

UNCOMMITTED MITIGATION MEASURES

Socioeconomics

The following items should be considered for inclusion in a socioeconomic mitigation plan:

1. Early and continuing efforts by the applicants to inform local governments and citizens of project plans and plan changes.

2. Reasonable action by the applicants to obtain qualified workers from the local area and dissuade large numbers of job seekers from coming to the local area—provision of, or assistance in, a job training or vocational education program.

3. Implementation of ride-sharing programs through the use of buses, van pools, and car pools.

Air Quality

ENERCOR

Paving Seep Ridge Road would reduce the size of the area expected to exceed Class II increments and the secondary NAAQS. However, fugitive dust generated by surface mining activities would cause the Class II and secondary NAAQS for TSP to still be exceeded near the mine.

KIRKWOOD

Paving the main haul and access road would prevent exceedance of the NAAQS for TSP Class II increment. A small area could still exceed the Class II increments for TSP.

MOBIL

Paving Seep Ridge Road would reduce the size of the area expected to exceed the primary NAAQS and Class II increment for TSP. The primary NAAQS and Class II increments for TSP would still be exceeded near the mine. Additional control of NO_x from earth-moving equipment could reduce the size of the area predicted to exceed the NAAQS for NO_2. However, the annual NAAQS for NO_2 would still be exceeded in the immediate vicinity of the mine.

APPENDIX 3

RESOURCE METHODOLOGY

SOILS AND VEGETATION

Assumptions

To determine erosion control and reclamation success on lands disturbed by project construction and operation, the following assumptions were made:

1. Applicants would comply with the proposed erosion control and reclamation programs they have developed and would *comply with appropriate regulations and required plans and stipulations to protect and restore the land disturbed by project construction and operation to a stable, productive and aesthetically acceptable condition.*

2. Applicants operating on Utah State land would prepare and follow appropriate plans, including measures to accomplish and ensure successful reclamation of state land affected by project construction and operation, as required by the Utah State Department of Natural Resources, Division of Oil, Gas, and Mining (State of Utah 1982).

3. Applicants would comply with soil protection and land use goals identified by the landowner on private lands.

4. Results of the third order soil survey and special studies accurately assess local conditions and potential for reclamation success.

5. The Reclamation Procedures identified in Appendix 2 would be included as stipulations in the right-of-way grants and mineral leases issued to the applicants by BLM and would also be implemented for all state and private lands, as agreed to by the applicants and landowner.

Soils

A third-order soil survey (SCS and BLM 1982) was used to evaluate potential impacts and would be used by the applicants and authorizing agencies to determine erosion control, reclamation, and revegetation measures.

The area of influence includes a wide variety and complex combinations of soils caused by variations in parent material (geologic) and climatic, topographic, and vegetation features. The soil map units from the third-order soil survey were combined into generalized groups to describe the soils within the area of influence, to evaluate potential impacts, and to determine effective erosion control measures, reclamation, and revegetation potential of the area. (Descriptions of these groups may be obtained from the BLM, Division of EIS Services, Denver.)

Vegetation

The vegetation inventory, forage availability, and vegetation potential information presented in this EIS is based on the Ecological Units as interpreted from the third-order Soil Survey (SCS and BLM 1982 and the vegetation map of the southeastern Uinta Basin, Utah and Colorado). Orthophotograph interpretations were also used to determine areas where vegetation was changed by chaining and spraying.

Description of the vegetation types occurring within the project areas are described in Section A.

RECLAMATION AND EROSION CONTROL

Analysis Methodology

Soils, vegetation, and climatic information was collected for the surface areas that would potentially be disturbed. The soil survey (SCS and BLM 1982), was used to identify soil types and terrain strongly affecting construction and surface mining procedures, revegetation, and restoration potential. The soils data was analyzed and evaluated to identify the following:

- areas with soil properties that strongly affect restoration and revegetation of native rangeland;
- the reconstruction potential of the affected soil types;
- areas that are susceptible to high wind and water erosion hazards;

- effective measures to lessen the effects of soil disturbances caused by construction, surface mining, *in situ* mining, and to control accelerated erosion; and

- areas where erosion and resultant sediment yield would affect water quality.

Sensitive soil areas were determined on the basis of the following soil and terrain characteristics: shallow over bedrock (less than 20 inches); sand, loamy sand, and clay-textured surface and subsurface soil layers; containing more than 35 percent coarse fragments by volume, exceeding sizes of 3 inches in diameter; soil reaction with pH value greater than 8.5, salinity more than 16 millimhos in the upper 40 inches; permeability less than 0.6 inch per hour and occupying slopes steeper than 25 percent. These soils are most susceptible to impacts and have a low reclamation potential.

Soil erosion losses were estimated by the use of the universal soil loss equation (USLE) and the wind erosion equation as applied to construction sites for selected soil areas representing various conditions occurring throughout the area of influence.

Recent developments on the USLE make it a valuable tool for selecting and evaluating conservation practices on disturbed areas resulting from construction. The information gained by applying the USLE to selected soil sites was used as a basis for determining appropriate erosion control and revegetation measures and to evaluate the effectiveness of those measures for ensuring successful erosion control, revegetation, and restoration.

Key soils were selected representing the major areas of land disturbance and conditions expected to occur within the project areas. These soils were analyzed by the use of the USLE to determine susceptibility to erosion and to determine the effectiveness of several erosion control measures or combinations that could be used to control erosion. Results of this analysis are available for review at the BLM, Division of EIS Services in Denver, Colorado.

Additional information, consisting of major rangeland management concerns and recommended conservation practices was obtained from the Book Cliffs Resource Management Plan (BLM 1984b).

Review and Evaluation of Applicants' Proposed Reclamation Programs

The applicant's erosion control, reclamation, and revegetation programs were reviewed and evaluated using information collected for the vegetation, soils, agriculture, and climate studies for the projects. The reclamation measures were evaluated in separate phases by the type of land disturbance, potential problem areas, and conditions found in the vegetation, soils, and climatic inventories.

Because the project plans are conceptual, the applicants provided only general reclamation programs. The applicants identified the intent to reclaim all land disturbance and to comply to the general measures and stipulations outlined in Appendix 2. Also refer to Appendix 2 for the applicants' proposed mitigation measures.

Successful erosion control, land restoration, reclamation, and revegetation are generally expected to be achieved throughout the project areas if the applicants implemented effective measures and procedures tailored to the kinds of land disturbance and to the conditions found. To ensure reclamation success, however, a strong compliance program accompanied by an effective monitoring and maintenance program is needed to ensure that measures are applied in a timely and effective manner and that follow-up measures are carried out. The compliance program would be conducted by the authorizing agencies and landowners for their lands. Impacts to soils and their potential to reproduce vegetation to predisturbance levels, however, would be significant if erosion control, soil reconstruction, and reclamation measures were not implemented because of non-compliance with approved plans.

SOCIOECONOMICS

The following describes the data sources and methods used to analyze the socioeconomic impacts. It is divided into the following sections:

Years of analysis,
Employment,
Personal income and per capita personal income,
Population, and
Subjects analyzed by qualitative methods.

In each section the sources of baseline and impacts data and the analytical methods are described for that subject. Short-form references are given; complete references can be found in the References Cited section.

Primary employment figures were provided by the applicants. Estimates of total employment, population, and personal income were obtained by using the UPED model of the Utah Office of Planning and Budget. UPED is an economic base type of economic model with associated demographic and geographic allocation submodels (see reference under Employment). Subjects that were analyzed qualitatively include infrastructure and quality of life.

Years of Analysis

Because the development schedules of the applicants differ, a single set of analysis years could not be used. Selection of years to be analyzed for each applicant was based on including 1 year for each of the three phases. When a phase continued for more than 1 year, the selection for that phase was based on (1) the year of largest employment impact, or (2) the first year of the phase when employment impacts were the same.

Employment

Baseline

Sources

County Data: State of Utah, Office of Planning and Budget 1984.

Ute Tribe Data: Superintendent, Uintah and Ouray Agency 1984b.

Methods

County Estimates: Data contained projections at 5-year intervals. Estimates for other years were obtained by straightline interpolation.

Ute Tribe Estimates: No employment projections were available. An estimate for the year 2000 was based on projected population (see Population) by assuming (1) the labor force participation rate to be unchanged, and (2) percent of the labor force employed to increase by 25 percent. Estimates for other years were obtained by straightline interpolation.

Impacts

Primary Employment Data—Applicants (identified in Chapter 1).

Total Employment

Source: UPED model (BLM 1983a)

Method: Data contained projections at 5 year intervals. Estimates for other years were obtained by the method that was used for the Sunnyside EIS (BLM 1984c).

Allocation to Applicants—Based on primary employment.

Geographic Allocation

Counties: Based on population allocation (see Population).

Ute Tribe: Any estimate of the number of tribe members obtaining tar sand jobs has to be arbitrary. A judgment estimate was made that 5 percent of the project-related employment (primary and secondary) would be obtained by tribe members.

Personal Income and Per Capita Personal Income

Baseline Personal Income

County Estimates

The data source and method were the same as those used for employment.

Ute Tribe Data

Source of 1983 average wage and average non-employment income: Coonrod 1984.

Method: The 1983 average wage was increased at the same rate of increase in real wages that was used in the UPED model (40.7 percent between 1985-2000). That average wage times employment for 2000 gave employment income for 2000. Non-employment income for 2000 was estimated by multiplying 1983 average non-employment income by population for 2000. The sum of employment and nonemployment income gave personal

income for 2000. Estimates for other years were obtained by straight-line interpolation.

Personal Income Impacts

Counties and Communities

Source: UPED Model (BLM 1983a)

Method—Allocation to Applicants: For each applicant in each analysis year, primary construction and operation employment, resulting secondary and total employment, and resulting population were multiplied by average construction, mining, and all other sector wages, average other labor income, and average property income, respectively, to obtain estimates of personal income impacts. The average wage and other income factors were obtained from the UPED output.

Geographic Allocation

Counties: Based on population allocation.

Ute Tribe: Based on employment allocation (no population allocation was made for the tribe).

Per Capita Personal Income

Total personal income divided by population.

Population

Baseline

Counties and Communities

Source: UPED model (BLM 1983a)

Method: Data contained projections at 5 year intervals. Estimates for other years were obtained by straightline interpolation. Estimates for small communities were based on 1980 Indian population figures (Coonrod 1984) and the growth rates for their CCDs.

Ute Tribe Data

Sources: 1983 Population: Superintendent, Uintah and Ouray Agency 1984b. 2000 Population: Ford, Bacon & Davis Utah Inc. 1982.

Method: An estimated population for the reservation of 3,000 in the year 2000 was derived from source data. Estimates for other years were obtained by straight-line interpolation.

Impacts

Total for Area of Influence and Allocation to Applicants: The data source and method were the same as those used for employment.

