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HYDROCARBON

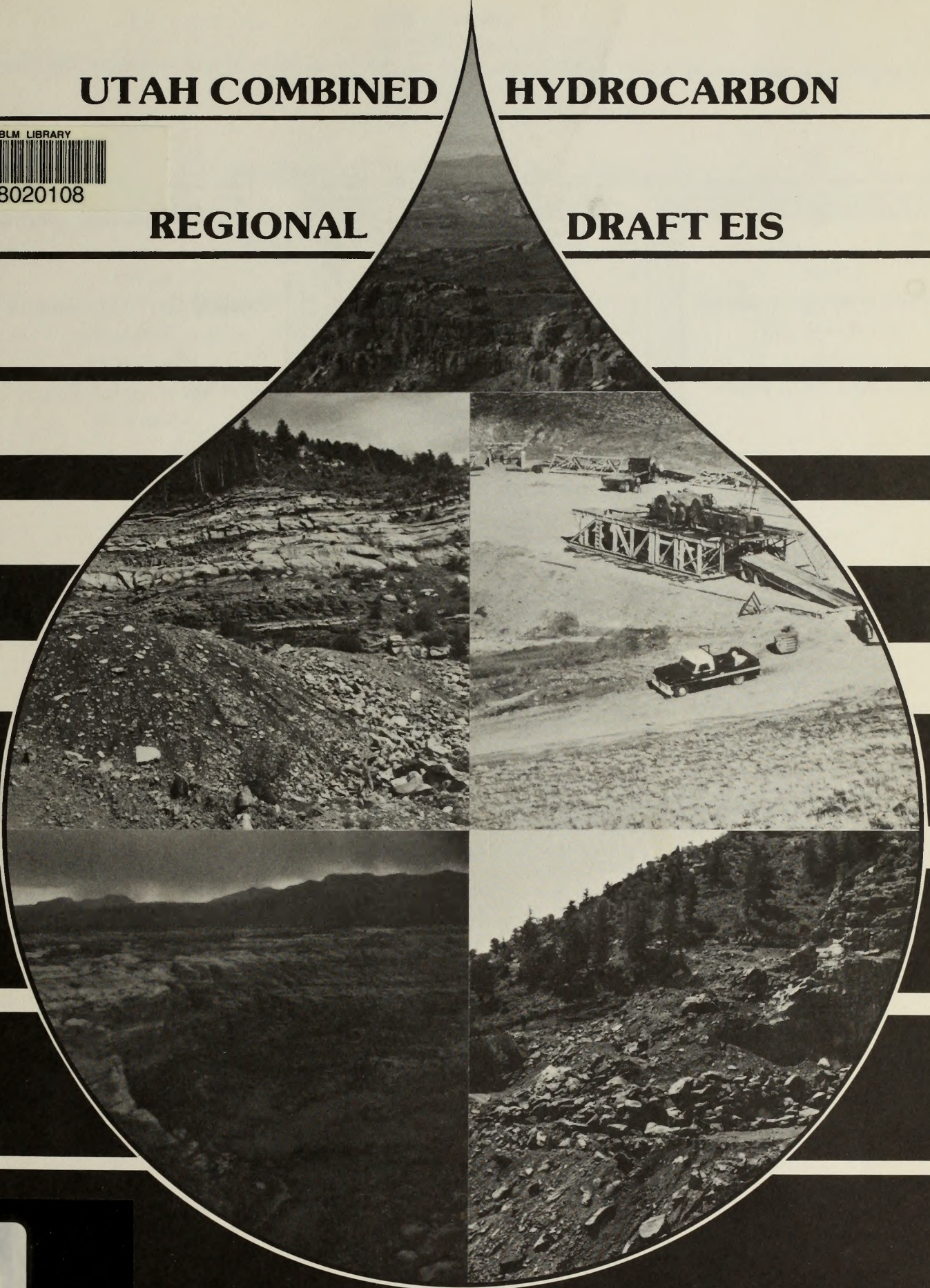
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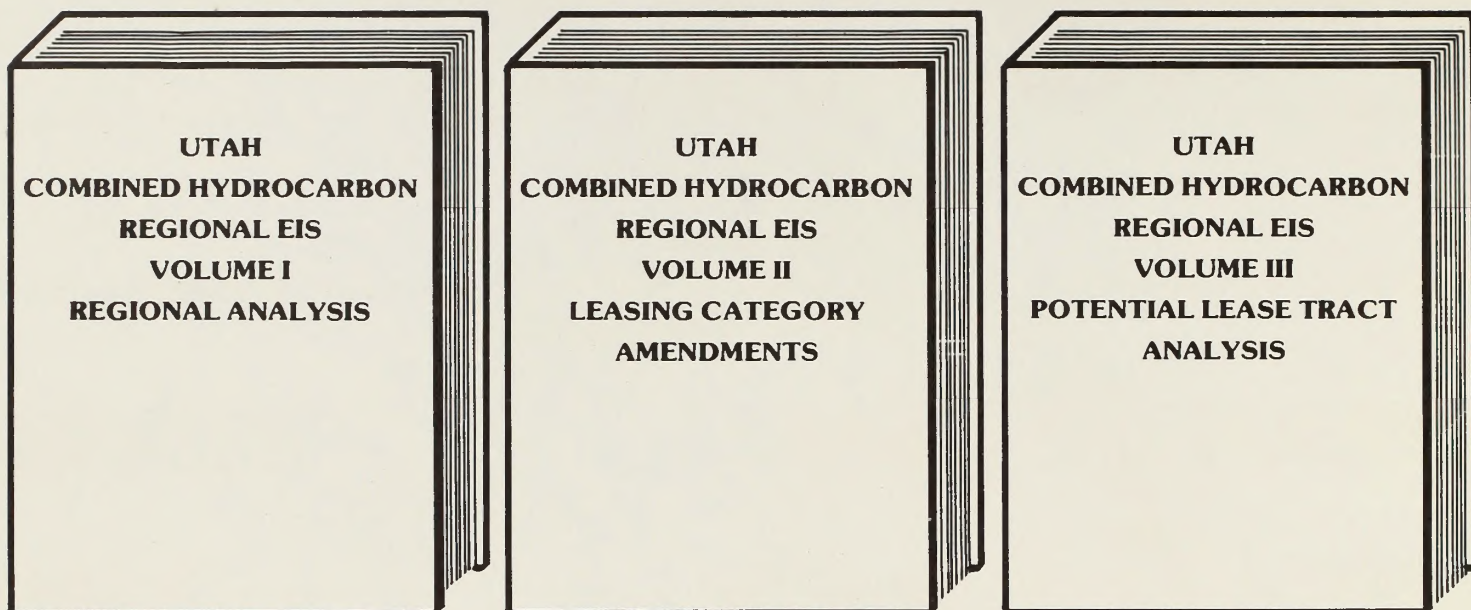
REGIONAL

DRAFT EIS



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VOLUME III: POTENTIAL LEASE TRACT ANALYSES



Why Is This Environmental Impact Statement Divided into Three Volumes?

This EIS is divided for ease of handling the volume of data involved and to clearly separate three levels of analyses. Each volume addresses a separate proposal and analyses, along with specific major Federal actions, required to implement the Combined Hydrocarbon Leasing Program in Utah.

What Does Each Volume of This EIS Contain?

Volume I contains the regional assessment for implementation of the Bureau of Land Management's Combined Hydrocarbon Leasing Program for Utah. This analysis examines high and low production levels and no action at various periods of time during a 20-year time frame. This volume serves as the regional assessment for all required site-specific Combined Hydrocarbon Lease EISs in Utah.

Volume II contains proposed planning amendments to update BLM's land use plans. These updates propose categories for issuing new leases or converting existing oil and gas leases to Combined Hydrocarbon Leases.

Volume III contains the site-specific assessment for issuing Combined Hydrocarbon Leases on potential lease tracts within Special Tar Sand Areas.

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UTAH COMBINED HYDROCARBON LEASING REGIONAL DRAFT EIS

Volume III

Potential Lease Tract Analyses

Prepared By:
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
RICHFIELD DISTRICT

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Richard Robinson

**State Director
Utah State Office**

Cooperating Agency: National Park Service

Counties That Could Be Directly Affected: Carbon, Duchesne, Emery, Garfield, Grand, San Juan, Uintah, and Wayne, all in the State of Utah.

ABSTRACT: The Bureau of Land Management proposes to offer competitive sales on new Combined Hydrocarbon Leases. Tracts qualifying must not be currently leased for oil and gas on November 16, 1981 and occur in areas known to contain tar sand (Special Tar Sand Areas). The first competitive sale of CHL tracts is scheduled for May 1984. This volume of the EIS analyzes impacts from allowing combined hydrocarbon development on 18 tracts. Included are a description of the affected environment and an assessment of five different alternatives, ranging from maximum development to no action.

For Further Information, Contact: Alan Partridge, EIS Team Leader, Richfield District Office, Bureau of Land Management, 150 East 900 North, Richfield, Utah 84701, or call Commercial: (801) 896-8221 or FTS: 584-8011.

Comments on the Draft EIS must be received by January 9, 1984.

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UTAH COMBINED HYDROCARBON LEASING

REGIONAL DRAFT EIS

Volume III

Potential Lease Land Analysis

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OIL AND GAS OFFICE

1994

State Director
Oil and Gas Office

1994

Comments on the Draft EIS should be submitted to the Bureau of Land Management, 1315 North 12th Street, Denver, Colorado 80202.

Comments should be submitted by the following dates:

Public Comment Period: February 1, 1994 to February 15, 1994

Agency Comment Period: February 1, 1994 to February 15, 1994

Comments received after the public comment period will be considered if they are received in time to be included in the final EIS.

Comments received after the agency comment period will be considered if they are received in time to be included in the final EIS.

Comments received after the final EIS is published will be considered if they are received in time to be included in the final EIS.

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LIST OF AGENCIES AND ORGANIZATIONS REQUESTED TO COMMENT ON THE DRAFT EIS

BLM is requesting comments on this Draft EIS from the agencies and organizations listed below. Comments from companies who expressed interest in leasing or applied for lease conversions are requested. All other interested and/or affected individuals, private groups, and agencies are also invited to comment.

Federal Agencies

Army Corps of Engineers
Environmental Protection Agency
Federal Energy Regulatory Commission
U.S. Department of Agriculture
 Forest Service
 Soil Conservation Service
U.S. Department of the Interior
 Bureau of Indian Affairs
 Bureau of Mines
 Bureau of Reclamation
 Fish and Wildlife Service
 Geological Survey
 National Park Service
 Office of Surface Mining

Utah State Agencies

Clearinghouse
Department of Community and Economic Development
Department of Transportation
Department of Natural Resources and Energy
Division of Lands
Division of Oil, Gas, and Mining
Division of State History
Division of Water Resources
Division of Wildlife Resources
Geological and Mineral Survey
Office of the State Planning Coordinator

Local Government Agencies

Carbon County Commission
Duchesne County Commissioners
Garfield County Commission
Roosevelt Chamber of Commerce
Six County Economic Development District
Six County Organization of Governments
Southeastern Association of Governments
Uinta Basin Association of Governments
Uintah County Commissioners
Wayne County Commission

Nongovernment Agencies

American Fisheries Society
Archaeological Society of Utah
Council on Utah Resources
Defenders of the Outdoor Heritage
Friends of the Earth

ISSUE

National Parks and Conservation Association
National Woolgrowers Association
Natural Resources Defense Council
Rocky Mountain Oil and Gas Association
Sierra Club

SOURCE

Utah Audubon Society
Utah Cattlemen's Association
Utah Geological Association
Utah Mining Association
Utah Nature Study Association
Utah Water Resources Council
Utah Wildlife Federation
Ute Indian Tribe
Wild and Scenic Rivers
Wilderness Society
WHOA!

EIS Availability

Copies of this Draft EIS will be available for public inspection at the BLM offices listed below:

Washington Office of Public Affairs

18th and C Street, N.W.
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Cedar City, Utah 84720
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Vernal, Utah 84078
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Copies of this Draft EIS may also be requested from the Utah State Office and the Richfield District Office at the above-listed addresses.

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SUMMARY

INTRODUCTION

The Combined Hydrocarbon Leasing Act (Public Law 97-78), which amended the Mineral Leasing Act of 1920, was enacted in 1981 "to facilitate and encourage the production of oil from tar sand and other hydrocarbon deposits (Ninety-Seventh Congress, 1981)." This Act allows existing oil and gas leases (as of November 16, 1981) to be converted to Combined Hydrocarbon Leases (CHLs) (i.e., oil and gas and tar sand), provided that complete plans of operation are submitted to the Bureau of Land Management (BLM) for consideration before the current lease expires or on November 15, 1983, whichever is later. The Act also allows CHLs within areas known to contain tar sand (Special Tar Sand Areas [STSAs]) on tracts not already being leased for oil and gas on or before November 16, 1981. The first competitive sale of CHL tracts having potential for development (hereafter called potential lease tracts) is scheduled for May 1984.

Under provisions of the Combined Hydrocarbon Leasing Act, environmental evaluations for each potential lease tract must be completed before it can be offered for competitive sale. The purpose of this volume of the Draft Environmental Impact Statement (EIS) is to analyze different development levels and different tracts for leasing.

THE SETTING

Figure 1 shows locations of STSAs. All of the STSAs are located within the Colorado Plateau physiographic province and range in elevations from 5,000 to 10,000 feet. The region is generally semi-arid and is characterized by low relative humidity, abundant sunshine, low to moderate precipitation, warm summers, and cold winters.

