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# CIRCLE CLIFFS COMBINED HYDROCARBON LEASE CONVERSION



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## Draft Environmental Impact Statement



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DEPARTMENT OF THE INTERIOR

DRAFT ENVIRONMENTAL IMPACT STATEMENT

on the

CIRCLE CLIFFS COMBINED HYDROCARBON LEASE CONVERSION

Prepared by

Bureau of Land Management

November 1984

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*Roland Robinson*

State Director, Utah

Morgan Jensen, District Manager  
Bureau of Land Management  
1579 North Main Street  
P.O. Box 124  
Cedar City, Utah 84720

Sincerely,  
Date by which comments must be received  
January 28, 1985  
Date EIS made available to the public  
November 26, 1984

November, 1984

Dear Reviewer:

This draft environmental impact statement (EIS) on the proposed conversion of existing oil and gas leases within the Circle Cliffs Special Tar Sand Area to combined hydrocarbon leases (and alternatives to the proposals) is submitted for your review and comment. It is tiered to and supplements the Utah Combined Hydrocarbon leasing Regional Final EIS (1984) and should be evaluated together with this earlier document. Please retain this Draft EIS for future references, as the Final EIS may be only an addendum.

The purpose of this public review is to improve the impact analysis 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 December 20, 1984, at 7:00 p.m. in Cedar City, Utah, at the Bureau of Land Management Office (1579 North Main Street).

Please address written comments to:

Morgan Jensen, District Manager  
Bureau of Land Management  
1579 North Main Street  
P.O. Box 724  
Cedar City, Utah 84720

In order to be considered in the Final EIS, all comments must be received by January 28, 1985.

Please make your comments as specific as possible. Comments will be most helpful if they address the adequacy and accuracy of the impact analysis of the proposed actions and alternatives.

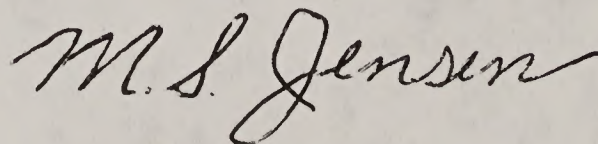
A copy of the Final EIS will be sent to all persons who provide comments on the Draft EIS or who request a copy. Requests for copies of the Draft EIS should be sent to:

Morgan Jensen, District Manager  
Bureau of Land Management  
1579 North Main Street  
P.O. Box 724  
Cedar City, Utah 84720

or

Public Room  
Bureau of Land Management  
Utah State Office  
136 East South Temple  
Salt Lake City, Utah 84111

Sincerely,



Morgan Jensen  
District Manager

COVER SHEET

Circle Cliffs Combined Hydrocarbon Lease Conversion  
Environmental Impact Statement

(X) Draft

( ) Final

Lead Agency

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

Cooperating Agencies

U.S. Department of the Interior  
National Park Service

The State of Utah

County That Would be Directly Affected

Garfield County, Utah

Abstract

This EIS assesses the environmental consequences of developing the Circle Cliffs tar sand deposit in accordance with a plan of operation submitted by W. C. Kirkwood Oil & Gas Company acting as agent under the Circle Cliffs Combined Hydrocarbon Unitization Agreement. This EIS addresses the impacts of the proposed action, a restricted development alternative, a worst case analysis, and a no action alternative.

The major areas of environmental concern relate to air quality in Capitol Reef National Park, changes in existing water use, socioeconomic factors, and effects on governmental plans and policies for the Boulder to Bullfrog road.

The development of this tar sand resource would utilize an "in situ" production method, a developing technology. Thus, there is a high degree of uncertainty regarding possible environmental impacts.

EIS Contact

Comments on this EIS should be directed to:

Morgan Jensen, District Manager  
Bureau of Land Management  
1579 North Main  
P.O. Box 724  
Cedar City, Utah 84720

Date By Which Comments on the EIS Must Be Received

January 28, 1985

Date EIS Made Available to EPA and the Public

Draft: November 26, 1984



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## SUMMARY

W. C. Kirkwood Oil and Gas Company has filed an application with the Bureau of Land Management (BLM) to convert existing oil and gas leases within a portion of the Circle Cliffs Special Tar Sands Area to combined hydrocarbon leases, in accordance with the Combined Hydrocarbon Leasing Act of 1981. Approval of the conversion applications would permit phased development of the tar sand resource. Because very little is known about the location and extent of the resource, project designs are conceptual. Therefore, should a lease be converted, additional site-specific environmental analyses would be required before the types of commercial production addressed in this environmental impact statement (EIS) would be permitted.

In situ tar sand development within the Circle Cliffs Special Tar Sands Conversion Area (STSCA) would cause impacts either by displacing resources (for example, removing vegetation), using resources (for example, consuming water), or changing conditions (for example, introducing visual scars on the landscape or increasing the rate of community growth). Many of these impacts are discussed in the Utah Combined Hydrocarbon Leasing Regional Final EIS, June 1984. Thus, this analysis is tiered to and supplements the Regional EIS and focuses on special impacts of concern either identified during scoping or required by law and regulation.

## ISSUES OF MAJOR ENVIRONMENTAL CONCERN

Throughout the public meetings, interagency coordination, and other facets of the EIS scoping process, numerous environmental issues were identified which can be summarized as follows:

- . Concern that Capitol Reef National Park and the Glen Canyon National Recreation Area may be adversely affected.
- . Concern that established water use patterns could be disrupted.
- . Concern over the potential effects to the local economy, social services, and quality of life.
- . Concern over the potential effects of project development on the proposed Boulder to Bullfrog road.
- . Concern regarding reclamation potential of the proposed development area.

## ALTERNATIVES

The DEIS addresses three tar sand development scenarios and the No Action Alternative. The applicant's proposal involves a 32,000 barrels per day (BPD) fire flood extraction process and the conversion of all existing oil and gas leases to combined hydrocarbon leases.



Alternative 1 would also utilize a fire flood extraction technology and convert all existing oil and gas leases, but restrictive stipulations would reduce production to 2,000 BPD and defer production on about 23 percent of the area proposed for development.

Alternative 2 would also convert all the existing oil and gas leases but utilize a steam injection process to produce 32,000 BPD of hydrocarbon.

All alternatives, except the No Action Alternative, analyze the effects of full development. Descriptive information for the applicant's proposal was taken from the Plan of Operation submitted by the applicant. Descriptions of the other developmental alternatives were extracted from other environmental documents and do not represent any applicant's proposal. These alternatives are included solely for purposes of comparative environmental analysis.

#### SUMMARY OF MAJOR IMPACT CONCLUSIONS

##### Proposed Action

Development in accordance with the applicant's plan of operation would result in violations of Class I Air Quality Standards within Capitol Reef National Park. Increased noise levels within the Park and the Glen Canyon National Recreation Area would reduce park values.

Anticipated water consumption would not disrupt existing water use patterns.

The large influx of people (1,706 in 2005) would cause temporary shortages in housing, law enforcement, health care, fire protection, etc. These effects would last until the public service sector could be expanded. The increased economic activity generated would provide for increased job opportunities and governmental revenues. Existing lifestyles may be substantially altered.

The proposed design of the Boulder to Bullfrog road would be incompatible with the applicant's need to utilize this road for the hauling of hydrocarbons.

The area appears to have an adequate reclamation potential.

#### Alternative 1 (Restricted Development)

Production at the 2,000 BPD level is predicted to just meet the Class I Air Quality Standards within Capitol Reef National Park after application of the specific mitigating measures noted on pages 4-1 and 4-2. Noise levels would increase within both Capitol Reef National Park and the Glen Canyon National Recreation Area, but are expected to be within the Environmental Protection Agency standards of 55 decibels A-weighted (dbA). Such noise levels within the Park may reduce park values. Anticipated water consumption would not disrupt existing water use patterns.

The influx of people (114 by 1995) would be accommodated within the existing public service sector without major disruption. The economic activity

would provide for some increased employment activities and increased governmental revenue. The existing lifestyles should not be substantially altered.

The stipulation to prohibit use of the Boulder to Bullfrog road in excess of its design standards would eliminate conflicts with this road.

The area's reclamation potential appears adequate.

#### Alternative 2 (Worst Case)

Production at the 32,000 BPD level using a steam injection process would violate Class I Air Quality Standards within Capitol Reef National Park. Noise levels, both within the Park and the Glen Canyon National Recreation Area, would reduce park values.

Anticipated water consumption would probably disrupt existing water use patterns by reducing the amount of water available (7,000 acre feet/year) for irrigational purposes.

A projected 2,350 increase in population would create temporary shortages in housing, law enforcement, health care, fire protection, etc. These effects would continue until the service sector expanded. The economic activity would provide for new employment opportunities and increased governmental revenues. The existing lifestyle would be substantially altered.

The proposed design of the Boulder to Bullfrog road would be incompatible with the need to utilize this road for hauling hydrocarbons.

The area's reclamation potential appears to be adequate.

### Alternative 3 (No Action)

No change in the natural environment would occur. Thus, impacts to Capitol Reef National Park, Glen Canyon National Recreation Area, water use patterns, the local economy, social structure, and the Boulder to Bullfrog road would be avoided. Reclamation of the area would no longer be of concern.

The tar sands resource would not be developed as proposed by the applicants, but would be available for future competitive leasing.

### UNRESOLVED ISSUES

The proposed plan of development submitted by W. C. Kirkwood Oil and Gas is conceptual in nature and only describes one of several possible developmental options. In addition the applicant retains the right to modify or amend the plan before or after the leases are converted. Thus, information relevant to the eventual developmental design is not available and indeed may be beyond the current "state of the art" for in situ recovery process.

In addition to the uncertainty regarding the eventual developmental methods a number of other factors are unknown. These are: ground water characteristics, tar sand occurrence in the White Rim or Cedar Mesa, future congressional action on wilderness instant study areas within the STSCA, soils data, and onsite meteorological data.

### Agency Preferred Alternative

The Restricted Development Alternative is recommended as the agency's preferred alternative. The reader is referred to the comparative analysis contained in Chapter 2 for the supporting rationale.



## CHAPTER 1

### DESCRIPTION OF PROPOSED ACTIONS AND ALTERNATIVES

#### I. INTRODUCTION

This environmental impact statement (EIS) was initiated by combined hydrocarbon lease conversion applications and a proposed plan of operations filed by W. C. Kirkwood Oil and Gas acting as agent for all 19 leaseholders within the Circle Cliffs development area under a unitization agreement. The application and plan of operations were filed pursuant to the Combined Hydrocarbon Leasing Act of 1981.

The projects analyzed in this EIS are highly conceptual. The impact analysis presented here is based on existing data and many assumptions. Should a decision to convert a lease be made, more detailed environmental analysis based on more defined project designs and more 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 recently released EISs - the Utah Combined Hydrocarbon Regional final EIS (BLM 1984), Sunnyside Combined Hydrocarbon Lease Conversion final EIS (BLM 1984), and the Tar Sand Triangle

Combined Hydrocarbon Lease Conversion EIS (NPS and BLM 1984). In addition, a combined hydrocarbon lease conversion EIS and six environmental assessments are in preparation. These documents are scheduled for completion in late 1984 and early 1985.

The purpose of the Regional EIS is to analyze the regional impacts of the proposed federal combined hydrocarbon leasing program. The EIS also analyzes potential new combined hydrocarbon lease tracts and the BLM land use planning amendments needed for the combined hydrocarbon leasing program. The Circle Cliffs STSCA is one of 11 special tar sand areas analyzed in the Utah Combined Hydrocarbon Regional EIS (BLM 1984) referred to as the Regional EIS.

This document tiers to and supplements the information contained in the Regional EIS. However, the general information pertaining to the National Environmental Policy Act process and specific data related to the Circle Cliffs Area contained in the Regional EIS is incorporated by reference. The Regional EIS is available at all national depository libraries and BLM offices within the State of Utah.

#### A. Purpose and Need for Proposed Actions

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



The Combined Hydrocarbon Leasing Act of 1981 entitles holders of oil and gas leases to convert their holdings to new combined hydrocarbon leases upon the submittal of a plan of operations which demonstrates reasonable protection of the environment and diligent development of the resources requiring enhanced recovery methods or mining. A limited timeframe was allowed for submittal of applications. The act also requires the Bureau to act on completed applications within 15 months of receipt.

This EIS provides a basis for determining whether or not the application by W. C. Kirkwood Oil and Gas meets the test of reasonable protection of the environment.

#### B. Location of Proposed Actions

The leases proposed for conversion are located within a portion of the Circle Cliffs Special Tar Sands Area (see photos 1 & 2). As shown in Map 1-1 the development area consists of all lands that lie outside of Capitol Reef National Park and the Glen Canyon National Recreation Area. The area itself is located in northeastern Garfield County some 18 miles southeast of Boulder, Utah. Photos 1 and 2 show some typical views of the proposed development area.

#### C. Authorizing Actions (Federal)

The first Federal action would be a decision to approve, in whole or in part, or deny the proposed lease conversions.

In the event of approval or partial approval of the lease conversions the following actions would then be taken:

- . Preparation of an environmental assessment(s) on the exploratory and pilot phases of the Plan of Operations.
- . Sequential approval of the exploratory and pilot phases of the Plan of Operations.
- . Preparation of an appropriate NEPA document on the commercial production phase of the final Plan of Operations.
- . Approval, denial, or modification of the Plan of Operation as related to commercial production.

Leaseholders would also be responsible for obtaining specific Federal authorizations for right-of-way and air quality related issues. Additional permits and authorizations would have to be acquired by the applicant from State and local governmental agencies.

#### D. Interrelationships

The interrelationships between this proposed development and other tar sand projects are addressed in Volume 1 of the Regional EIS (BLM 1984). In addition there are three ongoing projects/actions which would interact with the proposed tar sand development. They are the proposed Boulder to Bullfrog



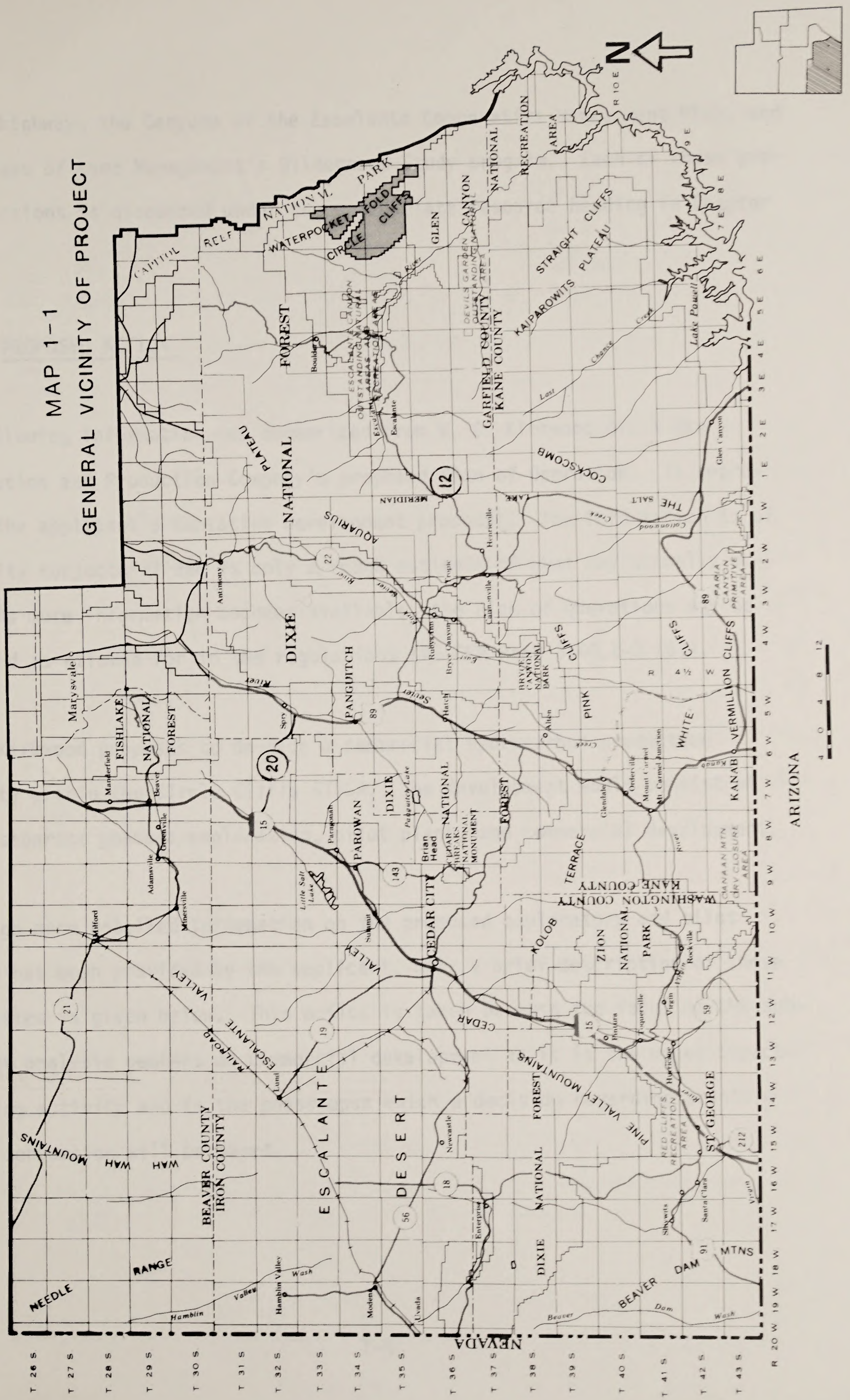
PHOTO 1 - Photograph of the Circle Cliffs for which the area is named.



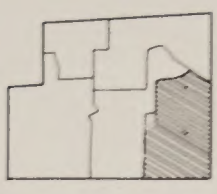
PHOTO 2 - Looking south from the Boulder to Bullfrog road across the Circle Cliffs STSA.



MAP 1-1  
GENERAL VICINITY OF PROJECT



ARIZONA





scenic highway, the Canyons of the Escalante Cooperative Management Plan, and the Bureau of Land Management's Wilderness Study program. Each of these projects/actions is discussed under the appropriate resource heading in Chapter 3.

## II. PROPOSED ACTION

The following information was summarized from W. C. Kirkwood Oil & Gas Exploration and Production Company's proposed Plan of Operation. It represents the applicant's tentative development proposal. The information is of necessity conjectural and is only a rough estimate of what may actually occur. As more information becomes available, the Plan of Operations may be modified as allowed for in the regulations (43 CFR Part 3140.2-3 (B)).

W. C. Kirkwood proposes to develop a commercial hydrocarbon production facility within the Circle Cliffs STSCA. The development would consist of three separate phases: exploration, pilot plant, and commercial development.

Although more detailed information on the proposed exploratory and pilot phases has been provided by the applicant, only a brief description of these activities is given below. This action is taken because the focus of the subsequent analysis centers on commercial development as it is the major impact-inducing activity and is the phase upon which a decision regarding possible lease conversion will be based.

## A. Exploration

The purpose of the exploration phase would be to determine the quantity and quality of tar sand underlying the conversion areas. The exploration phase is critical to the design of plans for commercial development because existing oil and gas leases do not permit exploration for tar sand. Therefore, current tar sand reserve estimates are speculative. Until reserve estimates are better defined, project plans can only be conceptual.

During the exploration phase, typical activities would include collection of geological, geophysical, hydrological, and geochemical data through field surveys, core hole drilling, and similar procedures. In this case the applicant proposes to drill approximately 14 test holes and construct 3 miles of access road utilizing standard industry equipment. Typically, one or two field seasons would be required to collect the necessary data to proceed to the pilot plant phase.




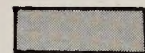

## B. Pilot Plant

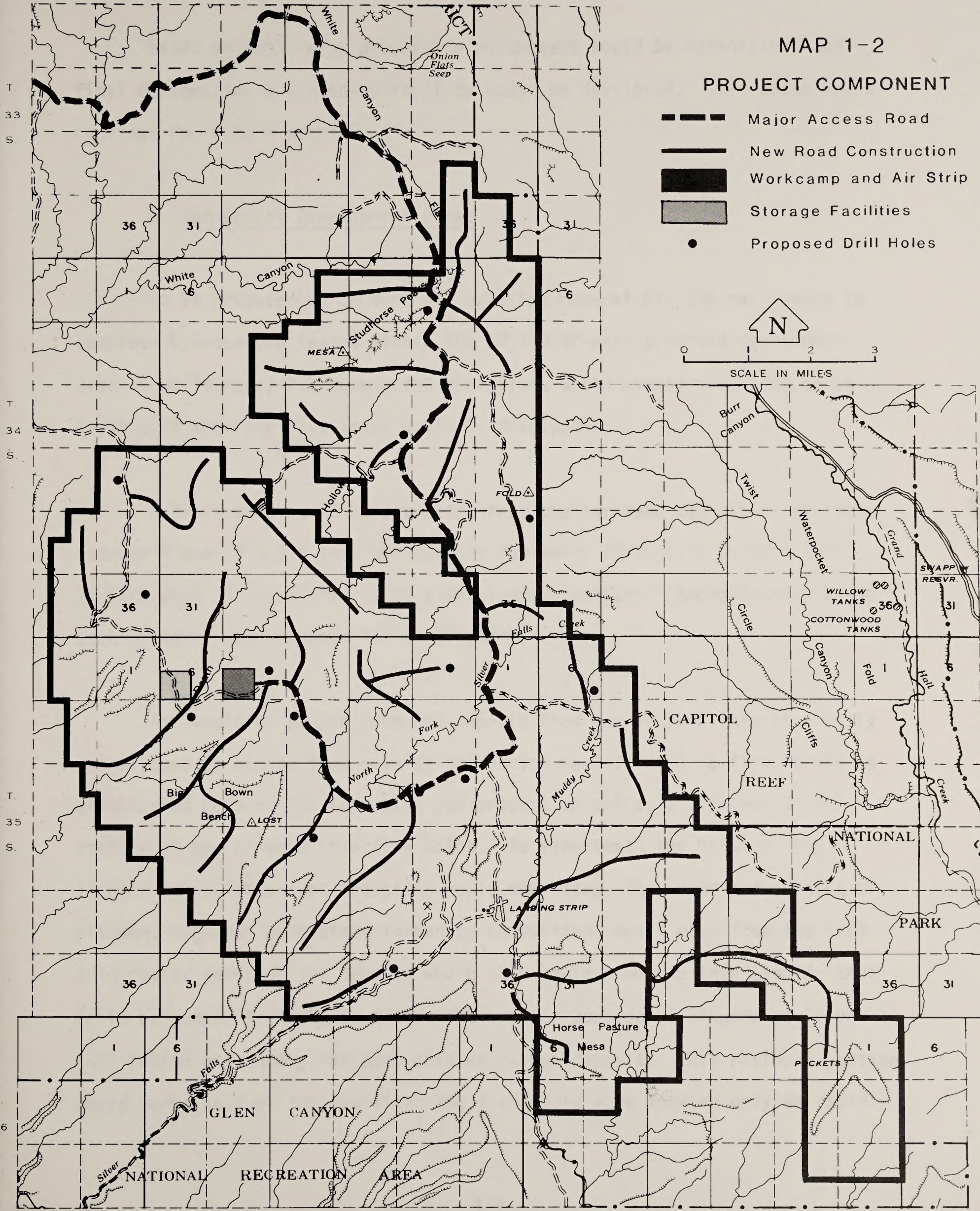
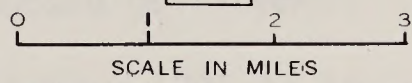
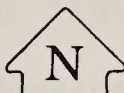
The purpose of the pilot plant phase would be to obtain the data necessary to develop final engineering design for a commercial level of development. Typically, small amounts of bitumen would be extracted via in situ process from a primary target area located within the proposed area to be developed. This hydrocarbon would serve as feedstock for a small pilot plant producing approximately 400 BPD. The location of the proposed pilot facility is shown in Map 1-2.



# MAP 1-2

## PROJECT COMPONENT

-  Major Access Road
-  New Road Construction
-  Workcamp and Air Strip
-  Storage Facilities
-  Proposed Drill Holes





Based on test runs, processing parameters would be established and final designs for a scaled-up facility would be developed. This phase would continue for 4 to 5 years.

### C. Commercial Development Phase

It is proposed to convert all existing Federal oil and gas leases to combined hydrocarbon leases within the 57,170.52-acre proposed development area shown in Map 1-2. Commercial operations would extend from 1991 to at least 2072 when the last lease would be developed.

Hydrocarbons would be extracted from the tar sand deposit by drilling between 9 and 13 wells into the deposit for every 20 surface acres. Each 20-acre unit is considered to be a development pattern. Approximately 2,436 such patterns are proposed for development.