Geographic Allocation

Counties and Communities

Source: UPED Model (BLM 1983a)

Method: Data contained impact estimates for CCDs and large communities at 5 year intervals. Allocation ratios were calculated, and ratios for other years were obtained by straight-line interpolation. Sub-allocations to small communities within CCDs were based on the results of a gravity model.

Uintah and Ouray Indian Reservation and Ute Tribe: Population allocations were not made to either the reservation or the tribe. Because there are areas of non-reservation land in and around communities within the reservation boundary, population impacts to those communities could be on either type of land. The effect that the Proposed Action would have on migration of Indians to the area could not be estimated. so population impacts to the tribe were not known.

Subjects Analyzed by Qualitative Methods

Infrastructure and Quality of Life: Data on existing infrastructure and social conditions were obtained from BLM 1983b, BLM 1983c, BLM 1984b, Ford, Bacon & Davis Utah Inc. 1982, Cuch 1984, and Coonrod 1984. Population impact estimates were combined with these data to provide judgment analyses of the likely effects on infrastructure and quality of life.

AIR QUALITY

An air quality analysis was performed by Aerocomp, Inc. (Aerocomp) under contract to BLM. The Aero-

comp report ***P R Spring Combined Hydrocarbon Lease Conversion Air Quality Technical Report*** (1985) may be obtained from the BLM Vernal District Office, Vernal, Utah. The information presented here is a summary of the methodology used in the Aerocomp analysis.

In order to perform an air quality analysis, the following information was compiled.

1. Emission Inventory
2. Meteorological and Topographic data

The data was then put into mathematical models that predicted pollutant concentrations and impacts to visibility.

Emissions

The emission inventory was based on plans of operations submitted by the applicants. For the *in situ* combustion operations, the main pollutant sources would be (1) flaring of off-gases produced by the combustion (mainly SO_2); (2) air compressors; (3) disturbed soil surfaces (TSP), and (4) unpaved haul and access roads (TSP). For all *in situ* projects, 95 percent removal of hydrogen sulfide before flaring was assumed. For the Kirkwood project, 90 percent control of SO_2 after flaring was also assumed.

For the projects involving surface mining operations, the main pollutant sources would be from (1) drilling and blasting; (2) removing overburden; (3) loading, transporting, and dumping of overburden, tar sand, and spent tar sand; (4) haul and access road traffic; (5) wind erosion of disturbed areas and; (6) an auxilliary boiler for combustion of residual vapors. Large amounts of fugitive particulates and nitrogen oxide and lesser amounts of sulfur oxides, carbon monoxide, and hydrocarbons would be emitted into the atmosphere.

Meteorological Data

For annual average pollutant concentration calculations, meteorological data collected at the U-a/U-b oil shale tracts (about 31 miles north of the P R Spring STSA) was used. Although the data does not strictly apply to the STSA, it was the best available. For short-term concentration estimates, hypothetical screening meteorological data was used. It was assumed that for 6 hours in a 24-hour period, stable (*Pasquill-Gifford F* stability) conditions with light winds (windspeed of 2.5 meters per second) affected each receptor.

Models Used

The atmospheric dispersion model *VALLEY-BID* (*VALLEY* with buoyancy-induced dispersion) was used to calculate short-term concentrations of SO_2, TSP, and CO and long-term concentrations of SO_2, TSP, and NO_2. The model used in the screening mode is recommended by EPA for short-term screening in complex terrain. Point and area sources can be considered by *VALLEY-BID*. Line sources, such as dirt roads, were divided up into a series of area sources for consideration by the model. Most of the TSP emissions would be large particles and would settle out rapidly with distance from the source. Because *VALLEY-BID* does not account for deposition or settling of pollutants, the areal extent of TSP impacts is overestimated.

The Level 1 visibility screening analysis used the model BU 424, which is similar to the EPA Level 1 analysis. The Level 1 model does not account for deposition of pollutants and assumes the particulates are small and, therefore, efficient at scattering light and impairing visibility. Because a large percentage of the particulates generated by the tar sand developments would be large particles, which would settle out quickly and also be much less efficient at scattering light than the small particles assumed in the model, TSP effects on visibility are greatly overestimated by the Level 1 analysis. If the significance criteria were exceeded by the Level 1 analysis, then the more refined and less conservative Level 2 model, BU 426, was used. Because BU 426 considers actual particle size distributions and accounts for deposition of particulates, estimated visibility impacts from TSP were greatly reduced in the Level 2 analysis.

For the acid deposition analysis, wet and dry deposition of sulfur and nitrogen were estimated.

Dry deposition in the project area was estimated from the annual average NO_2 and SO_2 concentration isopleth maps. The deposition velocity for these compounds was assumed to be 0.8 cm/sec (Sehmel 1980; Garland 1976). The annual dry deposition was determined by multiplying the annual average concentration by the deposition velocity.

Wet deposition velocities were estimated using precipitation statistics (U.S. Environmental Data Service 1968). In the estimation, contaminants were assumed to be completely scavenged from the atmosphere during a 1-hour precipitation period of 0.01 inches or greater. This yields an effective annual wet deposition velocity of approximately 1 cm/sec.

APPENDIX 4

ENDANGERED SPECIES ACT COMPLIANCE

The Endangered Species Act of 1973 requires under Section 7 that any federal agency carrying out any action that may affect an endangered species must consult with the U.S. Department of the Interior, Fish and Wildlife Service concerning the effects of the project on threatend or endangered species.

This appendix includes pertinent correspondence related to the Endangered Species Act and Section 7 consultation.

November 9, 1984

Memorandum

To: Chief, Division of EIS Services, Bureau of Land Management, Denver, Colorado

From: Field Supervisor, Endangered Species Office, U.S. Fish and Wildlife Service, Salt Lake City, Utah

Subject: Species List for P R Spring Combined Hydrocarbon Lease Conversion EIS

This responds to your memorandum of October 30, 1984, requesting a list of proposed and listed threatened and endangered species found within the conversion areas. It appears that the following endangered and threatened species may occur in the area of influence of this action:

American peregrine falcon	Falco peregrinus anatum
Bald eagle	Haliaeetus leucocephalus
Black-footed ferret	Mustela nigripes
Bonytail chub	Gila elegans
Colorado squawfish	Ptychocheilus lucius
Humpback chub	Gila cypha
Uinta basin hookless cactus	Sclerocactus glaucus

Critical habitat has not been designated for any of the above listed species.

We would like to bring to your attention species which are candidates for official listing as threatened or endangered. While these species have no legal protection under the Endangered Species Act we ask that you try and avoid them if they are found in the area. Candidate species which may occur in the area of your project are as follows:

Barneby catseye	Cryptantha barnebyi
Clay thelypody	Thelypodiopsis argillacea
Cliffdwellers candlestick	Cryptantha elata
Dragon milkvetch	Astragalus lutosus
Ferruginous hawk	Buteo regalis
Graham's beardtongue	Penstemon grahamii
Longbilled curlew	Numenius americanus
Razorback sucker	Xyrauchen texanus
Southern spotted owl	Strix occidentalis lucida
Toadflax cress	Glaucocarpum suffrutescens
Western yellowbilled cuckoo	Coccyzus americanus occidentalis
White River penstemon	Penstemon albifluvis

You should review the proposed action and determine if it would affect

any listed species or their critical habitat. If the determination is "may affect" for listed species you must request in writing formal consultation from the Field Supervisor, U.S. Fish and Wildlife Service (FWS) at the address given above. At this time you should provide this office a copy of the biological assessment and any other relevant information that assisted you in reaching your conclusion.

A specific concern the FWS has about this project is the potential impact of water depletion from the upper Colorado River basin on the three endangered fish species.

Your attention is also directed to Section 7(d) of the Endangered Species Act, as amended, which underscores the requirement that the Federal agency or the applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which, in effect, would deny the formulation or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species.

If we can be of further assistance, please advise us. The FWS representative who will provide technical assistance is Bob Ruesink. Feel free to call him at FTS 588-4430 or comm (801) 524-4430.