SCOPING AND ISSUE IDENTIFICATION

Public scoping and identification of potential lease tracts began in March 1982 when a public meeting was held to explain the CHL program. In July 1982, another public meeting was held and BLM called for Expressions of Interest for development on unleased Federal lands. At that time, industry submitted Expressions of Interest on 14 potential lease tracts; BLM nominated four additional tracts. Additional public meetings were held in March 1983 to identify significant issues resulting from tar sand development.

Based on information from public meetings and other sources, the following issues were identified as significant: air quality, water quality and use, wildlife, visual resources, socioeconomic impacts, and transportation development.

DESCRIPTION OF ALTERNATIVES

In May 1983, a ranking team developed alternatives for various development and production levels on potential lease tracts. The ranking team developed three alternatives, and the EIS team developed two additional alternatives. Development potential for each tract was ranked according to expected environmental and socioeconomic consequences, tar sand quantity and quality, and reclamation potential.

Five alternative levels are considered for leasing of potential tracts. The potential lease tracts are Sunnyside tracts 1-12, located in the Sunnyside STSA, Black Canyon tract, located in the San Rafael Swell STSA, Flint Flat and Gordon Corral tracts, located in the Tar Sand Triangle STSA; and Pariette tracts 1-3, located in the Pariette STSA. The following briefly summarizes each alternative; descriptions of BLM leasing categories and National Park Service (NPS) stipulations are included in Chapter 2.

Alternative 1: Lease 18 Tracts Under Maximum Development, Subject to BLM Categories 1 and 4 and NPS Stipulations

Alternative 1 considers leasing all of the 18 designated potential lease tracts. Sixteen of these tracts are on BLM-administered lands, while two are on NPS-administered lands.

This alternative is based on maximum development for all 18 tracts.

Alternative 1: Lease 18 Tracts Under Multiple Use, Subject to BLM Categories 2, 3, and 4 and NPS Stipulations

Alternative 2 also considers leasing of all 18 potential lease tracts. However, BLM leasing categories and NPS stipulations would be more restrictive than those under Alternative 1.

Alternative 3: Lease Seven Tracts Under Maximum Development, Subject to BLM Category 1.

This alternative proposes leasing only seven potential tracts (Sunnyside tracts 1-4 and Pariette tracts 1-3). Only those tracts with comparatively high development potential and maximum opportunity for reasonable environmental protection and rehabilitation are considered.

Alternative 4: Lease Seven Tracts under

SUMMARY

Multiple Use, Subject to BLM Categories 2 and 3 (Preferred Alternative)

This is the BLM-preferred alternative. This alternative offers the same seven potential tracts for leasing as Alternative 3; however, more restrictive leasing categories and stipulations would apply.

Alternative 5: No Action (No Competitive Federal Leasing in 1984)

The No Action Alternative would not offer any of the 18 potential lease tracts for sale in 1984. However, hydrocarbon development could be allowed on conversion lease tracts and could occur on State and private lands within and/or near potential lease tracts. Oil and gas development could also occur on those oil and gas leases not expired or not converted to CHLs.

ENVIRONMENTAL CONSEQUENCES

Summary Table 1 lists environmental impacts resulting from implementation of each alternative.

UNRESOLVED ISSUES

The following unresolved issues were identified for tar sand development.

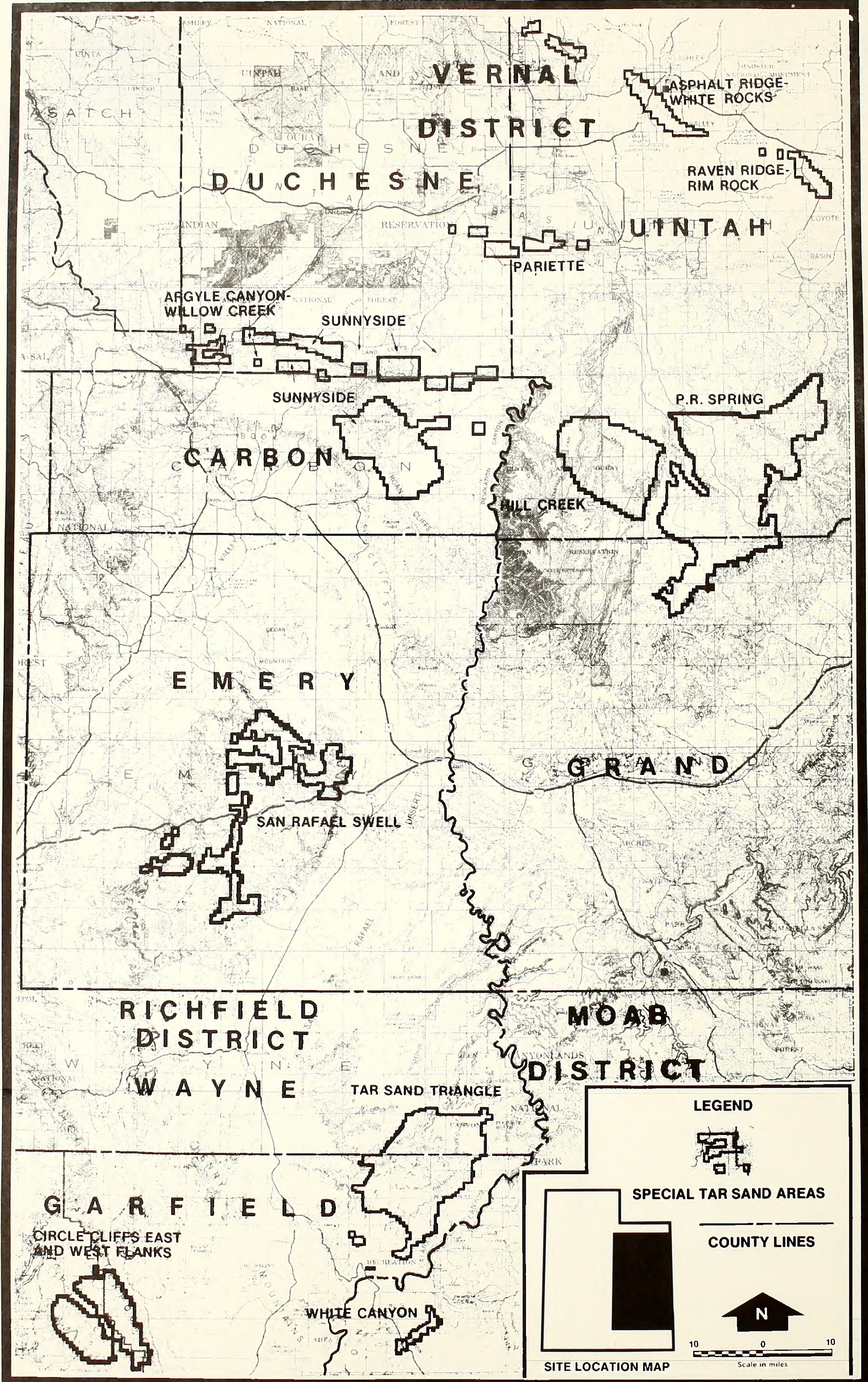
Air Quality: Additional air quality modeling and monitoring could be required before Prevention of Significant Deterioration (PSD) permits would be issued for construction and development within STSAs.

Water Supply and Threatened, Endangered, and Sensitive Aquatic Species: The amount of water needed to process tar sand is presently based on estimates; also, it is not known how much water could be available for tar sand development from the Colorado River system. There is controversy over water depletions from the White, Green, or Colorado rivers because of existing water rights and habitat requirements for the endangered Colorado squawfish and humpback chub and the sensitive razorback sucker. Salinity increases in the Colorado River are also of major concern. Other water sources such as groundwater have not been explored.

Degradation of Developed Areas : Proposed development methods, including surface and overburden removal, are of concern, as is rehabilitation. Topsoil storage, erosion control methods, drainage pattern disruptions, overburden redistribution, and disruption of natural ecosystems would be of a large magnitude using present tar sand recovery methods.

Split Estates: Surface disturbance and compensation for development on private lands are of concern.

Socioeconomics: There is controversy over potential growth. Although development would include positive effects, such as increased job opportunities, increased population and public service needs, and changes in traditional lifestyles would also occur.



SUMMARY FIGURE 1
SPECIAL TAR SAND AREAS IN UTAH

SUMMARY

SUMMARY TABLE 1

Summary of Major Environmental Consequences^a

Resources	Alternative 1: Lease 18 Tracts Under Maximum Development, Subject to BLM Categories 1 and 4 and NPS Stipulations	Alternative 2: Lease 18 Tracts Under Multiple Use Subject to BLM Categories 2, 3, and 4 and NPS Stipulations	Alternative 3: Lease Seven Tracts Under Maximum Development Subject to BLM Category 1	Alternative 4: Lease Seven Tracts Under Multiple Use Subject to BLM Categories 2 and 3 (Preferred Alternative)
Water Resources	Up to 12,582 acres in BLM category 1, 520 acres in category 2, and 3,169 acres of NPS land could be subjected to surface disturbance. Increased erosion and sediment yield to major drainages would occur from this disturbance. Contamination of surface and groundwater would also occur. It is estimated that water consumption would be 12,594 acre-feet annually under this alternative.	Erosion and sediment yield would increase on all tracts. Impacts would be similar to those in Alternative 1, except less surface disturbance would occur because 3,922 acres would be in category 1 and 8,654 acres in category 2. An estimated 12,594 acre-feet of water would be required annually.	Erosion and sediment yield would increase as in Alternative 1. However, only 6,078 acres would be subject to surface disturbance. It is estimated that water consumption would be 5,472 acre-feet annually.	Increased erosion and sediment yield would occur on up to 3,202 acres (category 1) and 2,516 acres in category 2. Water consumption is estimated at 5,472 acre-feet annually.
Soils	Up to 12,582 acres in BLM category 1, 520 acres in category 2, and 3,169 acres of NPS land could be subjected to surface disturbance. Soil loss from this disturbance would be increased, causing siltation and revegetation problems. Soil loss from wind erosion could exceed 50 tons/acre/year on some tracts.	Up to 3,922 acres in BLM category 1 lands and 8,654 acres on category 2 lands could be subject to surface disturbance. Impacts would be less than Alternative 1.	Up to 6,078 acres would be subject to surface disturbance and increased erosion. Therefore, impacts to soils would be less than Alternatives 1 or 2.	Up to 3,202 acres in category 1 and 2,516 acres in category 2 would be subject to surface disturbance from tar sand development. Therefore, impacts to soils would be slightly less than Alternative 3.
Minerals and Topography	Using surface-mining methods, 608 million barrels of oil could be recovered. In-situ processes could recover only 203 million barrels. Landforms would be greatly modified, and subsidence could occur on some tracts.	Using surface-mining methods, 562 million barrels of oil could be recovered. Landforms would be greatly modified, and subsidence could occur on some tracts.	Using surface-mining methods, 553 million barrels of oil could be recovered. Landforms would be greatly modified, and subsidence could occur on some tracts.	Using surface-mining methods, 553 million barrels of oil could be recovered. Landforms would be greatly modified, and subsidence could occur on some tracts.
Vegetation	Vegetation would be damaged by surface clearing, contour modification, and removal and mixing of topsoil. Surface mining would cause extensive changes in vegetation cover and composition. Some impacts to vegetation would be permanent. There would be no impact to threatened or endangered plant species.	Vegetation loss would be similar to Alternative 1 on 7,091 acres and different on 9,489 acres.	Vegetation loss would be the same intensity and extent as Alternative 1.	Impacts would be the same as Alternative 2.
Animal Life	The following acres of wildlife habitat would be destroyed: 6,918 acres of deer/elk summer range; 3,307 acres of deer/elk winter range; 2,800 acres of aspen habitat; 4.5 miles of riparian habitat; 11,717 acres of raptor and small game habitat; two sage grouse strutting grounds, and 4,156 and 780 acres of sage grouse yearlong and nesting habitat, respectively. There would be no impacts to any terrestrial threatened or endangered species. Fish habitat would be impacted by alteration in stream channels, increase in	The following acres of wildlife habitat would receive some protection from special stipulations: approximately 2,960 and 3,050 acres of deer/elk summer and winter range, respectively; 8,654 acres of small game habitat; two sage grouse strutting grounds and 680 acres of crucial nesting habitat; and 8,654 acres of raptor habitat. It is important to note that even these areas could be developed. The following wildlife habitats could be destroyed: 4,156 and 100 acres of sage grouse year-	The following acres of wildlife habitat could be destroyed: 3,795 and 1,356 acres of deer/elk summer and winter range, respectively; 5,150 acres of small game and yearlong raptor habitat; 1,500 acres of aspen habitat; 2,920 acres of sage grouse yearlong habitat, and 3 miles of riparian habitat. There would be no impacts to terrestrial threatened or endangered species. The potential fishery association with the Left Fork of Ory Creek could be lost. Habitats of the endangered Colorado	The following acres of wildlife habitat would receive some protection from special stipulations: approximately 1,160 and 1,356 acres of deer/elk summer and winter range, respectively and 2,516 acres of small game and raptor habitat. It is important to note that even these acres could be developed. The following wildlife habitats could be destroyed: 2,920 acres of yearlong sage grouse habitat; 1,500 acres of aspen habitat; and 3 miles of riparian habitat. There would be no impacts to any terrestrial threatened or endangered species. The potential fishery