Air would be pumped into the deposit from one or more injection wells and allowed to escape from several production wells. After a flow of air is established between the injection and production wells, a fire would be started at one or more injection holes. As fire heats the bitumen, the lighter molecular weight fractions would vaporize. The vaporized portion of bitumen, together with steam formed by combustion, would move from the fire into cooler parts of the deposit where they would condense into liquids that could be pumped from the deposit. The heavier portion of bitumen would be left behind as a heavy residual coke or carbon deposit. This residual portion would serve as fuel for the fire: the fire would move forward only as rapidly

as the residual portion was burned. In this process, the flame front would move in the same direction as the air. Maximum temperatures would be about 900 degrees Fahrenheit. Figure 1-1 provides a schematic diagram of this process.

It is anticipated that from 1 to 16 patterns may be in operation at the same time. Commercial operation may last as long as 3 to 5 years at each pattern with production ranging from 0 to a maximum of 2,000 BPD. If 16 patterns are operated simultaneously, this could result in production of a maximum of 32,000 barrels of oil per day.

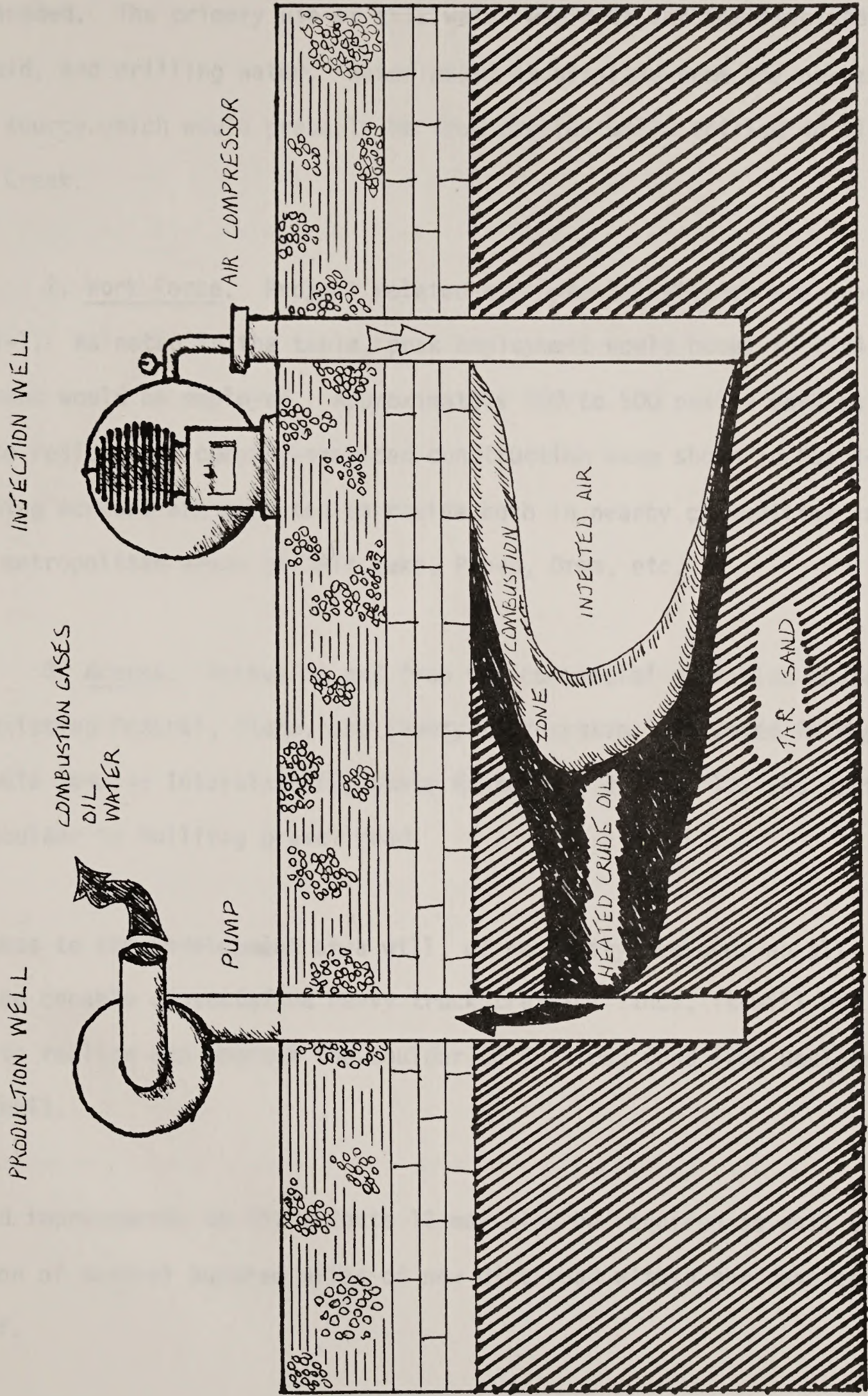
The first development patterns would probably be located in section 7, T. 35 S., R. 7 E. Development would start with just one pattern and then would be expanded up to the maximum of 16. Development would move in a sweep across the unit expanding to the boundaries of commercial production.

### 1. Surface Disturbance

Approximately 40 percent of the area to be developed would be subject to some type of surface disturbing activity. Disturbance could result from drill pad clearance, access road construction, pipelines or facility development. During operations a maximum of 1,000 acres per year would be disturbed with approximately 360 acres directly involved in hydrocarbon production. Disturbance over the life of the project is estimated to be about 21,000 acres.

FIGURE 1-1

In Situ Combustion





1. Water Requirements. A total of about 13 acre-feet per year would be needed. The primary use of this water would be for domestic uses, quench fluid, and drilling water. Water would be obtained from the nearest practical source which would probably be from shallow wells drilled on site or from Deer Creek.

2. Work Force. Project related employment estimates are provided in Table 1-1. As noted in the table, peak employment would occur in 1994 when 1,075 persons would be employed. Approximately 400 to 500 onsite workers are expected to reside in a company-provided construction camp shown in Map 1-1. The remaining workers are expected to reside both in nearby communities and in the major metropolitan areas of Salt Lake, Provo, Orem, etc.

3. Access. Access to and from the commercial operation would be over the existing Federal, State, and County road system. As noted in Map 1-1, it would involve Interstate 15, State Routes 20, 89, and 12, and Garfield County's Boulder to Bullfrog gravel road.

Access to the development area will, of necessity, be over an all-weather road capable of sustained heavy truck traffic. Thus, it will be necessary to realign and upgrade the Boulder to Bullfrog road from Boulder to the Burr Trail.

Road improvements to State Route 12 may also be required as well as the construction of several hundred miles of new dirt road within the development area itself.

Traffic during construction and operations in the development phase will consist of trucks hauling equipment, water, and fuel into the area and produced hydrocarbons out of the area. At a production level of 10,000 BPD, 50 truck loads of hydrocarbon, at 200 barrels per load, would be required to transport the hydrocarbon from the area. An additional maximum of 20 truck-loads per day could be used to haul equipment, water, and fuel into the area.

4. Pipeline. If hydrocarbon production approached 10,000 barrels per day, an oil pipeline would be constructed to carry all the produced oil to the nearest railhead. Possible destinations for the pipeline include Cedar City or Marysvale, Utah. Neither design specifications or a route has been selected at this point.

5. Support Facilities. A work camp, designed to support the 400 to 500 man crew, would be developed in the SW1/4 of Section 5, T. 35 S., R. 7 E (Map 1-2). A water supply will be drilled and a septic system installed. Power would be generated onsite. Offsite workers would be located in existing communities or in construction camps as yet unidentified.

An air strip would be constructed near the work camp to facilitate transportation of personnel and supplies (Map 1-2).

6. Abandonment. As each development pattern is exhausted it would be abandoned and the site restored in accordance with the procedures established by the surface owner.



TABLE 1-1  
 PROJECTED DIRECT EMPLOYMENT FOR  
 THE PROPOSED PLAN

<u>Year</u>	<u>Onsite</u>	<u>Truck Drivers</u>	<u>Site &amp; Pipeline Construction</u>	<u>Road Construction</u>	<u>Total</u>
1990	14			75	89
1991	133	20		100	253
1992	165	20		100	285
1993	165	80	100	75	420
1994	165	110	800		1,075
1995	205	110	100		415
1996	245				245
1997	281				281
1998	316				316
1999	366				366
2000	418				418
2001	420				420
2002	420				420
2003	420				420
2004	420				420
2005	420				420

Note: Onsite worker numbers were provided by the applicant. The other direct employment figures were estimated by BLM.



## 7. Applicant Committed Mitigating Measures

1. Areas with surface fractures extending into the tar sand deposit will not be developed.
2. A buffer in excess of 500 feet will be followed near the tar sand outcrops.
3. American Petroleum Institute and Occupational Safety and Health Administration safety procedures will be followed.
4. Onsite access roads will be maintained to control erosion.
5. Dust suppression methods will be used in connection with drilling activities and on access roads.
6. Facilities will be constructed to route any storm water into natural channels.
7. All engines will be equipped with approved mufflers.

### E. Energy Efficiency

According to information contained in Volume I, page 21 of the Regional EIS the percent recovery of the oil in place would be fair (approximately 30 percent). The overall in situ energy efficiency would be an estimated 10 to 20 percent.

### III. RESTRICTED DEVELOPMENT ALTERNATIVE

#### A. Description

This alternative is designed to provide a high level of protection to nonenergy resource values while providing for a modest tar sand development program. This alternative is not proposed by the applicant.




This alternative would involve the conversion of all proposed leases with constraints to reduce or eliminate environmental impacts (Map 1-3). In addition, development of any area covered by constraints listed below would not occur until after all other areas were developed.

The following constraints would be included as conditions of lease conversion. These are in addition to stipulations established by the Regional Tar Sands EIS and included in Appenix A.

- . A mile buffer zone will be established around each active eagle nest. Activities within this zone will not be permitted during the nesting period (March through June).
- . No occupancy or other surface disturbance (except for emergency actions in connection with pollution discharges) shall be permitted within any drainage leading into Capitol Reef National Park, or the Glen Canyon National Recreation Area, within a distance of one mile from their respective boundaries.

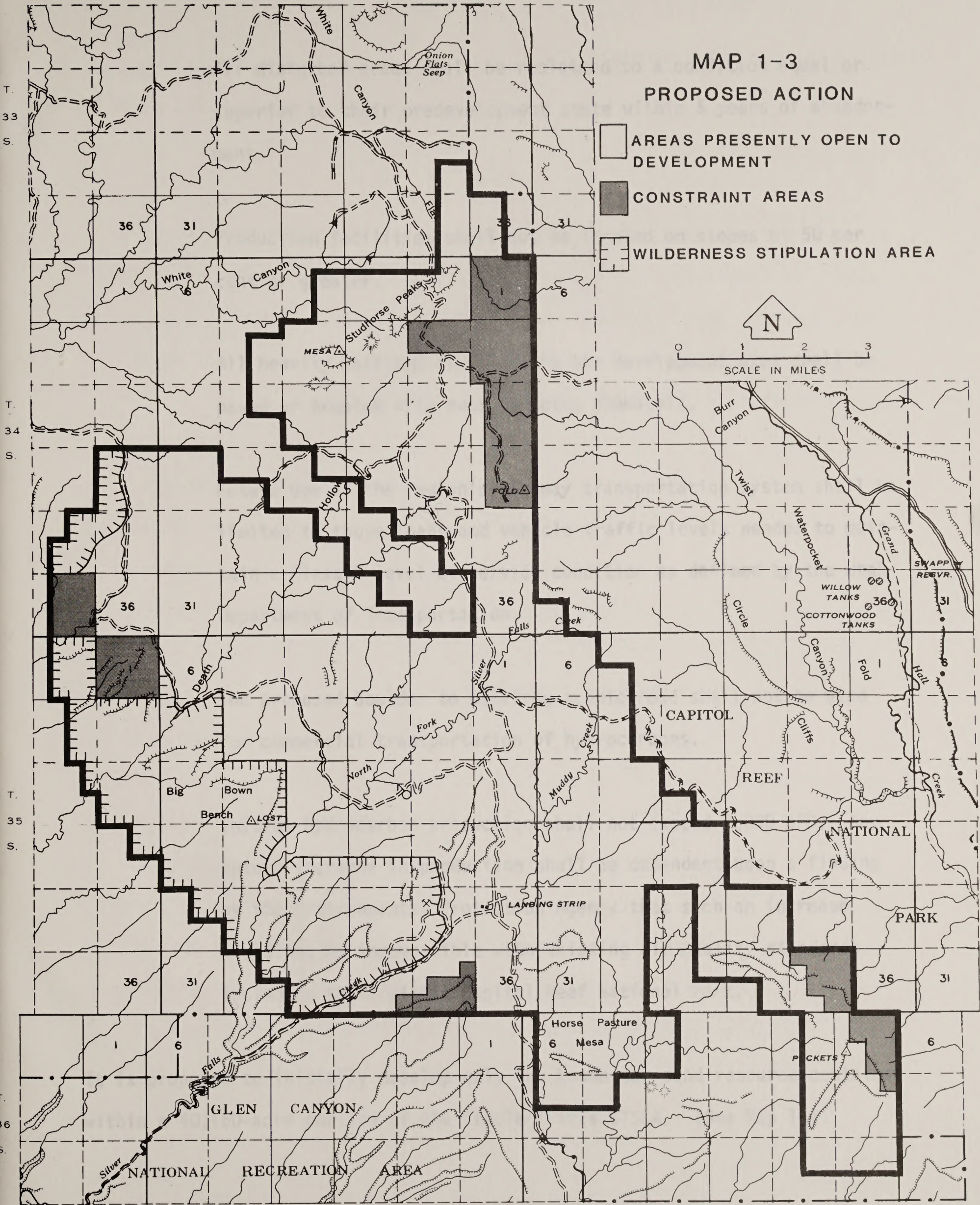
# MAP 1-3

## PROPOSED ACTION

-  AREAS PRESENTLY OPEN TO DEVELOPMENT
-  CONSTRAINT AREAS
-  WILDERNESS STIPULATION AREA



0 1 2 3  
SCALE IN MILES





- . All disturbed areas shall be reclaimed to a condition equal or superior to their predevelopment state within 5 years of abandonment.
- . Production facilities shall not be located on slopes of 50 per cent or greater.
- . All heavily utilized roads within the development area shall be paved or treated with dust reducing chemicals.
- . Future use of the region's highway transportation system shall be limited to those loads and vehicle traffic levels needed to maintain a Class C level of service condition as defined by the Utah Department of Transportation.
- . The proposed Boulder to Bullfrog scenic road shall not be used for commercial transportation of hydrocarbons.
- . Initial hydrocarbon production shall not exceed 2,000 BPD. Any future increase in production shall be dependent upon a finding by the Environmental Protection Agency that such an increase would not be incompatible with existing air quality standards including those within Capitol Reef National Park.

It is proposed to initially develop only the known tar sand resource contained within a 40,160-acre portion of the Circle Cliffs STSCA. (See Map 1-4)

Although the scale and location of activities would be smaller than those proposed by W. C. Kirkwood Oil and Gas the exploration and pilot phases would be almost identical.

As described previously an in situ combustion process would be utilized to extract the hydrocarbons. Approximately 2,000 20-acre development patterns would be utilized to produce 2,000 BPD of hydrocarbons. Assuming each pattern would produce 2,000 BPD for five years, an initial project life of about 10,000 years is anticipated.



1. Surface Disturbance. Based on the reclamation sequence assumptions outlined in the applicant's plan of operation, it was assumed that during commercial operation, about 60 acres of land would be disturbed at any one time over the life of the project. Total disturbance is estimated at 16,000 acres.

2. Water Requirements. A total of about 1.4 acre-feet of water per year would be needed for domestic and production purposes.

3. Work Force. Table 1-2 provides the anticipated employee levels for this alternative. As shown in the table, peak employment would occur in 1992 when 251 persons would be employed. Approximately one-half of the onsite work force would be expected to reside in Boulder or Escalante, Utah. The other half would be housed in an onsite construction camp.



RESTRICTED DEVELOPMENT  
ALTERNATIVE

-  AREAS AVAILABLE FOR DEVELOPMENT
-  CONSTRAINT AREAS

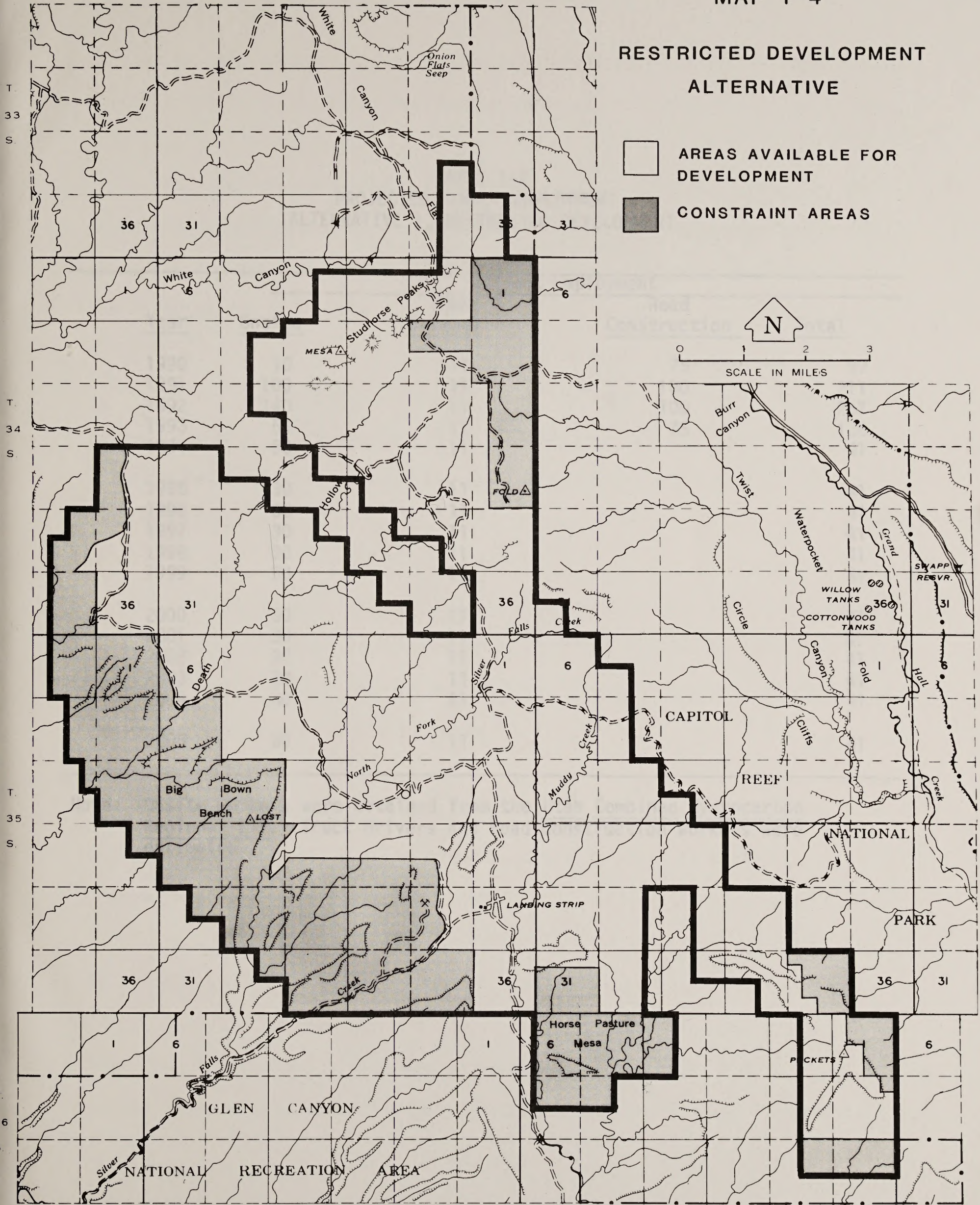
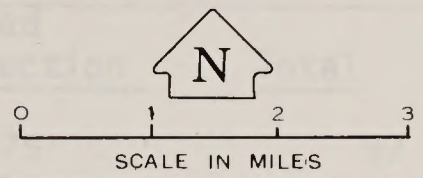




TABLE 1-2  
 PROJECTED DIRECT EMPLOYMENT  
 ALTERNATIVE 1, RESTRICTED DEVELOPMENT

Year	Direct Employment			Total
	Onsite	Truck Drivers	Road Construction	
1990	10	11	75	97
1991	100	11	100	211
1992	140	11	100	251
1993	50	11	75	136
1994	30	11		41
1995	30	11		41
1996	30	11		41
1997	30	11		41
1998	30	11		41
1999	30	11		41
2000	30	11		41
2001	30	11		41
2002	30	11		41
2003	30	11		41
2004	30	11		41
2005	30	11		41

Note: Onsite workers were obtained from the Utah Combined Hydrocarbon Regional EIS. Truck drivers and road construction workers were estimated.



4. Access. Access to the site would be identical to that described under the proposed action and shown on Map 1-1.

Road improvements would be required on State Route 12. However, the Boulder to Bullfrog Scenic Road would not be available for commercial use; thus, an alternative hydrocarbon transport system would have to be developed for this transport segment.

At full production, ten truckloads (200-barrel) of hydrocarbon would be hauled to the Salt Lake area every day. An additional ten round trips per day are expected from trucks and busses hauling equipment and personnel to and from the worksite.

5. Support Facilities. The construction camp would be developed in the same location as proposed by W. C. Kirkwood Oil and Gas (Map 1-2). Power would be generated onsite, a water well would be drilled, sewage systems developed, and an airstrip constructed.

6. Abandonment. As each development pattern is exhausted, it would be abandoned and the site restored within 5 years to at least predevelopment conditions.

#### IV. ALTERNATE TECHNOLOGY (WORST CASE)

This alternative results from making assumptions that would create or intensify some adverse environmental impacts, such as water use, employment, and

air pollution. The proposal is, however, reasonably possible, given our present knowledge regarding tar sand development. Photos 3 through 8 show an existing development area which uses this technology. This alternative is derived from actual production methods as analyzed in the Regional EIS. These assumptions are underlined in the following proposal description.

The exploration and pilot plant phases would be identical to those proposed by W. C. Kirkwood Oil and Gas.

A. Description. It is proposed to develop about 52,210 acres of both State and Federal lands within the Circle Cliffs STSCA. The hydrocarbons would be extracted utilizing a steam injection process. In this process steam produced in boilers at the surface would be pumped into the tar sand deposit through one or more injection wells; bitumen and water would be recovered from production wells. Steam would heat the bitumen in the deposit, which would reduce the bitumen's viscosity: the steam-heated bitumen would be driven to one or more production wells. Wells could be constructed in parallel rows or could form a ring around a well. Steam injection would use large quantities of water (Spencer et al., 1970). A ratio of bitumen to water could be as much as 1 to 10, but is usually considered to be 1 to 5.

As with the proposed action, from 9 to 13 wells would be drilled into the tar sands deposit for every 20 surface acres. At full production (32,000 BPD) 16 of these 20-acre sites would be in production.

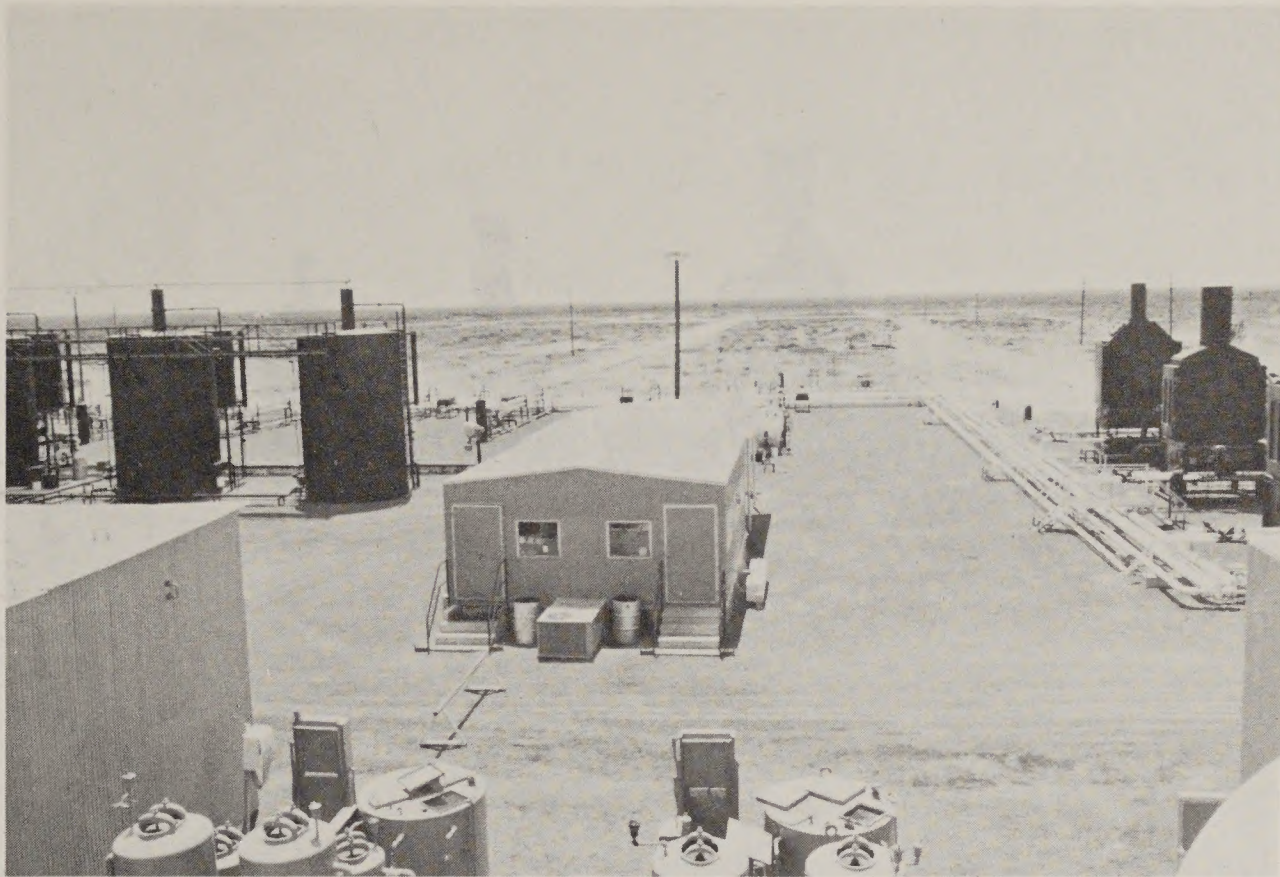


PHOTO 3 - In situ tar sands facilities near Uvalde Texas. The operation uses a steam injection process to produce hydrocarbons.