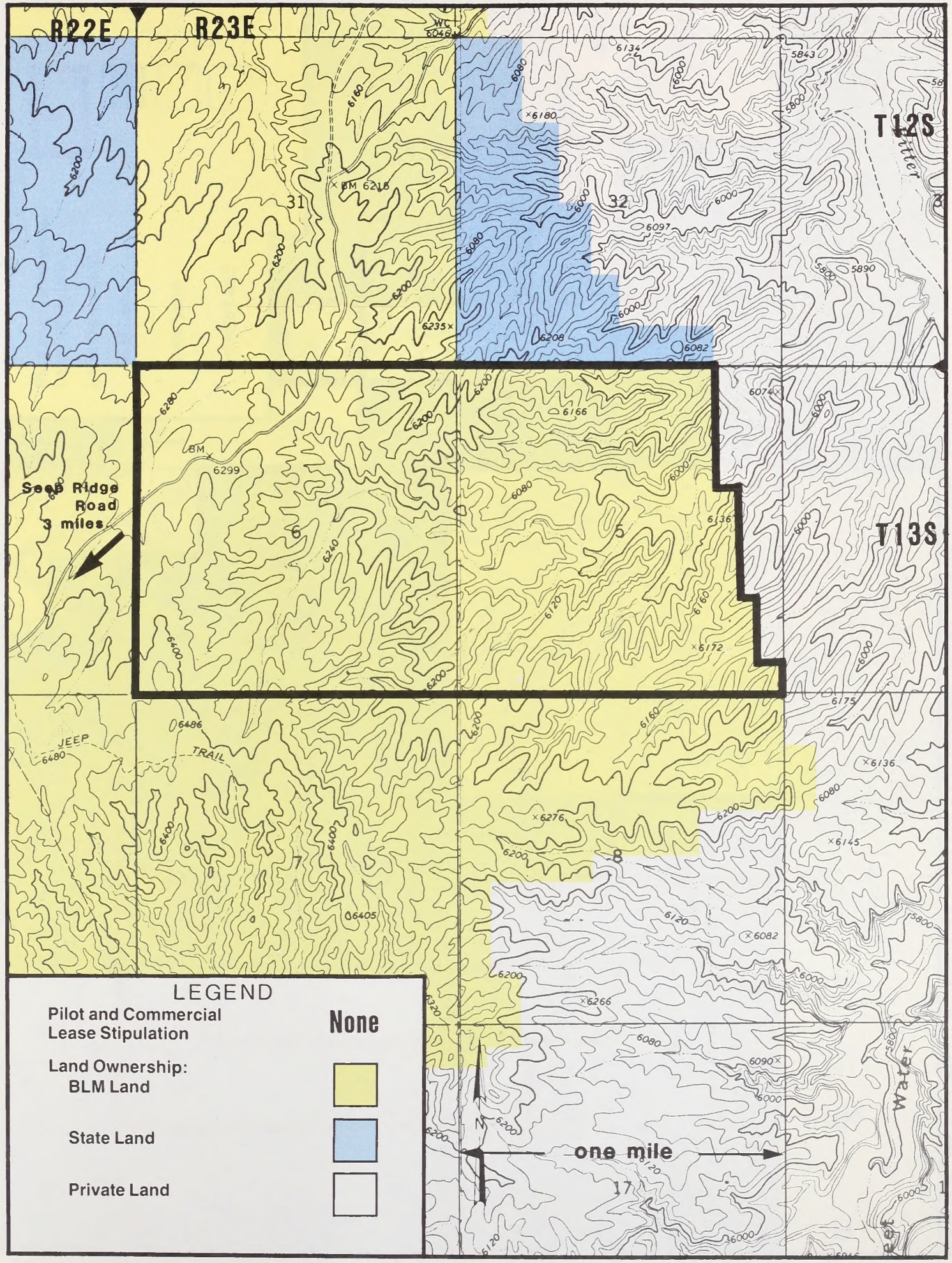
John L. England
Acting

APPENDIX 5

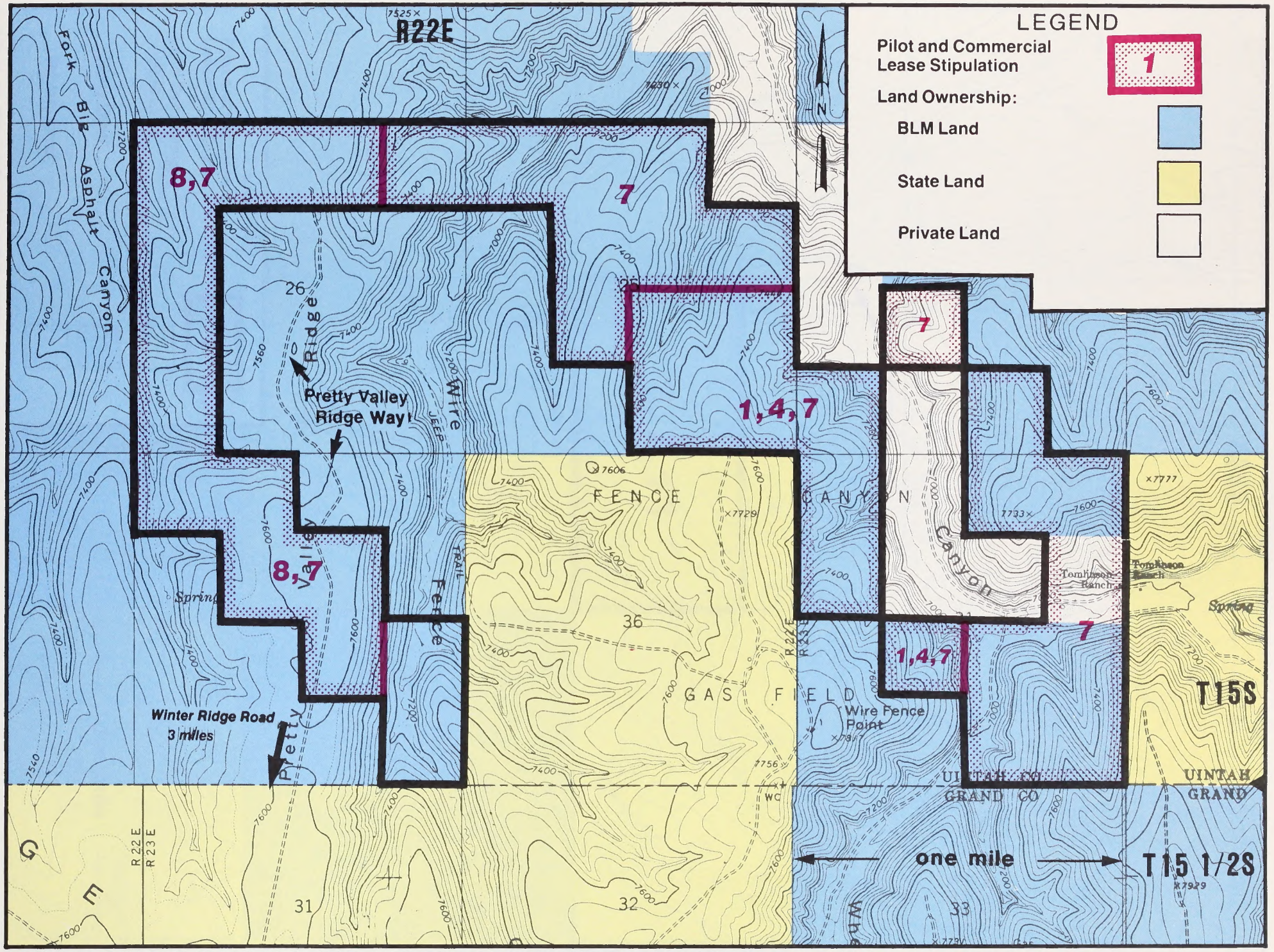
COMBINED HYDROCARBON PILOT AND COMMERCIAL PHASE SPECIAL LEASE STIPULATION MAPS

The maps contained in this appendix show the locations, within 40 acre legal descriptions, where the Combined Hydrocarbon Lease stipulations identified in Appendix 2 apply. These are special or site-specific stipulations which would be in addition to stipulations which are standard to all projects. (Each project map shows areas with the numbers that relate to the appropriate stipulation numbers.) In addition, the maps in this appendix show land ownership by project.

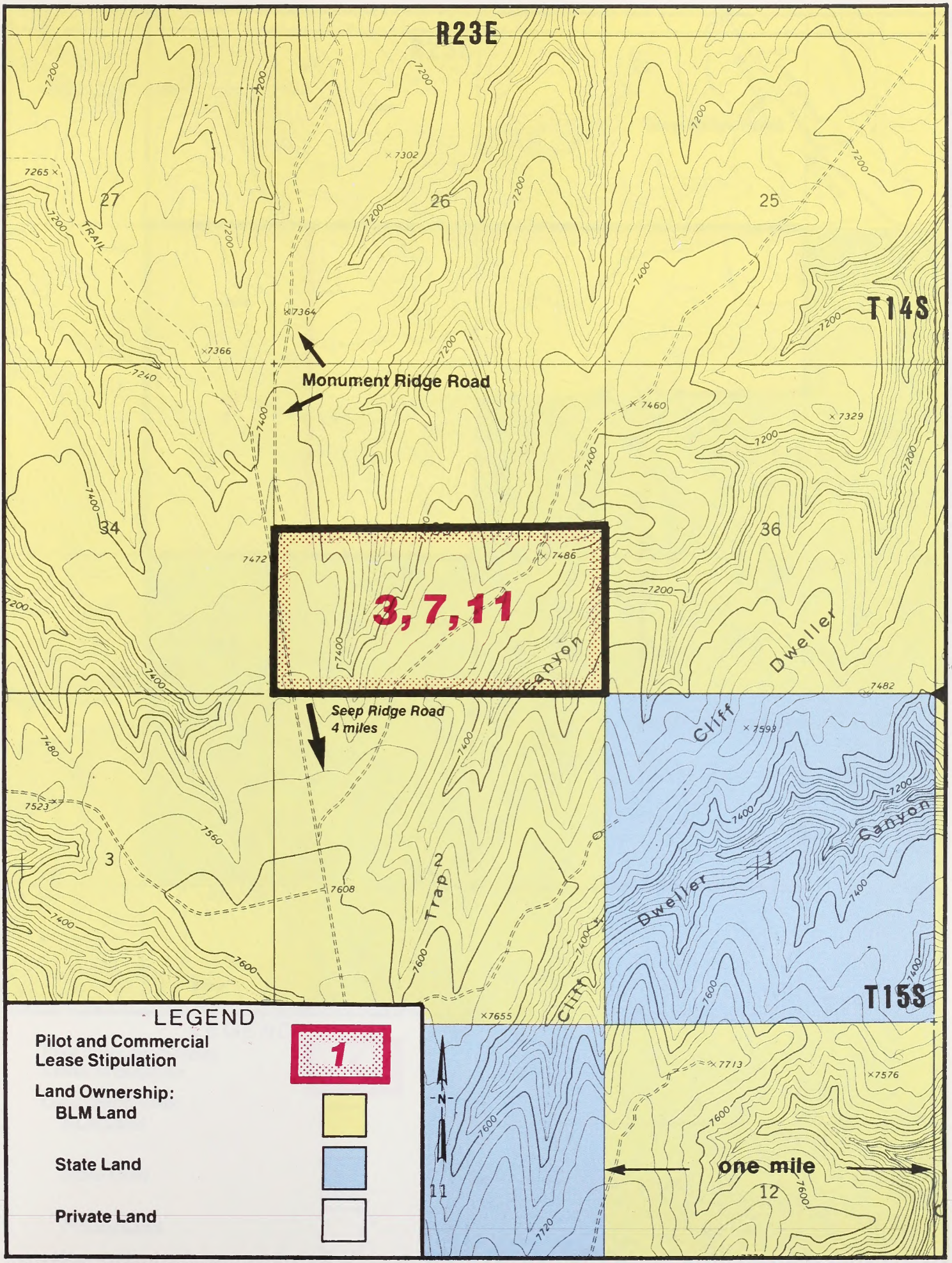
Beartooth A Project	Pilot and Commercial Lease Stipulations
Beartooth B Project	Pilot and Commercial Lease Stipulations
Bradshaw Project	Pilot and Commercial Lease Stipulations
Duncan Project	Pilot and Commercial Lease Stipulations
Enercor Project	Pilot and Commercial Lease Stipulations
Enserch Project	Pilot and Commercial Lease Stipulations
Farleigh Project	Pilot and Commercial Lease Stipulations
Kirkwood Project	Pilot and Commercial Lease Stipulations
Mobil Project	Pilot and Commercial Lease Stipulations
Thompson Project	Pilot and Commercial Lease Stipulations