SUMMARY

SUMMARY TABLE 1 (concluded)

Resources	Alternative 1: Lease 18 Tracts Under Maximum Development, Subject to BLM Categories 1 and 4 and NPS Stipulations	Alternative 2: Lease 18 Tracts Under Multiple Use Subject to BLM Categories 2, 3, and 4 and NPS Stipulations	Alternative 3: Lease Seven Tracts Under Maximum Development Subject to BLM Category 1	Alternative 4: Lease Seven Tracts Under Multiple Use Subject to BLM Categories 2 and 3 (Preferred Alternative)
Animal Life (continued)	sedimentation, reduction in in-stream flows, and degradation of water quality. Impacts to the endangered Colorado squawfish, humpback chub, and sensitive razorback sucker could occur from this development. No impacts to wild and free-roaming horses and burros would occur, although some habitat could be destroyed.	long and nesting habitats, respectively, and 4 miles of riparian habitat. There would be no impacts to any terrestrial threatened or endangered species. Fish habitat would be impacted by alteration in stream channels, increase in sedimentation, reduction in instream flows, and degradation of water quality. Impacts to the endangered Colorado squawfish and humpback chub and the sensitive razorback sucker could occur from development. No impacts to wild and free-roaming horses and burros would occur, although some habitat could be destroyed.	squawfish and humpback chub and the sensitive razorback sucker could be lost. No impact to wild and free-roaming horses or burros would occur, although some habitat could be destroyed.	associated with the Left Fork of Dry Creek could be lost. The endangered Colorado squawfish and humpback chub and sensitive razorback sucker habitats could be lost. No impacts to wild and free-roaming horses or burros would occur, although some habitat could be destroyed.
Recreation	All recreational uses and values would be degraded from tar sand development, and recreational visits for all uses would be expected to decline on all developed tracts.	All recreational uses and values would be degraded from development; however, impacts would be less than Alternative 1.	Although all recreational uses and values would be degraded from tar sand development, impacts would be less than Alternatives 1 and 2.	Although all recreational uses and values would be degraded on some areas, impacts would be less than under Alternatives 1, 2, and 3.
Wilderness	Tar sand development in areas contiguous or adjacent to WSAs would impact wilderness values because of impacts to solitude from visual intrusions and sounds.	Same as Alternative 1.	Leasing and development of potential lease tracts would not be expected to impact opportunities for solitude in any potential wilderness area.	Leasing and development of potential lease tracts would not be expected to impact opportunities for solitude in any potential wilderness area.
Visual Resources	In most cases, contrasts created by tar sand development would be high and would probably exceed VRM Class standards.	Impacts would be similar to Alternative 1, except development would be limited to 25 percent of the potential lease tract at any one time.	Degradation of visual resources would be the same as described in Alternative 1. All Class II and most Class III areas would probably experience permanent degradation of scenic values.	Impacts would be the same as described in Alternative 3.
Livestock Grazing	Both in-situ and surface mining methods would eliminate or greatly reduce suitability for livestock grazing. Impacts include: loss of forage, loss of water or access to water, loss of trails and disruptions in patterns of use. In addition, no range improvements for livestock would be preserved.	Impacts to livestock grazing would be similar to Alternative 1 because there are no special stipulations or categories 3 or 4 to protect this resource. Although most of the AUMs would be preserved, the suitability of the tracts for livestock grazing would be lost. In addition, no range improvements for livestock would be preserved.	It is expected that both in-situ and surface-mining methods would eliminate or greatly reduce suitability for livestock grazing. Impacts include: loss of forage, loss of water, access to water, loss of trails, and disruptions in patterns of use. In addition, no range improvements for livestock would be preserved.	It is expected that both in-situ and surface-mining methods would eliminate or greatly reduce suitability for livestock grazing. Impacts include: loss of forage, loss of water, access to water, loss of trails, and disruptions in patterns of use. In addition, no range improvements for livestock would be preserved. About half of the forage resource (51B AUMs) would be preserved, although the tract's general suitability for grazing would be lost.

^a Impacts on the 18 potential lease tracts under Alternative 5, No Action, would be as follows: (1) natural resources would remain as described in Chapter 3 (Affected Environment); there would be no significant on-tract impacts; (2) projections of baseline socioeconomic conditions indicate that the populations of Carbon and Emery counties would increase by approximately 68 and 27 percent, respectively, during 1985-2005; during the same period, employment would increase 31 percent in Carbon County, and 2 percent in Emery County. Recent instability (layoffs) in the coal industry in Emery County, however, could distort the projections for that county.

CHAPTER 1

INTRODUCTION

PURPOSE AND NEED

Federal tar sand deposits in Special Tar Sand Areas (STSAs) can be leased through one of the two following leasing provisions specified in the Combined Hydrocarbon Leasing Act of 1981 (Public Law 97-78):

1. The Act allows existing oil and gas leases (as of November 16, 1981) to be converted to Combined Hydrocarbon Leases (CHLs), provided that complete plans of operation are submitted to the Bureau of Land Management (BLM) for consideration before the current lease expires or on November 15, 1983, whichever is later. Plans of operation on these areas (hereafter called conversion lease tracts) must assure reasonable environmental protection and "diligent development," as specified in the Combined Hydrocarbon Leasing Act.
2. This Act also allows competitive CHLs within STSAs on tracts not already being leased for oil and gas on or before November 16, 1981. The first competitive sale of CHL tracts having potential for development (hereafter called potential lease tracts) is scheduled for May 1984. (This volume of the environmental impact statement [EIS] discusses only potential lease tracts.)

The BLM initiated competitive sale of potential lease tracts in July 1982, with a call for Expressions of Interest on unleased Federal land within eight of the eleven STSAs. Industry submitted Expressions of Interest on 14 potential lease tracts; also, four tracts were nominated by BLM. Only tracts not previously leased for oil and gas were considered.

Environmental evaluations for each potential lease tract must be completed before they can be offered for lease under provisions of the Combined Hydrocarbon Leasing Act. The purpose of this volume of the EIS is to analyze impacts resulting from several development levels of potential lease tracts. Although the analyses in this volume consider only five alternatives, the BLM State Director can select one or a combination of alternatives: he could offer any part of a tract, an entire tract, or any number of tracts for leasing.

New combined hydrocarbon leasing is being considered at this time for the following reasons:

- To allow maximum utilization of tar sand resources, thereby avoiding by-pass situations. Adjacent tracts contain either non-Federal tar sand holdings or applications for conversion of Federal oil and gas leases to CHLs.
- To make tracts adjacent to other viable units avail-

able, thereby increasing the production potential of the combined resource.

- To allow for entry into the tar sand industry by companies not holding Federal oil and gas leases in the STSAs.
- To allow for rational progression of conventional oil and gas development in areas where tar sand is not known to exist, thus furthering the Federal policy to produce opportunities for and encourage domestic energy development.

LOCATION OF POTENTIAL LEASE TRACTS

Potential lease tracts are located in central-eastern Utah in four of the eleven STSAs within Utah (see Figures 1-1 through 1-4). Sunnyside tracts 1-12 (Sunnyside and Vicinity [Southern Portion] STSA) and Black Dragon tract (San Rafael Swell STSA) are located in the BLM Moab District; Flint Flat and Gordon Corral tracts (Tar Sand Triangle STSA) are located in the BLM Richfield District and Glen Canyon National Recreation Area (NRA); and Pariette tracts 1-3 (Pariette STSA) are located in the BLM Vernal District. The Pariette STSA also includes land in the Uintah and Ouray Indian Reservation, but no potential lease tracts are being considered within Reservation boundaries. Table 1-1 lists the potential lease tracts and contains pertinent data for each.

An Expression of Interest has been received for a potential lease tract in the P. R. Spring STSA. If designated, this tract will be evaluated in the Book Cliffs Resource Management Plan (RMP) and a related EIS currently being prepared by the Vernal BLM District. This RMP is scheduled for completion in September 1984. No Expressions of Interest were received for the Hill Creek or Raven Ridge/-Rim Rock STSAs.

SCOPING

Scoping uses public participation and consultation with other agencies to identify significant issues requiring analysis in an EIS. Consultation has been maintained with the State of Utah, NPS, Bureau of Indian Affairs (BIA), Department of Energy, Ute Indian Tribe, county planning offices, and other affected and/or interested agencies and individuals throughout the planning and EIS process.

Scoping for this EIS was initiated at public meetings explaining the CHL program held in Salt Lake City, Utah, on March 18 and July 15, 1982. These meetings were fol-

lowed by a call for Expressions of Interest and Notices of Intent to amend land use plans on July 16, 1982.

BLM reviewed and, where necessary, made acreage adjustments for all Expressions of Interest submitted by industry. At that time, one potential lease tract in the Asphalt Ridge/White Rocks STSA (32 acres) was eliminated because it was determined that hydrocarbon resources did not exist there. Other tracts in the San Rafael and Tar Sand Triangle STSAs were also deleted or reduced in size because they conflicted with BLM Wilderness Study Areas (WSAs).

A formal Notice of Intent to prepare planning amendments and an EIS and a notice of additional public scoping meetings were published in the *Federal Register* on February 10, 1983. That notice invited public participation at meetings held in Vernal (March 8, 1983), Price (March 9, 1983), and Salt Lake City (March 15, 1983). Before these meetings were held, scenarios for different levels of tar sand development were developed by BLM, in cooperation with affected and/or interested oil and gas companies. Based on these scenarios and other information on combined hydrocarbon leasing, agencies and individuals identified the following issues as significant: air quality, water quality and use, wildlife, visual resources, socioeconomic impacts, and transportation development.

LEASING PROCESS

As discussed in Purpose and Need, there are two types of CHLs available within STSAs: (1) potential lease tracts; and (2) conversion lease tracts. Leases in STSAs would convey rights of all hydrocarbon materials except coal, oil shale, and gilsonite to the lessee. This would eliminate the need to distinguish tar sand leasing from oil and gas leasing, except where ownership of one or the other resource has been previously conveyed.

Initial competitive leasing of potential tracts is scheduled for May 1984, following public notice and submission of written sealed bids. Leases are expected to be awarded to the qualified bidder offering the highest price above fair market value.

CHLs have an initial 10-year lease term and will remain in effect as long thereafter as hydrocarbons are produced in paying quantities. Maximum potential lease size is 5,120 acres; rent would be \$2/acre/year, and royalties would be 12.50 percent.

The leasing process for Utah is as follows:

1. Definition of STSA by Congress. STSA boundaries were based on studies conducted by the U.S. Geological Survey (USGS). (Congress has not delegated any authority to change any STSA boundaries.)
2. Calls for Expressions of Interest and Notices of Intent to prepare land use plan amendments and an EIS.
3. Collection of data for land use plans, the EIS, and delineation of potential lease tracts.
4. Delineation of potential lease tracts.
5. Preparation of a planning analysis listing proposed leasing categories for affected land use plans in each District.
6. Preparation of a draft site-specific environmental analyses for each potential lease tract.
7. Conducting of public scoping to identify issues resulting from tar sand leasing and development.
8. Preparation and circulation of the Draft EIS.
9. Public comment and review of the Draft EIS.
10. Preparation and circulation of the Final EIS.
11. Public comment and review of the Final EIS.
12. Lease tract selection and tentative Record of Decision.
13. Consultation with the Utah State Governor.
14. Public Notice of Lease Sale.
15. Lease Sale.

Potential lease tracts would be subject to additional environmental review prior to any hydrocarbon development. This would occur when the lessee submitted a plan of operation to develop tar sand or an Application for a Permit to Drill (APD) to develop oil and gas.

CHAP. 1: INTRODUCTION

TABLE 1-1
Data on Potential Lease Tracts

Potential Lease Tract	Designated Special Tar Sand Area	Acreage ^a	Entity Submitting Expression of Interest	Federal Ownership (CHL Minerals)	In-Place Bitumen Resource Estimate From Tar Sand			Development Method/Current Potential ^c
					Best Estimate (bbls X 10 ⁶) ^b	Range of Estimate (bbls X 10 ⁶) ^b	Avg. Bitumen Content bbl/acre	
Sunnyside No. 1	Sunnyside	3,202.38	Phillips, Sabine	Tar Sand, Oil and Gas	477.0	47.7 to 4770	181,000 (2,635 acres)	Surface
Sunnyside No. 2	Sunnyside	2,715.74	Sabine	Tar Sand, Oil and Gas	116.0	11.6 to 1160	42,700	In-situ or Surface
Sunnyside No. 3	Sunnyside	120.00	Cities Service	Tar Sand, Oil and Gas	9.5	0.95 to 95	79,200	Surface
Sunnyside No. 4	Sunnyside	40.00	Amoco	Tar Sand, Oil and Gas	11.6	1.16 to 116	290,000	Surface
Sunnyside No. 5	Sunnyside	640.00	Sabine	Tar Sand, Oil and Gas	21.8	2.18 to 218	34,100	In-situ
Sunnyside No. 6	Sunnyside	2,493.86	Cities Service, Sabine	Tar Sand, Oil and Gas	128.0	12.8 to 1280	51,300	In-situ
Sunnyside No. 7	Sunnyside	960.00	Cities Service, Sabine	Tar Sand, Oil and Gas	36.1	3.61 to 361	43,000 (840 acres)	In-situ or Surface
Sunnyside No. 8	Sunnyside	1,764.25	Sabine	Tar Sand, Oil and Gas	108.0	10.8 to 1080	61,200	In-situ or Surface
Sunnyside No. 9	Sunnyside	596.04	BLM Nomination	Tar Sand, Oil and Gas	24.4	2.44 to 244	40,900	In-situ or Surface
Sunnyside No. 10	Sunnyside	(120.00)	Sabine	Oil and Gas	--	--	--	Conventional Oil and Gas
Sunnyside No. 11	Sunnyside	(2,040.00)	Cities Service, Sabine	Oil and Gas	--	--	--	Conventional Oil and Gas
Sunnyside No. 12	Sunnyside	(120.70)	Sabine	Oil and Gas	--	--	--	Conventional Oil and Gas
Black Dragon	San Rafael Swell	880.00	Cities Service, TRW, Inc.	Tar Sand, Oil and Gas	5.1	2 to 5	11,700 (438 acres)	In-situ or Surface
Flint Flat	Tar Sand Triangle	2,684.00	Cities Service	Tar Sand, Oil and Gas	49.0	16 to 150	18,200	In-situ
Gordon Corral	Tar Sand Triangle	485.00	Cities Service	Tar Sand, Oil and Gas	8.8	3 to 27	18,200	In-situ
Pariette No. 1	Pariette	(512.83)	BLM Nomination	Tar Sand, Oil and Gas	Insufficient Data	--	--	Conventional Oil and Gas
Pariette No. 2	Pariette	(3,560.00)	BLM Nomination	Tar Sand, Oil and Gas	Insufficient Data	--	--	Conventional Oil and Gas
Pariette No. 3	Pariette	(277.30)	BLM Nomination	Tar Sand, Oil and Gas	Insufficient Data	--	--	Conventional Oil and Gas
Total Tar Sand, Oil and Gas		23,022.06						
Total Tar Sand		16,391.23			995.3			

Source: U.S. Department of Interior (USDI), Minerals Management Service (MMS), 1982.