PHOTO 4 - Same facility as described above.







PHOTO 5 - Oil-fired boilers utilized to produce the steam needed for injection into the tar sands deposit at Uvalde facility.



PHOTO 6 - Oil storage facilities at Uvalde.



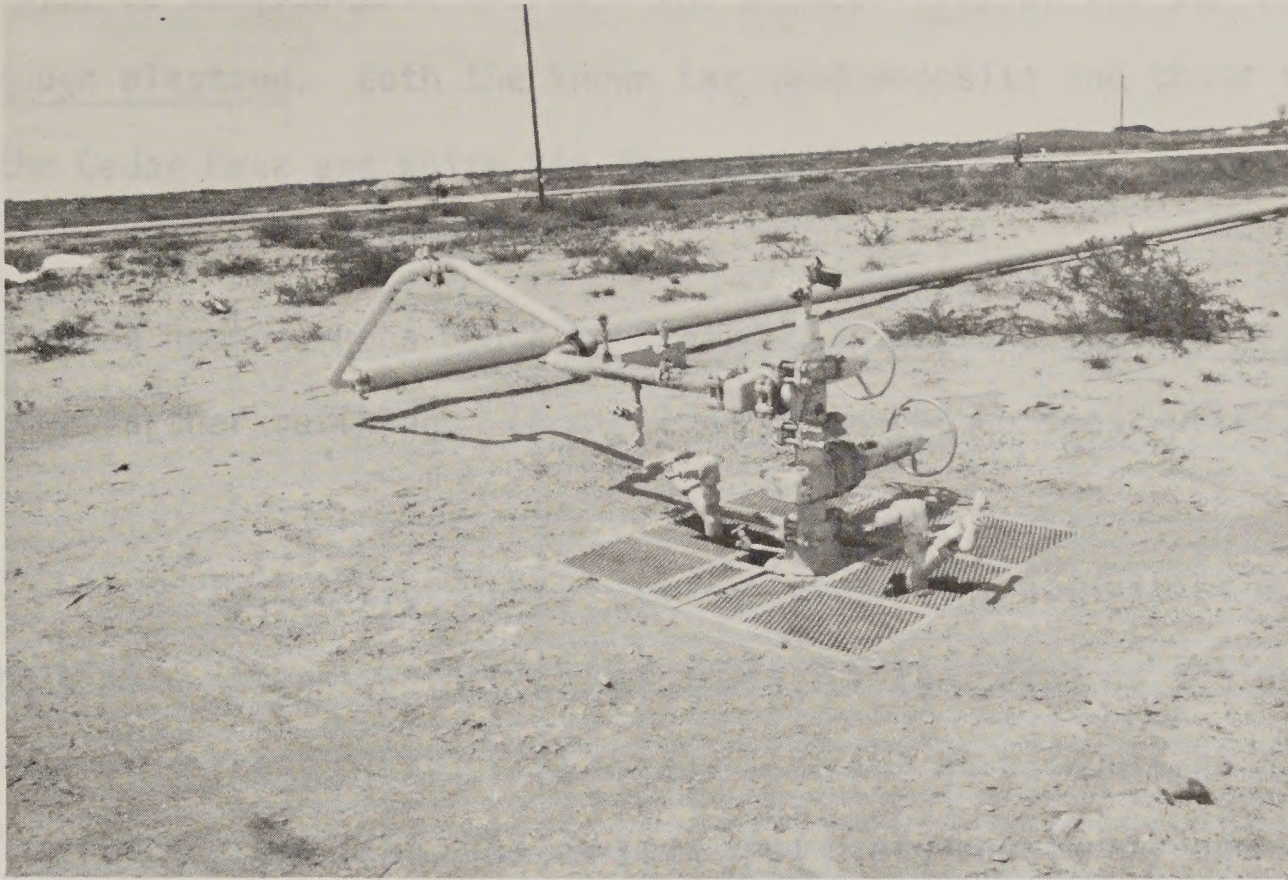


PHOTO 7 - Steam injection well and connecting pipelines at Uvalde.

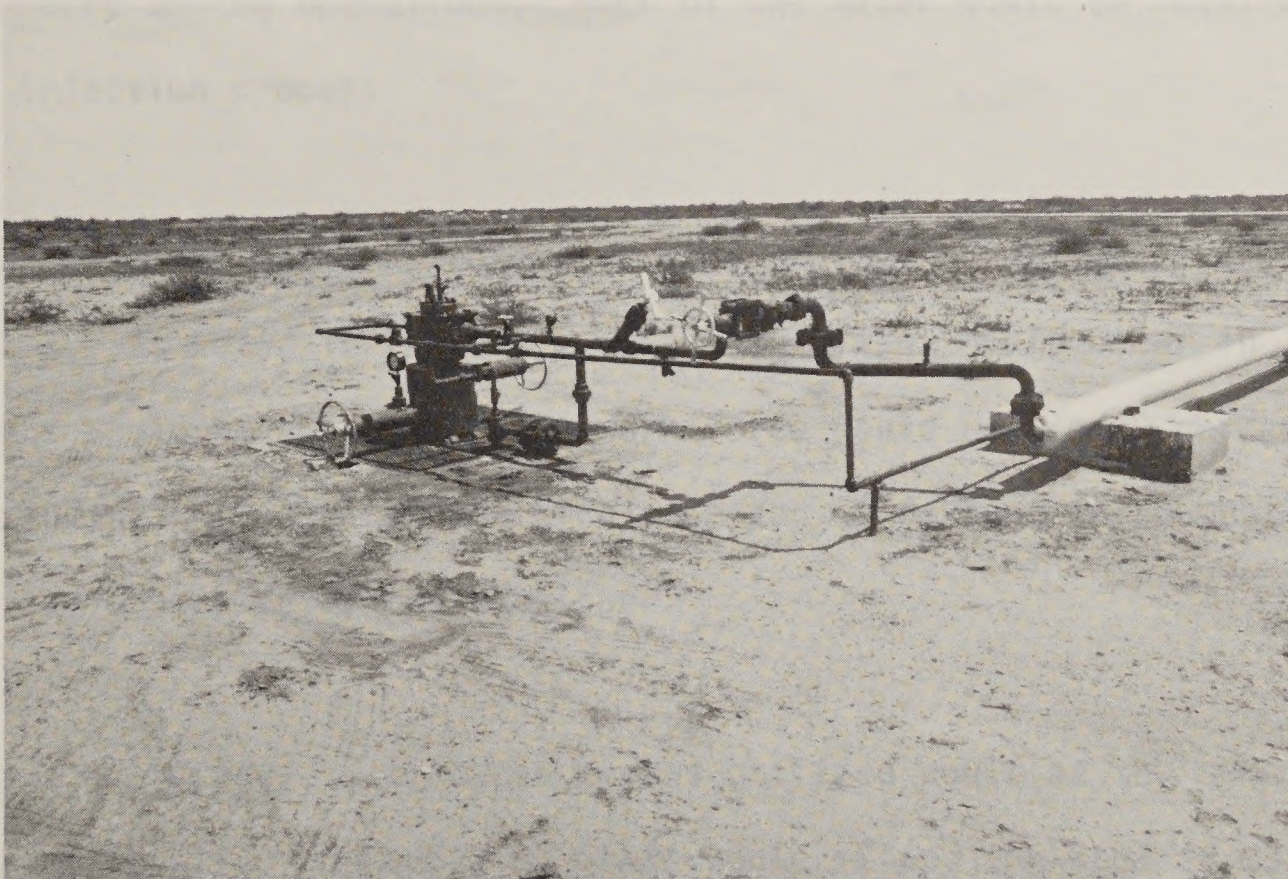


PHOTO 8 - Extraction well used to remove hydrocarbons from the tar sands deposit at Uvalde.



It will be necessary to increase the permeability of the tar sands deposits through blasting. Both the known tar sand deposits and those inferred to be in the Cedar Mesa and White Rim formations would have to be fractured.

Recovered hydrocarbons would be upgraded onsite and trucked to Salt Lake City for further refining. (A pipeline would not be constructed.)

1. Surface Disturbance. Surface disturbing activities would be only slightly more intensive than as described for the proposed action, i.e. approximately 40 percent of the area or about 21,000 acres would be disturbed over the life of the project. The maximum area disturbed in any one year would be 1,000 acres with approximately 360 acres directly involved in hydrocarbon production.

2. Water Requirements. A total of about 7,526 acre-feet per year would be needed during operations. Much of the water would be required for the steam injection process.

3. Work Force. Project related employment estimates are provided in Table 1-3. As noted in the table, peak employment would occur in 1992 when 2340 persons would be employed. The work force would reside 50 percent in the nearby communities of Boulder and Escalante and 50 percent in an onsite construction camp operated by the developer.

4. Access. The access routes utilized would be the same as described previously. Upgrading of State Route 12 and the Boulder to Bullfrog road would be required to handle up to 160 oil truckloads (200 barrels) per

day or 320 truck trips per day plus an additional 30 truck trips for other transport needs.

5. Support Facilities. The construction camp would be developed at the same location proposed by W. C. Kirkwood Oil and Gas. A water well would be drilled and a septic system installed. Power would be generated on-site. An airstrip would be constructed near the work camp.

6. Abandonment. The procedure previously noted for the proposed action would be utilized.

#### V. NO ACTION ALTERNATIVE

The No Action Alternative would result from a finding that the applicant's Plan of Operation does not provide (1) "diligent development of the hydrocarbon resource" or (2) "reasonable environmental protection". Such a finding would involve denial of all or part of the requested lease conversion applications. However, the area would remain available for conventional oil and gas exploration in accordance with current procedures and possible future competitive hydrocarbon leasing.

#### VI. ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

A partial conversion alternative was considered but eliminated from detailed analysis. This action was taken because (1) the critical environmental areas

TABLE 1-3  
 PROJECTED DIRECT EMPLOYMENT  
 ALTERNATIVE 2, ALTERNATE TECHNOLOGY

<u>Year</u>	<u>Onsite</u>	<u>Truck Drivers</u>	<u>Onsite Construction</u>	<u>Road Construction</u>	<u>Total</u>
1990			160	75	235
1991			1600	100	1700
1992			2240	100	2340
1993	576	320	640	75	1611
1994	576	320			1611
1995	576	320			1611
1996	576	320			1611
1997	576	320			1611
1998	576	320			1611
1999	576	320			1611
2000	576	320			1611
2001	576	320			1611
2002	576	320			1611
2003	576	320			1611
2004	576	320			1611
2005	576	320			1611

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Note: Onsite workers were estimated by assuming a 60-percent increase in figures presented in the Utah Combined Hydrocarbon Regional EIS. (The 60-percent increase represents the difference in production scale.) Truck drivers and road construction workers were estimated.





do not conform to lease boundaries, and (2) the same level of protection is provided by the Restricted Development Alternative which is analyzed in detail. Alternatives to tar sand development in general, such as conservation or solar energy development, are not considered in this EIS, but are addressed in the Utah Combined Hydrocarbon Regional EIS (BLM 1983a), which discusses the entire Federal tar sand program.

## VII. MITIGATION

Certain mitigating measures are common to all developmental alternatives. A list of these measures that would alleviate or minimize adverse impacts can be found in Appendix A.



CHAPTER 2  
COMPARATIVE ANALYSIS

I. INTRODUCTION

This chapter compares the significant impacts of the proposed action, the Restricted Development Alternative, the Alternate Technology (worst case) Alternative, and the No Action Alternative. It also sets forth the agency's Preferred Alternative.

A. Comparative Analysis. Table 2-1 provides a comparative format for evaluating the proposed action and each of the alternatives.

The comparative analysis is restricted to those elements which, in BLM's judgment, would have a substantial influence on the decision to convert the subject leases.

B. Agency Preferred Alternative. It is BLM's tentative decision to select the Restricted Development Alternative together with the specific mitigating measures noted in Chapter 4. This action is preferred because it provides for both reasonable environmental protection and future tar sand development. Table 2-1 indicates for the rationale utilized to support this tentative decision.



TABLE 2-1

Summary Comparison of Impacts of  
The Proposed Action and Alternative

Resource Values	Alternate Technologies			No Action
	Proposed Action	Restricted Development	Worst Case	
Water Resources	Contamination of surface waters from oil spills is possible from pipeline ruptures and oil truck accidents. The effects on ground water are unknown. Developments should not cause a major change in current water use.	Contamination of surface waters from oil spills are possible, but both the severity of the spill and the probability would be less than the proposed action due to a 94% reduction in production level and the elimination of the oil pipeline. The effects on ground water are unknown. Developments would not cause a major change in water use.	Same as proposed action except that higher truck usage (160 vs. 50) could increase the probability of a spill and use of up to 7,526 acre-feet per year would create a major change in water use patterns, probably from agriculture to industrial use. Blasting of tar sands could cause the loss of 4 springs. The average flow of Boulder Creek could be reduced by 45%.	No Effect - the existing water use patterns would continue.
Socioeconomic Factors	A population increase over the baseline of 1,706 is predicted by 2005. Local employment is projected to peak at 800 by 1994. Personal income is expected to increase by about \$25 million. Infrastructure elements, such as schools, fire protection, and medical services would have to be substantially expanded.	A population increase over the baseline of 139 is predicted by 2005. Local employment is projected to peak at 52 by 2005. Personal income is expected to increase by \$1.85 million. Infrastructure elements would have to be expanded but not to the degree required by the proposed action.	A population increase over the baseline of 2,350 is predicted by 2005. Local employment is projected to peak at 2,200 by 1992. Personal income is expected to increase by \$35 million. Infrastructure elements would have to be expanded to a level greater than needed for the proposed action.	The population for Garfield County is expected to increase 42% between 1980 and 2005. Employment and income are not expected to change significantly. The existing infrastructure elements would need to be expanded, but not to the degree required by any of the other alternatives.
Soils-Vegetation-Livestock Grazing	In general, the area appears to be suitable for reclamation and revegetation.  Vegetative disturbance of up to 21,000 acres is anticipated.  A 15 AUM reduction in permitted use is anticipated.	Same as the proposed action.  Vegetative disturbance of about 16,000 acres is anticipated.  No reduction in permitted use is anticipated.	Same as the proposed action  Vegetative disturbance of up to 21,000 acres is anticipated.  Same as the proposed action	No effect  No disturbance from tar sand development would occur.

Table 2-1 (Continued)

Resource Values	Proposed Action	Restricted Development	Alternate Technologies	
			Worst Case	No Action
Wildlife	Development would force the 13 horses of the Moody-Wagon Box wild horse herd to utilize lands within Capitol Reef National Park more intensively, thereby increasing conflicts between the horses and the desert bighorn. Effects would continue until the horses were removed. Adverse impacts to eagles would occur.	Same as the proposed action	Same as the proposed action, except that impacts to trout fisheries might occur.	Current plans call for the removal of the Moody-Wagon Box horse herd as soon as funds are available.
	Development would restrict expansion of the Moody Canyon desert bighorn herd into the Circle Cliffs area.	Same as the proposed action	Same as the proposed action	The Moody Canyon desert bighorn herd would probably be expanded into the Circle Cliffs area.
	Transportation of equipment and personnel over the main access road could adversely affect a T&E species - Peregrine falcon.	Same as the proposed action	Same as the proposed action	No effect
Recreation and Wilderness	Capitol Reef National Park and the Glen Canyon National Recreation Area would be adversely impacted from reductions in air quality values and the sights and sounds of development in adjoining lands. The probability of oil contamination and interference with springs and wells within the park units is unknown.	Impacts would be about the same as the proposed action but at a substantially lower intensity.	Same as the proposed action	No effect
	Wilderness values with the north Escalante Canyon (tracts 2, 3, & 4) ISA, the Gulch, Phipps-Death Hollow, and North Escalante Canyon (tract 1) ISA would be adversely affected by the sights and sounds of development on adjoining lands.	Same as proposed action.	Same as the proposed action	No effect
	Wilderness values within the development area could be lost if the Instant Study Areas are "released" for development at some future time.	Wilderness values would not be affected for at least 100 years by tar sands development	Same as the Proposed Action	If the areas are "released" nontar developments could also cause the loss of the development area's wilderness values.

Table 2-1 (Continued)

Resource Values	Alternate Technologies		
	Proposed Action	Restricted Development	Worst Case
Visual Resources	Disturbed areas would be visually altered to a VRM Class V.	Same as proposed Action but at a slower rate.	Same as the proposed action
	Approximately 20 miles of state roads would have to be upgraded to handle the anticipated traffic.	Same as the proposed action	Impacts to State highways would be greater than indicated for the proposed action although the degree of increase is unknown.
Transportation Systems	Information on the proposed pipeline is unavailable.	Pipeline impacts may be avoided	Pipeline impacts would be avoided.
	The Boulder to Bullfrog road would have to be upgraded to an industrial level from Boulder to the Burr Trail.	The Boulder to Bullfrog road would be upgraded to a standard compatible with the State and county scenic highway design parameters.	Same as the proposed action
Air Quality	Class I (in Captiol Reef) and Class II air quality standards would be violated for all averaging times.	Standards would not be violated.	Same as the proposed action
	Visibility reductions would not violate any standards.	Same as the proposed action	Possible atmospheric discol- orations visible within Capitol Reef National Park.
Noise	Increased noise levels of up to 65 dbA within 1,000 feet of developments are expected.	Same as proposed action	Same as Proposed Action
	About 221 acres of agricultural land would be taken out of pro- duction for housing and urban expansion related to the project.	About 18 acres of agricultural land would be taken out of production.	About 1,500 acres of land could be removed from production (probably alfalfa) essentially eliminating irrigated agricul- ture near Boulder, Utah.
Cultural Resources	An estimated 240 sites with National Register potential could be affected.	An estimated 169 sites with National Register potential could be affected.	Same as the proposed action
			No effect

Continued

Table 2-1 (Concluded)

Resource Values	Proposed Action	Restricted Development	Alternate Technologies Worst Case	No Action
Paleontology and Mineral Resources	Little impact on paleontological values is anticipated.	Same as proposed action	Same as the proposed action	No effect
	Hydrocarbon production would be 32,000 BPD which would exhaust the known reserves in 14 years.	Hydrocarbon production would be reduced to 2,000 BPD or lower as a result of air quality, transportation, and water use restrictions. Production could last for over 100 years.	Same as the proposed action	No effect
	Little impact on other mineral values is anticipated.	Same as the proposed action	Same as the proposed action	No effect
Land Use Plans, Policies and Programs	The proposal appears to conflict with the State and County's proposed Boulder to Bullfrog scenic highway.	No conflict	Same as the proposed action	No effect
	Conflicts between Park unit general management plans and the proposal would also occur.	Conflicts with the general management plan would occur but at a lower level of intensity	Same as the proposed action	No effect
	At the 32,000 BPD production level a conflict with the moderate growth objectives of Garfield County's master plan is possible.	No conflict	Same as the proposed action	No effect



## CHAPTER 3

### AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

percent

#### I. INTRODUCTION

A general description of the affected environment and the environmental consequences of tar sand development within the Circle Cliffs STSCA has previously been addressed in the Regional EIS. The Regional EIS identified a range of possible environmental consequences depending upon the intensity of development which varied from No Action to a Maximum Development Alternative. A summary of these possible environmental consequences is given below.

In situ development would recover about 30 percent of the tar sands resource. Such developments would have little impact on other mineral values. In situ technologies could pose serious air quality problems. At a production level of 20,000 barrels per day, violations of both Class I and Class II standards are projected. Visibility impact would not, however, exceed threshold limits. Topography and geology would not be significantly affected, except possibly from subsidence. It is estimated that about 40 percent of the area to be developed would be disturbed. Disturbed areas would change drainage patterns and increase sediment yields. Water quality could be affected by the increased sediment yield and any accidental release of hydrocarbons or leachate waters. Existing aquifers could be adversely impacted. Salinity levels at Imperial Dam, California would increase less than 2 milligrams per liter. Wildlife habitat losses would occur both from direct construction impacts and secondarily from increased human activity. Changes in livestock distribution

patterns would occur along with the loss of some range improvements. All visual class limitations would be exceeded during operations as a result of changes in the basic visual elements of line, form, color, and texture. Major recreational use patterns would be disrupted. Outside sights and sounds of development would affect wilderness study areas and park units. Developments would result in significant increases in population, employment, and demands on community infrastructures. Existing land use plans may need modification.

For further information on these possible impacts and the cumulative effects of this and other tar sand developments the reader is referred to the discussions contained in Volumes I and II of the Regional EIS.

This analytical base is sufficient to meet National Environmental Policy Act requirements for general impacts common to all proposed developmental alternatives. Thus, the focus of the following discussion will relate to those issues or concerns raised during scoping and/or impacts unique to the proposed action or its alternatives.

It must be noted that there is a great deal of scientific uncertainty regarding the proposed commercial development phase. The commercial development proposal has not been finalized, since its formulation depends upon the results of both the exploration and pilot plant phases. What has been submitted by W. C. Kirkwood Oil and Gas represents a "best case scenario" from their prospective; i.e., substantial new reserves of tar sand would be encountered throughout the lease area, blasting of the tar sand would not be required, the fire flood recovery process would prove effective, few workers and only

minimal water needs would be required. In view of the uncertainty regarding this phase of development, we are required (40 CFR 1502.2[b][2]) to evaluate a worst case situation and provide some indication of its probability. Thus, an Alternate Technology Alternative utilizing a steam injection recovery process is presented.

## II. WATER RESOURCES

### A. Areas of Special Concern

- . Impacts to surface waters
- . Effects on ground water
- . Changes in current water use

B. Affected Environment. The Circle Cliffs STSCA is made up of two distinct watershed areas. Hall Creek drainage (1,218 acres) flows into Capitol Reef National Park and then into Lake Powell. The remainder of the area (56,592.52 acres) drains into the Escalante River and eventually into Lake Powell.

There are no perennial streams and only four known springs within the development area. Total water flow from the springs is estimated at 2.9 acre-feet per year. The water rights are held by the BLM and the State of Utah. The water is presently utilized for livestock and wildlife purposes.

Some streams outside the conversion area could be affected by transportation of the hydrocarbon. Several perennial streams would be encountered between the development area itself and Interstate 15, the major north-south transportation corridor. These streams include Deer Creek, Calf Creek, Boulder Creek, the Gulch, the Escalante River, Sevier River, and the Fremont River. With the exception of the Sevier River, all the streams are commonly found within very steep-walled canyons.

It is probable that a substantial ground water resource does not exist within the area. Although actual drilling has not been done, the geology of the Circle Cliffs area is not amenable to the formation of large aquifers. A well-drained limestone formation (Kaibab) is overlain by a less permeable formation of claystone, siltstone, and sandstone (Moenkopi), which does not readily absorb, transmit, or yield water. Alluvial deposits in drainage bottoms may be sources of small amounts of ground water. It is probable that wells would be less than 50 feet deep and yield less than one gallon per minute.

The Circle Cliffs tar sand area is contained within the State of Utah (Division of Water Rights) designated drainage basin No. 97. This basin is presently closed to surface water and ground water appropriations around the communities of Boulder and Escalante and is presently being adjudicated by the State of Utah.