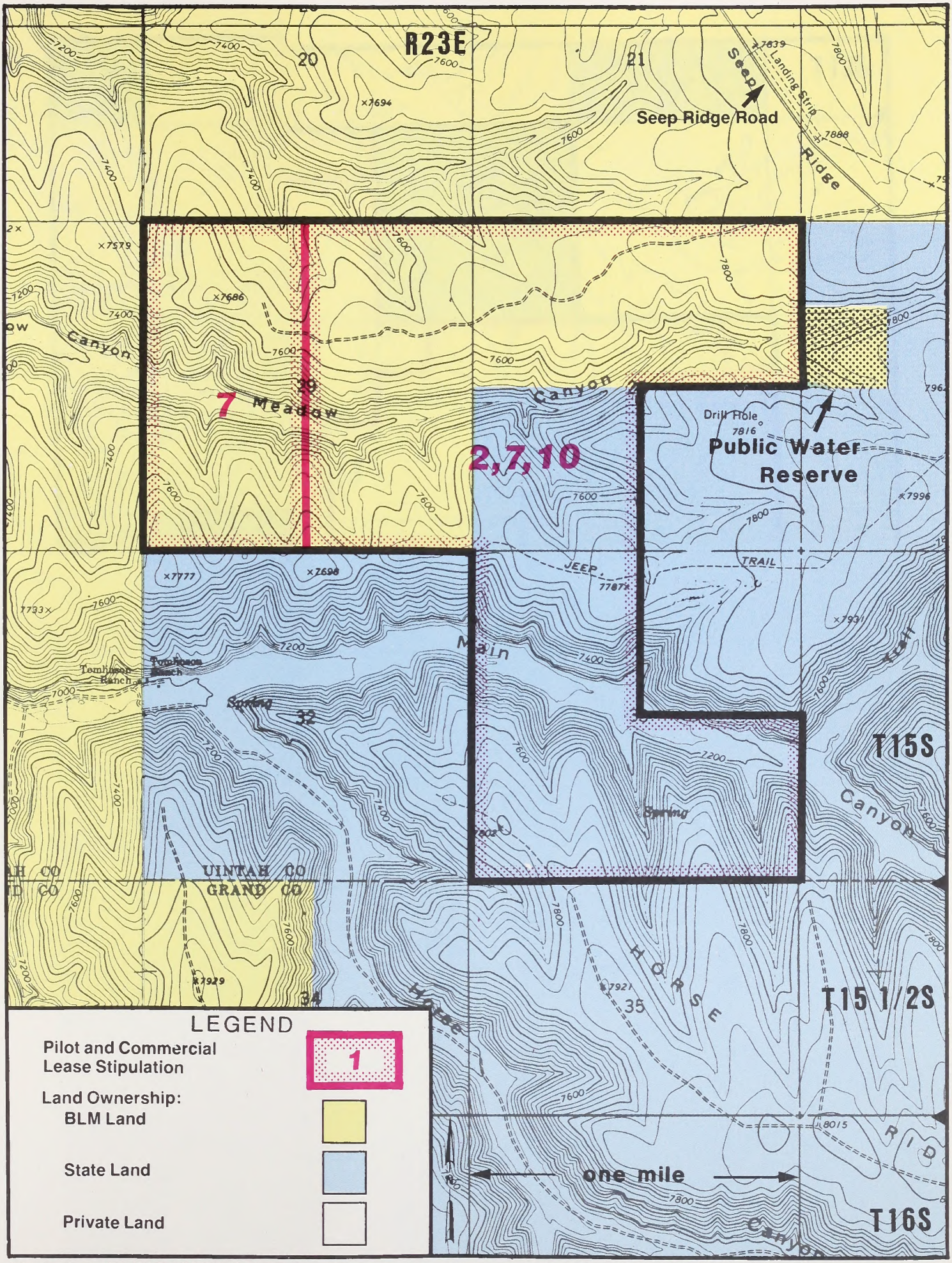
MAP C-1 BEARTOOTH A PROJECT — PILOT AND COMMERCIAL LEASE STIPULATIONS



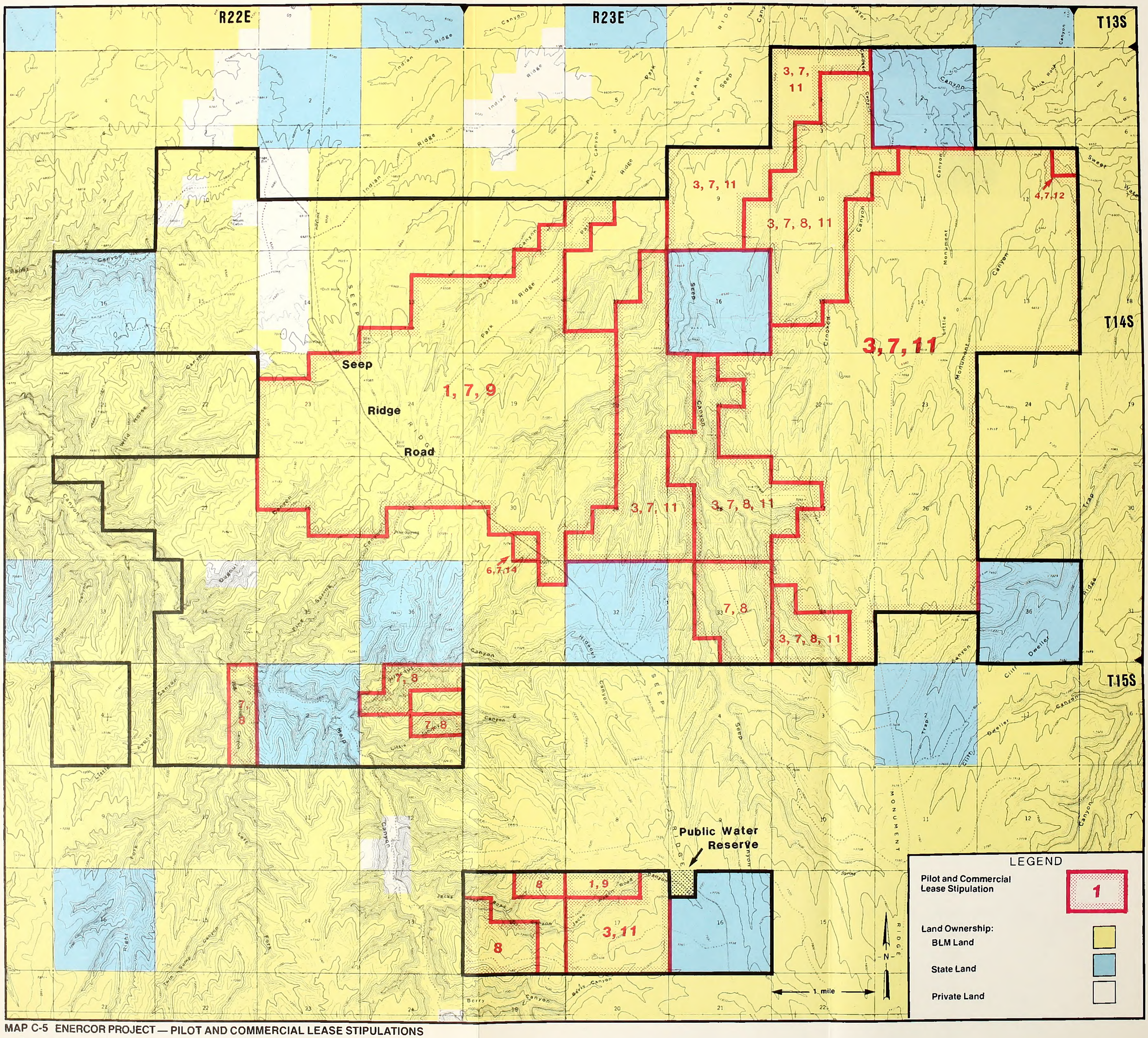
MAP C-2 BEARTOOTH B PROJECT — PILOT AND COMMERCIAL LEASE STIPULATIONS



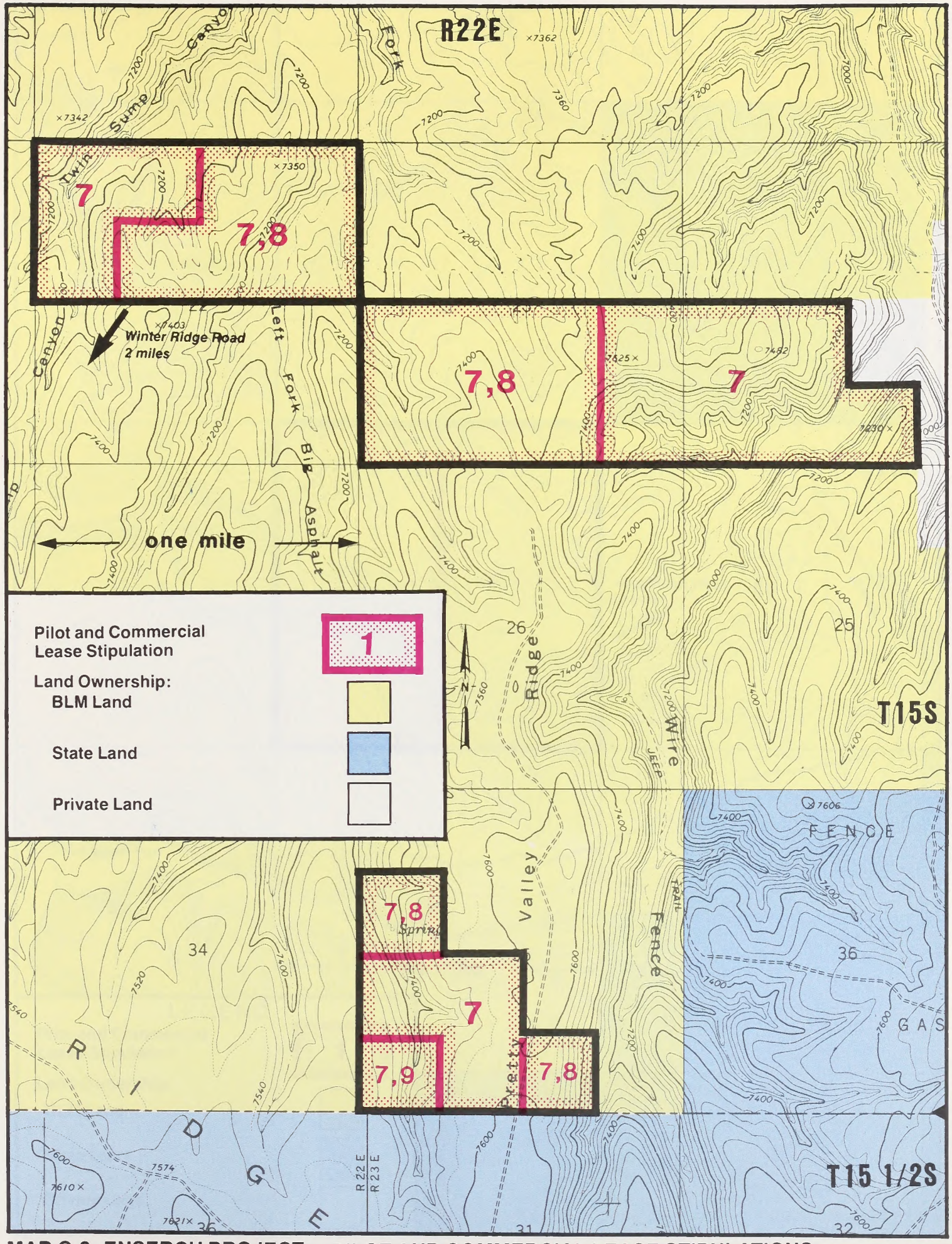
MAP C-3 BRADSHAW PROJECT — PILOT AND COMMERCIAL LEASE STIPULATIONS



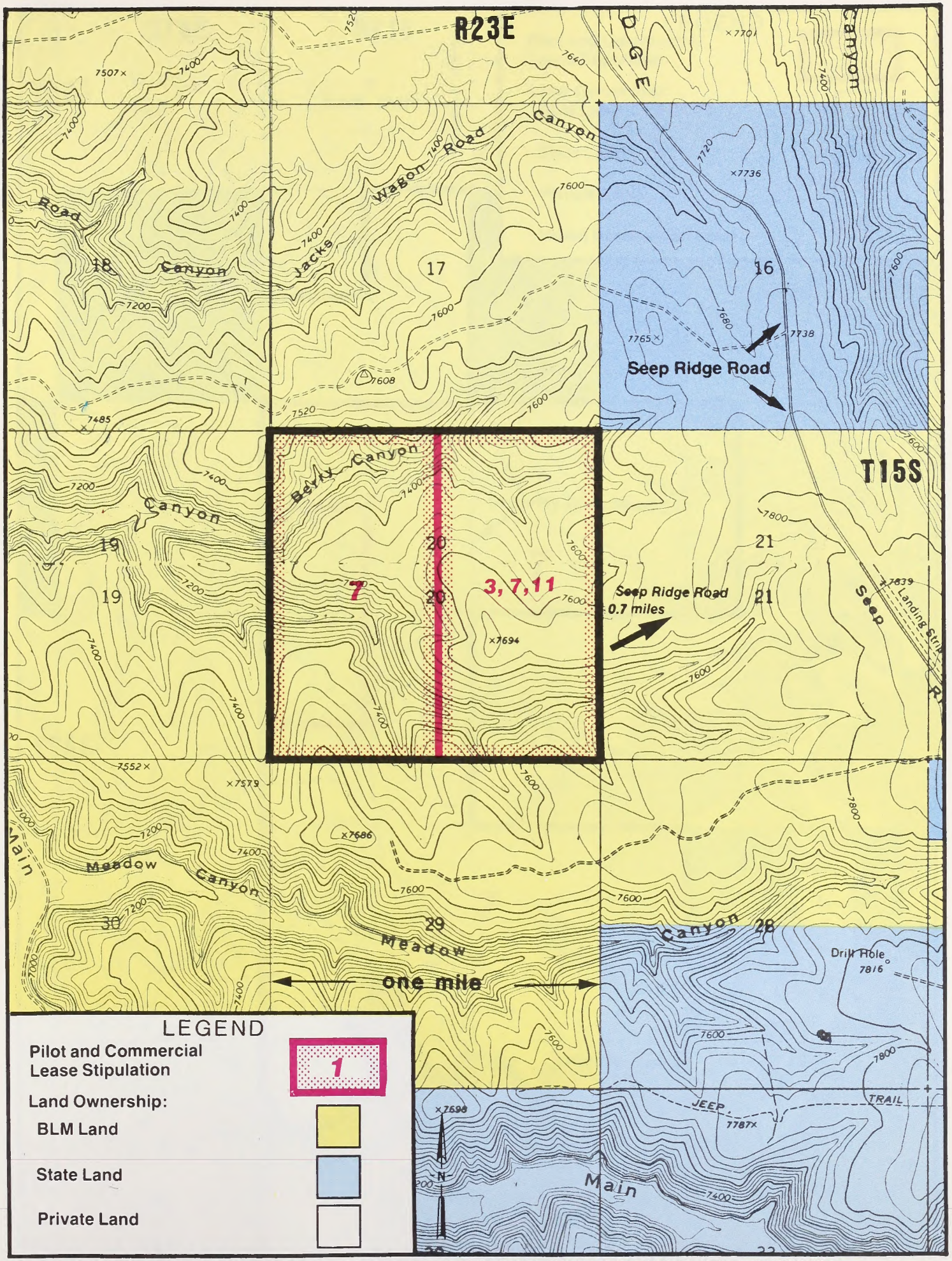
MAP C-4 DUNCAN PROJECT— PILOT AND COMMERCIAL LEASE STIPULATIONS



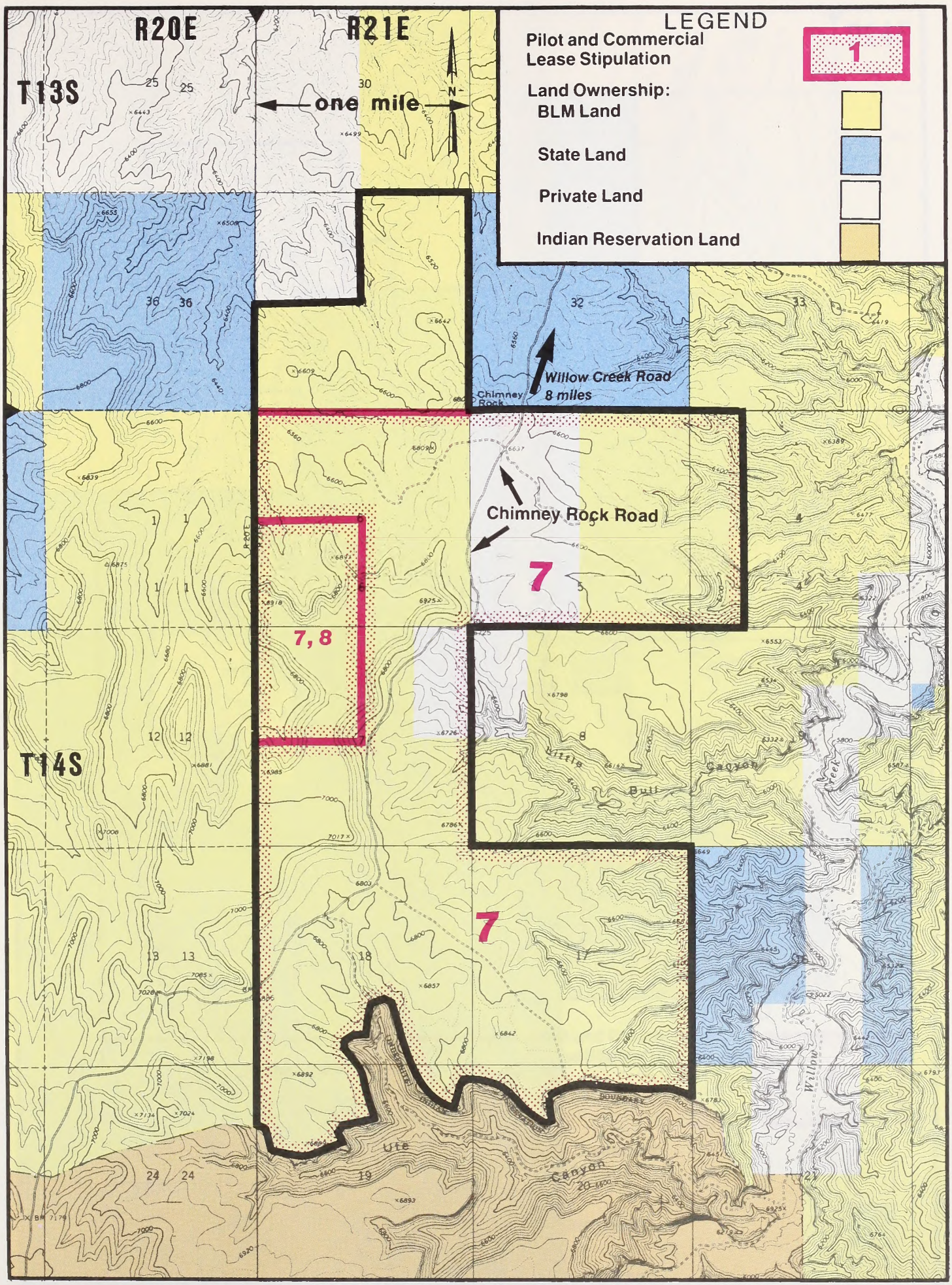
MAP C-5 ENERCOR PROJECT — PILOT AND COMMERCIAL LEASE STIPULATIONS



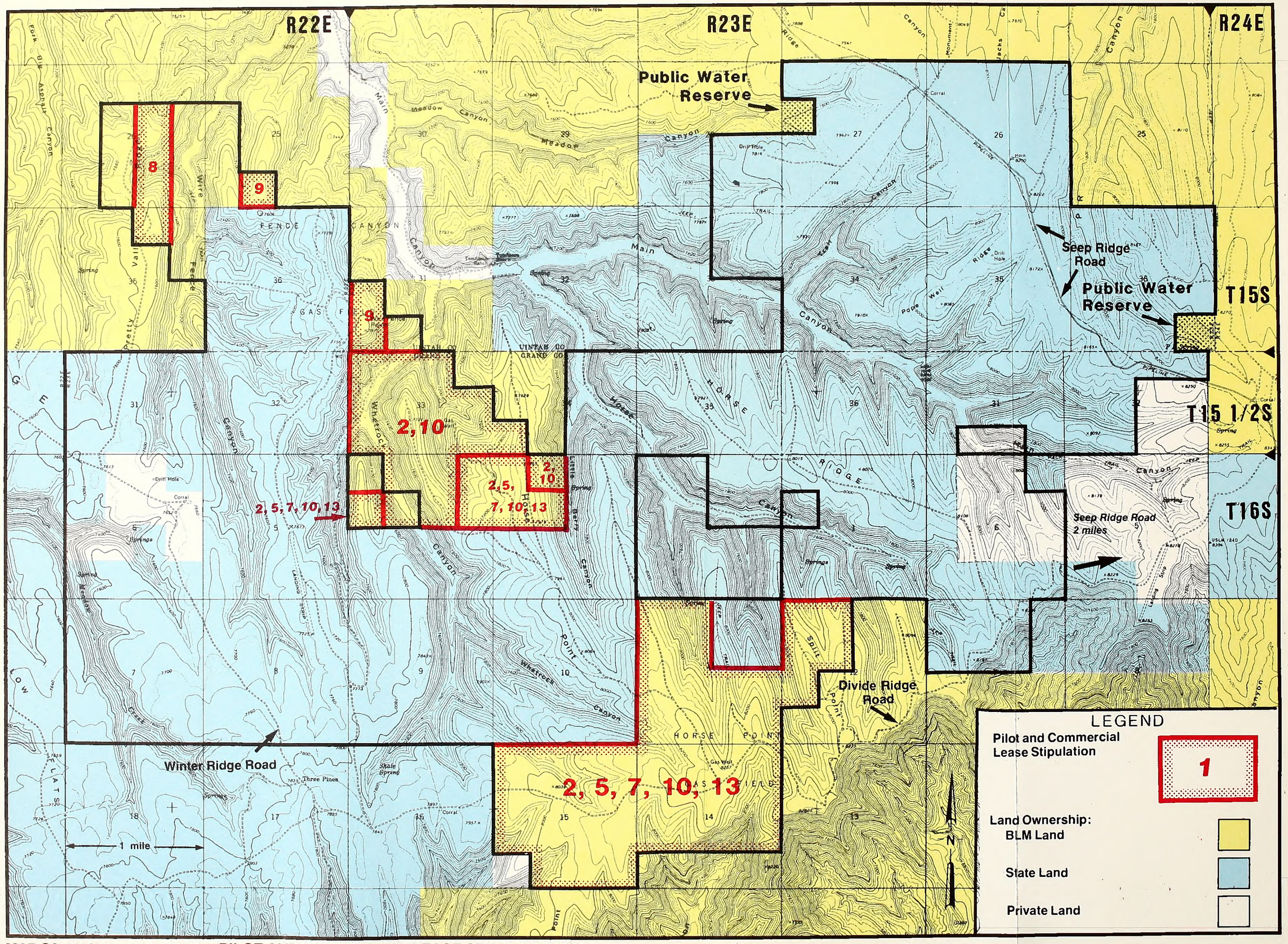
MAP C-6 ENSERCH PROJECT — PILOT AND COMMERCIAL LEASE STIPULATIONS



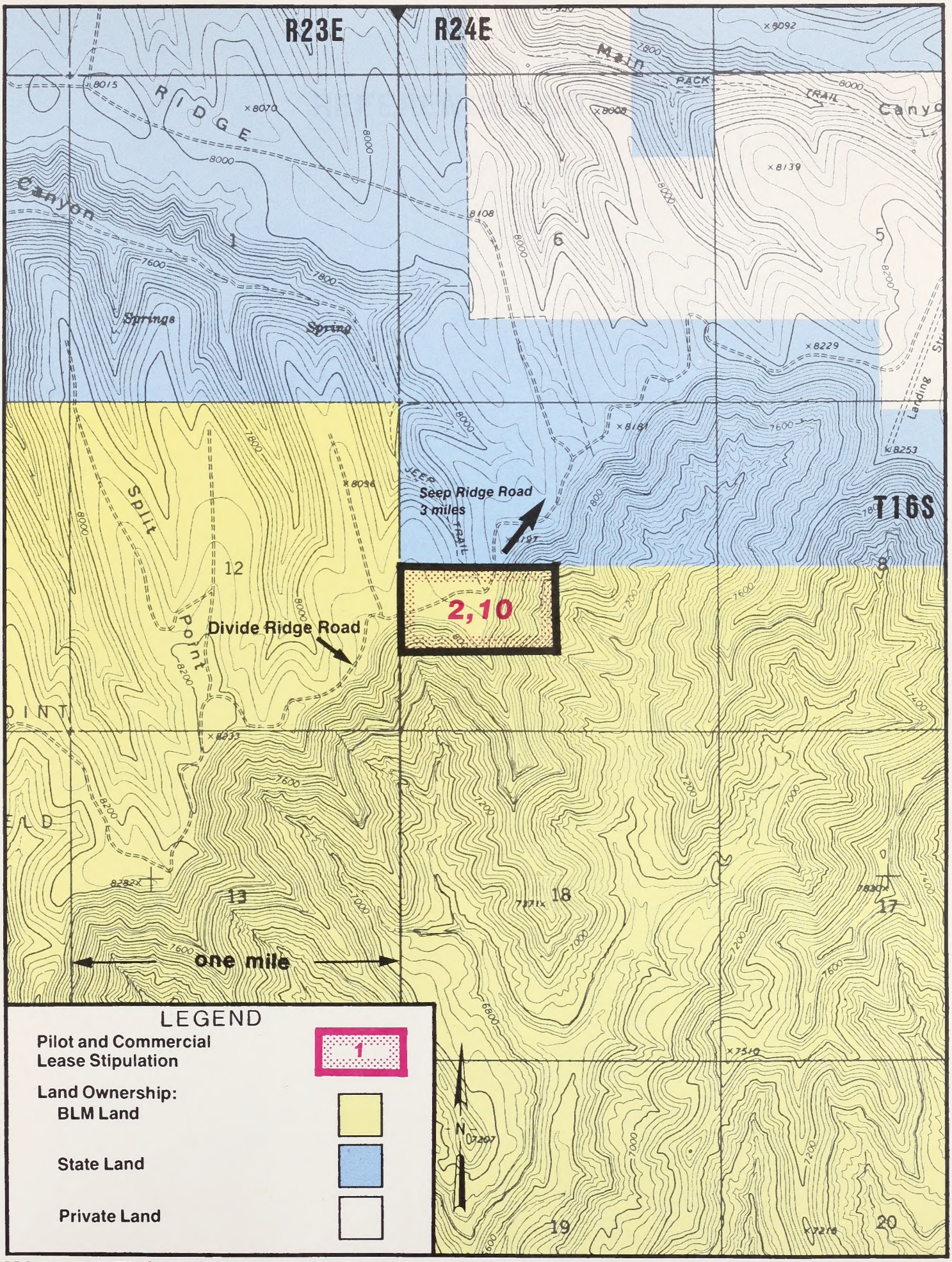
MAP C-7 FARLEIGH PROJECT— PILOT AND COMMERCIAL LEASE STIPULATIONS



MAP C-8 KIRKWOOD PROJECT — PILOT AND COMMERCIAL LEASE STIPULATIONS



MAP C9 MOBIL PROJECT— PILOT AND COMMERCIAL LEASE STIPULATIONS



MAP C-10 THOMPSON PROJECT— PILOT AND COMMERCIAL LEASE STIPULATIONS

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REFERENCES CITED

The following symbols are used to help the reader locate copies of the references. The appropriate symbol will appear at the end of each citation.

a- May be inspected at Bureau of Land Management (BLM), Division of Environmental Impact Statement Services, 555 Zang Street, First Floor East, Denver, Colorado 80228. Copies of some items are available at cost for reproduction.

b- May be obtained through public library loan system.

c- May be inspected at the BLM Vernal District Office, 170 South 500 East, Vernal, Utah 84078.

d- May be inspected at the BLM Book Cliffs Resource Area Office, 170 South 500 East, Vernal, Utah 84078.

e- May be inspected at BLM Utah State Office, Consolidated Financial Center, 324 South State Street, Salt Lake City, Utah 84111.

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ACRONYMS AND ABBREBIATIONS

ACRONYMS AND ABBREBIATIONS

ac-ft/year—acre-feet per year

AADT—average annual daily traffic

ADT—average daily traffic

AQRV—air quality related value

AUM—animal unit month

bbl—barrel

BACT—best available control technology

BIA—U.S. Department of the Interior, Bureau of Indian Affairs

BLM—U.S. Department of the Interior, Bureau of Land Management

bpd—barrels per day