^aNumbers in parentheses will be leased for oil and gas only and are not added in tar sand total.

^bEstimate in millions of barrels.

^cAs determined by BLM District Mining or Oil and Gas Supervisor.

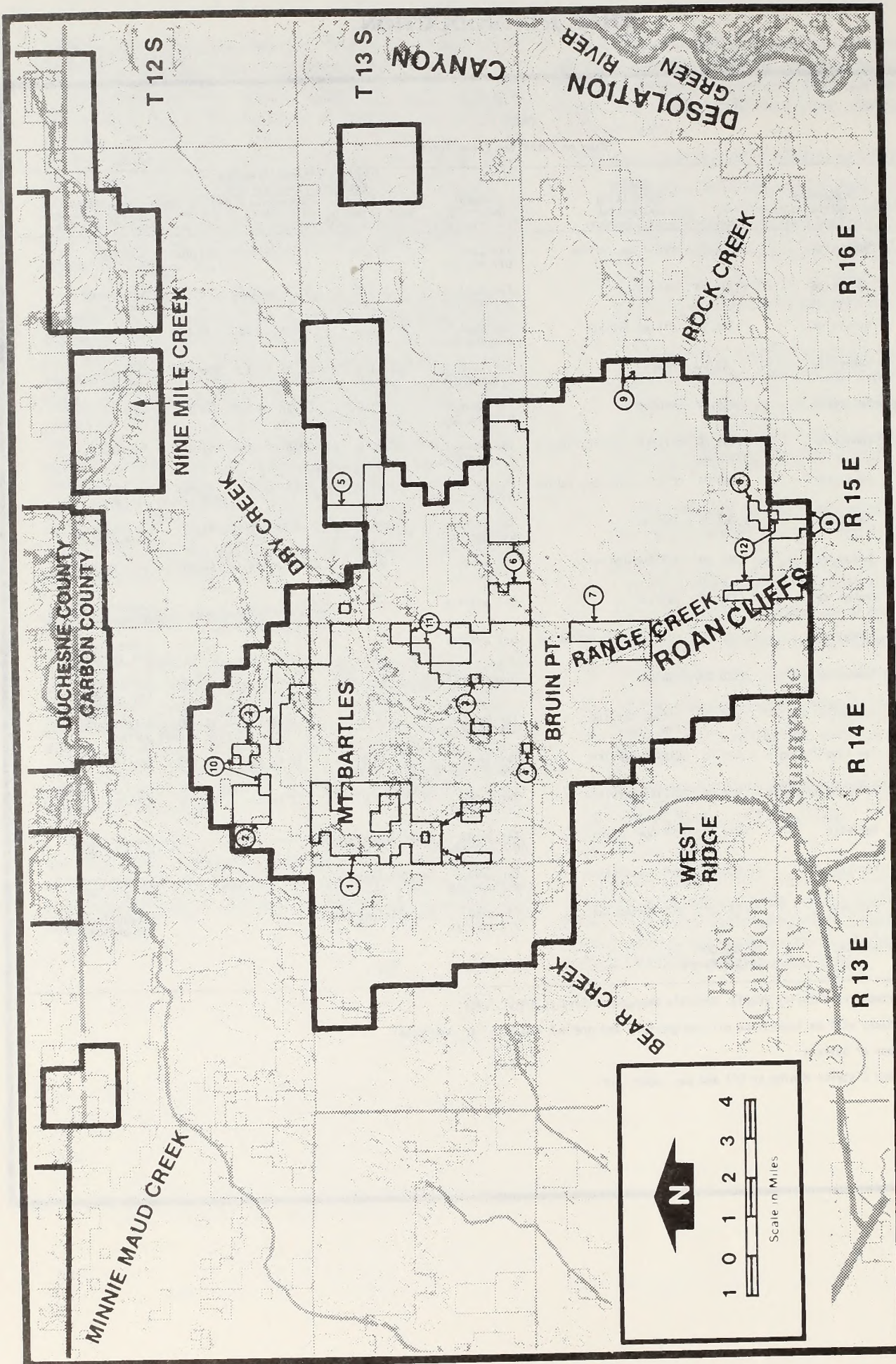


FIGURE 1-1
SUNNYSIDE POTENTIAL LEASE TRACTS

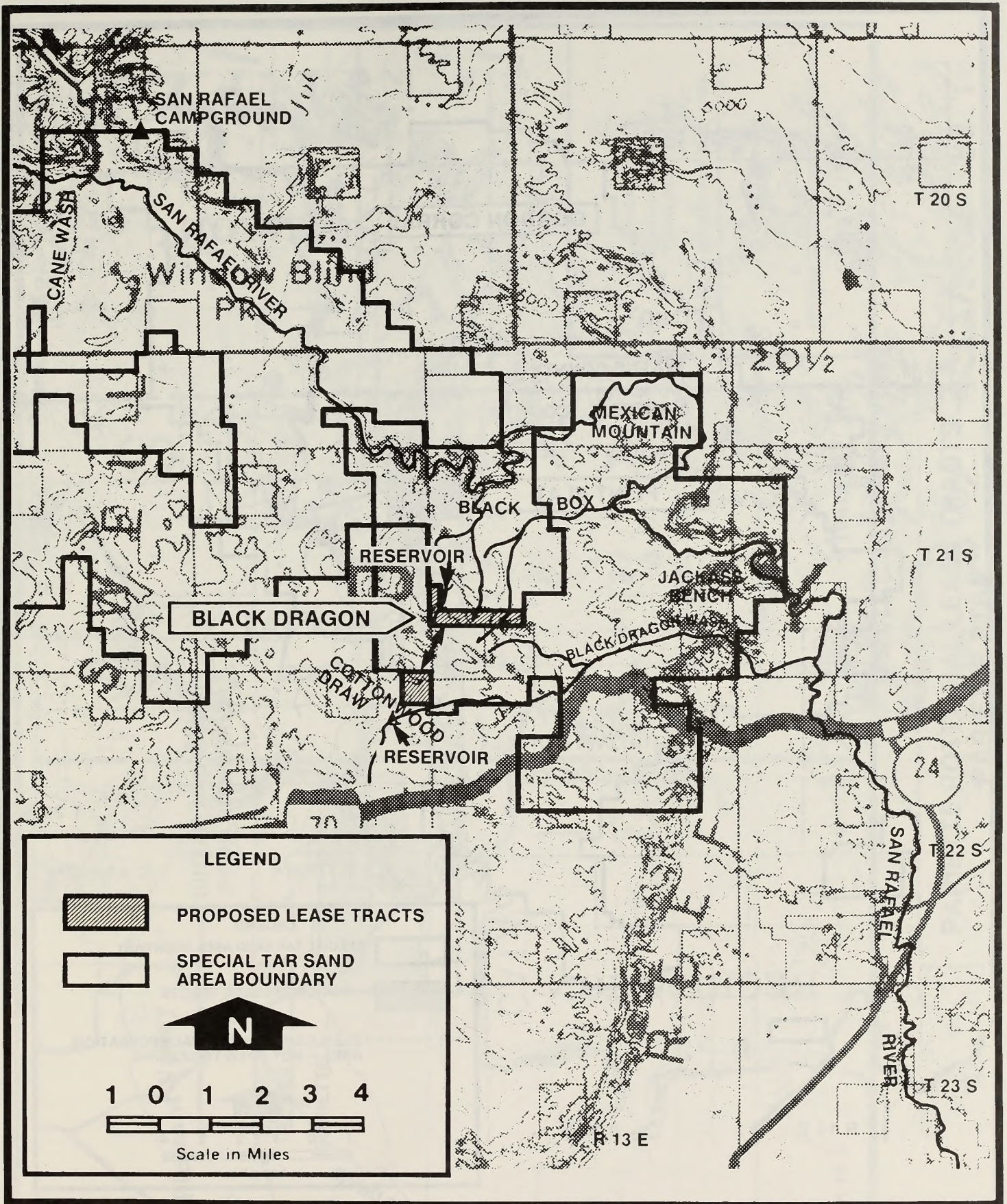


FIGURE 1-2
BLACK DRAGON POTENTIAL LEASE TRACT
SAN RAFAEL SWELL STSA

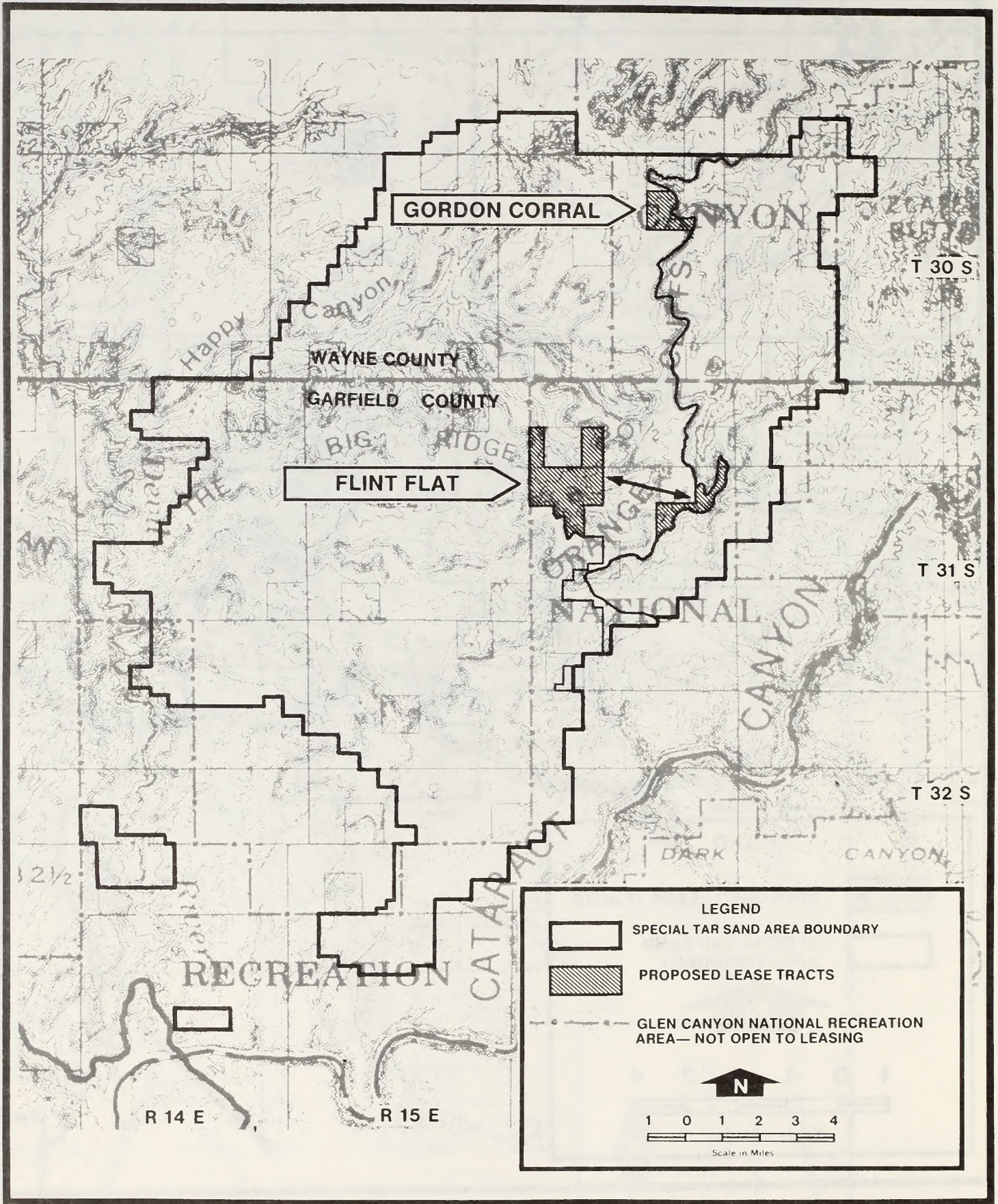


FIGURE 1-3
TAR SAND TRIANGLE STSA

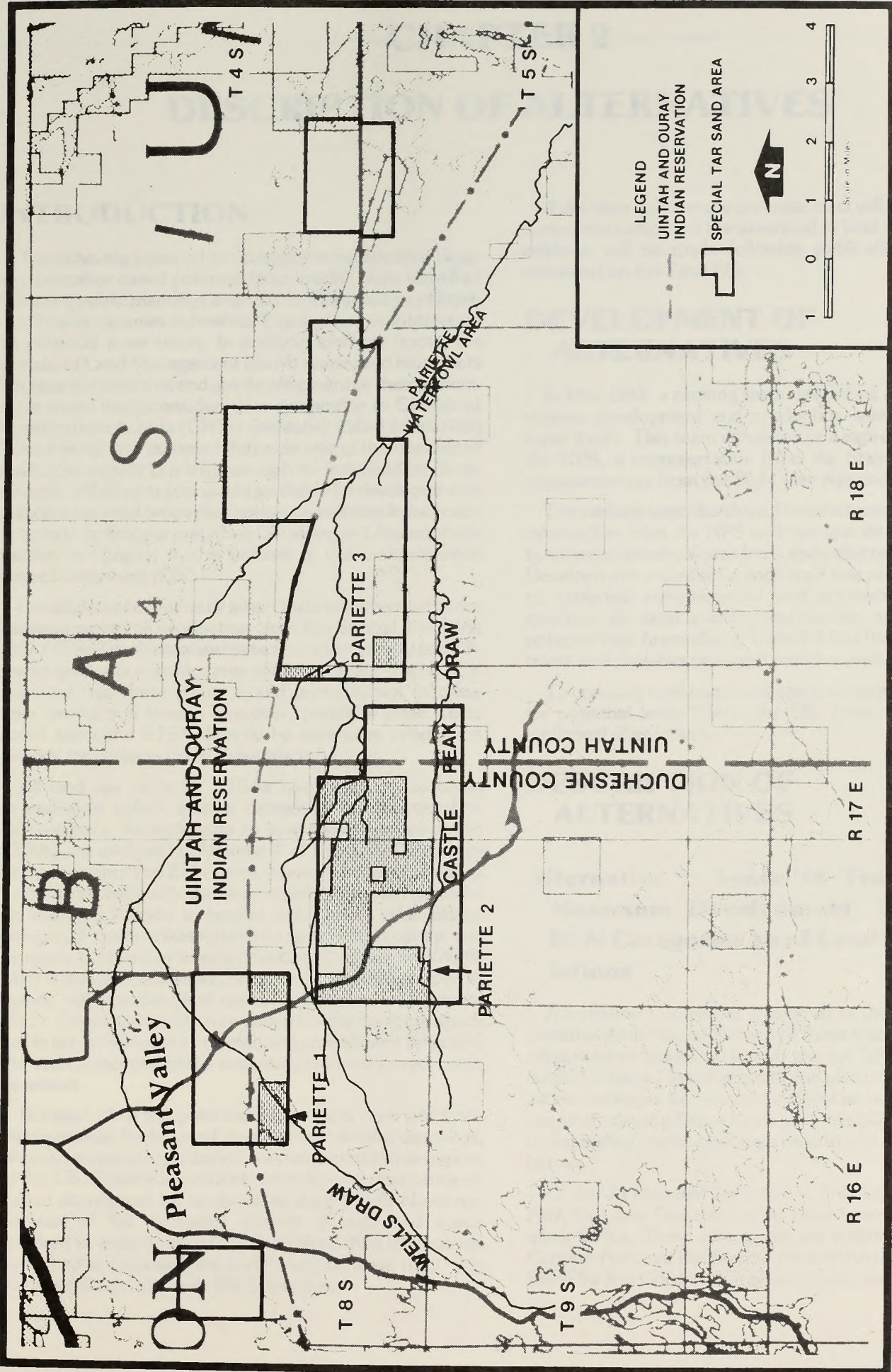


FIGURE 1-4
PARIETTE POTENTIAL LEASE TRACTS
PARIETTE STSA

CHAPTER 2

DESCRIPTION OF ALTERNATIVES

INTRODUCTION

Tracts having potential for competitive hydrocarbon leasing (hereafter called potential lease tracts) were identified following public meetings and calls for Expressions of Interest. Five companies submitted Expressions of Interest on 14 potential lease tracts. In addition to these tracts, the Bureau of Land Management (BLM) nominated four tracts because of current oil and gas development or their proximity to tracts being considered for conversion to Combined Hydrocarbon Leases (CHLs) (hereafter called conversion lease tracts). It is assumed that only one of the nominated tracts (Sunnyside 1) is large enough for independent development. All other tracts would probably be developed with adjacent tar sand properties (either conversion lease tracts or private or State areas). (See Development Assumptions section in Chapter 4, this volume of the Environmental Impact Statement [EIS].)

Development of potential lease tracts would probably not increase yearly oil production from the Special Tar Sand Area (STSA) itself because these tracts would only contribute to production from plants within adjacent tracts. (It is assumed that these plants would probably not increase their production levels.) However, potential lease tracts could affect the STSA directly by extending production periods for projects using these tracts.

All land use plans for STSAs have been or are being amended to reflect leasing categories for hydrocarbon development. Amendments to land use plans for seven STSAs are analyzed in Volume II of this EIS. Categories being considered on BLM-administered lands are: category 1--open to leasing with standard stipulations (see Appendix 1); category 2--open to leasing with special stipulations; category 3--open to leasing with no surface occupancy; and category 4--closed to leasing. National Park Service (NPS) lands within potential lease tracts are all classified as open to leasing with standard and special stipulations (see Appendix 2). Compliance with the existing leasing category specified in the land use plan or a planning amendment reflecting the new category would be necessary before any tract could be leased.

Because all of the potential lease tracts have not been recategorized for tar sand development in land use plans, alternatives for categorization are considered in this volume of the EIS. Volume II considers from three to five categorization alternatives for lands within each STSA. However, because of the excessive amount of data and space required to analyze each of the categorization alternatives described in Volume II for each potential lease tract, this volume will consider only five alternatives.

A decision to lease any potential tract will be made at the same time categories are amended in land use plans. This decision will be made following publication and public comment on the Final EIS.

DEVELOPMENT OF ALTERNATIVES

In May 1983, a ranking team developed alternatives for various development and production levels on potential lease tracts. This team consisted of a representative from the NPS, a representative from the State of Utah, and representatives from the BLM (see Appendix 3).

The ranking team developed three alternatives, based on information from the NPS and site-specific data prepared by interdisciplinary teams from each affected BLM district. Development potential for each tract was ranked according to expected environmental and socioeconomic consequences, tar sand quantity and quality, and reclamation potential (see Appendix 3). Table 1-1 lists the potential lease tracts and provides pertinent data for each.

To consider variations in planning category amendments for potential lease tracts, the EIS Team developed two additional alternatives.

DESCRIPTION OF ALTERNATIVES

Alternative 1: Lease 18 Tracts Under Maximum Development, Subject to BLM Categories 1 and 4 and NPS Stipulations

Alternative 1 considers leasing all of the 18 designated potential lease tracts. Sixteen of these tracts are on BLM-administered lands, while two are on NPS-administered lands. (Table 2-1 lists the tracts and also portrays categorization acreages for maximum development and multiple use alternatives.) These tracts cover 23,022 acres and have an estimated in-place bitumen resource of over 995 million barrels.