The area's dominant water use is for irrigated agriculture. This use occurs primarily around the communities of Boulder and Escalante, Utah. Water use on Boulder Creek is estimated at 3,000 acre-feet per year out of an average flow of 16,650 acre-feet per year. Water use on the Escalante River is

estimated at between 7,000 and 10,000 acre-feet per year, which still yields an average flow of 10,870 acre-feet per year at Escalante, Utah.

### C. Environmental Consequences.

1. Proposed Action. The proposed action is not expected to adversely affect the area's springs and, in the absence of other surface waters, it can be concluded that the project poses little risk to the STSCA's surface waters.

Transportation of the hydrocarbons creates the greatest probability for surface water contamination. For example, the National Petroleum Council (1971) estimated annual pipeline spillage at 0.8 barrels of oil per mile of pipeline. Assuming a 200-mile pipeline, 60 barrels of oil per year would be released. Trucking spillage figures are unavailable, but would probably be limited to 200 barrels or less per incident.

Negative impacts to water quality could last 2 years or more (Toso Technical Report, 1982). All uses of the affected water would be impaired. The severity of impacts depends on site specific variables such as soil texture, stream flow, and existing uses. These variables have not been analyzed for this report. Generally, the severity of impacts would increase with finer textured soils and lower stream flows. Release of water soluble toxic substances would continue as long as oil residues are held by the soil or stream substrate.

At the present time it is not possible to make quantifiable and scientifically supportable projections regarding possible ground water impacts.

Only after the hydrological study required by the lease stipulations (Appendix A) is completed, can such an estimate be made. None the less, it is likely that a major ground water impact would not occur because of the unfavorable geo- logical conditions.

Project utilization of 13 acre-feet of water per year could probably be obtained onsite from shallow wells or catchments. No change in existing water use would result.

2. Alternative 1 (Restricted Development). The possibility of onsite surface water loss or contamination would be unlikely.

The potential hazard for a spill into a live stream from an oil truck would still occur. However, such risk is probably lower than the proposed action because of the smaller number of oil trucks (10 vs. 50 trucks per day) involved and the overall lower level of production.

Impacts to ground water resources cannot be predicted at this time.

Use of an estimated 1.4 acre-feet/year of water would not result in any change in water use as it is probable that sufficient water could be obtained from shallow aquifers.

3. Alternative 2 (Worst Case). Blasting of the tar sand deposit could result in the loss of the four springs within the development area.

As previously noted, ground water impacts cannot be predicted at this time. However, under a worst case situation any aquifers within the area could become contaminated with hydrocarbon products or simply cease to flow.

Project development would require the acquisition of approximately 7,526 acre-feet per year of water. It is probable that the water would be obtained by the direct purchase of existing agricultural water rights. Should these rights be acquired from Boulder Creek and the Escalante River, current water use patterns would be significantly changed. About 50 percent of the irrigation rights on the Escalante River and all such rights on Boulder Creek would be converted to industrial purposes.

If water rights are purchased to provide the required water, no change in existing flows would occur on Boulder Creek or the Escalante River because a new use would be substituted for a previous use. If water is taken from Boulder Creek over the existing rights, a reduction of 45 percent in the average annual flow would result.

4. Alternative 3 (No Action). No significant changes would occur to the area's water resources. Conventional oil and gas exploration should not pose any threat to water resources.

### III. SOCIOECONOMICS

#### A. Areas of Special Concern

- . Increased population and employment
- . Personal income
- . Effects on existing services

## B. Affected Environment

1. Population and Employment. The area of influence consists primarily of the Escalante-Boulder area in Garfield County (see Photos 9 & 10). Garfield County is sparsely populated, having only .71 people per square mile. In the State as a whole, there were 17.8 people per square mile in 1980, while the figure for the United States was 64.0.

In 1980, 3,673 people lived in Garfield County. The east central part of the county has less than 1,000 inhabitants (see Table 3-1). Most of the population lives in Panguitch and Hatch, in the western portion of the county. Boulder and Escalante populations changed little during the 1970s. Boulder increased by 20 people between 1970 and 1980, while the population of Escalante increased by 14 people during the same period.





PHOTO 9 - Photograph of Main Street in Escalante, Utah.



PHOTO 10 - View of agricultural lands south and west of Boulder, Utah. Portion of community in central part of photo.



Table 3-1  
 Historical Population Levels for Potentially Impacted Communities  
 1970 and 1980

<u>County/Community</u>	<u>1970</u>	<u>1980</u>
State of Utah	1,059,273	1,461,037
<u>Garfield County</u>	3,157	3,673
Boulder	93	113
Escalante	638	652

Source: Adapted from Regional Socioeconomic Analysis of Tar Sands Development in Utah, Argonne National Laboratory, July, 1983.

The baseline population of Garfield County is forecast to increase 42 percent between 1980 and 2005, reaching a total of 5,210 in 2005. These projections do not anticipate any large projects being built in the area.

Traditionally, the area has been dependent upon agriculture; however, tourism and trade are presently increasing in importance and agriculture is declining. Total baseline employment in Garfield County is forecast to increase roughly 1 percent annually between 1985 and 2005. Table 3-2 provides current employment data for Garfield County by sector.

Table 3-2  
Historical Employment Levels for Garfield County  
1970 and 1980

<u>Employment Sector</u>	<u>1970</u>	<u>1980</u>
Agriculture	281	236
Mining	NA	210
Construction	34	379
Manufacturing	204	248
Transportation Com. & Util.	46	85
Wholesale and Retail Trade	127	125
Finance	NA	16
Services	220	266
Government	330	457
Non Farm Properties	106	157
Total	<u>1348</u>	<u>2179</u>

Source: Adapted from Regional Socioeconomic Analysis of Tar Sands Development in Utah, Argonne National Laboratory, July, 1983.

2. Personal Income. Per capita personal income (PCPI) increased by 33 percent in Garfield County in the past decade. Garfield County experienced a decrease in PCPI in 1975. The ratio of Garfield County and the State of Utah PCPI was 0.9125 in 1980.

Garfield County is expected to increase in baseline total personal income by 70.4 percent between 1985 and 2005. The 2005 baseline PCPI would be 85 percent of the State's average.

3. Housing. There were 1,770 housing units existing in Garfield County in 1980. Escalante Census County Division (CCD) accounted for 430 of these, with 300 in the City of Escalante and 71 in Boulder. Both Boulder (19.7 percent) and Escalante (15.5 percent) had vacancy rates higher than the county average of 14.4 percent (Table 3-3).

Table 3-3  
Infrastructure, Baseline Demand, and Applicant Proposed Demand

County/Service Category	1985			1990			1995			2000			2005		
	Projected			Projected			Projected			Projected			Projected		
	Baseline Demand	Applicant Proposed Demand	Increment	Baseline Demand	Applicant Proposed Demand	Increment	Baseline Demand	Applicant Proposed Demand	Increment	Baseline Demand	Applicant Proposed Demand	Increment	Baseline Demand	Applicant Proposed Demand	Increment
<u>Garfield County</u>															
Housing															
Single Family	139	0	199	241	275	277	289	319	296						
Multi-family	35	0	50	61	70	70	73	80	74						
Mobile Homes	58	0	83	101	115	116	121	133	124						
Education															
Students	128	0	328	428	326	588	423	628	491						
Classrooms	6	0	14	18	14	22	17	26	20						
Teachers	6	0	14	18	14	22	17	26	20						
Health Care															
Hospital beds															
General care	2	0	2	3	3	3	3	4	3						
Long-term care	3	0	3	3	1	1	2	2	2						
Medical personnel															
Doctors	1	0	1	1	1	1	1	1	1						
Dentists	1	0	1	1	1	1	1	1	1						
Nurses	2	0	2	2	3	3	3	3	3						
Public health nurses	1	0	1	1	1	1	1	1	1						
Mental health care															
Clinical psychologists	1	0	1	1	1	1	1	1	1						
Mental health workers	1	0	1	1	1	1	1	1	1						
Public Safety															
Law enforcement															
Police officers	2	0	2	3	3	3	3	4	3						
Patrol cars	2	0	2	3	3	3	3	4	3						
Jail space (sq ft)	314	0	464	564	705	664	806	764	850						
Juvenile holding cells	1	0	1	1	1	1	1	1	1						

CONTINUED

Table 3-3 (Concluded)

County/Service Category	1985			1990			1995			2000			2005		
	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	
Fire Protection															
Fire flow (gpm) duration (hr)	1,000 4	0	1,000 4	1,000 4	1,250 5	1,000 4	1,163 4	1,250 5	1,250 5	1,450 6	1,163 4	1,250 5	1,450 6	1,450 6	
Emergency Medical Service Ambulance	1	0	1	1	1	1	1	1	1	1	1	1	1	1	
Emergency medical technicians	7	0	7	7	7	7	8	7	7	8	8	7	11	8	
Utility Service Demands															
Water system															
Connections	203	0	300	300	364	95	453	364	429	521	453	429	718	547	
Supply (10 <sup>6</sup> gal/d)	0.3	0	0.5	0.5	0.6	0.2	0.7	0.6	0.7	0.8	0.7	0.7	0.8	0.9	
Storage (10 <sup>6</sup> gal/d)	0.2	0	0.2	0.2	0.3	0.1	0.3	0.3	0.3	0.4	0.3	0.3	0.4	0.4	
Treatment (10 <sup>6</sup> gal/d)	0.3	0	0.5	0.5	0.6	0.2	0.7	0.6	0.7	0.8	0.7	0.7	0.8	0.1	
Sewage system (10 <sup>6</sup> gal/d)	0.1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	
Solid waste <sup>a</sup>															
Other Services															
Parks (acres)	4	0	6	6	7	2	9	7	8	10	9	8	10	10	
Libraries															
Books	1,254	0	1,854	1,854	2,254	584	2,811	2,254	2,652	3,225	2,811	2,652	3,054	3,401	
Space (sq. ft.)	314	0	464	464	564	146	703	564	664	806	703	664	764	835	

Source: Developed from guidelines prepared by the Department of Community and Economic Development, State of Utah and the Utah State Planning Coordinator's Office, UPED Model Output. Taken from the Argonne National Laboratory Report, July 1983.

Note: Projected baseline demand increments represent service demands required to satisfy the post-1980 baseline population growth regardless of 1980 operating conditions.

<sup>a</sup>The State of Utah community facility guidelines do not include a solid waste standard. Therefore, an estimate of solid waste disposal impacts could not be determined.

4. Education. The seven schools in Garfield County had a total of 1,319 students in 1983. All of the schools are relatively small. Escalante Elementary has 107 students and the high school 64 students. Boulder has no schools, so students are bussed 29 miles to Escalante. Escalante's elementary school can accommodate 42 more students and the high school 113 more students.

5. Health Care. Health care in Garfield County is very limited. A clinic in Escalante is visited by a doctor three days a week. Other physicians, dentists, and a small hospital are located in Panguitch, 68 miles from Escalante and 97 miles from Boulder.

Mental health services for Garfield County are available in Panguitch, as a satellite operation of the State Mental Health Services in St. George. One full-time psychologist is located in Panguitch and a psychiatrist visits the Panguitch office two times a month.

6. Public Safety. The current law enforcement needs of Garfield County are handled by 8 full-time workers which include four peace officers. One is stationed in Escalante and covers both the Escalante and Boulder areas.

Escalante and Boulder both have volunteer fire departments. Escalante has two pumps, and Boulder has one truck that is currently without a pump. The county has established fire districts and agreements with communities and has signed agreements for fire protection in unincorporated areas.

Boulder and Escalante each has one ambulance. Four volunteer emergency medical technicians staff the ambulance in Boulder, and six volunteer emergency medical technicians staff the ambulance in Escalante.

7. Utility Services. There is no central sewage system in either Boulder or Escalante. Culinary water for Boulder and Escalante is obtained from springs. Boulder obtains water from the Boulder Farmstead Water Company, and there is an estimated storage capacity of 100,000 gallons. Escalante receives water from eight springs. The Escalante system was recently improved and is designed to handle 750 connections.

8. Other Services. There is one community park, ball fields and playgrounds associated with the schools in Escalante. Boulder has one picnic area with playground furniture. Both towns, however, are near State Parks, Anasazi Indian Village at Boulder, and the Escalante Petrified Forest near Escalante. There are BLM and Forest Service campgrounds nearby.

There are no city organized recreation programs operated in Boulder or Escalante. Some civic and youth organizations are located in each city. There are no public libraries, but a bookmobile visits the area.

9. Local Government Finance. Garfield County revenue for 1982 was about \$2 million. Intergovernmental revenue (sources such as revenue sharing and payments in lieu of taxes) accounted for 51 percent of the county's revenue. Taxes (20 percent), service (9 percent), fines (7 percent), and other (13 percent) accounted for the remainder. In 1983, county revenues totaled \$2.3 million.



Escalante collected \$96,000 in revenues in 1983. Service charges accounted for 34 percent of the total. Property taxes (21 percent), sales taxes (18 percent), and miscellaneous revenues (18 percent) were other key sources of revenue for the city.

Boulder collected \$18,000 in revenues in 1983. State transfer payments accounted for 38 percent of the total, while Federal transfer payments, miscellaneous revenues, property taxes, and service charges each accounted for over 10 percent.

Expenditures in Garfield County averaged \$2.1 million between 1980 and 1982. General administration, with 45 percent of the total, was the largest category of spending, followed by roads with 24 percent. In 1983, spending declined to \$1.7 million - a 19-percent drop from the average of the previous three years. Expenditures for roads increased from an average of \$515,000 in 1980 through 1982 to \$620,000 in 1983. Roads and general administration accounted for 61 percent of total county expenditures in 1983.

Escalante spent \$72,000 in 1983. General expenditures (30 percent), utilities (28 percent), and streets (19 percent) were the primary areas of spending. Expenditures in Boulder totaled over \$10,000 in 1983. Forty-nine percent of the total was for general expenditures, while recreation and streets accounted for over 20 percent each.

The property tax in Garfield County was collected in 1983 by a 9.13-mill levy on \$43,489,219 in assessed valuation. About 89 percent of the total valuation in the county is from oil and gas extraction and uranium mining.

In 1983, the mill levy was 5.5 in Boulder and 14.48 in Escalante. The assessed valuation in each city rose between 1979 and 1980 but has declined somewhat since then. The 1983 assessed valuation in Boulder was \$481,893, and the assessed valuation in Escalante was \$1.6 million.

In 1981, Garfield County had \$315,000 in outstanding general obligation bonds and also \$1,775,000 in outstanding revenue bonds. Escalante had \$41,000 in outstanding general obligation bonds in 1981.

Just over 40 percent of the revenues raised in Garfield County between 1980 and 1982 originated from outside the county. These revenues were in the form of State and Federal transfer payments, such as State road funds and Federal payments in lieu of taxes. The current budget anticipates only about 27 percent of the revenue being in the form of transfer payments, but potential changes in State or Federal funding could have significant impacts on the Garfield County budget. The uncertainty this creates reduces the fiscal strength of the county.

C. Environmental Consequences. The socioeconomic impact assessment was performed by extrapolating data from the Regional Socioeconomic Analysis of Tar Sands Development in Utah, prepared by Argonne National Laboratory.

It is assumed that even though a work camp would be provided on site, workers and their families would eventually move to nearby communities (Boulder and Escalante).

1. Proposed Action. The applicant's proposed project would cause a population increase of 1,706 by 2005, an increase of 33 per- cent over the baseline population projection of 5,210 in 2005.

All of the projected changes in population above baseline levels in Garfield County are expected to occur in the Escalante CCD. For analytical purposes it was assumed that 90 percent of the change would occur in Escalante; 10 percent would be in Boulder, and there would be no change in the unincorporated areas of the CCD (see Table 3-4).

Table 3-4  
Population and Household Impact Projections by Community for Garfield County  
Applicant Proposed Development Scenario

Geographic Area and Impact Category	Change from Baseline Population and Households, by Year				
	1985	1990	1995	2000	2005
<u>Escalante CCD</u>					
Escalante CCD Total					
Population	0	290	1,399	1,615	1,706
Households	0	104	456	481	495
Boulder					
Population	0	29	140	162	171
Households	0	11	46	48	50
Escalante					
Population	0	261	1,259	1,453	1,535
Households	0	93	410	433	445
Unincorporated Areas					
Population	0	0	0	0	0

Source: Data adapted from Utah State Planning Coordinator's Office, UPED Model Output, Argonne National Laboratory (July 1983).

a. Employment. The applicant's construction workforce would peak in 1994 at 800. The permanent operations workforce would peak in 2001 at 420 (Table 3-5). In 2005 the total employment would increase over the base-line projection by 711 (Table 3-6).

Table 3-5  
Direct and Indirect Employment and Population Increase From Baseline

Year	Direct Employment			Indirect Employment Changes	Population Increase
	Onsite	Truck Drivers	Site & Pipeline Construction		
1990	14			54	290
91	133	20			
92	165	20			
93	165	80	100		
94	165	110	800		
1995	205	110	100	228	1,399
96	245				
97	281				
98	316				
99	366				
2000	418			271	1,615
01	420				
02	420				
03	420				
04	420				
2005	420			291	1,706

Note: Onsite worker numbers were provided by the applicant. Other direct employment figures were estimated; Direct and indirect employment changes and population increases were interpolated from the Utah Combined Hydrocarbon Region EIS (1984) and Argonne National Laboratory.

Table 3-6  
Changes in Garfield County Employment Resulting from the  
Applicant Proposed Development Scenario<sup>a</sup>

Industry Sector	Change From Baseline Employment, By Year				
	1985	1990	1995	2000	2005
Agriculture	0	0	0	0	0
Mining	8	14	205	415	420
Contract Construction	0	92	115	17	19
Manufacturing	0	1	5	5	5
Transportation, Communication, and Utilities	0	2	120	13	13
Wholesale and Retail Trade	0	11	59	69	72
Finance, Insurance, and Real Estate	0	2	9	10	12
Services	0	5	33	39	42
Government	0	9	54	69	77
Nonfarm Proprietors	0	7	43	49	51
Total	0	143	643	689	711

Source: Adapted from Utah State Planning Coordinator's Office, UPED Model Output, Argonne National Laboratory, July 1983.

Note: Totals may not add due to rounding.  
<sup>a</sup>All figures are positive and represent increases.

b. Personal Income. The impact of the proposed development would increase PCPI significantly because mining and construction wages would be higher than the existing sectors. Table 3-7 shows the population increase and associated total personal income increase.

Table 3-7  
Total Personal Income and Per Capita Income Projections,  
Applicant Proposed Development Scenario

County Population and Income Category	Income and Population, By Year				
	1985	1990	1995	2000	2005
Change from Baseline Garfield County Population	16	290	1,399	1,615	1,706
Total Personal Income (1980 \$ x 10 <sup>6</sup> )	.32	4.48	22.35	23.16	25.61

Source: Adapted from UPED model output, Utah State Planning Coordinator's Office, Argonne National Laboratory Technical Report, July 1983.

The substantial increase in personal income of \$25,610,000 would likely have significant effects on the cost of consumer goods, services and housing. Significant local price inflation could result from local increased purchasing power. This would have an adverse effect on those people with fixed incomes, e.g., the elderly, and those who do not possess the skills to be employable in the higher income occupations.

### c. Community Services

The following information is extracted from the data presented in Table 3-3. It provides only an approximation of what may occur since the data base is countywide and the impacts would occur primarily in the Escalante CCD.

(1) Housing. The impacts of the applicant's proposed tar sand development would seriously test the ability of the affected communities to provide adequate and affordable housing. A critical housing shortage would occur near 1995. Housing impacts, however, would be softened because the proposed base camp would allow workers to commute greater distances and take advantage of existing housing vacancies located outside the Escalante CCD.

Increased housing demand would have a beneficial effect on the housing construction and finance industries. Nevertheless, limited housing supply would likely contribute to land speculation and increased housing costs in both Escalante and Boulder. This could have a beneficial effect on land owners in the towns of Boulder and Escalante.

(2) Education. Significant increases in teachers and classrooms over projected baseline would be required in the area of influence as a result of the proposal. By the year 2005, 20 new classrooms and teachers would be required over baseline projections to meet demands attributed to the proposed tar sands development.

(3) Health Care. Medical services and facilities would be inadequate under the proposed action. The lack of permanent medical services in both Escalante and Boulder is currently a problem.

(4) Public Safety. Significant increases would be needed in law enforcement, fire protection, and emergency medical service to meet the projected demands of the proposed tar sands development (see Table 3-3). The proposed development would approximately double the projected baseline demand. Even under baseline demand there is a significant need by 1985 which is an indication that present facilities and programs are inadequate. The applicant would provide security at the base camp, but the camp could create law enforcement problems that the local law enforcement officers would have to handle, thus drawing law enforcement capability away from Boulder and Escalante.

(5) Utility Services. Neither Boulder nor Escalante has a central sewage system, thus, their ability to accommodate new growth is limited. Table 3-3 shows the sewage system capacity needed for various years. The community of Boulder may be able to accommodate the increased demand through individual septic tanks because of the town's large lot size.

Increased demands for water in Boulder and Escalante would be significant over the increases required under the baseline, particularly from 1995 on. The excess water connection capacity in Escalante would be gone by 1990 and an additional 547 connections required by 2005.

(6) Other Services. There is presently an unmet demand for recreational and other services that would be greatly expanded with the proposed tar sands development. Table 3-3 shows the baseline projections plus the additional demand created by the proposal.

d. Local Governmental Finance. Garfield County has the ability to raise funds to support new services, and has had some experience with energy development in remote areas, e.g., Ticaboo. Although difficulties are expected, the county should be able to respond to the anticipated demand with adequate impact planning. The small size of the towns of Boulder and Escalante, together with their lack of services and extremely weak tax base, would make it difficult to respond to large, rapid growth.

Demands on local infrastructure from the proposed tar sands development would require significant increases in capacity. Expansions would be needed in education, health care, public safety, and utilities. It is expected that severe fiscal pressure would result from the proposed action unless mitigated by Kirkwood Oil and Gas Exploration Company with some State and Federal assistance. The rapid growth in population would cause immediate service demand increases. Revenues would lag initially. Coordinated mitigation planning would be necessary to avoid severe short-term service inadequacies.



The long-term fiscal effects could be both beneficial and adverse. Large-scale investments associated with the proposed project would result in substantial increases in tax base. However, there could be long-term adverse effects from facilities becoming underutilized tax burdens when the resource is depleted in approximately 14 years if new tar sands deposits are not found.

e. Quality of Life. A development of this size in a fairly sparsely populated area would cause both beneficial and adverse impacts. The adverse impacts would occur first in the form of service shortfalls, local government fiscal problems, housing shortages, inflation, and strains on social organizations and individuals. After intensive mitigation planning and funding have overcome these problems, the area would benefit from a larger employment and tax base and a stronger infrastructure.

Local residents' attitudes toward the proposed developments would probably be keyed to the degree of confidence they have in product development. Since there have been numerous developments proposed in the past, that for one reason or another did not materialize, the developer might be greeted with skepticism until it became certain that the developments would occur.

Commercial oil recovery from tar sands is a developing technology within the United States. Its economic viability is dependent on the price for oil. It is reasonable to assume that current oil prices would have to substantially increase in order to make this proposal economically viable. Thus, there is a reasonable probability that the proposed development would not occur until such a price rise became a reality.

The possibility also exists that should oil prices rise sufficiently to initiate project development, they subsequently could fall making production uneconomic. This situation would leave the county and affected communities with current capitol improvement obligations and a much restricted tax base from which to repay them.

2. Alternative 1 (Restricted development)

a. Population. The additional population of Garfield County generated by the restricted development alternative would be 114 by 1995. Between 1995 and 2005, the population would continue to increase, but at less than 1 percent annually. The number of households would increase by 37 in 1995 and fluctuate thereafter. School-age population would have the highest rate of growth during any 5-year period; between 1990 and 1995 the change would be 36.08 percent. The change in retirement-age population would be small, growing from zero in 1985 to four in 2005.

All of the new population resulting from this alternative would be in the Escalante CCD. About 90 percent of the change would be in Escalante. The rest of the additional population would be in Boulder; the unincorporated areas would remain at baseline levels. Households would be distributed the same as the population (see Table 3-8).

Table 3-8  
 Summary of Population and Household Impact Projections  
 Restricted Development Alternative

<u>County and Window Years</u>	<u>Population Change from Baseline</u>	<u>New Households Change from Baseline</u>	<u>School-Age Population Change from Baseline</u>
<u>Garfield County</u>			
1985	0	0	0
1990	29	10	6
1995	114	37	28
2000	124	35	36
2005	139	36	39

Source: Adapted from Regional Socioeconomic Analysis of Tar Sand Development in Utah, Argonne National Laboratory, July, 1983.

b. Employment. Under this alternative the applicant's construction workforce would peak in 1992 at 140; the permanent operation workforce would peak in 1993 at 30 people. However, total permanent employment (primary and secondary) would not peak until 2005 with 52 employees.