CCD—Census County Division

CHLA—Combined Hydrocarbon Leasing Act

cm—centimeter

CO—carbon monoxide

CO_2—carbon dioxide

COM Plan—Construction, Operation, and Maintenance Plan

cu-ft/day—cubic feet per day

cu.yd.—cubic yard(s)

EDS—U.S. Department of Commerce, Environmental Data Service

EIS—Environmental Impact Statement

EPA—U.S. Environmental Protection Agency

FWS—U.S. Department of the Interior, Fish and Wildlife Service

g/m^2—grams per square meter

gpm—gallons per minute

GPO—Government Printing Office

H_2S—hydrogen sulfide

HUD—U.S. Department of Housing and Urban Development

kg/hr—kilograms per hour

KGS—known geologic structure

KOSLA—Known Oil Shale Lease Area

km—kilometers

KW—kilowatt

Mcf—thousand cubic feet

mg—milligram

mg/1—milligram per liter

MLRA—major land resource area

mm—millimeter

MMcfd—thousand thousand (million) cubic feet per day

MW—megawatts

NAAQS—National Ambient Air Quality Standards

NEPA—National Environmental Policy Act

NO_x—Nitrogen Oxides

NO_2—Nitrogen Dioxide

O_3—Ozone

ORV—off-road vehicle

PCPI—per capita personal income

PSD—Prevention of Significant Deterioration (air quality)

psi—pounds per square inch

RMP—Resource Management Plan

ACRONYMS AND ABBREVIATIONS

SCS—U.S. Department of Agriculture, Soil Conservation Service

SMSA—standard metropolitan statistical area

SO_2—Sulfur Dioxide

STSA—Special Tar Sand Area

TDS—total dissolved solids

tpd—tons per day

tpy—tons per year

TSP—total suspended particulates

UBS—Uintah Basin Synfuels

UDEH—Utah Division of Environmental Health

UDWR—Utah Division of Wildlife Resources

$\mu g/m^3$—micrograms per meter cubed

μm—one millionth of a meter

UPED—Utah Process Economic and Demographic model

USBR—U.S. Department of the Interior, Bureau of Reclamation

USDA—U.S. Department of Agriculture

USDC—U.S. Department of Commerce

USDLF—Utah Division of State Lands and Forestry

USGS—U.S. Department of the Interior, Geological Survey

USLE—Universal Soil Loss Equation

VRM—Visual Resource Management

VMT—vehicle miles of travel

WSA—Wilderness Study Area

GLOSSARY

GLOSSARY

ACCELERATED EROSION—Soil loss more rapid than normal, natural, or geologic erosion, mainly as a result of the influence of human activities or in some cases of animals or natural catastrophies that expose bare surfaces.