Of the 18 potential lease tracts, only land use plans for Flint Flat and Gordon Corral have been categorized to allow CHLs. These two tracts are within the NPS Glen Canyon National Recreation Area (NRA). NPS classified Flint Flat and Gordon Corral as open to mineral disposition:

CHAP. 2: DESCRIPTION OF ALTERNATIVES

TABLE 2-1

Proposed Leasing Categories for
Maximum Development and Multiple Use

Potential Lease Tract	Total Acres	Maximum Development	Multiple Use (Preferred)	
Sunnyside No. 1 Category 1	3,202	3,202	3,202	
Sunnyside No. 2 Category 1 Category 2 Category 3	2,716	2,716	2,356 ^a 360 ^b	^a Elk and deer summer range on 1,000 acres and deer winter range on 1,356 acres. ^b Public water reserves/riparian areas on 360 acres or 160 and 200 acres.
Sunnyside No. 3 Category 1 Category 2	120	120	120 ^c	^c Elk and deer summer range on 120 acres.
Sunnyside No. 4 Category 1 Category 2	40	40	40 ^d	^d Elk and deer summer range on 40 acres.
Sunnyside No. 5 Category 1 Category 2	640	640	640 ^e	^e Elk and deer summer range on 320 acres and deer winter range on 320 acres. ^f Sage grouse strutting and nesting areas on 240 acres (category 3) and 400 acres (category 2) or 640 acres (category 3) and public water reserves/riparian on 80 acres.
Sunnyside No. 6 Category 1 Category 2 Category 3	2,494	2,494	400 ^f 480 ^g 1,374 ^h 240 ⁱ	^g Elk and deer summer range on 480 acres. ^h Deer winter range on 1,374 acres. ⁱ Sunnyside water supply reserve on 640 acres (category 4).
Sunnyside No. 7 Category 1 Category 2 Category 4	960	320 640 ^l	960 ^j	^j Elk and deer summer range on 320 acres and Sunnyside Water Supply Reserves on 640 acres. ^k Elk and deer summer range on 440 acres. ^l Range Creek watershed on 1,324 acres.
Sunnyside No. 8 Category 1 Category 2	1,764	1,764	440 ^k 1,324 ^l	^m Elk and deer summer range on 240 acres and sage grouse strutting and nesting area on 280 acres. ⁿ Sage grouse strutting and nesting area on 76 acres.
Sunnyside No. 9 Category 1 Category 2 Category 3	406	406	330 ^m 76 ⁿ	^o Elk and deer summer range on 120 acres. ^p Elk and deer summer range on 1,960 acres. ^q Public water reserves/riparian area on 80 acres.
Sunnyside No. 10 Category 1 Category 2	120	(120)	120 ^o	^r Range Creek watershed on 81 acres and elk and deer summer range on 40 acres. ^s Interstate 70 Scenic Corridor stipulation on 320 or 160 acres.
Sunnyside No. 11 Category 1 Category 2 Category 3	2,040	(2,040)	1,960 ^p 80 ^q	^t These NPS tracts have already been categorized as equivalent to category 2. ^u Parentheses indicate that tar sand development is not considered on this potential lease tract.
Sunnyside No. 12 Category 1 Category 2	121	(121)	121 ^r	^v Threatened or endangered plant species (Uinta Basin hookless cactus) stipulation on 2,480 acres.
Black Dragon Category 1 Category 3	880	880	720 160 ^s	^w Includes the NPS tracts. ^x Category totals do not include the number in parentheses in the table.
Flint Flat ^t Category 2	2,684	2,684	2,684	^y Includes 3,169 acres of NPS-administered lands.
Gordon Corral ^t Category 2	485	485	485	
Pariette No. 1 Category 1	513	(513) ^u	(513) ^u	
Pariette No. 2 Category 1 Category 2	3,560	(3,560)	(1,080) (2,480) ^v	
Pariette No. 3 Category 1	277	(277)	(277)	
Total	23,022	23,022	23,022	
Category 1 ^w		12,582	3,922	
Category 2 ^x		3,169	11,633 ^y	
Category 3			836	
Category 4		640		

this classification is almost equivalent to BLM's category 2, open to leasing with general and special stipulations (see Appendix 2).

This alternative is based on the maximum development alternatives for all STSAs, as described in Volume II. Under maximum development (see Table 2-1), category 1 would encompass 12,582 acres, while 3,169 acres (NPS-administered land) would be placed in category 2, and 640 acres in category 4. Sunnyside 10, 11, and 12 tracts would allow only development of oil and gas because there is no Federally owned tar sand on these tracts. The Pariette tracts are located in a producing oil and gas area; little or no tar sand development is expected within these tracts because this resource is scattered and has low development potential. Therefore, this analysis will not consider impacts from tar sand development on Sunnyside 10, 11, and 12 and Pariette tracts. However, should the Pariette tracts be leased and the lessee desire to develop tar sand at a later date, a detailed plan of operation or Application for Permit to Drill (APD) would be required prior to development. A detailed environmental review would also be mandatory at that time. Impacts from oil and gas development have already been analyzed for the Pariette area in the Vernal Districtwide Oil and Gas Environmental Assessment (EA) (U.S. Department of Interior [USDI], BLM, 1976).

Alternative 2: Lease 18 Tracts Under Multiple Use, Subject to BLM Categories 2, 3, and 4 and NPS Stipulations

Alternative 2 considers leasing of all 18 potential lease tracts. Tracts are identified in Table 1-1; Table 2-1 lists the tracts and shows categorization acreages for maximum development and multiple use. These tracts cover 23,022 acres and have an estimated in-place bitumen resource of 995 million barrels.