Table 3-9 shows the change from baseline employment. Employment would grow from zero in 1985 to 52 in 2005, with most of this increase occurring by 1995. The mining sector would account for 30 additional workers in 1995, 2000, and 2005, and the contract construction sector would account for 10 additional workers in 1990. No other sector would have more than six additional workers in any window year.

Table 3-9  
Changes in Garfield County Employment Resulting From the  
Restricted Development Alternative

Industry Sector	Change From Baseline Employment, By Year				
	1985	1990	1995	2000	2005
Agriculture	0	0	0	0	0
Mining	0	0	30	30	30
Contract Construction	0	10	1	1	1
Manufacturing	0	0	0	0	0
Transportation, Communi- cation, and Utilities	0	0	1	1	1
Wholesale and Retail Trade	0	1	5	5	5
Finance, Insurance, and Real Estate	0	0	1	1	1
Services	0	1	3	3	3
Government	0	1	5	6	6
Nonfarm Proprietors	0	1	3	4	4
Total <sup>a</sup>	0	14	49	51	52

<sup>a</sup>Totals may not add due to rounding.

Source: Data adapted from Utah State Planning Coordinator's Office, UPED Model Output, Argonne National Laboratory, July 1983.

c. Personal Income. Because mining activities pay relatively high salaries, PCPI would increase significantly over the level projected for the baseline. A increase of 1.85 million dollars (1980 dollars) in 2005 could benefit all economic sectors in the county. Some significant price inflation could result from increased purchasing power. This would have an adverse effect on those with fixed incomes, such as the elderly and those who do not possess the skills to be employable in the higher income occupations.

d. Community Services

(1) Housing. The impacts of the restricted development alternative would create a demand over baseline projections of 37 housing units in 2005. Table 3-10 shows the additional household demand for the various years. This demand would be expressed in the communities in direct proportion to the increased population.

Increased housing demand would have a beneficial effect on the housing construction and finance industries. Nevertheless, limited housing supply could contribute to land speculation and increased housing costs in the affected communities.

(2) Education. The increased population would include approximately 39 students by 2005. This would create a demand for two classrooms and two teachers over baseline projections. These impacts would occur in Escalante since there are no schools in Boulder.

(3) Health Care. The limited medical services would be adversely affected by the restricted development alternative. Even under the baseline demand, there is need for additional physicians, dentists, and hospital beds by 1985. Table 3-10 shows the projected demand due to the restricted development scenario over baseline projections.

(4) Public Safety. A 20 percent increase or one officer and one patrol car over baseline demand would occur in 2005. Jail space would have to increase by approximately 8 percent. Additional fire equipment and emergency medical services would likely be required in the area of influence (see Table 3-10).

(5) Utility Services. Increased demands for water in Boulder and Escalante would increase approximately 10 percent over baseline projections by 2005. The Escalante water system could meet the demand for new water connections created by the restricted development alternative.

Neither Boulder nor Escalante has a central sewage system, however, individual septic tanks may accommodate the new growth. This would depend on the location of the dwellings, lot size, and the suitability of the sites.

(6) Other Services. The restricted development alternative would increase demand for parks and libraries by approximately 10 percent. The present unmet demand for these services will be increased by this alternative.

e. Local Government Finances. It is expected that fiscal pressure would result from the Restricted Development Alternative unless mitigated by the applicants with some Federal and State assistance. The rapid growth in population would cause immediate service demand increases. Revenues would lag initially, and coordinated mitigation planning would be necessary to avoid short-term service inadequacies.

Table 3-10  
Infrastructure, Baseline Demand and Restricted Development Demand Projections

County/Service Category	1985			1990			1995			2000			2005		
	Projected Baseline Demand	Restricted Development Demand	Projected Baseline Demand Increment	Projected Baseline Demand	Restricted Development Demand	Projected Baseline Demand Increment	Projected Baseline Demand	Restricted Development Demand	Projected Baseline Demand Increment	Projected Baseline Demand	Restricted Development Demand	Projected Baseline Demand Increment	Projected Baseline Demand	Restricted Development Demand	Projected Baseline Demand Increment
<b>Housing units</b>															
Single family	139	0	199	241	6	23	277	21	319	22					
Multifamily	35	0	50	61	2	6	70	6	80	6					
Mobile Home	58	0	83	101	3	10	116	9	133	9					
Education															
Students	128	0	328	428	6	28	528	36	628	39					
Classrooms	6	0	14	18	1	2	22	2	26	2					
Teachers	6	0	14	18	1	2	22	2	26	2					
<b>Health Care</b>															
<b>Hospital beds</b>															
General care	2	0	2	3	1	1	3	1	4	1					
Long-term care	3	0	3	3	1	1	1	1	2	1					
<b>Medical personnel</b>															
Doctors	1	0	1	1	1	1	1	1	1	1					
Dentists	1	0	1	1	1	1	1	1	1	1					
Nurses	2	0	2	2	1	1	3	1	3	1					
Public health nurses	1	0	1	1	1	1	1	1	1	1					
<b>Mental health care</b>															
Clinical psychologists	1	0	1	1	1	1	1	1	1	1					
Mental health workers	1	0	1	1	1	1	1	1	1	1					
<b>Public Safety</b>															
<b>Law enforcement</b>															
Police officers	2	0	2	3	1	1	3	1	4	1					
Patrol Cars	2	0	2	3	1	1	3	1	4	1					
Jail space (sq ft)	314	0	464	564	15	57	664	62	764	65					
Juvenile holding cells	1	0	1	1	1	1	1	1	1	1					

CONTINUED

Table 3-10 (Concluded)

County/Service Category	1985			1990			1995			2000			2005		
	Projected Baseline Demand Increment	Restricted Development Demand	Projected Baseline Demand Increment	Restricted Development Demand	Projected Baseline Demand Increment	Restricted Development Demand	Projected Baseline Demand Increment	Restricted Development Demand	Projected Baseline Demand Increment	Restricted Development Demand	Projected Baseline Demand Increment	Restricted Development Demand	Projected Baseline Demand Increment	Restricted Development Demand	
<b>Fire Protection</b>															
Water flow (gpm)/ duration (hr)	1,000/4	0/0	1,000/4	1,000/4	1,250/5	1,000/4	1,250/5	1,000/4	1,250/5	1,000/4	1,250/5	1,000/4	1,500/6	1,000/4	
<b>Emergency Medical Service</b>															
Ambulances	1	0	1	1	1	1	1	1	1	1	1	1	1	1	
Emergency medical technicians	7	0	7	7	7	7	7	7	7	7	7	7	7	7	
<b>Utility Service Demands</b>															
Water systems	203	0	300	10	364	37	429	41	493	42	493	41	493	42	
Connections	0.3	0	0.5	0.1	0.6	0.1	0.7	0.1	0.8	0.1	0.8	0.1	0.8	0.1	
Supply (10 <sup>6</sup> gal/d)	0.2	0	0.2	0.1	0.3	0.1	0.3	0.1	0.4	0.1	0.4	0.1	0.4	0.1	
Storage (10 <sup>6</sup> gal/d)	0.3	0	0.5	0.1	0.6	0.1	0.7	0.1	0.8	0.1	0.8	0.1	0.8	0.1	
Treatment (10 <sup>6</sup> gal/d)	0.1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	
Sewage system (10 <sup>6</sup> gal/d)															
<b>Other Services</b>															
Parks (acres)	4	0	6	1	7	1	8	1	10	1	10	1	10	1	
Libraries															
Books	1,254	0	1,854	58	2,254	228	2,654	248	3,054	258	3,054	248	3,054	258	
Space (sq ft)	314	0	464	15	564	57	664	62	764	65	764	62	764	65	

Source: Adapted from Regional Socioeconomic Analysis of Tar Sands Development in Utah, Argonne National Laboratory, July, 1983.

Note: Numbers represent service demands required to satisfy the post-1980 baseline population growth regardless of 1980 operating conditions.



Because demands on local infrastructure from baseline growth would equal or exceed their present capacities in many cases, the additional demands that would be imposed by the Restricted Development Alternative and the inter-related projects would require significant increases in capacity. Expansions would be needed in school classrooms, medical facilities, jails, water and sewer systems, and probably in other facilities that were not included in this analysis. A majority of the additional capacity would be needed to meet the demands of the construction period, but the largest part of the increased revenues from the developments would become available only after the building of in situ operations. Also those revenues would accrue largely to Garfield County, since the well fields would be located in unincorporated areas, whereas much of the infrastructure costs would be borne by the Escalante and Boulder communities.

f. Quality of Life. There would be an impact to the area's quality of life directly related to the anticipated population increase of up to 139 persons. The specific effects would be the same as noted for the proposed action, but at a much lower intensity.

### 3. Alternative 2 (Worst Case)

a. Population. The additional population of Garfield County created by this proposal would be 2,350 in 2005. Between 1995 and 2005, the population would continue to increase, but at less than 1 percent annually. The number of households would increase by 680 in 2005 and fluctuate thereafter. School-age population would have the highest rate of growth increasing 700 students from baseline projections.

It was assumed all of the new population resulting from this alternative would be in the Escalante CCD with about 90 percent of the change. The rest of the additional population would be in Boulder. The unincorporated areas would remain at baseline levels. Households would be distributed the same as the population (see Table 3-11).

Table 3-11  
Summary of Population and Household Impact Projections  
Alternative Technology

<u>County and Window Years</u>	<u>Population Change from Baseline</u>	<u>School-Age</u>	
		<u>New Households Change from Baseline</u>	<u>Population Change from Baseline</u>
<u>Garfield County</u>			
1985	0	0	0
1990	470	170	100
1995	1940	630	450
2000	2220	660	580
2005	2350	680	680

Source: Adapted from Regional Socioeconomic Analysis of Tar Sands Development in Utah, Argonne National Laboratory, July, 1983.

b. Employment. Under this alternative the applicant's construction work force would peak in 1992 at 2,200; the permanent operations work force would peak in 1993 with 900 people. However, total permanent employment (primary and secondary) would not peak until 2005 with about 1,200 employees. See Table 1-3.

Table 3-12 shows the change from baseline employment. Employment would grow from zero in 1985 to 1,200 in 2005, with most of this increase occurring by 1995. The mining sector would account for 580 additional workers in 1995, 2000, and 2005, and the contract construction sector would account for 2200 additional workers in 1992.

Table 3-12  
Changes in Garfield County Employment Resulting From the  
Worst Case Scenario

Industry Sector	Change from Baseline Employment, By Year				
	1985	1990	1995	2000	2005
Agriculture	0				
Mining	0	0	580	580	580
Contract Construction	0	160	21	24	24
Manufacturing	0	2	6	6	6
Transportation, Communi- cation, and Utilities	0	200	200	200	200
Wholesale and Retail Trade	0	19	82	94	100
Finance, Insurance, and Real Estate	0	3	13	14	16
Services	0	10	46	54	58
Government	0	16	75	94	106
Nonfarm Proprietors	0	13	59	26	70
Total	0	423	1082	1092	1160

Source: Adapted from Utah State Planning Coordinator's Office, UPED Model Output, Argonne National Laboratory, July 1983.

c. Personal Income. Because mining activities pay relatively high salaries, PCPI would increase significantly over the level projected for the baseline. Personal income would increase from 0 dollars in 1985 to \$35,000,000 in 2005. The substantial increase in personal income would cause price inflation. This would have an adverse effect on those with fixed incomes, e.g., the elderly and those who do not possess the skills to be employable in the higher income occupations.

d. Community Services. Table 3-13 lists the anticipated demands for such social services as housing, education, health care, public safety, utility services, fire protection, libraries, and parks. These impacts are similar but greater than those described in the proposed action.

e. Local Governmental Finance and Quality of Life. Impacts related to local governmental finance and quality of life would be about the same as described for the proposed action. The major difference would be one of the degree or intensity of change - approximately 40 percent greater. The exception to this would be the anticipated loss of irrigated agriculture near the community of Boulder. Eliminating irrigated agriculture in Boulder would significantly change the area's lifestyle and its quality.

4. Alternative 3 (No action). The population for Garfield County is expected to increase 42 percent between 1980 and 2005, based on Utah Process Economic and Demographic (UPED) projections. Employment is expected to slightly decrease during the same period. Personal income is expected to rise slightly. Community infrastructure baseline demand is shown in Table 3-3. See the Utah Combined Hydrocarbon Regional EIS for more detail.

Table 3-13  
Infrastructure, Baseline Demand and Worst Case Scenario Demand

County/Service Category	1985			1990			1995			2000			2005		
	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	
<b>Housing units</b>															
Single family	139	0	199	101	241	379	277	398	408						
Multifamily	35	0	50	26	61	96	70	101	102						
Mobile Home	58	0	83	43	101	158	116	9	171						
<b>Education</b>															
Students	128	0	328	96	428	451	528	36	675						
Classrooms	6	0	14	5	18	22	22	2	27						
Teachers	6	0	14	5	18	22	22	2	27						
<b>Health Care</b>															
<b>Hospital beds</b>															
General care	2	0	2	2	3	5	3	1	5						
Long-term care	3	0	3	2	3	2	1	1	4						
<b>Medical personnell</b>															
Doctors	1	0	1	2	1	2	1	1	2						
Dentists	1	0	1	2	1	2	1	1	2						
Nurses	2	0	2	2	2	5	3	1	5						
Public health nurses	1	0	1	2	1	2	1	1	2						
<b>Mental health care</b>															
Clinical psychologists	1	0	1	2	1	2	1	1	2						
Mental health workers	1	0	1	2	1	2	1	1	2						
<b>Public Safety</b>															
<b>Law enforcement</b>															
Police officers	2	0	2	2	3	5	3	1	5						
Patrol Cars	2	0	2	1	3	5	3	1	5						
Jail space (sq ft)	314	0	464	234	564	57	970	62	1173						
Juvenile holding cells	1	0	1	2	1	1	2	1	2						

CONTINUED

Table 3-13 (Concluded)

County/Service Category	1985		1990		1995		2000		2005	
	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand	Projected Baseline Demand Increment	Applicant Proposed Demand
<b>Fire Protection</b>										
Water flow (gpm)/ duration (hr)	1,000/4	0/0	1,000/4	1,600/4	1,250/5	1,600/4	1,250/5	2,000/4	1,500/6	2,000/4
<b>Emergency Medical Service</b>										
Ambulances	1	0	1	2	1	2	1	2	1	2
Emergency medical technicians	7	0	7	11	7	11	7	11	11	11
<b>Utility Service Demands</b>										
Water systems	203	0	300	152	364	626	429	718	718	757
Connections	0.3	0	0.5	.32	0.6	.1	0.7	1.1	0.8	1.3
Supply (10 <sup>6</sup> gal/d)	0.2	0	0.2	.16	0.3	.48	0.3	.6	0.4	.6
Storage (10 <sup>6</sup> gal/d)	0.3	0	0.5	.32	0.6	1	0.7	1.1	0.8	1.3
Treatment (10 <sup>6</sup> gal/d)	0.1	0	0.1	.16	0.1	.2	0.1	0.2	0.2	.2
Sewage system (10 <sup>6</sup> gal/d)										
<b>Other Services</b>										
Parks (acres)	4	0	6	32	7	13	8	14	10	14
Libraries										
Books	1,254	0	1,854	934	2,254	3,878	2,652	4,448	3,054	4,691
Space (sq ft)	314	0	464	234	564	970	664	1112	764	1173

Source: Developed from guidelines prepared by the Department of Community and Economic Development, State of Utah and the Utah State Planning Coordinator's Office, UPED Model Output, Argonne National Laboratory, July 1983.

Note: Projected baseline demand increments represent service demands required to satisfy the post-1980 baseline population growth regardless of 1980 operating conditions. The State of Utah community facility guidelines do not include a solid waste standard. Therefore, an estimate of solid waste disposal impacts could not be determined.

The area's quality of life should remain essentially rural although subject to increasing urbanization pressures.

#### IV. SOILS VEGETATION - LIVESTOCK GRAZING

##### A. Areas of Special Concern

- Reclamation potential of disturbed area
- Loss of forage for livestock

B. Affected Environment. Specific data on the soil resource within the development area are not available. Thus, the discussions presented here are of a general nature only.

Soil parent materials are shale, siltstone, sandstone, and limestone. Soil textures range from sandy to clayey with various amounts of gravel, cobble, or stone. Dominant soil textures are loamy and gravelly loams. Soil depths range from very shallow to very deep with shallow soils dominating. The soils have moderate to high pH, calcareous profiles, low organic matter content, some carbonate accumulation, and occasionally a high soluble salt content. Soils occur on variable undulating rolling and steep slopes that generally change in short distance. Approximately 4,600 acres within the development area have slopes of 50 percent or greater.

Productivity potential on most of the soils in the STSCA is low. Erosion is evident in the area, and 70 to 80 percent of the soils have a moderate to critical water erosion hazard. An estimate of sediment yield (BLM, 1977) shows that 64 percent of the area has a sediment yield of 0.6 acre-feet/square mile/year or less, and 29 percent has a yield of 0.6 to 0.9 acre-feet/square mile/year.

The Circle Cliffs development area encompasses about 57,170 acres and has three major vegetation types: desert shrub (9,258 acres), pinyon-juniper (44,340 acres), and sagebrush-grass (1,304 acres). The remaining 2,268 acres are classified as barren land. The area lacks riparian vegetation. The average vegetative ground cover in the Circle Cliffs STSCA is 17 percent and ranges from a high of 35 percent to a low of 6 percent.

There are no threatened or endangered plant species known to occur in the Circle Cliffs STSCA.

The desert shrub type occurs in the basin areas where annual precipitation is less than 10 inches. Major shrub species include shadscale, rabbitbrush, blackbrush, and big sagebrush. Common grasses are Indian ricegrass, galleta, blue grama, and squirreltail. Forage capacity is most commonly low.

The pinyon-juniper type occurs in the semidesert and upland zones within the area of influence. Species composition changes with elevation, slope, and aspect. Juniper trees are the major species, with pinyon pine increasing with elevation and precipitation. Common species include Utah juniper, pinyon



pine, Mormon tea, and big sagebrush. Grasses included are Indian ricegrass, galleta grass, western wheatgrass, and blue gramma grass. Forage capacity is low to moderate.

The sagebrush-grass type most commonly occurs on benches, mesas, and park-like areas about 6,200 feet. This type is characterized by an overstory of big sagebrush. The main understory grasses are Indian ricegrass, galleta, sand dropseed, and blue grama. Forage production is moderate.

Carrying capacity averages 28 acres/animal unit month on the 21,752 acres classified as suitable for livestock grazing. The STSCA is grazed by cattle from September 1 to May 31. Approximately 62 percent of the STSCA is rated as unsuitable for livestock grazing. Table 3-14 provides a summary of current livestock use within the area. Photos 11 through 16 show typical areas within the development area.

### C. Environmental Consequences

1. Proposed Action. An estimate of the area's revegetation potential was made utilizing a model developed by the Forest Service's Intermountain Forest and Range Experiment Station (General Technical Report INT-1239, 1982). Based upon the modeling results it appears that the development area would be suitable for revegetation and reclamation. BLM experience in reseeding areas adjacent to the proposed development area (onion beds)

also tends to support the modeling results, although it has been our experience that more than one reseeding attempt may be necessary because of yearly rainfall variations. Two exceptions to the favorable projections are areas without sufficient soil and slopes in excess of 50 percent.

Assuming that Congress releases those portions of the area under wilderness review, vegetative disturbance is projected to occur on about 21,000 acres within STSCA. Of this amount only 42 percent would be suitable for livestock use or 8,820 acres. Assuming 28 acres per AUM, the maximum forage loss would be 315 AUMs over the life of the project. At a 1,000-acre annual rate of disturbance some 15 AUMs per year could be lost. To the extent that reclamation proves successful, especially in the pinyon-juniper and sagebrush-grass vegetative types, a net increase in forage production could occur.

It is probable that an initial reduction of 15 AUMs would be made to the permit of the livestock user whose allotment was affected. Such a reduction would continue until the disturbed areas were reclaimed and revegetated.

The most significant impact to livestock use would come from disruptions of grazing patterns, livestock water sources, and harrassment of animals.

2. Alternative 1 (Restricted Development). The area's reclamation potential is the same as discussed under the Proposed Action.

TABLE 3-14

GRAZING USE IN STSCA

<u>Allotment</u>	<u>Acres Suitable/Unsuitable</u>	<u>Total Acres in STSCA</u>	<u>Number of AUMs in STSCA</u>	<u>Number of Active Preference</u>	<u>Season of Use</u>	<u>Kind of Livestock</u>	<u>Percent of Allotment in STSCA</u>
Big Bowns Bench	2,297	2,432	56	1,500	10/16 - 04/15	Cattle	13
Circle Cliffs	41	894	7	1,455	11/01 - 03/31	Cattle	3
Death Hollow	6,538	15,308	267	1,055	11/01 - 05/15	Cattle	74
Escalante River	83	208	7	2,775	09/01 - 03/31	Cattle	1
King Bench	42	2,359	3	2,500	11/01 - 03/31	Cattle	4
Moody	800	8,065	33	1,600	11/01 - 03/31	Cattle	19
Muley Twist	0	2,548	0	623	11/01 - 05/31	Cattle	16
Steep Creek	218	520	11	448	11/16 - 06/15	Cattle	4
Wagon Box Mesa	<u>11,733</u>	<u>24,836</u>	<u>467</u>	<u>633</u>	11/01 - 03/31	Cattle	89
Totals	21,752	57,170	851	12,589			

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Source: USDI, BLM Allotment Files, Escalante Resource Area





PHOTO 11 - Pinyon/Juniper area on east side of Stud Horse Peaks  
in northern part of the STSCA.



PHOTO 12 - Grass and brush area in northern part of STSCA  
about 1½ miles south of Boulder to Bullfrog road.





PHOTO 13 - Typical area on west central portion of the unit.



PHOTO 14 - Top of a small mesa in the central portion of the STSCA.







PHOTO 15 - Looking south from the existing airstrip toward Colt Mesa.



PHOTO 16 - Southern portion of STSCA within Silver Falls Canyon.



Vegetative disturbance on about 16,000 acres is projected. Of this amount 6,720 acres suitable for livestock use is projected. At 28 acres per AUM the maximum forage loss would be about 240 AUMs. However, with a total yearly disturbance rate of 60 acres no reduction in licensed livestock use is anticipated.

As with the proposed action, disruption of livestock use patterns, water sources, and harrassment of animals would be the more significant problem.

3. Alternative 2 (Worst Case). Effects would be the same as noted under the proposed action with the following addition. The special impact created by this alternative would be the anticipated loss of some 2,000 acres of irrigated agriculture, due to the use of irrigation water rights for the tar sand production.

Diversion of water from Boulder Creek is not expected to significantly affect the stream's riparian vegetation.

4. Alternative 3 (No Action). No impact to vegetation/reclamation or livestock use is anticipated.

## V. WILDLIFE

## A. Areas of Special Concern

- . Aquatic wildlife
- . Wild horses
- . Desert bighorn
- . Eagles
- . Threatened or endangered species

B. Affected Environment. Aquatic habitat is absent from the proposed development area, but there are several streams (Escalante River, Boulder Creek, etc.) that would be crossed by oil trucks or a pipeline. These river systems provide a good aquatic environment often supporting a harvestable game fish population.

A 16,000-acre portion of the Moody-Wagon Box Mesa Wild Horse Herd Unit is within the Circle Cliffs STSCA. There are approximately 13 wild horses in the herd. Wild horses use the Circle Cliffs STSCA mostly during the spring and summer.

Desert bighorn sheep are not found within the tar sands development area. They are year-round residents in the Moody Canyon area south of the STSCA. However, the animals have been expanding their range northward toward the proposed development area (DWR 1984).

One golden eagle nest is known to occur within the STSCA. It is located near Wagon Box Mesa and presumed to be active.

An active peregrine falcon nest is located within 1/4 mile of the main access road to the development area. It is one of only 20 known active nest sites within southern Utah. The Peregrine is an endangered species.

### C. Environmental Consequences

1. Proposed Action. An onsite oil spill reaching live water or an oil spill into one of the offsite river systems would pose a severe threat to aquatic wildlife. Impacts could vary from almost complete destruction to a temporary loss of values on a small area depending upon the amount of spill and the success of remedial actions. Refer to water resources for more detail on impacts of oil spills.

Development activities would force the Moody-Wagon Box wild horse herd to spend increasing time in Capitol Reef National Park. It may also have the effect of increasing competition for water and forage between the wild horses and the desert bighorn sheep population. Loss of springs utilized by the horses could permanently reduce their suitable range. BLM currently plans to remove these horses as soon as funding can be obtained (Moody-Wagon Box Wild Horse Removal - EA, 1983). Thus, wild horse impacts should be of short-term duration.

The proposed actions would tend to prevent future expansion of the Moody Canyon desert bighorn sheep population into the Circle Cliffs Area. Increased access and human activity would be the primary factors causing this effect as bighorn sheep are believed to be quite sensitive to human intrusions.