ACRE-FOOT—The volume of water that would cover 1 acre to a depth of 1 foot, equal to 325,853 gallons.

AIR QUALITY CLASS I, II, AND III AREAS—Regions in attainment areas where maintenance of existing good air quality is of high priority. In Class I areas, maintaining air quality has the highest priority with respect to other values; in Class III areas, air quality has lower priority than it does in the other areas. Initially, all attainment areas except mandatory Class I areas were designated Class II.

AIR QUALITY STANDARDS—The concentrations of pollution and lengths of exposure at which specified adverse effects to health and welfare occur.

AIR QUALITY MODEL—A mathematical representation of the behavior of air pollutants or their effects on air quality related values.

AIR QUALITY-RELATED VALUE—Resources identified by federal land managers as being susceptible to degradation of air quality, such as visibility, odor, flora, fauna, cultural resources, geologic features, and climate. Soil and water quality are values that could be affected by acid rain.

AIRSHED—The air encompassing a specific geographic region.

ALLOTMENT—An area where one or more operators graze their livetsock. An allotment generally consists of public lands but may include parcels of private and state-owned lands. BLM stipulates the number of livestock and season of use for each allotment, which may consist of one or several pastures.

ALLUVIAL FAN—A sloping, fan-shaped mass of sediment deposited by a stream or drainageway where it emerges onto a plain.

ALLUVIUM—Clay, silt, sand, gravel, or other loose stream-deposited material.

AMBIENT AIR QUALITY—Concentration levels in the surrounding air for a specified pollutant and a specified averaging time period within a geographic region.

AMBIENT AIR QUALITY STANDARD—Established by federal or state agencies, the level of ambient air quality to be achieved and maintained. Primary standards are those judged to be needed, with an adequate margin of safety, to protect the public health. Secondary standards are those judged to be needed to protect the public welfare from any known or expected adverse effects of a pollutant. Ambient standards are given in micrograms per cubic meter ($\mu g/m^3$).