As explained in Alternative 1, Pariette tracts 1, 2, and 3 and Sunnyside tracts 10, 11, and 12 have not been considered for tar sand development. This alternative would lease Sunnyside tracts 1 to 9, Black Dragon, Flint Flat, and Gordon Corral tracts. Leasing categories for these potential tracts would be: category 1, 3,922 acres; category 2, 8,464 BLM acres and 3,169 NPS acres; and category 3, 836 acres. The areas which would require special stipulations are shown in Table 2-1.

Alternative 3: Lease Seven Tracts Under Maximum Development, Subject to BLM Category 1.

This alternative proposes leasing only seven potential tracts (Sunnyside 1-4 and Pariette 1-3) in May 1984. Only those tracts with comparatively high development potential and maximum opportunity for reasonable environmental protection and rehabilitation are considered. Table 1-1 lists potential lease tracts and contains pertinent data for each

tract. Table 2-1 lists the special stipulations required for protection of sensitive areas on each tract. These tracts cover 10,428 acres and have an estimated in-place bitumen resource of 614 million barrels.

As explained in Sunnyside tract 1 could be developed as a unit, whereas the remaining Sunnyside tracts (2, 3, and 4) would be developed with adjacent conversion lease tracts on State or private areas. The Pariette tracts, which are located in a producing oil and gas area, would only be considered for oil and gas development.

Alternative 4: Lease Seven Tracts Under Multiple Use, Subject to BLM Categories 2 and 3 (Preferred Alternative)

This is the BLM-preferred alternative. This alternative offers the same seven potential tracts for leasing as Alternative 3. Table 1-1 contains pertinent data for tracts considered in this alternative. Table 2-1 lists the special stipulations required for protection of sensitive areas on each tract.

This alternative would place only Sunnyside tract 1 in category 1 (3,202 acres). Sunnyside tracts 3 and 4 (160 acres) and 2,356 acres of tract 2 would be placed in category 2 (2,516 acres); 360 acres of Sunnyside tract 2 would be placed in category 3.

Alternative 5: No Action (No Competitive Federal Leasing in 1984)

The No Action Alternative would not offer any of the 18 potential lease tracts for sale in 1984. However, hydrocarbon development would be allowed on conversion lease tracts and on State and private lands within and/or near potential lease tracts. Oil and gas development could also occur on those oil and gas leases not expired or not converted to CHLs. Leasing categories (see Glossary) selected after publication of this Final EIS (1984) would guide future leasing decisions should the need for such leasing occur. (Leasing categories being considered are discussed in Volume II of this EIS.)

SUMMARY OF UNAVOIDABLE ADVERSE IMPACTS, IRREVERSIBLE/IRRETRIEVABLE COMMITMENTS OF RESOURCES, AND THE RELATIONSHIP OF SHORT-TERM USE OF THE ENVIRONMENT TO MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

CHAP. 2: DESCRIPTION OF ALTERNATIVES

Table 2-2 summarizes and compares the unavoidable adverse impacts discussed in Chapter 4. The comparison is by alternative and environmental element. This table does not list impacts of low significance, short duration, or those that are readily mitigated.

Table 2-2 also indicates whether the adverse impact is irreversible or irretrievable. Actions committing future generations to continue a similar course are considered

irreversible. Irretrievable is defined as irrecoverable, not retrievable; once used, not replaceable.

The relationship between short-term uses of the environment to maintenance and enhancement of long-term productivity is briefly discussed for each alternative and resource and completes the table. Short term is generally used as the life of the project (20 years). Long term is the period beyond the project's predicted life.

TABLE 2-2

Summary of Unavoidable Adverse Impacts, Irreversible/Irretrievable Commitments of Resources, and the Relationship of Short-Term Use of the Environment to Maintenance and Enhancement of Long-Term Productivity^a

Resources	Alternative 1: Lease 18 Tracts Under Maximum Development, Subject to BLM Categories 1 and 4 and NPS Stipulations	Alternative 2: Lease 18 Tracts Under Multiple Use Subject to BLM Categories 2, 3, and 4 and NPS Stipulations	Alternative 3: Lease Seven Tracts Under Maximum Development Subject to BLM Category 1	Alternative 4: Lease Seven Tracts Under Multiple Use Subject to BLM Categories 2 and 3 (Preferred Alternative)	Irreversible/Irretrievable ^b Commitment of Resources	Relationship Between Short-Term Use of the Environment to Maintenance and Enhancement of Long-term Productivity
Water Resources	Up to 12,582 acres in BLM category 1, 520 acres in category 2, and 3,169 acres of NPS land could be subjected to surface disturbance. Increased erosion and sediment yield to major drainages would occur from this disturbance. Contamination of surface and groundwater would also occur. It is estimated that water consumption would be 12,594 acre-feet annually under this alternative.	Erosion and sediment yield would increase on all tracts. Impacts would be similar to those in Alternative 1, except less surface disturbance would occur because 3,922 acres would be in category 1 and 8,654 acres in category 2. An estimated 12,594 acre-feet of water would be required annually.	Erosion and sediment yield would increase as in Alternative 1. However, only 6,078 acres would be subject to surface disturbance. It is estimated that water consumption would be 5,472 acre-feet annually.	Increased erosion and sediment yield would occur on up to 3,202 acres (category 1) and 2,516 acres in category 2. Water consumption is estimated at 5,472 acre-feet annually.	Degraded water quality could be reversed; however, losses would be irretrievable until water quality improved. It is doubtful water quality could reach pre-development levels.	Water quality would decline both in the short and long terms. Mitigation measures could reduce impacts; however, water quality would never equal pre-development levels. In the long term, less water and poorer quality water would be available.
Soils	Up to 12,582 acres in BLM category 1, 520 acres in category 2, and 3,169 acres of NPS land could be subjected to surface disturbance. Soil loss from this disturbance would be increased, causing siltation and revegetation problems. Soil loss from wind erosion could exceed 50 tons/acre/year on some tracts.	Up to 3,922 acres in BLM category 1 lands and 8,654 acres on category 2 lands could be subject to surface disturbance. Impacts would be less than Alternative 1.	Up to 6,078 acres would be subject to surface disturbance and increased erosion. Therefore, impacts to soils would be less than Alternatives 1 or 2.	Up to 3,202 acres in category 1 and 2,516 acres in category 2 would be subject to surface disturbance from tar sand development. Therefore, impacts to soils would be slightly less than Alternative 3.	Increased erosion would be reversible, but soil lost would be irretrievable.	Short-term and long-term mitigation measures could reduce impacts to soil. However, soil erosion would still occur. Watershed and water resource values would be expected to decline in the long term.
Minerals and Topography	Using surface-mining methods, 608 million barrels of oil could be recovered. In-situ processes could recover only 203 million barrels. Landforms would be greatly modified, and subsidence could occur on some tracts.	Using surface-mining methods, 562 million barrels of oil could be recovered. Landforms would be greatly modified, and subsidence could occur on some tracts.	Using surface-mining methods, 553 million barrels of oil could be recovered. Landforms would be greatly modified, and subsidence could occur on some tracts.	Using surface-mining methods, 553 million barrels of oil could be recovered. Landforms would be greatly modified, and subsidence could occur on some tracts.	All recovered bitumen would be irretrievable.	Topographical features would be significantly altered both in the short and long terms. Recoverable tar sand deposits would decline in both the short and long terms.
Vegetation	Vegetation would be damaged by surface clearing, contour modification, and removal and mixing of topsoil. Surface mining would cause extensive changes in vegetation cover and composition. Some impacts to vegetation would be permanent. There would be no impact to threatened or endangered plant species.	Vegetation loss would be similar to Alternative 1 on 7,091 acres and different on 9,489 acres.	Vegetation loss would be the same intensity and extent as Alternative 1.	Impacts would be the same as Alternative 2.	Decreased forage production could be reversible, but forage production lost until vegetation recovered would be irreplaceable.	Mitigation measures could restore damage to vegetative cover and composition both in the short and long terms. However, some loss of vegetation would be permanent, resulting in an unknown loss of AUMs for livestock and big game animals.
Animal Life	The following acres of wildlife habitat would be destroyed: 6,918 acres of deer/elk summer range; 3,307 acres of deer/elk winter range; 2,800 acres of aspen habitat; 4.5 miles of riparian habitat; 11,717 acres of raptor and small game habitat; two sage grouse strutting grounds, and 4,156 and 780 acres of sage grouse yearlong and nesting habitat, respectively. There would be no impacts to any terrestrial threatened or endangered species. Fish habitat would be impacted by alteration in stream channels, increase in	The following acres of wildlife habitat would receive some protection from special stipulations: approximately 2,960 and 3,050 acres of deer/elk summer and winter range, respectively; 8,654 acres of small game habitat; two sage grouse strutting grounds and 680 acres of crucial nesting habitat; and 8,654 acres of raptor habitat. It is important to note that even these areas could be developed. The following wildlife habitats could be destroyed: 4,156 and 100 acres of sage grouse year-	The following acres of wildlife habitat could be destroyed: 3,795 and 1,356 acres of deer/elk summer and winter range, respectively; 5,150 acres of small game and yearlong raptor habitat; 1,500 acres of aspen habitat; 2,920 acres of sage grouse yearlong habitat, and 3 miles of riparian habitat. There would be no impacts to terrestrial threatened or endangered species. The potential fishery association with the Left Fork of Dry Creek could be lost. Habitats of the endangered Colorado	The following acres of wildlife habitat would receive some protection from special stipulations: approximately 1,160 and 1,356 acres of deer/elk summer and winter range, respectively and 2,516 acres of small game and raptor habitat. It is important to note that even these acres could be developed. The following wildlife habitats could be destroyed: 2,920 acres of yearlong sage grouse habitat; 1,500 acres of aspen habitat; and 3 miles of riparian habitat. There would be no impacts to any terrestrial threatened or endangered species. The potential fishery	Declines in animal populations could be reversible, but animals lost would be irretrievable.	There would be both short- and long-term losses of animal habitat. However, mitigation measures could restore habitat loss in the long term. Some habitat would never be able to support wildlife again. This would result in an unknown loss of big game, small game, upland game, and raptor species.

TABLE 2-2 (concluded)

Resources	Alternative 1: Lease 18 Tracts Under Maximum Development, Subject to BLM Categories 1 and 4 and NPS Stipulations	Alternative 2: Lease 18 Tracts Under Multiple Use Subject to BLM Categories 2, 3, and 4 and NPS Stipulations	Alternative 3: Lease Seven Tracts Under Maximum Development Subject to BLM Category 1	Alternative 4: Lease Seven Tracts Under Multiple Use Subject to BLM Categories 2 and 3 (Preferred Alternative)	Irreversible/Irretrievable Commitment of Resources ^b	Relationship Between Short-Term Use of the Environment to Maintenance and Enhancement of Long-term Productivity
Animal Life (continued)	sedimentation, reduction in in-stream flows, and degradation of water quality. Impacts to the endangered Colorado squawfish, humpback chub, and sensitive razorback sucker could occur from this development. No impacts to wild and free-roaming horses and burros would occur, although some habitat could be destroyed.	long and nesting habitats, respectively, and 4 miles of riparian habitat. There would be no impacts to any terrestrial threatened or endangered species. Fish habitat would be impacted by alteration in stream channels, increase in sedimentation, reduction in instream flows, and degradation of water quality. Impacts to the endangered Colorado squawfish and humpback chub and the sensitive razorback sucker could occur from development. No impacts to wild and free-roaming horses and burros would occur, although some habitat could be destroyed.	squawfish and humpback chub and the sensitive razorback sucker could be lost. No impact to wild and free-roaming horses or burros would occur, although some habitat could be destroyed.	associated with the Left Fork of Dry Creek could be lost. The endangered Colorado squawfish and humpback chub and sensitive razorback sucker habitats could be lost. No impacts to wild and free-roaming horses or burros would occur, although some habitat could be destroyed.		
Recreation	All recreational uses and values would be degraded from tar sand development, and recreational visits for all uses would be expected to decline on all developed tracts.	All recreational uses and values would be degraded from development; however, impacts would be less than Alternative 1.	Although all recreational uses and values would be degraded from tar sand development, impacts would be less than Alternatives 1 and 2.	Although all recreational uses and values would be degraded on some areas, impacts would be less than under Alternatives 1, 2, and 3.	Declines in recreational opportunities would be reversible, but recreational opportunities lost would be irretrievable.	Recreational opportunities would be lost both in the short and long terms. Some recreational opportunities would be irretrievable.
Wilderness	Tar sand development in areas contiguous or adjacent to WSAs would impact wilderness values because of impacts to solitude from visual intrusions and sounds.	Same as Alternative 1.	Leasing and development of potential lease tracts would not be expected to impact opportunities for solitude in any potential wilderness area.	Leasing and development of potential lease tracts would not be expected to impact opportunities for solitude in any potential wilderness area.	Declines in wilderness values could be reversible; however, wilderness values lost would be irretrievable.	Wilderness values would be lost in the short and long terms. However, some values could be restored at the end of the project's life.
Visual Resources	In most cases, contrasts created by tar sand development would be high and would probably exceed VRM Class standards.	Impacts would be similar to Alternative 1, except development would be limited to 25 percent of the potential lease tract at any one time.	Degradation of visual resources would be the same as described in Alternative 1. All Class II and most Class III areas would probably experience permanent degradation of scenic values.	Impacts would be the same as described in Alternative 3.	Declines in VRM Class standards could be reversible, but scenic values lost would be irretrievable.	Although mitigation measures could reduce short-term impacts caused by the extreme changes in topography, some impacts to visual resources would be permanent.
Livestock Grazing	Both in-situ and surface mining methods would eliminate or greatly reduce suitability for livestock grazing. Impacts include: loss of forage, loss of water or access to water, loss of trails and disruptions in patterns of use. In addition, no range improvements for livestock would be preserved.	Impacts to livestock grazing would be similar to Alternative 1 because there are no special stipulations or categories 3 or 4 to protect this resource. Although most of the AUMs would be preserved, the suitability of the tracts for livestock grazing would be lost. In addition, no range improvements for livestock would be preserved.	It is expected that both in-situ and surface-mining methods would eliminate or greatly reduce suitability for livestock grazing. Impacts include: loss of forage, loss of water, access to water, loss of trails, and disruptions in patterns of use. In addition, no range improvements for livestock would be preserved.	It is expected that both in-situ and surface-mining methods would eliminate or greatly reduce suitability for livestock grazing. Impacts include: loss of forage, loss of water, access to water, loss of trails, and disruptions in patterns of use. In addition, no range improvements for livestock would be preserved. About half of the forage resource (518 AUMs) would be preserved, although the tract's general suitability for grazing would be lost.	Declines in AUMs could be reversible, but AUMs lost would be irretrievable.	There would be both short- and long-term reductions in AUMs. Mitigation measures could restore vegetative production on certain areas. However, because some vegetation would be permanently lost, long-term AUM production would remain below pre-development levels.