Activities near Wagon Box Mesa could disrupt the nesting activities of a golden eagle pair. This would be in conflict with the requirement of the Federal Eagle Act.

Additional human activity may have an effect on the active peregrine nest located within 1/4 mile of the area's major access road. Because of this effect determination, a biological assessment was prepared and transmitted to the U.S. Fish and Wildlife Service in accordance with the Endangered Species Act. The results of this formal consultation will be made available in the final EIS.

2. Alternative 1 (Restricted development). The effects of an oil spill would be the same as noted above. What would change would be the probability of such an event occurring. With an oil production rate 94 percent less than the proposed action, a reduction in both the likelihood of a spill and the amount of spill would probably result.

Restrictive stipulations would prevent conflicts with the Eagle Act.

Other impacts would occur as described above.

3. Alternative 2 (Worst Case). The anticipated impacts noted under the proposed action would be intensified due to the 60 percent greater work force involved and increased truck traffic on the major access route. Reduction of the average water flow in Boulder Creek by about 45 percent could adversely affect the stream's trout fishery during years of low flow.

4. Alternative 3 (No Action). The projected impacts noted above would not occur. It is likely that the bighorn sheep population would expand into the Circle Cliffs Area and the Wagon Box wild horse herd would be removed.

## VI. RECREATION AND WILDERNESS

### A. Areas of Special Concern

. Impacts to Glen Canyon National Recreation Area and Capitol Reef National Park

. Impacts to wilderness study areas

B. Affected Environment. The STSCA is bordered on the west by Capitol Reef National Park. This area was established as a park to preserve the many outstanding geological and erosional landscape features found within its boundaries.

The Glen Canyon National Recreation Area (GCNRA) is directly south of the proposed tar sands development and shares about 5 miles of common boundary. The GCNRA was established in recognition of the area's national recreational values.

The Circle Cliffs STSCA encompasses two instant study areas. They are: a portion of the North Escalante Canyon, the Gulch, Phipps-Death Hollow, and North Escalante Canyon (Tract 2, 3, and 4) ISA (12,194 acres), and the Escalante Canyon (Tract 1) ISA (886 acres).

Those portions of the ISAs within the STSCA have been tentatively recommended as unsuitable for wilderness designation by the BLM. However, only Congress can make a final determination as to their eventual status. Thus, they must continue to be managed so as to preserve all their wilderness characteristics until such time as Congress makes a decision regarding their status.

### C. Environmental Consequences.

1. Proposed Action. Of special concern to the National Park Service would be: (1) impacts to ground water; (2) reductions in air quality and visibility values; (3) the potential for pollution discharges to reach park unit areas, and (4) increased noise levels. Such events would tend to reduce the quality of visitor experiences.



Possible impacts to the ground water underlying the park units cannot be predicted at this time. Information contained in the air quality section indicates that although visibility values would remain essentially unchanged, air quality levels within both park units would be reduced below EPA standards. Onsite oil spills would not pose a hazard to the National Park but would for the Recreation Area. The potential for an offsite spill into a stream flowing into the Recreation Area does exist. The probability of its occurrence is unknown. Noise levels are anticipated to exceed EPA standards within about 1,000 feet of the proposed developments.

In summary, it is likely that the proposed development would reduce the quality of visitor experience within the park units.

The proposed action would not have any direct impact on areas under wilderness study due to restrictive stipulations established by the Regional FEIS. It is, however, the applicant's assumption that the areas would be released for development by Congressional action. Thus, if the applicant is correct, the proposed developments scheduled for 1992 could take place without directly affecting areas under wilderness review.

Indirect impacts to wilderness study areas would occur. These effects would result from proposed developments on lands adjoining the ISAs. Noise, lighting, and dust produced from the activities would detract from the ISA's solitude and visual characteristics.

2. Alternative 1 (Restricted development). As with the proposed action, projections relating to possible impacts on ground water cannot be made at this time.

Reducing the production level by 94 percent would reduce air quality impacts but not eliminate violations of air quality standards. However, application of the special mitigating measures cited in Chapter 4 would bring the proposal development within these standards. Visibility values would not be significantly affected.

The one mile buffer area in drainages would effectively eliminate oil spill impacts from on site discharges. The potential for an accidental release into a live stream that drains into a park unit would remain, although at a lower probability level due to the smaller number of oil trucks. (See water resources section for more detail.)

This same buffer area would eliminate noise impacts to the Recreation Area. Noise impacts to the National Park would be the same as described for the Proposed Action.

Development activities would indirectly diminish the solitude wilderness characteristic of the ISAs within the development area as a result of the sights and sounds of in situ development near the ISA boundaries.

3. Alternative 2. Although ground water impacts to park units are unknown it seems likely that blasting of the tar sand deposits would increase the probability of an impact occurring. The proposed development would exceed the air quality and possibly the visibility standards of both park units. Possible oil spill effects and noise levels would be as described for the proposed action. In summary, a reduction in park visitor experience is anticipated

4. Alternative 3 (No Action). The impacts discussed above would essentially be avoided. Depending on Congressional action, existing wilderness study areas may or may not be established as wilderness areas.

## VII. VISUAL RESOURCES

### A. Areas of Special Concern

- . Park viewsheds
- . VRM Class 1 areas

B. Affected Environment. Visual scenery within the STSCA is dominated by the Wingate Formation of the Circle Cliffs. The majority of the STSCA lies in the basin of the Circle Cliffs between Capitol Reef National Park and the Glen Canyon National Recreation Area. The Basin is intermittently broken with numerous pinyon-juniper covered mesas (Colt, Stud Horse Peaks, and Wagon Box Mesa), which add variety. The ridge line of the water pocket fold basically

screens the STSCA from Captitol Reef National Park. There are no established overlooks or viewpoints within the National Park which include the STSCA as a portion of its immediate viewshed.

The development area can be seen from ridge tops and mesas along the Glen Canyon National Recreation Area's northern boundary. The STSCA is not a portion of the viewshed of any established overlook or viewpoint within the recreation area.

It is estimated that 2,500 visitor days of use occur within the STSCA per year.

The STSCA falls within the following Visual Resource Management (VRM) classes: I (632 acres); II (12,636 acres); III (8,372 acres); IV (36,171 acres). VRM Class I lands have the highest possible values. Typically Class I areas are National Parks. Map 1-3 indicates the location of this special area within the STSCA.

### C. Environmental Consequences

1. Proposed Action. Highly significant visual impacts which would occur as a result of the proposed action would create a severely changed landscape in the STSCA. Over time, revegetation would help lessen the impacts, but would not overcome the contrasts between the present natural and the proposed highly modified landscape. Significant impacts caused by long-term landform, vegetative, and structure additions would be viewed from

within the project areas and surrounding viewing points. All areas in which a significant disturbance would occur would be reclassified as being in VRM Class V. Photos 17 and 18 show typical disturbance at a similar project. Although substantial visual change is anticipated little effect on park viewsheds would occur.

The Class I VRM area would not be affected due to restrictive stipulations in the Regional EIS.

2. Alternative 1 (Restricted Development). Visual impacts would be reduced, but not eliminated, as a result of the overall reduction in mining intensity.

3. Alternative 2 (Worst Case). Impacts are the same as discussed under the proposed action.

4. Alternative 3 (No Action). Visual resource classes are not expected to change.

## VIII. TRANSPORTATION SYSTEMS

### A. Areas of Special Concern

- . Changes in road service class
- . Feasibility of potential pipeline routes

B. Affected Environment. Garfield County's Boulder to Bullfrog (graded) road is the only access to the proposed development area (Photos 19, 20, & 21). As the name implies, the road extends from Boulder, Utah on the north to Lake Powell's Bullfrog Marina on the south. Vehicle use on this road is restricted from late November through March due to snow and muddy conditions. River crossings are subject to washouts. A segment of this road, which passes through Capitol Reef National Park, is commonly referred to as the Burr Trail.

From Boulder, Utah, State Route 12, a two-lane paved roadway, extends through Escalante and Bryce Canyon National Park terminating at its junction with US 89, a major north-south route (Photos 22 through 27). Ten miles north of Panguitch, Utah 20 connects US 89 with Interstate 15. Interstate 15 is a four-lane expressway, providing the major road link between Salt Lake City and Los Angeles, California (see Map 1-1).

The proposed development area is surrounded on three sides by special land uses which preclude the development of new transportation corridors. South of the area is the Glen Canyon National Recreation Area. East of the area is Capitol Reef National Park, and to the west is the North Escalante Canyon, the Gulch, Phipps-Death Hollow, and Escalante Canyon (tract 2, 3, and 4) instant wilderness study area. North of the development area is the Dixie National Forest.

### C. Environmental Consequences



PHOTO 17 - Geokinetics in situ development area near Vernal, Utah. The shallow deposit is blasted to increase permability.



PHOTO 18 - Same area as shown in photo above.







PHOTO 19 - Hairpin turn along the Boulder to Bullfrog road as it drops into Long Canyon.



PHOTO 20 - View down Long Canyon. Note the narrowness of the canyon and the steep-walled sides which confines potential access routes.





PHOTO 21 - The Boulder to Bullfrog road as it emerges from Long Canyon into the Circle Cliffs area.



PHOTO 22 - State Route 12 between Escalante and Boulder.



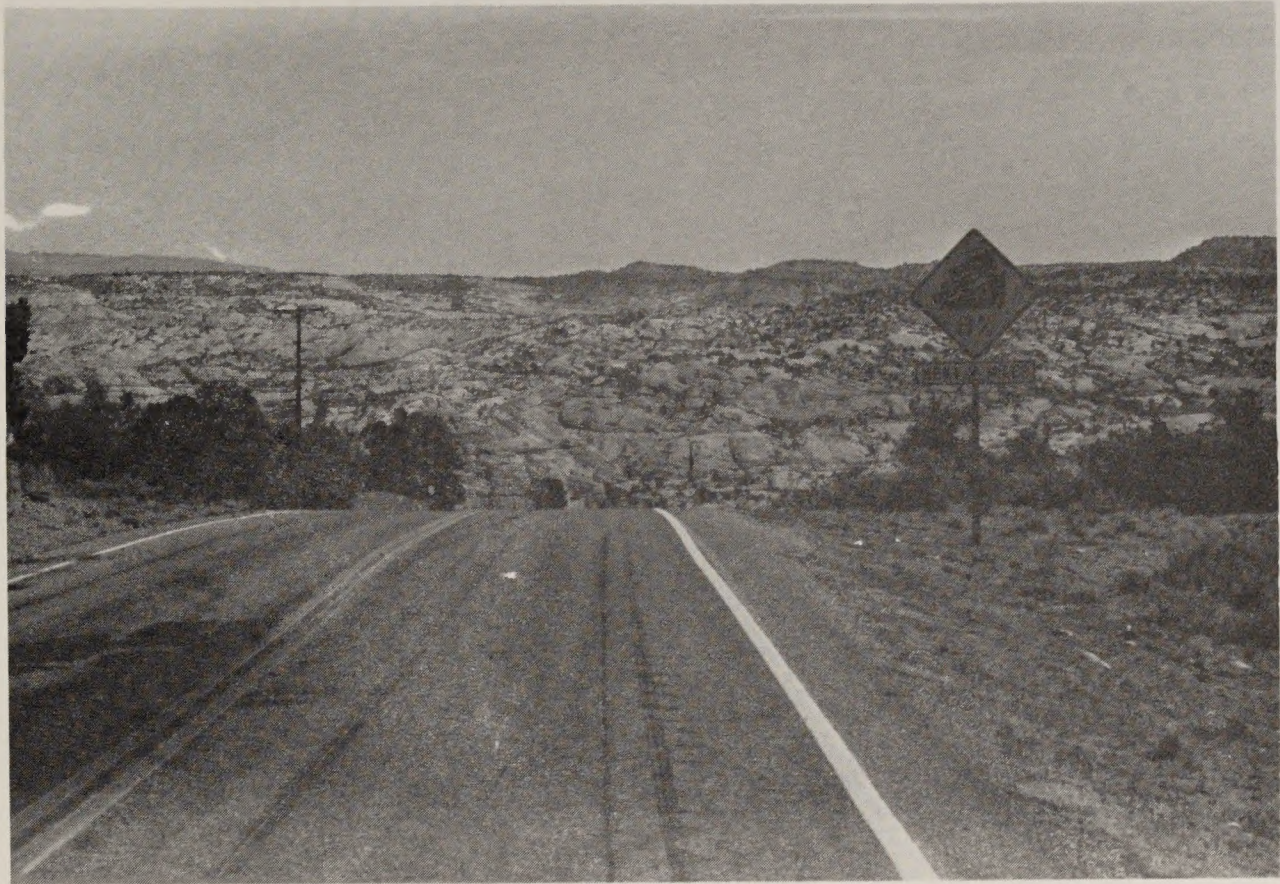


PHOTO 23 - Steep grade between Escalante and Boulder.



PHOTO 24 - State Route 12 crossing the Escalante River between Escalante and Boulder.





PHOTO 25 - Same area as shown in photo 24.



PHOTO 26 - Junction of US 89 and State Route 12. Oil trucks would turn north on US 89 at this point.







PHOTO 27 - Two hundred barrel oil truck traveling State Route 12 between Escalante and Bryce Canyon.



1. Proposed Action. Garfield County's Boulder to Bullfrog road is not presently designed to handle the projected truck traffic of 140 trips per day. Use of this roadway for hydrocarbon transport would soon result in its loss as an access road for all but four-wheel drive vehicles. Major improvements to this road would be required to permit the proposed development. The Utah Department of Transportation was requested to evaluate the proposed action to determine if any significant impacts to State highways would occur. Based upon their analysis it is projected that the level of service on portions of State Routes 12 and 20 would fall below the State standards throughout the project's operational life. Road segments totaling up to 8.02 miles on State Route 20 would have to be upgraded to bring it within State standards. Up to 12.50 miles of State Route 12 would also have to be upgraded. Significant impacts are not anticipated to occur on State Route 89 or Interstate 15.

Increased traffic through the communities along State Route 12 would increase traffic congestion and the possibility of accidents.

The proposed development calls for the construction of an oil pipeline to transport up to 32,000 barrels per day. Possible terminuses include Cedar City and Marysvale, Utah. Although information regarding this aspect of the project has not been submitted by the applicant some general comments can be made.

The most obvious place for such a pipeline would be to follow the existing road system described previously. However, such a choice would pose the following major problems:

Garfield County and the State of Utah would have to agree to share their highway rights-of-way.

The road between the STSCA and Escalante, Utah forms the boundary between several wilderness study areas (that have been recommended as suitable). Thus, any pipeline would be physically confined to the existing right-of-way. The existing road twists and turns to such an extent that a pipeline would have substantial difficulty following the road alignment.

State Route (SR) 12 passes through Bryce Canyon National Park. Discussion with park personnel indicate that they would oppose using the park for a oil pipeline corridor.

Land administered by the Forest Service would have to be crossed. SR 12 passes through the Forest Service Red Canyon Recreational Development. They, too, are not in favor of a pipeline in this area (Photo 28).

Since new access routes are precluded on the west, south, and east, the only remaining option would be to go north through the Dixie National Forest to the Torrey-Grover Area. From this point the pipeline could follow State and county highways to Marysvale. This route is probably the more likely, although it is not without problems, i.e. critical wildlife habitat, prime farmland, visual resources, etc.

3. Alternative 1 (restricted development). Use of the shoulder to  
allow roadway would occur. Traffic on State Highways is not expected  
to exceed State of Utah level of service standards.

Traffic within the corridor along SR 12 would increase resulting in  
traffic congestion and the probability of accidents.

3. Alternative 1 (restricted development). This alternative would dramati-  
cally increase the projected highway impacts under the proposed action.  
These effects are anticipated as a result of the need for 100-foot right-of-

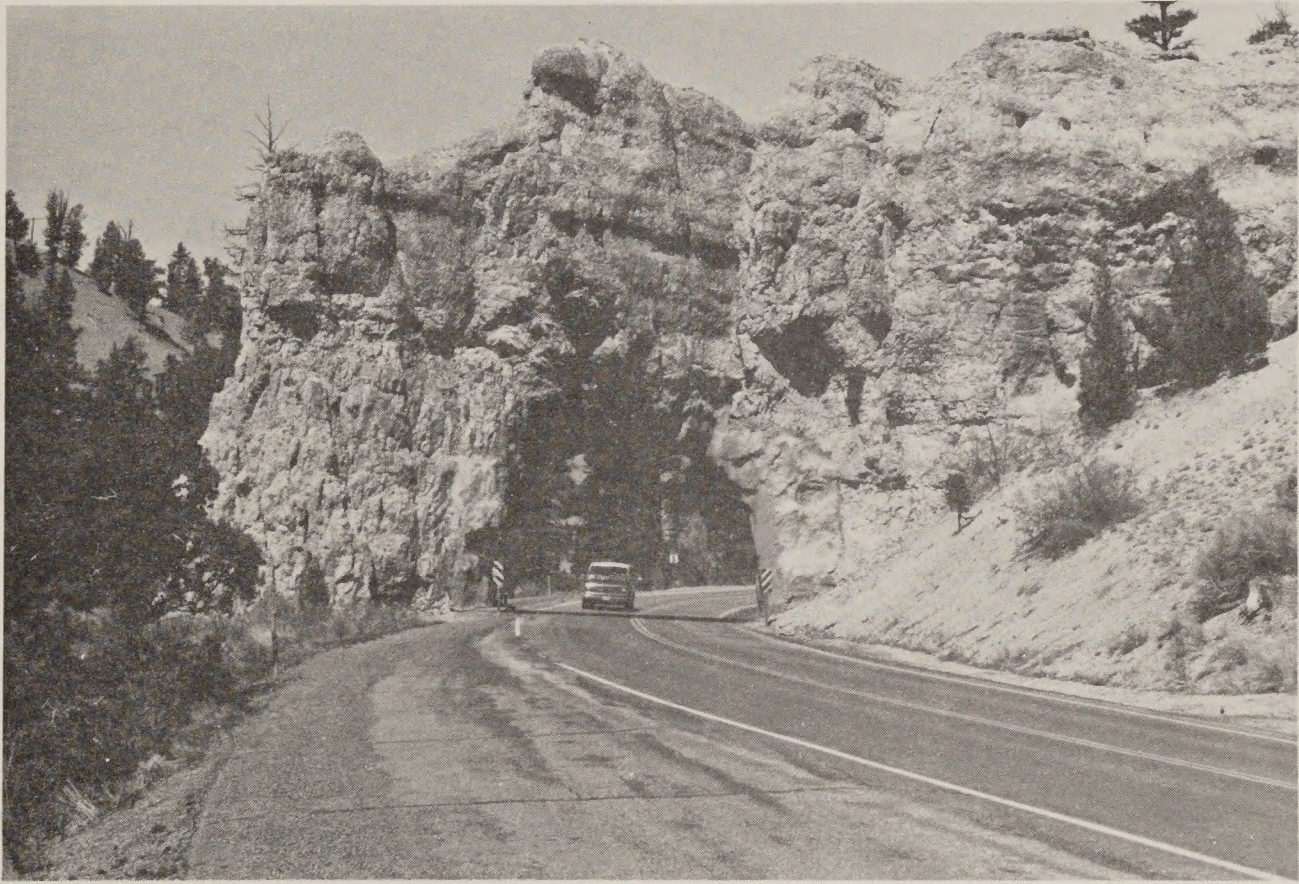


PHOTO 28 - State Route 12 as it passes through the Forest Services Red Canyon scenic area.



2. Alternative 1 (Restricted Development). Use of the Boulder to Bullfrog roadway would not occur. Traffic on State highways is not expected to exceed State of Utah level of service standards.

Traffic within the communities along SR 12 would increase adding to traffic congestion and the probability of accidents.

3. Alternative 2 (Worst Case). This alternative would dramatically increase the projected highway impacts noted under the proposed action. These effects are anticipated as a result of the need for 380 truck trips per day.

4. Alternative 3 (No Action). It is probable that modifications to the Boulder to Bullfrog road would occur for recreational programs. SRs 20 and 12 would be improved as part of State and County road improvement programs.

## IX. AIR QUALITY

### A. Areas of Special Concern

- . Possible violations of air quality standards
- . Visibility impacts to Capitol Reef National Park
- . Acid Deposition

B. Affected Environment. The proposed development area, in common with most of the State, is designated as an air quality Class II area. Class II areas are those in which deterioration that normally accompanies moderate, well-controlled growth would not be considered significant. Capitol Reef National Park, located adjacent to the area's eastern border, is designated as a Class I area. Class I areas are those in which practically any air quality deterioration would be considered significant.

The Clean Air Act defines specific maximum allowable increases over baseline concentrations for only two pollutants, SO<sub>2</sub> and total suspended particulates (TSP). Table 3-15 lists those allowable increments. Developments which would exceed these Class II increments cannot be permitted. Developments which would exceed the Class I increment can receive a Prevention of Significant Deterioration (PSD) permit from the EPA only if the developer shows, to the satisfaction of the Federal land manager responsible for that Class I area, that air quality related values (AQRVs) would not be adversely affected.

Table 3-15

Prevention of Significant Deterioration Increments

Pollutant	Averaging Time	Maximum Allowable Concentration Increases	
		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: Circle Cliffs Combined Hydrocarbon Lease Conversion Air Quality Technical Report, Aerocomp, Inc., July 1984.

Note: Numbers given in micrograms per cubic meter



The air quality analysis area is principally rural; therefore, the existing air quality is very good. Measured TSP matter, SO<sub>2</sub>, and nitrogen dioxide (NO<sub>2</sub>) concentrations at sites within or near the study area indicate that with the exception of TSP, ambient concentrations are well within the primary and secondary National Ambient Air Quality Standards (NAAQS).

Measured results indicate that various areas within the region experiences TSP annual geometric mean concentrations as low as 15 micrograms per cubic meter (Ug/m<sup>3</sup>) and as high as 70 Ug/m<sup>3</sup>. The measurements also show that the annual maximum 24-hour TSP concentrations currently range from 50 to 400 ug/m<sup>3</sup>.

Visibilities in the area of influence are usually good, with seasonal average visual ranges from 160 kilometers (km) (99 miles (mi)) to 211 km (131 mi) between 1978 and 1981 at Capitol Reef National Park. Geometric mean of visual range at Capitol Reef are 181 km (112 mi). The good visibility reflects the presently low regional SO<sub>2</sub> concentration and low relative humidities.

Present acid (sulfur) deposition rates have been estimated to be 0.28 grams per square meter per year (g/mk<sup>3</sup>/yr) (Dietrich et al. 1985). Because western soils are generally alkaline in nature a substantial buffering capacity exists. However, the high elevation lakes on Boulder Mountain may be poorly buffered.

### C. Environmental Consequences

The following analysis is based upon a series of assumptions described in detail in a technical report prepared by Aerocomp, Inc. (1984). Some of the key assumptions are listed below.

- . All gases to be flared would be piped to a central location, treated, and emitted from a 200+ foot high stack.
- . Removal of 95 percent of the hydrogen sulfide and 90 percent of the sulfur dioxide prior to emission.
- . Emission rates for the proposed action are assumed to be:

252 Kg/hr of suspended particulates

1073 Kg/hr of sulfur dioxide

264 Kg/hr of nitrogen oxides

47 Kg/hr of carbon monoxide

20 Kg/hr of hydrocarbons

- . Emission rates for the Restricted Development Alternative are assumed to be:

10 Kg/hr of suspended particulates

68 Kg/hr of sulfur dioxide

25 Kg/hr of nitrogen oxides

4 Kg/hr of carbon monoxide

2 Kg/hr of hydrocarbons

## 1. Proposed Action

a. Pollutant Concentrations. Estimated increased SO<sub>2</sub> and TSP concentrations that would be expected with implementation of the proposed action are compared to the PSD Class I and Class II increments in Table 3-16; the table also compares total maximum estimated concentrations for SO<sub>2</sub>, TSP, and NO<sub>2</sub> to the NAAQS. The analysis indicated that Class I and Class II increments for SO<sub>2</sub> and TSP would be exceeded for all averaging times. Class I increments at Capitol Reef would be exceeded by up to a factor of 20. Class II increments would be exceeded by up to a factor of 8. All NAAQS for SO<sub>2</sub>, TSP, and NO<sub>2</sub> would be exceeded with the exception of the 3-hour SO<sub>2</sub> standards. These results strongly suggest that a PSD permit from EPA may be difficult to obtain for a project of this size.

b. Visibility. Several analyses have been performed to determine if the proposed development would adversely affect visibility values at Capitol Reef National Park. Aerocomp, Inc. (1984) reported that little visibility impairment would occur.

c. Acid Deposition. Sulfur deposition rates of 0.5 g/m<sup>2</sup>/yr. for 5 kg/hectare/yr. have been identified as having the potential to adversely impact sensitive ecosystems (Oppenheimer, 1982). The estimated annual sulfur deposition rates are shown in Table 3-17. The results indicate that the sulfur deposition rates would be high enough to potentially cause adverse impacts to sensitive receptors such as mountain lakes.