ANIMAL UNIT MONTH (AUM)—The amount of forage a cow and a calf (6 months of age and under) consume in 1 month. This unit is used to calculate livestock carrying capacities and serves as a basis for grazing fees.

ANNUAL AVERAGE DAILY TRAFFIC—The average number of vehicles passing a specified point during a 365-day period.

ANTHROMORPHS—Painted or etched graphics showing human form or human attributes.

AQUIFER—A water-bearing bed or layer of permeable rock, sand, or gravel, capable of yielding water.

AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC)—An area "within the public lands where special management attention is required (when such areas are developed or used, or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life and safety from natural hazards." (See section 103(a) of the Federal Land Policy and Management Act.)

ASPECT—The direction that a slope faces.

AUTHORIZED OFFICER—A designated federal regulatory agency employee responsible for activities involving the use of public lands or delegated to exercise authority over grants for use of these lands.

BACKFILL—The material used to refill a ditch or other excavation or the process of doing so.

BARREL—A liquid measure of oil, usually crude oil, equal to 42 gallons or about 306 pounds.

BASELINE—Projected conditions expected to exist in the area of influence, excluding applicant and interrelated projects.

BERM—The shoulder of a road.

BITUMEN—A naturally occurring viscous mixture of hydrocarbons, such as asphalt, which may contain sulphur compounds and which, in its naturally occurring state, is not recoverable at a commercial rate through a well. When processed, however, bitumen produces a synthetic oil.

BLOCK VALVE—A valve that can be closed to isolate one section of pipe from an adjacent section.

BROWSERS—Cattle, deer, elk, and other animals that usually eat tender shoots, twigs, tree leaves, shrubs, or woody vines.

CAIRNS—Small mounds of rocks made by prehistoric peoples. Although the exact function is unknown, historic tribes often used cairns as landmarks or hunting blinds.

CAPACITY—In transportation studies, the greatest number of vehicles having a reasonable opportunity to pass over a given section of a roadway within a given time under prevailing roadway and traffic conditions.

CARBON MONOXIDE (CO)—A colorless, odorless, toxic gas produced by the incomplete combustion of carbon-containing substances. One of the major air pollutants, CO is emitted in large amounts in the exhaust of gasoline-powered vehicles.

CENSUS COUNTY DIVISION (CCD)—A county division used by the Bureau of the Census for listing some census data. Maps showing CCD boundaries are included in the population census report for each state.

CHAINING—A method of increasing forage production by which two bulldozers drag an anchor chain across an area and uproot target plants, particularly pinyon and juniper.

CHANNERS—Thin flat fragments of limestone, sandstone, or schist up to 6 inches in major diameter.

CLAYEY SOIL—A fine-grained soil that has high plasticity and contains more than 35 percent clay by weight. Clayey soil includes mainly clay loams, clays, sandy clay loams, and sandy clays.

COLLUVIAL—Pertaining to rock debris and soil accumulated at the foot of a slope.

COMBINED HYDROCARBON LEASE—A lease issued in a special tar sand area (STSA) that entitles the lessee to remove any gas or nongaseous hydrocarbon substance other than coal, oil shale, or gilsonite.

COW-CALF LIVESTOCK OPERATION—A livestock operation in which a base breeding herd of mother cows and bulls is maintained. The cows produce a calf crop each year, and the operation keeps some heifer calves from each calf crop for breeding herd replacements. The operation sells the rest of the calf crop between the ages of 6 and 12 months along with old or nonproductive cows and bulls.

COW-CALF-YEARLING LIVESTOCK OPERATION—A cow-calf operation that, instead of selling its calves between the ages of 6 to 12 months, sells them after they are 12 months old.

CRITICAL AREA—An area of habitat that is essential to the survival of any wildlife species sometime during its life cycle.

CULTURAL RESOURCE INVENTORY CLASSES:

Class I—Existing data inventory: an inventory study of a defined area designed (1) to provide a narrative overview (cultural resource overview) derived from existing cultural resource information and (2) to provide a compilation of existing cultural resource site record data on which to base the development of the BLM's site record system.

Class II—a sample-oriented field inventory designed to locate and record, from surface and exposed profile indications, all cultural resource sites within a portion of a defined area to allow an objective estimate of the nature and distribution of cultural resources in the entire defined area.

The Class II inventory is a tool for use in management and planning as an accurate predictor of cultural resources in the area of consideration. The primary area of consideration for implementing a Class II inventory is a planning unit. The secondary area is a specific project in which an intensive field inventory (Class III) is neither practical nor necessary.

Class III—an intensive field inventory designed to

locate and record, from surface and exposed profile indications, all cultural resource sites within a specified area.

After Class III inventories are completed in an area, no further cultural resource inventory work is normally needed. A Class III inventory is appropriate on small project areas, all areas to be disturbed, and primary cultural resource areas.

CULTURAL RESOURCES—Remains of human activity, occupation, or endeavor, reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that were of importance in past human events. These resources consist of (1) physical remains, (2) areas where significant human events occurred, even though evidence of the event no longer remains, and (3) the environment immediately surrounding the actual resource.

DENDRITIC DRAINAGE (PATTERN)—A drainage pattern with tributaries branching like a tree's boughs.

DIAGNOSTIC ARTIFACTS—Handmade objects (as a tool or ornament) that is known to represent a culture or stage of technological development.

DILUENT—A diluting agent.

DIP—Angle at which a stratum or any plan or feature is inclined from the horizontal.

EMISSION—Effluent discharge into the atmosphere, usually specified by mass per unit time.

EMISSION INVENTORY—A set of emission source information, usually applied in an air quality simulation model; a list of air pollutants emitted into a community's atmosphere in amounts (commonly tons) per day by type of source.

ENDANGERED SPECIES—Any animal or plant species in danger of extinction throughout all or a significant portion of its range.

ENVIRONMENTAL IMPACT STATEMENT (EIS)—An analytical document developed for use by decision-makers to weigh the environmental consequences of a potential action.

EOLIAN DUNE—A hill or ridge of sand piled up by the wind.

EPHEMERAL STREAM—A stream that flows only in direct response to precipitation.

ESCARPMENT—A long cliff or steep slope separating two comparatively level or more gently sloping surfaces and resulting from erosion or faulting.

FIVE-SPOT WELL SITE—A square area, often of 5, 10, 20, or 40 acres, where five production or air injection wells are drilled, one on each corner and one in the center.

FLYROCK DISTANCE—The distance that rock fragments are thrown and scattered during blasting for mining, which defines the hazard zone around blasting.

FLUVIAL—Of or relating to rivers: growing or living in streams or ponds, as a fluvial plain.

FORB—A low-growing, herbaceous plant that is not a grass, sedge, or rush.

FORAGE—All browse and herbaceous foods available to grazing animals, which may be grazed or harvested for feeding.

FOSSIL—Any remains, trace, or imprint of a plant or animal that has been preserved by natural processes in the Earth's crust since some past geologic time.

FUGITIVE DUST—Airborne particles emitted from any source other than through a stack.

HABITAT—A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

HYDROCARBONS—Organic chemical compounds of hydrogen and carbon atoms that form the basis of all petroleum products.

***IN SITU* EXTRACTION**—Extracting bitumen from tar sand while it is still in the ground by injecting steam, solvents, heat, or a combination of these three.

INDICATED RESOURCES—Tar sand resources computed partly from specified measurements and partly from projecting visible data for a reasonable distance from geologic evidence.

INFRASTRUCTURE—The set of systems and facilities that support a region or community's social and

economic structures. Examples of such systems include transportation, education, medical service, communication, and fire and police protection.

INTERBURDEN—The rock lying between the tar sand beds to be mined.

INVADER PLANTS—Plant species that were absent in undisturbed portions of the original plant community and will invade under disturbance or continued overuse.

ISOPLETH—A line or contour drawn on a map connecting points of equal value, such as similar temperature (isotherm), pressure (isobar), or pollutant concentrations.

LAND USE PLAN—A plan that identifies and establishes land uses and restrictions for a given geographic area.

LEACHING—The separation of dissolving soluble constituents from a rock or ore by chemical solutions or water.

LEK—An area where grouse gather for ritualistic display and breeding; also sage grouse strutting ground.

LEVEL OF SERVICE—In transportation studies, a qualitative measure of traffic flow along a given road in consideration of a variety of factors, including speed and travel time, traffic interruptions, and freedom to maneuver. Levels of service are designated A through F: A being a free-flowing condition with low volumes and high speeds and F being a congested condition of low speeds and stop-and-go traffic. Intermediate levels describe conditions between these extremes. A level-of-service below C involves unstable to forced traffic flow in which a driver's freedom to select a speed is restricted and in which traffic stoppages cause congestion.

LIVESTOCK CARRYING CAPACITY—The most livestock that can graze an area without damaging vegetation or related resources. The carrying capacity can vary from year to year depending on the range's forage production.

MAHOGANY ZONE—The most persistent and widespread oil shale bed in the Green River formation, which represents the maximum extent of ancient Lake Uinta and may yield up to 70 gallons of oil per ton.

MANAGEMENT FRAMEWORK PLAN (MFP)—A public land use plan that states the goals and constraints for a specific area and provides guidance for managing the area's resources.

MICROCLIMATE—Climatic conditions of a small area. Microclimates are influenced by local geography and vegetation and may greatly differ from regional climate in temperature, wind, length of growing season, or precipitation patterns.

MITIGATION—The abatement or reduction of a construction or operation impact to the environment by (1) avoiding a certain action or parts of an action, (2) employing certain construction measures to limit the degree of impact, (3) restoring an area to predisturbance conditions, (4) preserving or maintaining an area throughout the life of a project, or (5) replacing or providing substitute resources to the environment.

MULCH—A natural or artificial layer of suitable materials (crop residue, wood chips, netting) that aids in soil stabilization and soil moisture conservation, thus providing microclimatic conditions suitable for germination and growth.

NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)—The allowable concentrations of air pollutants in the air specified by the Federal Government in Title 40, Code of Federal Regulations, Part 50. The 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 and requisite to protect the public welfare from any unknown or expected adverse effects of air pollutants). Welfare includes effects on soils, water, crops, vegetation, manufactured 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 REGISTER OF HISTORIC PLACES—The official list, established by the Historic Preservation Act of 1966, of the Nation's cultural resources worthy of preservation.

NATIONWIDE RIVERS INVENTORY—The Nationwide Rivers Inventory program is a listing being kept by the National Park Service of the best remaining

free-flowing rivers in the nation that may be appropriate for protection at the federal, state, or local level.

NON-ATTAINMENT AREA—A geographic area in which the quality of the air is worse than federal ambient air quality standards.

NOXIOUS PLANT—A plant that is undesirable because it conflicts with or restricts management objectives or otherwise causes problems.