^a Impacts on the 18 potential lease tracts under Alternative 5, No Action would be as follows: (1) natural resources would remain as described in Chapter 3 (Affected Environment); there would be no significant on-tract impacts; (2) projections of baseline socioeconomic conditions indicate that the populations of Carbon and Emery counties would increase by approximately 68 and 27 percent, respectively, during 1985-2005; during the same period, employment would increase 31 percent in Carbon County, and 2 percent in Emery County. Recent instability (layoffs) in the coal industry in Emery County, however, could distort the projections for that county.

^b Irreversible/Irretrievable commitment of resources would be similar for each Alternative; however, the magnitude of the impacts could differ significantly.

CHAPTER 3

AFFECTED ENVIRONMENT

INTRODUCTION

This chapter describes the affected environment for the 18 potential lease tracts affected by implementation of the leasing alternatives described in Chapter 2. This chapter does not describe all components of the environment: only those resources which would be significantly affected by tar sand development are described.

THE SETTING

All of the Special Tar Sand Areas (STSAs) are located within the landforms of the Colorado Plateau physiographic province and range in elevations from 5,000 to 10,000 feet. These landforms are within the Colorado River watershed.

Utah's climatic variations significantly correlate to the differences in elevation. The region is generally semi-arid and is characterized by low relative humidity, abundant sunshine, low to moderate precipitation, warm summers, and cold winters. Lower elevation STSAs are characterized by lack of moisture, having 8 or less inches of precipitation per year. Higher elevation STSAs receive 30 or more inches of precipitation per year. Seasonal and daily temperature variations can be extreme. Average January Fahrenheit (F) temperatures range from the teens at higher elevations to the upper 20s in valleys. Average July temperatures range in the high 50s in the mountains to the low 80s along the Colorado River. The mean length of the frost-free season ranges from 30 days at high elevations to 180 days at low elevations (Aerocomp, Inc., 1983).

AIR QUALITY

Regional airsheds encompassing STSAs have been determined based on meteorological data and considerations such as confinement of air movement and topographic barriers.

The San Rafael Swell and Tar Sand Triangle STSAs are in the Upper Colorado River airshed, and the Pariette and Sunnyside STSAs are in the White River airshed. These airsheds are topographically bound on the west by the Wasatch Plateau and on the north and east by the Unita and Rocky mountains. Airflow out of this regional basin is significantly limited by these topographic features.

Ambient air quality is regulated by the provisions of the Federal Clean Air Act and its amendments of 1970. Two sets of ambient air quality standards apply to the region: the National Ambient Air Quality Standards (NAAQS) and the

Prevention of Significant Deterioration (PSD) standards. NAAQS are uniform minimum national standards for air quality, whereas PSD standards provide additional protection to air quality and related values where existing air quality is better than the minimum standard required, such as is typical in STSAs. Individual states may also establish air quality standards if pollutant levels above the national minimum limits are not allowed. Both Utah and Colorado have ambient air quality standards equal to the NAAQS (Table 3-1).

Tar sand development could affect ambient air quality standards in areas with PSD standards. These areas fall into one of the following PSD classes:

Class I: Applies to areas in which practically any air quality deterioration would be considered significant, thus allowing little or no major energy or industrial development.

Class II: Applies to areas in which deterioration normally accompanying moderate, well-controlled growth would not be considered significant.

All potential lease tracts are located within designated Class II areas. However, several nearby national parks (Arches, Canyonlands, and Capitol Reef) are mandatory Class I areas. Dinosaur and Colorado national monuments in Colorado are Colorado Category I areas, having standards similar to Federal Class I. The following lists Class I and Class II allowable increments for sulfur dioxide (SO₂) and total suspended particulates (TSP).

Pollutant	Averaging Time	Maximum Allowable Concentration ^a (ug/m ³)	
		Class I	Class II
SO ₂	Annual	2	20
	24-hour	5	91
	3-hour	25	512
TSP	Annual	5	19
	24-hour	10	37

Source: Aerocomp, Inc., 1983.

^aStandard is given in micrograms per cubic meter.

All potential lease tracts are located in rural areas relatively removed from major pollution sources. The following shows ambient air quality for each potential lease tract.

TABLE 3-1

Utah, Colorado, and National Ambient Air Quality Standards

Pollutant	Averaging Time	Primary Standard	Secondary Standard
Oxidant (ozone)	1 hour ^a	235 µg/m ³	b
Carbon monoxide	8 hour	10 mg/m ³	b
	1 hour	40 mg/m ³	b
Nitrogen dioxide	Annual	100 µg/m ³	b
Sulfur dioxide	Annual	80 µg/m ³	--
	24 hour	365 µg/m ³	--
	3 hour	--	1,300 µg/m ³
Total suspended particulate matter	Annual	75 µg/m ³	60 µg/m ³
	24 hour	260 µg/m ³	150 µg/m ³
Lead	Calendar Quarter	1.5 µg/m ³	b
Hydrocarbons ^c	3 hour	160 µg/m ³	b

Source: Aerocomp, Inc., 1983.

Note: National standards are not to be exceeded more than once per year, other than those for ozone or those based on an annual average. Standards are given in micrograms per cubic meter (µg/m³), and milligrams per cubic meter (mg/m³).

^aOne or more hourly values could equal or exceed the ozone standard less than or equal to 1 day.

^bSame as primary standard.

^cGuideline for oxidant control, no longer a national standard.

Pollutant	Sunnyside 1-12	Flint Flat and		
		Black Dragon	Gordon Corral	Pariette 1-3
<i>TSP (ug/m³)</i>				
24-hr max.	53-127	90	90	53-127
Annual	13-25	19	19	13-25
<i>Sulfur Dioxide (ug/m³)</i>				
24-hr max.	0-14	<13	<13	0-14
Annual	0-3	<13	<13	0-3
<i>Nitrogen Dioxide (ug/m³)</i>				
Annual	0-6	13	13	0-6
<i>Carbon Monoxide (mg/m³)</i>				
1-hr max.	700-7400	--	--	700-7400
8-hr max.	400-4500	--	--	400-4500
<i>Ozone (ug/m³)</i>				
1-hr max.	137-160	132	132	137-160

Source: Aerocomp, Inc. 1983.

Note: Standards are given in micrograms per cubic meter (ug/m³), or milligrams per cubic meter (mg/m³).

Regional visibility is usually good. The following shows background median visual ranges for each STSA.

STSA	Background Median Visual Range (miles)	Monitoring Station
Sunnyside	123	Dinosaur National Monument
San Rafael Swell	129	Cedar Mountain
Tar Sand Triangle	121	Canyonlands National Park
Pariette	123	Based on Data From a Comparable STSA

Source: Aerocomp, Inc., 1983

WATER RESOURCES

A description of water resources for potential lease tracts is shown in Table 3-2. All tracts are located in the upper Colorado hydrologic region in Utah. Water drains into the San Rafael, Dirty Devil, and Green rivers; drainage is primarily from intermittent streams. Only Sunnyside tracts 1, 2, 6, and 7 have perennial streams. Intermittent and perennial streams in Sunnyside tracts 1-12 are shown in Figure 3-1. Intermittent streams for Black Dragon tract are shown in Figure 3-2; for Gordon Corral and Flint Flat tracts in Figure 3-3; and for Pariette tracts 1-3 in Figure 3-4. There are no floodplains or wetlands within any of the potential lease tracts.

Spring snowmelt and summer thundershowers contribute the major water source to surface flow, but groundwater does sustain a base flow along a few stream reaches. Continuous surface water measurements are not available for the tracts, but estimates are that flows are very low to zero in early fall and throughout the winter; increasing to peak runoffs in the spring and early summer with snowmelt; then receding rapidly, with mid- to late-summer flows being

very low to zero.

The occurrence and availability of groundwater within potential lease tracts are generally unknown. Some Sunnyside tracts are believed to be recharge areas to local and area aquifers. Sunnyside tracts 1, 2, 6, 11, and 12 produce some water from seeps and springs. Sunnyside tract 7 contains 640 acres of the Sunnyside water supply reserve. This area was set aside in the 1940s to assure a stable water supply for the Town of Sunnyside.

Four geologic zones within Gordon Corral and Flint Flat tracts potentially contain useable groundwaters. Groundwater in the Pariette tracts occurs in shallow consolidated and unconsolidated geologic deposits.

SOILS

Potential lease tracts are located in the Tavaputs Plateau and Roan Cliffs of the Uinta Basin section and on the Canyonlands section of the Colorado Plateau province of Utah.

Gordon Corral, Flint Flat, and probably other tracts include Cryptogamic soils. These have a surface crust of associated lichens (i.e., algae and fungi). General soils data for potential lease tracts are shown in Table 3-3.

Soils are generally formed in residuum, alluvium, and colluvium derived from sandstone, shale, and siltstone. Textures range from very gravelly and very bouldery sandy loams to clay. Clay is found near or on shale outcrops. Depths range from shallow to very deep, and slopes range from 1- to 80-percent.

The wind erosion hazard for soils varies from none to high. Susceptibility to water erosion varies from slight to high, depending on the steepness of slope, the inherent nature of the soil to erode, and the amount of rock fragments, surface vegetation, and litter. Generally soil losses from bare exposed soil range from less than 1 ton/acre/year on gentle slopes (3-30 percent) to more than 50 tons/acre/year on steeper slopes (greater than 60 percent). Where the rock fragment content is greater than 50 percent, soil loss ranges from less than 0.02 tons/acre/year to greater than 10 tons/acre/year for the same slope breaks.

TOPOGRAPHY, TAR SAND, AND OTHER MINERALS

Sunnyside STSA

Bitumen impregnations occur in sandstones of the Green River formation. Concentrations and thicknesses of bitumen differ throughout the STSA. Test sites are widely spaced, and available data are scarce. Estimates for tar sand resources are based on indications of overburden depths and thicknesses. Coal deposits underlying tar sand resources occur at more than 3,000 feet below the surface. (See Volume I for detailed information concerning mining methods and estimates.)

TABLE 3-2

Water Resources Within Potential Lease Tracts

STSA	Tract	Streams/Watershed		Springs		Groundwater
		Name	Characteristics	No.	Characteristics	
Sunnyside	1	Stone Cabin Cr. Dry Creek Sheep Canyon Whitmore Canyon (Right Fork)	Tributary reaches originate on or cross tract. Sunnyside Municipal Reservoir is downstream along Whitmore Canyon.	5	Late summer flows measure from less than 1 gpm ^a to several gpm. Quality is unknown.	Recharge area and flow paths are not known.
	2	Sheep Creek Stone Cabin Cr. Dry Creek Cold Spring Draw	Some streams have perennial reaches within tracts.	2	Flows average approximately 1 gpm. Quality is unknown.	
	3	Dry Creek	No perennial reaches.	None Known		Probably not a recharge area.
	4	Dry Creek Whitmore Canyon (Right Fork)	No perennial reaches.	None Known		Some of the area may be a recharge area for local and area aquifers.
	5	Cottonwood Canyon Dry Creek	No perennial reaches.	None Known		May be a recharge area but amount would be small.
	6	Jack Creek Cottonwood Canyon Bishop Canyon	Perennial reaches in Jack Creek and Cottonwood Canyon.	4	Flows average from <1 to 4 gpm.	Recharge is most likely local.
	7	Range Creek Cottonwood Canyon Jack Creek	Sec. 13 is within the Sunnyside municipal water supply reserve. Range Creek has excellent water quality and is perennial within the tract.	None Known		
	8	Bear Canyon Range Creek	No perennial reaches.	None Known		Higher elevations are potential recharge areas.
	9	Flat Canyon Summerhouse Canyon Rock Creek	No perennial reaches.	None		May be a recharge area for all three streams.
	10	Stone Cabin Creek	No perennial reaches.	None Known		Probably not a recharge area.
	11	Dry Creek Cold Spring Draw Cottonwood Canyon	Not perennial within tract, but reaches are just outside the tract.	Sev- eral	Presently used by livestock and wildlife.	Probably a recharge area for small local springs.
	12	Rock Creek Range Creek	Not perennial within tract but Rock Creek is an average quality trout stream and Range Creek is used for irrigation, livestock, a trout fishery, and has been historically used as a culinary source for the Town of Sunnyside.		Sec. 4, T. 15 S., R. 15 E., is probably a groundwater discharge area part of the year.	Probably a recharge area for local aquifers.
Black Dragon	None in tract.	Intermittent drainages. Two off-site reservoirs occur downslope.	None			
Flint Flat	None in tract.	Intermittent drainages.	None		Same as above. Nearest well is at Hans Flat Ranger Station 12 miles north. Five gpm with 2DD feet drawdown. Slightly saline (sodium), 1,720 mg/l ^b TDS.	
Gordon Corral	None in tract	Intermittent drainages.	None		May occur in four geologic zones (Navajo-Kayenta, Wingate, White Rim, and Cedar Mesa) (Hand, 1979).	
Pariette	1-3 Wells Draw Castle Peak Draw	Both are intermittent. Pariette Draw, off the tract, is perennial and averages 25 cfs from irrigation. Return flow is slightly saline and TDS averaged 2,560 mg/l (1976-1981). State standards for boron are regularly exceeded.	None Known		BLM water filing on well (Sec. 4, T. 9 S., R. 17 E.). No quantity or quality data. Found in shallow consolidated and unconsolidated geologic deposits.	