## 2. Alternative 1 (Restricted Development)

TABLE 3-17  
Acid Deposition Estimates in the Study Region for Proposed Action

Areas of Concern	Annual Deposition Rate (g/m <sup>2</sup> - yr.)
	Sulfur
Capitol Reef NP	0.9
Glen Canyon NRA	0.4
Dixie NF	0.3

Source: Circle Cliffs Combined Hydrocarbon Lease Conversion Air Quality Technical Report, Aerocomp, Inc., July 1984

Pollutant Concentrations, Visibility and Acid Deposition. Pollutant levels are compared to the NAAQS and PSD increments in Table 3-18. Increased annual average SO<sub>2</sub> concentration estimates are equal to the Class I increment at Capitol Reef. The 24-hour SO<sub>2</sub> concentration increase estimate is slightly above the Class I increment at Capitol Reef. Predicted SO<sub>2</sub> concentrations in Class II areas are within the Class II increment. The Class II increments for TSP are predicted to be exceeded as a result of wind erosion on disturbed land. No NAAQS violations are expected. Results of the visibility analysis show that no perceptible visibility impairment is anticipated (Aerocomp 1984).

Sulfur deposition rates were predicted to be well below the level identified as having the potential to cause adverse impacts to sensitive ecosystems.

TABLE 3-16

Comparison of SO<sub>2</sub>, TSP, and NO<sub>2</sub> Impacts  
to the NAAQS and the PSD Increments for the  
Proposed Action

	Maximum Concentrations					
	SO <sub>2</sub>			Ug/m <sup>3</sup> TSP		NO <sub>2</sub>
	3 hour	24 hour	Annual	24 hour	Annual	Annual
1. Maximum Projected Concentration	1087	482	148	230	98	139
2. NAAQS Standards	1300	365	80	150	60	105
3. Projected Impact of Capitol Reef NP	232	103	32	66	42	NA <sup>b</sup>
4. Allowable Class I Increment	25	5	2	10	5	NA
5. Projected Maximum Impact in Class II Areas	1069	475	147	168	79	NA
6. Allowable Class II Increments	512	91	20	37	19	NA

Source: Circle Cliffs Combined Hydrocarbon Lease Conversion Air Quality Technical Reports, Aerocomp, Inc., July 1984.

<sup>a</sup>Maximum total concentrations, including background are for comparison with NAAQS; increased concentrations from the proposed action only are for comparison with the PSD increments.

<sup>b</sup>Not applicable; there are currently no PSD increments for NO<sub>2</sub>



TABLE 3-18  
 Comparison of SO<sub>2</sub>, TSP, and NO<sub>2</sub> Impacts  
 to the NAAQS and the PSD Increments  
 Restricted Development Alternatives

Maximum Concentrations (ug/m<sup>3</sup>)<sup>a</sup>

	SO <sub>2</sub>			TSP		NO <sub>2</sub>
	3 hour	24 hour	Annual	24 hour	Annual	Annual
1. Maximum Projected Concentration	86	37	10	112	48	21
2. NAAQS Standards	1300	365	80	150	60	100
3. Projected Impact in Class I Areas	14	6	2	3	2	NA <sup>b</sup>
4. Allowable Class I Increment	25	5	2	10	5	NA
5. Projected Impact in Class II Areas	68	30	9	39	19	NA
6. Allowable Class II Increment	512	91	20	37	19	NA

Source: Circle Cliffs Combined Hydrocarbon Lease Conversion Air Quality Technical Report, Aerocomp, Inc., July 1984

<sup>a</sup>Maximum total concentrations, including background are for comparison with the NAAQS; increased concentrations from the proposed action only are for comparison with the PSD increments.

<sup>b</sup>Not applicable; there are currently no PSD Increments for NO<sub>2</sub>





3. Alternative 2 (Worst Case). The Worst Case Alternative for air quality would be a steam assisted in situ combustion operation. In addition to emission sources for the proposed action, a boiler to produce steam would be necessary. Emissions would be increased, the magnitude depending upon the amount of steam needed. Pollutant concentrations would be higher than the proposed action, which was estimated to exceed PSD Class I and Class II increments and NAAQS for TSP and SO<sub>2</sub> and the NAAQS for NO<sub>2</sub>. Increased TSP and NO<sub>x</sub> emissions may cause particulate plumes and atmospheric discoloration that may be visible in Capitol Reef National Park. Acid deposition rates would be greater than the proposed action rates and damage would occur to sensitive areas.

4. Alternative 3 (No Action). Air quality values would remain essentially the same as described in the existing environment.

## IX. NOISE

### A. Areas of Special Concern

- . Violations of standards
- . Increases within communities

B. Affected Environment. The proposed development area is perceived by visitors as essentially free of man-caused sound. Ambient noise levels are estimated to be between 16 and 20 decibels, A-weighted (dbA). these levels would also occur in the adjacent areas, such as Canyon Lands National Park, Glen Canyon National Recreation Area, and wilderness study areas.

The major access route to the development area would pass through several rural communities (Escalante, Boulder, Tropic, Henrieville, and Cannonville). General noise levels within these communities are not known but are estimated to be below 55 dbA.

### C. Environmental Consequences

1. Proposed Action. The anticipated development and construction activities would generate a substantial amount of noise. An exact level is not known but should be similar to that reported in the Tar Sand Triangle Draft EIS (1984) where a 66 dbA level at 1,000 feet from the project area was predicted. This noise level would exceed the Environmental Protection Agency standard of 55 dbA "for outdoor areas where people spend widely varying amounts of time in which quiet is a basis for use." (EPA 1974). Such a level would increase ambient levels by at least 230 percent.

Heavy truck traffic through several southern Utah communities could increase noise levels adjacent to the main highway. Levels should be about the same as reported in the Tar Sand Triangle DEIS (1984), i.e., about 86 dbA within 50 feet of the highway.

Noise level increases within Boulder, Escalante, Tropic, Henrieville, and Cannonville would, at least temporarily, disturb the sleep and concentration of residents along the main highway.

2. Alternative 1 (Restricted Development). Development activities are estimated to create noise levels in the STSCA of between 52 and 54 dbA which are slightly below the 55 dbA standard but still 160 percent above existing levels.

Noise levels in the communities along the main access route would be increased by an amount proportionate to the number of truck trips involved (20 vs. 140 for the proposed action). Should a direct relationship exist between the number of trucks and the predicted noise level, then approximately a 12 dbA increase would be expected.

Noise level increases within the communities noted previously may be a minor annoyance to residents living adjacent to the main highway.

3. Alternative 2 (Worst Case). Probable increases of at least 66 dbA are predicted within the STSCA. This level would exceed the EPA standards. At 320 truck trips per day noise levels within several communities would be expected to increase to a degree substantially higher than the 86 dbA predicted for the proposed action.

In addition to the impacts noted for the proposed action, normal conversational speaking and a temporary inability to hear speech would affect downtown areas. The severity of the effect, as well as the duration, would be about twice as noticeable as the proposed action.

4. Alternative 3 (No Action). Noise levels are expected to remain essentially unchanged from the current ambient levels.

## XI. AGRICULTURE

### A. Areas of Special Concern

- . Impacts on cropland in Boulder and Escalante

B. Affected Environment. No cropland occurs within the Special Tar Sands Area. However, approximately 1,000 acres of cropland occur on the terraces and floodplains near Boulder, Utah and about 2,500 acres on the gently sloping plains in the vicinity of Escalante. Crop production in these areas is entirely dependent on irrigation due to the low annual precipitation (6 to 12 inches). The farmlands under irrigation are considered to be prime and unique.

The principal type of farming is the production of livestock feed. Alfalfa hay, the principal crop, is grown on approximately 80 percent of the cropland areas. Other crops included small grains (barley and oats), corn, and pasture and meadow hay.

### C. Environmental Consequences

1. Proposed Action. No cropland would be affected by any of the site facilities or in situ resource recovery operations. However, cropland losses are anticipated due to population expansion. Project-related population increases due to mining activities proposed by the applicants would cause the conversion of an estimated 221 acres of land to homesites and other

related urban development in the areas of Boulder and Escalante (0.13 acres per capita, ERS 1970). An unknown portion of the land converted to residential purposes may include prime and unique farmland.

2. Alternative 1 (Restricted Development). Cropland conversions totaling about 18 acres are projected.

3. Alternative 2 (Worst Case). Anticipated project related water demands of about 7,500 acre-feet per year would require the retirement of about 2,000 acres of prime and unique farmlands. Probably the focus of these effects would be on Boulder Creek, the closest source of substantial water rights. Since Boulder Creek presently has approximately 3,000 acre-feet of irrigation water rights, project development would essentially eliminate all irrigated agriculture dependent on this source. The remaining requirement of 4,500 acre-feet/year would probably be obtained from water rights on the Escalante River causing the retirement of about 1,000 acres of irrigated farmland.

4. Alternative 3 (No Action). No impacts are anticipated.

## XII. CULTURAL RESOURCES

### A. Areas of Special Concern

- Impacts to National Register properties or sites eligible for nomination to the National Register of Historic Places

## B. Affected Environment

The STSCA lies within the Colorado Plateau. The Colorado Plateau has been inhabited for approximately 12,000 years. Within this time span, population patterns have fluctuated according to environmental and socioeconomic constraints. These population patterns have been assigned by prehistorians to several culture periods: Paleo-Indian, Archaic, Fremont-Anasazi, and Shoshonean (BLM 1980b).

The area contains a variety of site types including rock art, dry masonry fortresses, pit houses, granaries, caves, and rock shelters. A recent (1984) 5 percent archaeological survey indicates that some 240 sites with potential for nomination to the National Register of Historic Places could be located within the development area.

## C. Environmental Consequences.

1. Proposed Action. If the conversion applications and plans of operations are approved, the lease areas and other properties directly affected by the proposed actions would be subjected to 100 percent surveys of cultural and historical resources prior to any surface disturbance. The surveys will be conducted in consultation with the Authorized Officer and the Utah State Historic Preservation Office.

Identified sites would be evaluated for their National Register potential and mitigated in an appropriate manner prior to actual surface disturbance. Even with mitigation some loss of data is probable from destruction of undiscovered sites and increased vandalism.

2. Alternative 1 (Restricted Development). The impacts of this alternative on historic and prehistoric resources would be similar in nature to those described for the proposed actions. It is possible that fewer cultural resources would be affected, as fewer acres would be disturbed.

3. Alternative 2 (Worst Case). Impacts to cultural resources would be the same as those described under the proposed action although vandalism may be somewhat more intense because of a larger projected population increase.

4. Alternative 3 (No Action). Direct impacts to cultural values are not anticipated. Baseline population growth would probably increase the unauthorized use of cultural values within the STSCA.

### XIII. PALEONTOLOGY AND MINERAL RESOURCES

#### A. Areas of Special Concern

. Wolverine Petrified Wood Area

. Other mineral values

. Potential for sand deposits in the Cedar Mesa and White Rim  
Formation

B. Affected Environment. Fossil wood is common in the Petrified Forest Member of the Chinle Formation throughout the lower elevations in the Wolverine Petrified Wood area. Field examination of the area showed that most of the wood has been exposed by erosion in gullies and washes. It is probable that petrified wood also occurs throughout the Petrified Forest Member in the area even though much of it is covered by overlying deposits. The fossil wood occurs as fragments and/or segments up to 80 feet in length and 3 feet in diameter. The wood is not of a gem quality, but is preserved well enough to allow limited scientific study.

There are numerous inactive uranium prospects and claims in the STSCA. Uranium occurs chiefly in the Shinarump at the base of the Triassic Chinle Formation where it rests on the Triassic Moenkopi Formation. Significant channel deposits occur in Capitol Reef National Park in T. 35-36 S. R. 8 E., near Deer Point and at White Canyon Flat outside the Capitol Reef National Park boundary. The Department of Energy (DOE) (1980) has assigned approximately 19,000 acres in the western part of the STSCA to the Greater Circle Cliffs probable uranium resource area. According to DOE, probable resource areas are those areas with a high potential to contain deposits of uranium.



Exploration for oil and gas has been limited in the area because of rugged topography, hardrock formations, and loss of drill fluid. Limited drilling in T. 34 S., R. 7 E., Sec. 24 yielded good oil shows in the Permian Cedar Mesa sandstone along with saturation in the Moenkopi Formation and Kaibab Limestone. However, the oil was too thick for production through the wells. This is partially the result of major breaching of the anticline and exposure of the deposit, causing extensive weathering and degradation of the oil contained in the trap. Most of the volatiles have escaped, and as much as 50 percent of the heavier oil, once in place, may have been removed by erosion. However, the STSCA is underlain by older pre-Mesozoic rocks which remain largely untested for oil and gas.

The Circle Cliffs tar sand deposit consists of two major portions, an east and west flank, which are considered separate deposits by Ritzma (1980). The STSCA also includes the relatively small White Canyon Flat deposit, which is also considered a separate deposit by Ritzma (1980). The White Canyon Flat deposit occurs in the Triassic Shinarump Member of the Chinle Formation and is estimated to contain 2.8 million barrels of oil.

The Moenkopi Formation contains more than 99.8 percent of the known tar sand resource in the Circle Cliffs STSCA. According to Davidson (1967), the lower ledge-forming unit of the Moenkopi Formation is the major oil-impregnated sandstone in the Circle Cliffs area. This unit is variably impregnated with oil over a wide area in the STSCA and contains about 95 percent of the oil in the deposit (Ritzma, 1980). Thickness of oil-impregnated intervals ranges from a few feet on the fringes of the deposits to over 200

feet in the central portions. Based on Ritzma (1980) there are roughly 447 million barrels of oil in place on the west flank and about 100 million barrels of oil in place along the CRNP boundary.

According to Ritzma (1980), much of the reservoir sandstone is fine-grained, clayey, and micaceous and would present formidable problems in mining and extraction. Limited sampling suggests that the reservoir sand has porosities from 12.5 to 16.5 percent, permeabilities from 1.10 to 2.91 millidarcies and oil saturation by weight from 6.05 to 8.16 percent. The oil contained in the samples ranged from 10 degrees to 22.5 degrees APO gravity and from 42 to 421 centipoise viscosity at 180 degrees F.

Ritzma (1980) reported a sulfur content of 3.58 and 4.19 percent of 2 samples from outcroppings of the Moenkopi on the west flank. This is in contrast with analyses for sulfur for core hole samples from the west flank, which averaged 2.7 percent for 4 samples (Campbell and Ritzma, 1979). It is apparent that there has been considerable degradation of the petroleum through weathering at surface exposures.

The White Rim and Cedar Mesa Sandstone, both members of the Permian Cutler Group, may represent potential tar sand resources in the Circle Cliffs area. To date, only one well, the Hunt No. 1 Government Test (1953-1954) in Section 24, T. 34 S., R. 7 E. has penetrated these units at Circle Cliffs. While oil shows were reported in the Cedar Mesa in this well, the presence of tar sand in these units is purely speculative.

## C. Environmental Consequences

1. Proposed Action. Because the Wolverine Petrified Wood Area is protected by a "no surface occupancy" lease stipulation, little direct impact is anticipated. Some removal of the wood is projected to occur due to the 1,700 population increase and the Interior Department Policy which permits the collection of up to 25 pounds of petrified wood by individual collectors.

In situ operations would interfere with any uranium, oil, and gas exploration and development activities proposed for the same time and location where tar sand operations are occurring. However, since only 1,000 acres would be occupied by development at any one time, and then only for a period of 3-5 years, it appears that any impact on other mineral activities resulting from in situ mining of tar sand would be temporary. The potential to eliminate mineral resources other than tar sand from recovery due to the tar sand development is low.

At 32,000 barrels/day, 14 years would be required to extract the known recoverable reserves of 557 million barrels. To achieve the proposed lease development schedule of approximately 80 years and the production of 32,000 barrels/day an unknown tar sand deposit of about 3.37 billion barrels (4 times the known resource) would have to be discovered in the Cedar Mesa or White Rim Formations.

It is estimated that the in-place forward combustion process used in the proposed action would extract no more than 30 percent of the in-place oil resource (167 million barrels). The remaining 70 percent, representing the heavier portion of the bitumen, would be left behind as a heavy residual cake

or carbon deposit. Much of this residual material would be consumed as fuel for the fire. Accordingly, after in situ extraction, there would be no bitumen remaining that could be recovered by other enhanced recovery methods. As a result, about 390 million barrels of the estimated 557 million barrels of in-place oil would be foregone from possible recovery and would represent an irreversible/irretrievable commitment of resources.

2. Alternative 1 (Restricted Development). Impacts to the Wolverine Petrified Wood area would be the same as noted above but of reduced intensity due to the smaller projected population increase.

Effects to other mineral values would be the same as noted above except that only 60 acres per year would be involved.

Since only about 70 percent of the total area would be developed, a potential reserve of about 390 million barrels would be available for development. Of this amount approximately 117 million barrels of oil would be extracted and 213 million barrels of oil would be burned or left as coke which represents an irreversible, irretrievable commitment of the tar sand resource.

At a production rate of 2,000 barrels/day, 160 years would be required to extract the known recoverable resources.

3. Alternative 2 (Worst Case). The anticipated impacts would be the same as described under the proposed action.

4. Alternative 3. (No Action). Exploration and possible development of the Circle Cliffs tar sand deposit would be postponed indefinitely as would the impacts associated with such development.

#### XIV. LAND USE PLANS, POLICIES, AND PROGRAMS

##### A. Areas of Special Concern

- . Any identified conflicts with land use plans, policies, or programs

B. Affected Environment. The National Park Service has developed general management plans for Capitol Reef National Park and the Glen Canyon National Recreation Area. Except for those lands immediately adjacent to the Burr Trail Park and Recreation Area, lands have all been designated as natural and recommended for wilderness status.

The proposed development area is addressed in BLM's Escalante Management Framework Plan (MFP) as amended by Volume II of the Utah Combined Hydrocarbon Regional FEIS (1984). The STSCA is available for tar sand development with certain restrictive stipulations (see Appendix A).

Garfield County is in the process of updating its master plan. A draft document, which is subject to revision, was released in April 1984. Although the draft plan does not address tar sand development specifically, mineral

development within the county was encouraged. The plan also calls for the construction of the Boulder to Bullfrog all-weather highway.

A series of goals and policies for future development are included in the county planning document. Two of these statements, which appear especially applicable to the proposed development, are given below.

"Garfield County should encourage moderate growth. Growth should be managed in such a manner that the utilities are not over taxed and become antiquated."

"The County should adopt an Impact Policy Declaration stating that in any Boom Town development developers or those entities causing the impact shall provide for front end funding or a comprehensive development plan that assures financing by revenues generated from the proposed project. Thus, the financial burden shall not fall back on the existing population."

The Governor and all 5 members of the State Congressional Delegation are presently supporting a project to pave the Boulder to Bullfrog Scenic Road. The road runs from Boulder over the old Burr Trail to Bullfrog Basin on Lake Powell. The intent of the project is to construct a noncommercial scenic road which emphasizes numerous scenic overlooks. Current design specifications anticipate a heavy-vehicle volume of 5 vehicles per day. Approximately 3 miles of this roadway are within the proposed lease conversion area.

The BLM, in cooperation with the National Park Service, is developing a special recreation area management plan which includes the western portion of the proposed development area as well as one mile buffer zone along the Boulder to Bullfrog roadway. The plan is referred to as The Canyons of the Escalante Special Recreation Area Management Plan. The objective of this plan would be to maintain the natural setting that provides for outstanding recreational opportunities. The draft plan has designated those areas within the STSCA as a resource utilization zone. Such a designation would permit mineral developments such as tar sand extraction.

### C. Environmental Consequences

1. Proposed Action. The anticipated increase in noise levels and air pollution within park and recreation area lands adjacent to the development area would not meet the objectives of the general management plans.

The proposed development appears to be compatible with BLM's land use plan and The Canyons of the Escalante Special Recreation Area Management Plan.

Conflicts with Garfield County's land use plan could occur if 32,000 barrels per day of oil production is not considered "moderate" growth. The identification of other possible conflicts must await more refined development plans.

Commercial use of the Boulder to Bullfrog road would not be compatible with the proposed designs of the Boulder to Bullfrog scenic highway. If this road segment is constructed as a scenic highway, "Industrial" highway access to the Circle Cliffs Tar Sands Area may be lost because the Boulder to Bullfrog road is the only access road to the area.

2. Alternative 1 (Restricted Development). Under this alternative restrictive stipulations would eliminate all conflicts except for those related to increased noise levels and air pollution within adjacent park units.

3. Alternative 2 (Worst Case). Conflicts would be the same as noted under the proposed action.

4. Alternative 3 (No Action). Selection of this alternative would avoid conflicts with construction of the Boulder to Bullfrog scenic highway, but would not meet the growth objectives of Garfield County.



## CHAPTER 4

### SITE-SPECIFIC MITIGATION, MONITORING, IRREVERSIBLE/IRRETRIEVABLE COMMITMENTS, UNAVOIDABLE ADVERSE IMPACTS, AND LONG-TERM ENVIRONMENTAL CONSEQUENCES

This chapter provides additional mitigation measures, monitoring programs, irreversible/irretrievable impacts, and the unavoidable adverse impacts that would occur as a result of the proposed action. Also provided is a perspective on the effects of implementing all the applicant's proposed plan of operation on the long-term use of man's environment. Of special concern are new trends that would be established, short and long-term benefits and trade offs, and irreversible and irretrievable commitments of resources. In this context, "short-term" is defined as 1 to 10 years, which corresponds to the average construction period; "long-term" is defined as longer than 10 years.

#### I. SITE-SPECIFIC MITIGATION

Following the impact assessment several mitigating measures were identified that could further alleviate or minimize the environmental effects of the proposed action. These mitigating measures are essentially the same as the restrictive criteria utilized in the Restricted Development Alternative plus the following additions:

- Water use would be restricted to 13 acre-feet per year or less.

- . No blasting and/or rubblizing of the tar sand deposit would be permitted.
- . An increased efficiency of pollution control equipment to bring emission rates within the Class I standards of Capitol Reef National Park.
- . Mulching of disturbed areas and/or other treatments to control particulates.
- . At least 14 exploratory wells shall be drilled within 5 years of the lease conversion to test and confirm the existing tar sand deposit. The results of these exploratory wells shall be provided to the BLM.

## II. MONITORING

The authorizing agency has the right to require monitoring; however, that responsibility has been passed on to the State agencies. In this STSCA, the responsibility for compliance with permits serves as the basis for the monitoring.

The Utah Department of Health, Division of Environmental Health, Bureau of Air Quality requires that meterological data be monitored 1 year prior to construction (which is the same as the prevention of significant deterioration (PSD) permit requirement) and for 1 year during full production.

The Utah Department of Natural Resources, Division of Oil, Gas, and Mining is the monitoring agency for reclamation. At the time a mine plan is submitted, a reclamation plan and a performance bond must accompany it. The Division monitors the success of the reclamation for a period of 3 years. The Division would also require monitoring of surface and ground water.

### III. IRREVERSIBLE/IRRETRIEVABLE COMMITMENTS OF RESOURCES

Bitumen removed from the tar sand deposit would be consumptively used, constituting an irreversible and irretrievable resource commitment.

Water used for tar sand development would not be available for other uses for up to at least 100 years, and would be irreversibly and irretrievably committed for that time period.

Soil losses due to erosion and vegetative production lost due to changes in land use would be irretrievable losses.

Wildlife habitat for big horn sheep within the proposed unit would be irretrievably lost for the duration of the project life.

Due to the large-scale and permanent changes in topographic features and the long-term changes in vegetative cover and growth patterns, irretrievable impacts on the landscape character (a change from primarily natural and undeveloped to primarily altered and industrial) and the scenic resources would result.

Destruction of in-context archaeological remains would be unavoidable as the project progresses; such loss of data and resources is permanent, irreversible, and irretrievable.

Changes in the character and cultural composition of the surrounding rural communities and counties would be irretrievable.

For BLM lands, an irretrievable commitment of the land base to a single purpose for a long period of time would occur.

The amount of land where one could go to experience solitude or enjoy primitive and unconfined recreational experiences would be reduced by at least 40,160 acres; the change in character of the recreational lands from primarily undeveloped and natural to primarily industrialized would be irreversible.

The Utah Department of Health, Division of Environmental Health, Bureau of Water Pollution Control uses the National Pollutant Discharge Elimination System permit requirement of background water sampling as a baseline for water quality. In addition to this, the standards applicable to streams in the area apply. The Bureau also monitors continuously by sampling discharges at various unannounced times.