OFF-ROAD VEHICLE (ORV)—A vehicle (including four-wheel drive vehicles, trail bikes, and snowmobiles but excluding helicopters, fixed-wing aircraft, and boats) capable of traveling off-road over land, water, ice, snow, sand, and marshes.

OIL SHALE—A fine-grained sedimentary rock containing (1) organic matter derived chiefly from aquatic organisms, waxy spores, or pollen grains, which is only slightly soluble in ordinary petroleum solvents and a large proportion of which is distillable into synthetic petroleum, and (2) inorganic matter that may contain other minerals. The term "oil shale" applies to any argillaceous, carbonate, or siliceous sedimentary rock that, through destructive distillation, will yield synthetic petroleum. Oil shale products include both shale oil and other minerals such as hahcolite and dawsonite.

OPEN PIT MINING—A mining process in which the overburden or surface and other covering material is drilled and blasted over a large area and removed to expose ore. The ore is then drilled, blasted, and removed.

OVERSTORY VEGETATION—The upper canopy or canopies of plants, usually consisting of trees, tall shrubs, and vines.

PALEONTOLOGY—A science dealing with the life of past geoiogical periods as known from fossil remains.

PARTICULATE—A particle of solid or liquid matter: soot, dust, aerosols, fumes, and mist.

PEAK TRAFFIC FLOW—The maximum flow of traffic passing a given point within a specified length of time.

PEDIMENT—A broad gently sloping bedrock surface at the base of a steeper slope, which is usually thinly covered with alluvial gravel and sand.

PERCOLATION—The downward movement of water through soil.

PETROGLYPHS—Carvings or inscriptions on a rock.

pH—A numeric value that gives the relative acidity or alkalinity of a substance on a 0 to 14 scale with the neutral point at 7. Values lower than 7 show the presence of acids, and values greater than 7 show the presence of alkalis.

PHYSIOGRAPHIC PROVINCE—An extensive portion of the landscape normally encompassing hundreds of square miles, portrayed by similar qualities of soil, rock, slope, vegetation, and climate of the same geomorphic origin.

PICTOGRAPHS—Ancient or prehistoric drawings or paintings on a rock wall.

PLAN OF OPERATIONS—A mandatory plan, developed by an applicant of a mining operation or construction project, that specifies the techniques and measures to be used during construction and operation of all project facilities on public land. The plan is submitted for approval to the appropriate federal agency before any construction begins.

PLANO PERIOD—A Paleo-Indian cultural complex (6000-5000 B.C.) characterized by a particular point style.

PLEISTOCENE—The epoch forming the earlier half of the Quaternary period, originating about 1 million years ago and characterized by widespread glacial ice and by the appearance of humans.

POLLUTANT—Any substance discharged into the ambient air that tends to create a harmful effect upon humans, animals, property, convenience, or happiness or that causes contamination in ambient air to exceed legal limits.

POTSHERDS—A pottery fragment.

PREVENTION OF SIGNIFICANT DETERIORATION (PSD)—A regulatory program based not on the absolute levels of pollution allowable in the atmosphere but on the amount by which present air quality will be allowed to deteriorate in a given area. Under this program, geographic areas are divided into three classes, each allowing different increases in increments of total suspended particulates and sulfur dioxide concentrations.

Class I—minimal additional deterioration in air quality (certain national wilderness areas).

Class II—moderate additional deterioration in air quality (most lands).

Class III—greater deterioration for planned maximum growth (industrial areas).

PRIMARY (DIRECT) EMPLOYMENT—Employment in economic activities that earns money from outside the area being studied. In this document, primary employment is employment in tar sand construction or operation.

PRIME AGRICULTURAL LAND (PRIME FARMLAND)—Land that is best suited for producing food, feed, forage, fiber, and oilseed crops. The inventory of prime agricultural land is maintained by the U.S. Department of Agriculture, Soil Conservation Service.

PROJECT LIFE—The estimated time a project would be operating.

PROTOHISTORIC—A transitional period from prehistoric to historic times. The first cultural trends of the historic Indians occurred during this period.

PUBLIC LANDS—The official name of lands administered by the Bureau of Land Management.

PUBLIC WATER RESERVE—Public lands set aside under the authority of the General Withdrawal Act of June 25, 1910, commonly referred to as the Pickett Act (36 Stat. 847). The Pickett Act states "that the President may, at any time in his discretion, temporarily withdraw from settlement, location, sale or entry any of the public lands in the United States, including Alaska, and reserve the same for water power sites, irrigation, classification of lands, or other public purposes to be specified in the orders of withdrawals, and such withdrawals or reservations shall remain in force until revoked by him or an Act of Congress."

QUADRAPEDAL-ZOOMORPHS—Painted or etched graphics showing animal forms that have four legs.

QUATERNARY—The present geologic period, forming the latter part of the Cenozoic era, originating about 1 million years ago and including the Recent and Pleistocene epochs.

RANGE CONDITION—The present state of rangeland based on the potential vegetation it is capable of producing.

RECHARGE—The process by which water is added to an aquifer. Recharge can be natural such as the infiltration of rainfall below the land surface or artifical such as the injection of water through a well.

RECLAMATION—The process of converting disturbed land to its former use or other productive uses.

ROAD SEGMENTS—Designated segments of roads for which specific traffic data is collected.

RUN-OF-MINE ORE—Raw ore as it is delivered by mine cars, skips, or conveyors before any treatment.

SCENERY QUALITY CLASSES (VRM):

Class A—Areas that combine the most outstanding characteristics of each rating factor.

Class B—Areas that combine some outstanding features and some features that are fairly common to the physiographic region.

Class C—Areas where the features are fairly common to the physiographic region.

SCOPING—An early and open process for determining the scope of issues to be addressed in an environmental impact statement and for identifying the significant issues related to a proposed action.

SECONDARY EMPLOYMENT—Employment in economic activities that earn money from within the area being studied. It is also called indirect employment. Examples are employment in stores, laundries, and other local services and local government.

SENSITIVE PLANT SPECIES—Plants whose populations are consistently small and widely dispersed or whose ranges are restricted to a few localities, such that any appreciable reduction in numbers, habitat availability, or habitat condition might lead toward extinction. Sensitive plants also include species rare in one locality but abundant elsewhere. See Endangered Species and Threatened Species.

SENSITIVE SOILS—These are areas that contain less favorable soils, slopes, and climatic conditions; are

more susceptible to erosion hazards; and have a lower revegetation potential.

SLURRY—A watery mixture of a solid and a liquid.

SOIL PRODUCTIVITY—The capacity of a soil to produce a plant or sequence of plants under a system of management.

SOIL PROFILE—A vertical section of soil that shows all horizons and parent material.

SPECIAL TAR SAND AREA (STSA)—An area having large deposits of tar sand as identified by the Department of the Interior in the ***Federal Register***—November 20, 1980 (45 FR 76800) and January 21, 1981 (46 FR 6077). All STSAs are located in Utah.

SPENT SAND—Sand exhausted of active or required components of qualities for a particular purpose, such as tar sand that has been processed.

SPOIL—Earth and rocks excavated or dredged.

SULFUR OXIDES—Pungent, colorless gases formed mainly by the combustion of fossil fuels. Considered major air pollutants, sulfur oxides may harm the human respiratory tract as well as damage vegetation.

SYNTHETIC FUEL (SYNFUEL)—Any direct substitute for liquid petroleum fuels, including fuels derived from unconventional nonpetroleum sources such as coal, oil shale, tar sand, agricultural products, or municipal solid wastes.

TAR SAND—A sand that is naturally impregnated with petroleum.

THREATENED SPECIES—Any plant or animal species likely to become endangered within the foreseeable future throughout all or a part of its range.

TOESLOPES—The lower, gentle slope of a hillside, lying at the foot of an escarpment or steep rock face and usually covered by an accumulation of colluvium or alluvium.

TOPSOIL—The surface tilled layer in cultivated areas or the uppermost layer of soil containing organic materials.

TOTAL DISSOLVED SOLIDS (TDS)—An aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, and nitrates of calcium, magnesium, manganese, sodium, potassium, and other cations that form salts. High TDS solutions can change the chemical nature of water, exert varying degrees of osmotic pressures, and often become lethal to life in an aquatic environment.

TOTAL SUSPENDED PARTICULATE (TSP) MASS—A pollutant measured as the mass of all particles in the atmosphere without regard to size or chemical composition.

TRAFFIC—The flow of vehicles along a roadway.

UNDERSTORY VEGETATION—Plants growing beneath the canopy of other plants, usually grasses, forbs, and low shrubs.

UNITIZED OPERATION—Form of management that provides for the exploration, development, and operation of an entire structure or area by a single operator so that production may proceed in an efficient and economical manner.

VEGETATION MANIPULATION—Modification of vegetation cover by fire or mechanical, chemical, or biological means to meet range management objectives.

VEGETATION TYPE—A plant community with distinguishable characteristics described by the dominant vegetation present.

VISIBILITY—A measurement of the maximum distance from which large objects may be viewed. Fixed reference objects such as mountains, hills, towers, or buildings are normally used to estimate visibility.

VISUAL RESOURCE MANAGEMENT (VRM)—The planning, design, and implementation of management objectives to provide acceptable levels of visual impacts for all resource management activities.

VISUAL RESOURCE MANAGEMENT (VRM) CLASS—The degree of visual change that is acceptable within the existing characteristic landscape. It is based upon the physical and sociological characteristics of any given homogeneous area and serves as a management objective.

VISUAL RESOURCE MANAGEMENT CLASSES:

Class I—Class I provides mainly for natural ecological changes; management activities are to be restricted and are not to attract attention.

Class II—In Class II areas, changes in the basic elements by management activities should not be evident in the characteristic landscape.

Class III—In Class III areas, contrasts to the basic elements may be evident and begin to attract attention, but they should remain subordinate to the existing characteristic landscape.

Class IV—In Class IV areas, alterations may attract attention but should repeat the form, line, color, and texture characteristics of the landscape.

Class V—In Class V areas, rehabilitation is needed to restore the landscape to the character of the surrounding landscape.

WATER BAR—A low (several inches high) barrier (usually of logs, stone, soil, or concrete) placed across a trail on a slope to divert water from the trail and prevent erosion.

WILD AND SCENIC RIVERS ACT—Provides for the designation and protection of rivers of national significance if they are free-flowing and contain one or more outstandingly remarkable scenic, recreation, geologic, fish and wildlife, historic cultural, or other similar values.

WILDERNESS AREA—An uncultivated, uninhabited, and usually roadless area set aside by Congress for preservation of natural conditions.

WILDERNESS STUDY AREA (WSA)—A roadless area or island that has been inventoried and found to have wilderness characteristics as described in Section 603 of the Federal Land Policy and Management Act and Section 2(c) of the Wilderness Act of 1964 (78 Stat. 891).

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Form 1279-3
(June 1984)

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