#### IV. UNAVOIDABLE ADVERSE IMPACTS OF THE PREFERRED ALTERNATIVE

Application of the site-specific mitigating measures would yield the same impacts as set forth in Chapters 2 and 3 for the Restricted Development Alternative, except that air quality violations would not occur. Of special importance are the following impact conclusions:

- . Some increase in wind and water erosion would be unavoidable.
- . The potential impacts to surface and ground water are unknown.
- . A temporary disturbance of wildlife habitat would be unavoidable.
- . State and county road systems would have to be upgraded and traffic increased in nearby communities.
- . Changes in landscape character.
- . Local infrastructure would be adversely affected at least initially.
- . The potential for an accidental oil spill would exist for as long as oil production occurred.
- . The sights and sounds of development would reduce solitude within the STSCA and adjoining areas under wilderness review.

V. LONG-TERM ENVIRONMENTAL CONSEQUENCES

A. TRENDS HAVING SIGNIFICANT IMPACTS

Approval of the lease conversion would prepare the way for a series of sequential steps that could lead to the development of the Circle Cliffs tar sands resource.

Development of the proposed tar sand conversion leases at a commercial level would further the synfuels technology in the United States. Additionally, it would fully establish a trend for continuing tar sand resource use in the Circle Cliffs STSCA. A successful and maturing tar sand industry could be established.

Development or expansion of tar sand reserves located in the STSA would increase the competition for any remaining PSD increments in the area. The Clean Air Act (Public Law 95-95) ensures through National Ambient Air Quality Standards and the PSD provisions that air quality violations, and BLM lessees cannot conduct their activities in violation of any applicable air quality standards or related plans of implementation. A maturing tar sand industry would, therefore, tend to increase the competition for available consumable air resource increments.

Conversion would tend to promote the eventual "industrialization" of this remote area of Utah with an attendant increase in population and socio-economic change.

#### B. BENEFITS AND TRADE OFFS

The benefits of converting existing oil and gas leases to combined hydrocarbon leases would be to:

- Encourage synfuel development

- . Encourage economic development in a high unemployment area
- . Gain knowledge regarding the tar sand deposits located in STSA through a required drilling program
- . Obtain data on soils, hydrology, cultural values, and threatened and endangered species

The trade offs that would be a function of the lease conversion process would be:

- . A 5 to 10-year commitment of a 557-million barrel national oil resource
- . Possibly unknown adverse impacts which may result from future development





## CONSULTATION AND COORDINATION

In addition to the scoping meeting held on November 9, 1983 and the Federal Register Notice of Availability published on October 20, 1983 the following individuals and agencies were specifically consulted regarding the project.

Utah State Office of Planning and Budget  
Mr. Robert Montgomery (Kirkwood Oil and Gas)  
U. S. Fish and Wildlife Service  
Garfield County Commission  
Ivan M. Matheson (Utah State Senator)  
Utah Department of Transportation, Federal Highway Administration  
State of Utah Resource Development  
Coordination Committee, Agricultural Stabilization & Conservation Service  
Five County Association of Governments  
Dixie National Forest  
Bryce Canyon National Park  
Capitol Reef National Park  
Glen Canyon National Recreation Area  
Soil Conservation Service  
Utah Division of Wildlife Resources  
Federal Energy Regulatory Commission  
Bureau of Mines  
Bureau of Reclamation  
Mining claimants within the Circle Cliffs Development Area

Copies of this Draft EIS will be sent to the individuals and agencies noted above and all persons who have requested to be notified of energy developments within the Cedar City District. In addition, copies will be sent to the following agencies and organizations which may have a special interest in the proposed development.

### Federal Agencies

Environmental Protection Agency  
National Advisory Council on Historic Preservation  
Utah Congressional Delegation

### State Agencies

Utah Division of Oil, Gas, and Mining  
NE Regional Office, Division of Wildlife Resources

### Organizations and Businesses

Environmental Defense Fund  
Sierra Club  
Utah Wilderness Association  
Northwestern University  
Humane Society of Utah  
Chevron USA, Inc.



LIST OF PREPARERS

EIS Team	Title	Assignment	Education	Years of Professional Experience
Dave Everett	Supervisory Environmental Specialist	Team Leader	BS - Biology	14
Dennis Curtis	Chief, Planning and Environmental Assessment	Socioeconomics	MS-Geography	15
Ronald Hooper	Hydrologist	Hydrology	BS-Range/ Hydrologist	6
Pete Wilkins	Planning Coordinator	Analyst/ Writer	BS-Resource Manager	6
Steve Hedges	Wildlife Management Biologist	Analyst/ Writer	BS-Wildlife	11
Jerry Meredith	Public Affairs Officer	Analyst/ Writer	BS-Comunications	13
Max Hodson	Soil Scientist	Soils	BS-Agronomy/ Botany	20
Tom Hansen	Recreation Specialist	Recreation/ Wilderness	Technical Instruction	12
Mark Littlefield	Wildlife Specialist	Wildlife	BS-Wildlife	4
Greg Christensen	Range Conservationist	Range Vegetation	BS-Range	4
Mark Green	Air Quality Specialist	Air Quality	MS-Meteorology	7
Don Stucker	District Engineer	Transportation	BS-Engineering	14
Sharon Paris	Clerk-Typist	Clerical Assistance	Technical Instruction	8
Douglas McFadden	Archaeologist	Cultural Resources	MA-Anthropology	10



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## GLOSSARY

Air Quality Criteria - The varying amounts of pollution and lengths of exposure at which specified adverse effects to health and welfare take place.

Air Quality Model - A mathematical representation of the behavior of air pollutants or their effects on air quality related values.

Air Quality Related Value (AQRV) - A feature or property of an area (e.g., visibility) that is affected in some way by air pollution.

Ambient Air Quality - Concentration levels in ambient air for a specified pollutant and a specified averaging time period within a given area.

Ambient Air Quality Standard - A level of ambient air quality established by Federal or State agencies which is to be achieved and maintained; primary standards are those judged necessary, with an adequate margin of safety, to protect the public health; secondary standards are those judged necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Ambient standards are given in micrograms per cubic meter.

Ancillary Facilities - Structures (compressor stations, power and communication lines, cathodic protection systems) which are necessary for the continuous operation or maintenance of the project.

Animal Unit Month - The amount of forage required to sustain the equivalent of 1 cow or 6.2 sheep for 1 month; 5.8 deer for 1 month; 9.6 antelope for 1 month; 5.5 bighorn sheep for 1 month; or 2.2 burros for one month (usually 800 lbs. of usable air-dried forage).

Aquatic - Living or growing in or on the water.

Aquifer - A geologic formation or structure that transmits water. Aquifers are usually saturated sands, gravel, fractured rock, or cavernous rock.

Archaeology - The scientific study of past cultures.

Bitumen - A naturally occurring viscous mixture of hydrocarbons, such as asphalt, that may contain sulphur compounds and that, in its naturally occurring state, is not recoverable at a commercial rate through a well, but when processed produces a synthetic oil.

Carbon Monoxide (CO) - A colorless, odorless, toxic gas produced by the incomplete combustion of carbon-containing substances. One of the major air pollutants, it is emitted in large quantities by exhaust of gasoline-powered vehicles.

Census County Division (CCD) - A part of a county, defined by the Bureau of the Census. Maps showing CCD boundaries are included in the Population Census report for each state.

Centipoise - A unit of viscosity equal to 1/100 poise. (A poise is a cgs absolute unit of viscosity that is equal to one dyne-second per square centimeter.)

Class I, II, and III Areas (Air Quality) - Regions in attainment areas where maintenance of existing good air quality is of high priority. In Class I areas, maintaining air quality is regarded as having 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 designed Class II.

Combined Hydrocarbon Lease - A lease issued in a Special Tar Sand Area (STSA) which entitles the lessee to remove any gas and nongaseous hydrocarbon substance other than coal, oil shale, or gilsonite.

Cretaceous - Of, relating to, or being the last period of the Mesozoic era or the corresponding system of rocks.

Cultural Resources - Remains of human activity, occupation, or endeavors, as reflected in sites, buildings, artifacts, ruins, etc.

Decibel - A unit for expressing the relative intensity of sounds on a scale from zero for the average least perceptible sound to about 130 for the average pain level.

Emission - Effluent discharge into the atmosphere, usually specified in terms of mass per unit time.

Endangered Species - Any animal or plant species in danger of extinction throughout all or a significant portion of its range.

Environmental Analysis - A systematic process for consideration of environmental factors in land management actions.

Extraction - As used in this EIS, the process by which bitumen is separated from sand, water, and other impurities.

Fugitive Dust - Solid airborne particles emitted from any source other than a stack.

Hydrocarbons - Organic chemical compounds of hydrogen and carbon atoms which form the basis of all petroleum products.

Increments (Air Quality) - Maximum allowable increases over baseline concentrations of pollutions covered by the PSD provisions in Class I, II, and III areas.

Infrastructure - The set of supporting systems and facilities (i.e., transportation, education, medical service, communication, fire, police protection, etc.) that support a region's or community's social and economic structures.

In Situ Extraction - Extracting the bitumen from tar sand while it is still in the ground by injecting steam, solvents, and/or heat.

Interim Management Policy (IMP) - An interim measure governing uses on lands under wilderness review. This policy protects Wilderness Study Areas (WSAs) from impairment of their suitability for designation as wilderness.



Lease (Mineral) - A contract between a landowner and another granting the latter the right to search for and produce gas, hydrocarbons, or other mineral substances upon payment of an agreed-upon rental, bonus, and/or royalty.

Lease Conversion - As used in this EIS, the process of converting an existing oil and gas lease in a Special Tar Sand Area (STSA) to a Combined Hydrocarbon Lease (CHL). The conversion is completed through approval of a plan of operation outlining how the hydrocarbon resource will be developed.

Leachates - A solution or product obtained by percolating liquid in order to separate the soluble components.

Management Framework Plan (MFP) - A land use plan for public lands administered by BLM which provides a set of goals, objectives, and constraints for a specific planning unit or area; a guide to the development of detailed plans for the management of each resource.

Mandatory Class I Area (Air Quality) - An international park, a national wilderness area or national memorial park larger than 5,000 acres, or a national park larger than 6,000 acres. States may not reclassify mandatory Class I areas.

Millidarcy - A unit of porous permeability equal to 1/1000 darcy. Having to do with flow of fluids under pressure. A darcy is a unit of measure where the rate of flow of a fluid having one centipoise viscosity under pressure gradient of one atmosphere per centimeter would be 1 cubic centimeter per second per square centimeter cross section.

Mitigation Measures - Measures developed to lessen impacts to resources resulting from proposed projects.

Multiple Use - Management of public lands and their various resource values so that they are used in the combination best meeting the present and future needs of the American people. Relative resource values are considered, not necessarily the combination of uses that will give the greatest potential economic return or the greatest unit output.

National Ambient Air Quality Standard (NAAQS) - National standards, established under the Clean Air Act by the Environmental Protection Agency, prescribing levels of pollution in the outdoor air which may not be exceeded. Primary NAAQS: Standard set at a level to protect public health from damage from air pollution. Secondary NAAQS: Standard set at a level to protect public welfare from damage from air pollution.

National Wilderness Preservation System (NWPS) - A system composed of Federally owned areas designated by Congress as Wilderness Areas. These areas shall be administered for the use and enjoyment of the American people; management actions will preserve wilderness values for future use and enjoyment.

Nitrogen Oxides (NOx) - Compounds produced by combustion, particularly when there is an excess of air or when combustion temperatures are very high. Nitrogen oxides are primary air pollutants.

Nonimpairment Criteria - A series of guidelines which govern surface-disturbing activities on lands being studied by BLM for inclusion in the National Wilderness Preservation System (NWPS). The guidelines require that lands be managed so as to not impair their suitability for designation as wilderness and so that any reclamation of disturbed areas be substantially unnoticeable by the time the Secretary of Interior makes his recommendation on wilderness areas to the President.

Ozone - A pungent, colorless, toxic gas. As a product of the photochemical process, it is a major air pollutant.

Paleontology - A science dealing with the life of past geological periods as known from fossil remains.

Particulate Matter - Any material, except water, in a chemically uncombined form that is or has been airborne and exists as a liquid or a solid at standard temperature and pressure conditions. Minute particules of coal dust, fly ash, and oxides temporarily suspended in the atmosphere.

Parts Per Million (PPM) - The number of parts of a given pollutant in a million parts of air; a measure of concentration.

Perennial Stream - A stream with a yearlong flow.

Pilot Plant - A small plant for testing chemical processes under actual production conditions.

Plan of Operations - As used in this EIS, a plan submitted by a lessee which outlines in detail exploration and mining proposals.

Planning Unit - A geographic unit within a BLM district which includes related lands, resources, and use pressure problems; these items are all considered for resource inventory and planning.

Point Source - A point at which matter is added to a system either instantaneously or continuously. An example of a point source in the context of air pollution would be a smokestack.

Pollutant - With respect to the atmosphere, any substance discharged into the ambient air tending to create a harmful effect upon man, his property, convenience or happiness, or that causes the contamination in ambient air to exceed legally established limits.

Prevention of Significant Deterioration (PSD) - A regulatory program based not on the absolute levels of pollution allowable in the atmosphere but rather on the amount by which present air quality will be allowed to deteriorate in a given area.

Reclamation - The process of converting mined land to its former or other productive uses.

Scenic Quality - The visual aesthetics of an area, based on the visual elements of landforms, vegetation, color, water, adjacent scenery, and amount of cultural modification. It indicates the visual quality of an area relative to other scenery in the region. BLM ratings are A (exceptional/extraordinary); B (high); and C (low/common).

Scoping Process - A process whereby public issues and concerns for a proposed project are identified.

Sediment Yield - The average amount of sediment (mineral or organic soil material) from a square mile transported by water from source areas into local water courses. Sediment yield represents an average over a long period, such as 25 years or more (USDI, Bureau of Reclamation, 1975).

Special Tar Sand Area (STSA) - An area containing substantial 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.

Sulfur Oxides - Pungent, colorless gases formed primarily by the combustion of fossil fuels; considered major air pollutants, sulfur oxides may damage the respiratory tract as well as vegetation.

Tar Sand - A sand which is impregnated with petroleum.

Thermal Extraction - A method of extracting bitumen by use of heat.

Threatened Species - Any plant or animal species likely to become endangered within the foreseeable future throughout all or part of its range.

Total Suspended Particulate Mass (TSP) - A criteria pollutant measured as the mass of all particles in the atmosphere, without regard to size or chemical composition.

Unit Resource Analysis (URA) - A compilation of physical resource data and an analysis of the current use, production, condition, and trend of resources; the URA also contains a profile of ecological values and described potentials and opportunities for development of resources within a planning unit or area.

Visual Resource Management - 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 homogenous area and serves as a management objective.

Visual Sensitivity - An expression of the average number of people that view an area and the relative degree (high, medium, or low) of concern they have regarding potential or proposed modification of the landscape in that area.

Volatile Organic Compounds (VOC) - Hydrocarbon emissions that react in the presence of sunlight to produce ozone.

Watershed - The total area above a given point on a stream that contributes water to the flow at that point.

Wilderness Area - An area officially designated as wilderness by Congress. Wilderness areas will be managed to preserve wilderness characteristics and shall be devoted to the public purposes of conservation and recreational, scenic, scientific, educational, and historical uses.

Work Force - The total number of workers on a specific project or group of projects. Other terms for it are direct employment and primary employment.

Wilderness Management Policy - The BLM policy which governs administration of public lands designated as Wilderness Areas by Congress. It is based on the mandate of Congress as contained in the Wilderness Act of 1964 and the Federal Land Policy and Management Act (FLPMA) of 1976. FLPMA requires a Wilderness Area to be a roadless area or island that has been inventoried and found to have wilderness characteristics as described in Section 603 of FLPMA and Section 2(c) of the Wilderness Act.

Wilderness Study Area (WSA) - An area under study for possible inclusion as a wilderness area in the National Wilderness Preservation System (NWPS).

## APPENDIX A

### General Stipulations

#### SURFACE DISTURBANCE STIPULATIONS FOR COMBINED HYDROCARBON LEASES

1. Notwithstanding any provisions of this lease to the contrary, any drilling, construction, or other operation on the leased lands that will disturb the surface thereof or otherwise affect the environment, hereinafter called "surface-disturbing operation," conducted by lessee shall be subject, as set forth in this stipulation, to prior approval of such operation by the BLM in consultation with any other appropriate surface management agency and to such reasonable conditions, not inconsistent with the purposes for which this lease is issued, as the BLM may require to protect the surface of the leased lands and the environment.
2. Prior to entry upon the land or the disturbance thereof for mining, drilling, or other purposes, the lessee shall submit for approval a plan of operations to the authorized officer of BLM and the appropriate surface management agency. The plan shall meet the requirements of 43 CFR 3160 for drilling and in situ operations and 43 CFR 3570 for mining operations. The submitted plan of operations must be in compliance with applicable operation orders and notices to lessees and must contain, in addition to all requirements stated above, the methods and actions proposed for the following:

- a. Stripping and saving of topsoil.
- b. Reclamation of the disturbed areas, including, but not limited to recontouring and revegetation with native species or ecological equivalents.
- c. Erosion and control measures on all disturbed areas, roads, and waterway crossings.
- d. Road design, construction, and maintenance standards would be subject to BLM 9113 Roads Manual.
- e. Cultural resource protection and clearance and/or protection plan would be required prior to all surface disturbing activities. All costs of inventory and data recovery would be borne by the lessee.
- f. Livestock protection such as fencing or otherwise excluding livestock from active mining areas and areas under reclamation.
- g. Fugitive dust and emissions control with fugitive dust abatement being required on all major haulage roads.
- h. Wildlife protection and mitigation would include threatened or endangered species. Clearance would have to be given by the appropriate agency prior to any surface disturbance, and all transmission lines would be raptor-proof.

- i. Protection of streams, springs, water wells, and other water sources would include, but would not be limited to, streams and drainage crossings being protected by appropriate stipulations, including a U.S. Army Corps of Engineers 404 Permit.
  - j. Methods of retaining all mine drainage and runoff onsite.
  - k. Environmental analysis will be made by the authorized officer in consultation with the appropriate surface management agency for the purpose of assuring proper protection of the surface, the natural resources, the environment, existing improvements, and for assuring timely reclamation of disturbed lands.
3. Upon completion of said environmental analysis, the BLM, as appropriate, shall notify lessee of the conditions, if any, to which the proposed surface disturbing operations will be subject.

Said condition may relate to any of the following:

- a. Location of drilling or other exploratory or developmental operations or the manner in which they are to be conducted; and
- b. Manner or location in which improvements such as roads, buildings, pipelines, or other improvements are to be constructed.

ENDANGERED SPECIES, CULTURAL, AND PALEONTOLOGICAL WILDERNESS RESOURCES AND  
PUBLIC WATER RESERVE 107 AND LEGAL WATER SOURCE STIPULATIONS

## Protection of Endangered or Threatened Species

The Federal surface management agency is responsible for assuring that the area to be disturbed is examined prior to undertaking any surface disturbing activities on lands covered by this lease, to determine effects upon any plant or animal species listed or proposed for listing as endangered or threatened, or their habitats. If the findings of this examination determine that the operations may detrimentally affect an endangered or threatened species, some restrictions to the operator's plans or even disallowances of use may result.

The lessee/operator may, at his discretion and cost, conduct the examination on the lands to be disturbed. This examination must be done by or under the supervision of a qualified resource specialist approved by the surface management agency. An acceptable report must be provided to the surface management agency identifying the anticipated effects of the proposed action on endangered or threatened species or their habitat.

## Protection of Cultural and Paleontological Resources

The Federal Surface Management Agency is responsible for determining the presence of cultural resources and specifying mitigation measures required to protect them. Prior to undertaking any surface disturbing activity on the lands covered by this lease, the lessee/operator, unless notified to the contrary by the authorized officer of the surface management agency, shall:

1. Engage the services of a qualified cultural resource specialist acceptable to the surface management agency to conduct an intensive inventory for evidence of cultural resource values.



2. Submit a report acceptable to the authorized officer of the surface management agency; and
3. Implement such mitigation measures as required by the authorized officer of the surface management agency to preserve or avoid destruction of inventoried cultural resource values. Mitigation may include relocation of proposed facilities, testing, and salvage or other protective measures deemed necessary. All costs of the inventory and mitigation shall be borne by the lessee/operator and all data and materials salvaged shall remain under the jurisdiction of the U.S. Government.

The lessee/operator shall immediately bring to the attention of the authorized officer of the surface management agency any cultural resources, paleontological, and other objects of scientific interest discovered as a result of surface operations under this lease and shall leave such discoveries intact until directed to proceed by the Bureau of Land Management (BLM).

#### Wilderness Protection Stipulations

By accepting this lease, the lessee acknowledges that the following described lands are being inventoried or 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 Sec. 1782), and that exploration or production activities which 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 BLM determines they will not impair wilderness suitability. This will be the case until Congress has decided not to designate the lands included within this lease as wilderness. Activities will be considered nonimpairing if the BLM determines that they meet each of the following three criteria:

1. It is temporary. This means that the use or activity may continue until the time when it must be terminated in order to meet the reclamation requirement of paragraphs 2 or 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 management of 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 wilderness study area (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. If the wilderness study is postponed, the reclamation deadline will be extended accordingly. If the wilderness study is accelerated, the reclamation deadline will not be changed. A full schedule of wilderness studies will be developed by the department upon completion of the intensive wilderness inventory. In the meantime, in areas not yet scheduled for wilderness study, the reclamation will be scheduled for completion within 4 years after approval of the activity. (Obviously, if and when the interim

Management Policy ceases to apply to an inventory unit dropped from wilderness review following a final wilderness inventory decision of the BLM State Director, the reclamation deadline previously specified will cease to apply.) 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 unsuitability 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 conservation 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 complete, 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 unsuitability 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 historical value. If all or any part of the area included within the leasehold estate is 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.

#### Public Water Resource 107 and Legal Water Source Stipulations

To protect important aquifers, all surface and in situ mining must be preceded by complete hydrological testing and evaluation as specified by the authorized officer of BLM. Any loss of springs or reduction in perennial streamflow will be fully mitigated with an equal quantity and quality of water lost. Such mitigation must be approved by the authorized officer of BLM.

SPECIAL STIPULATIONS REQUIRED BY THE UTAH COMBINED  
HYDROCARBON REGIONAL LEASING FINAL EIS

No in situ or surface mining methods will be employed to extract tar sand deposits from the following described areas:

Escalante Canyons Outstanding Natural Area (3,360 acres)

Township 35 South, Range 7 East, Sec. 34, SE1/4SE1/4; Sec. 35, SE1/4NE1/4, NE1/4SW1/4, S1/2S1/2, N1/2SE1/4

Wolverine Petrified Wood Area (1,120 Acres)

Township 34 South, Range 6 East, Sec. 35, E1/2, E1/2W1/2;  
Township 35 South, Range 6 East, Sec. 1

Sensitive Watershed (3,480 acres)

Township 34 South, Range 7 East, Sec. 1, all; Sec. 11, N1/2; Sec. 12, all;  
Sec. 13, E1/2, E1/2W1/2; Sec. 24, E1/2, E1/2W1/2;

Township 35 South, Range 8 East, Sec. 35, E1/2, E1/2NW1/4, NW1/4NW1/4,  
NE1/4SW1/4;

Township 36 South, Range 8 East, Sec. 1, E1/2, E1/2NW1/4; Sec. 12,  
NE1/4NE1/4.

Circle Cliffs (10,560 acres).

Stipulation: No surface mining of tar sand deposits is allowed on this lease. The tar sand may be extracted by in situ or underground mining methods only.

This stipulation applies to the following areas:

Township 34 South, Range 7 East, Sec. 25, E1/2, NW1/4, NW1/4SW1/4,  
E1/2SW1/4;

Township 35 South, Range 8 East, Sec. 30, SW1/4SW1/4, E1/2SW1/4,  
W1/2SE1/4; SE1/4SE1/4; Sec. 31, N1/2N1/2, S1/2NW1/4, SW1/4NE1/4;

Township 35 South, Range 6 East, Sec. 11, E1/2; Sec. 12, all; Sec. 13,  
all; Sec. 14, E1/2NE1/4; Sec. 24, NE1/4;

Township 35 South, Range 7 East, Sec. 7, W1/2NW1/4, S1/2; Sec. 17, all;  
Sec. 18, all; Sec. 19, all; Sec. 20, all; Sec. 21, SW1/4; Sec. 22,  
E1/2SE1/4, SW1/4SE1/4; Sec. 23, SW1/4, Sec. 25, SW1/4; Sec. 26, NW1/4,  
S1/2; Sec. 27, E1/2, E1/2NW1/4, SW1/4NW1/4, SW1/4; Sec. 28, SE1/4NE1/4,  
W1/2NE1/4, W1/2, SE1/4; Sec. 29, all; Sec. 30, NE1/4; Sec. 33, all; Sec.  
34, N1/2, SW1/4, W1/2SE1/4, NE1/4SE1/4; Sec. 35, N1/2N1/2, SW1/4NE1/4,  
S1/2NW1/4, NW1/4SW1/4.



Form 1279-3  
(June 1984)

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