Source: USDI, BLM and USDI, NPS, 1983.

^a gpm = gallons per minute, a measurement of flow.

^b mg/l = milligrams per liter. A measurement used in this report to classify water according to the concentration of total dissolved solids (TDS). Fresh water contains less than 1,000 mg/l of dissolved solids, slightly saline contains 1,000-3,000, moderately saline contains 3,000-10,000, very saline contains 10,000-35,000, and briny contains more than 35,000.

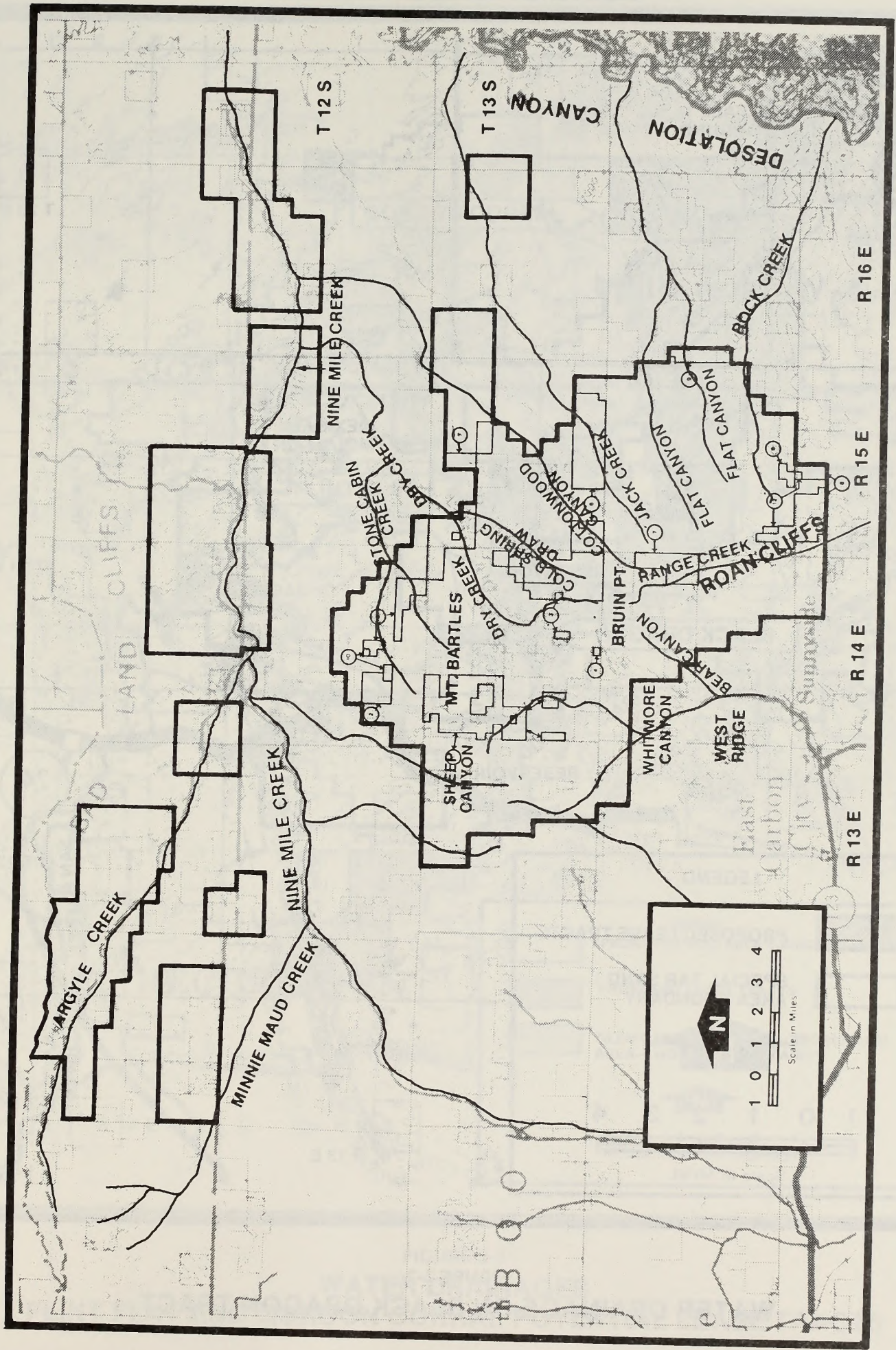


FIGURE 3-1
WATER DRAINAGE ON SUNNYSIDE TRACTS 1-12

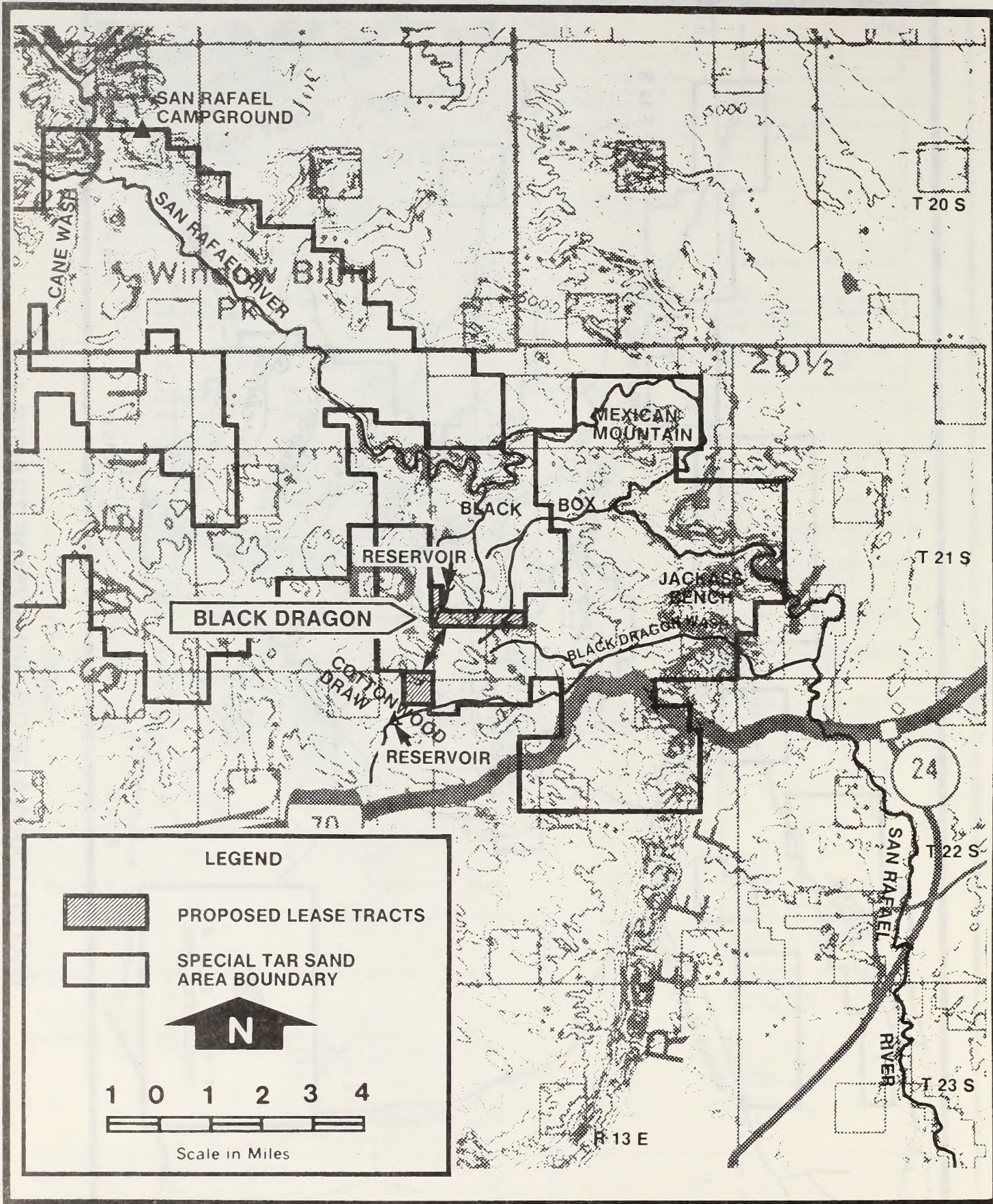


FIGURE 3-2
WATER DRAINAGE ON BLACK DRAGON TRACT

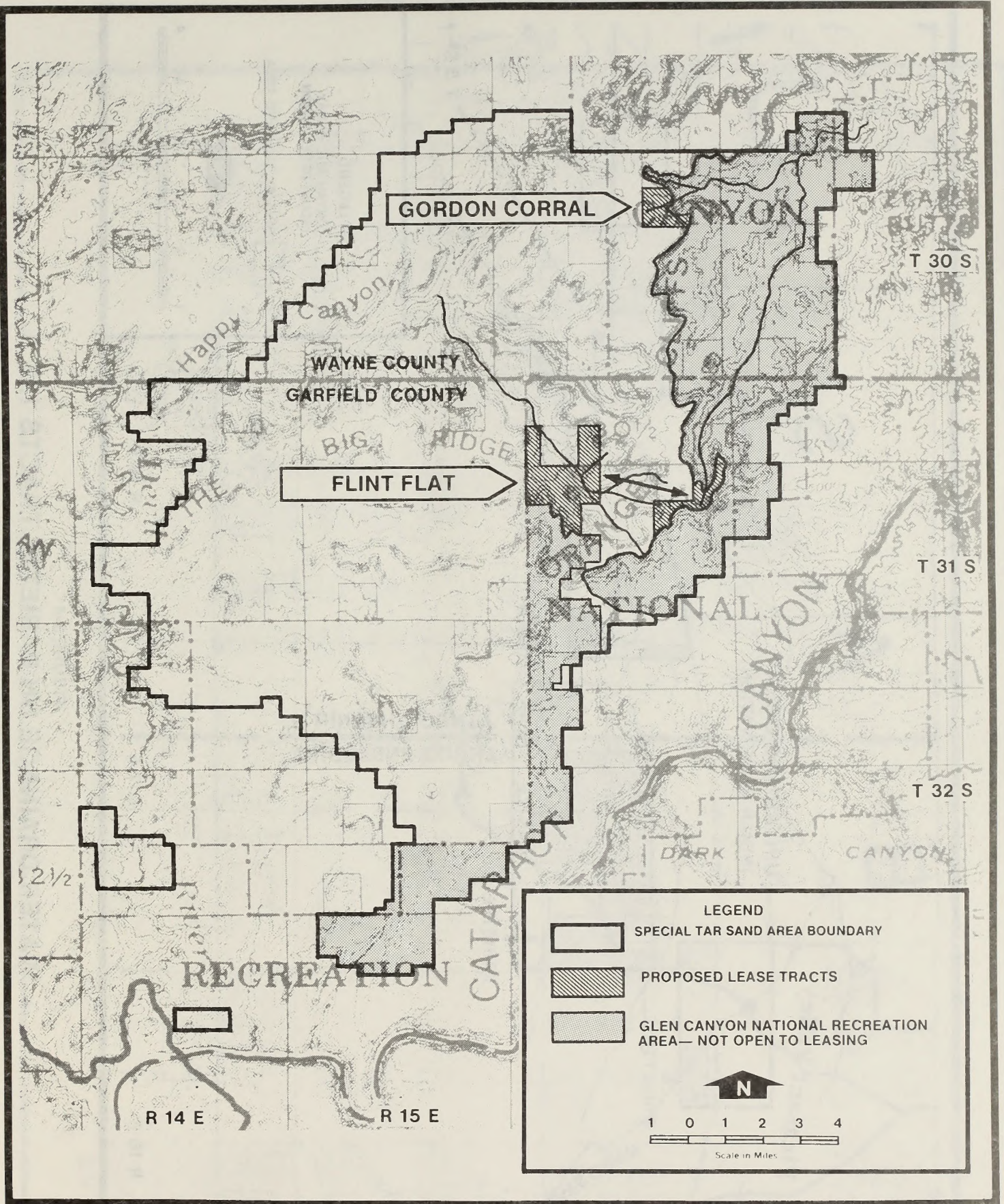


FIGURE 3-3
WATER DRAINAGES
FLINT FLAT AND GORDON CORRAL POTENTIAL LEASE TRACTS

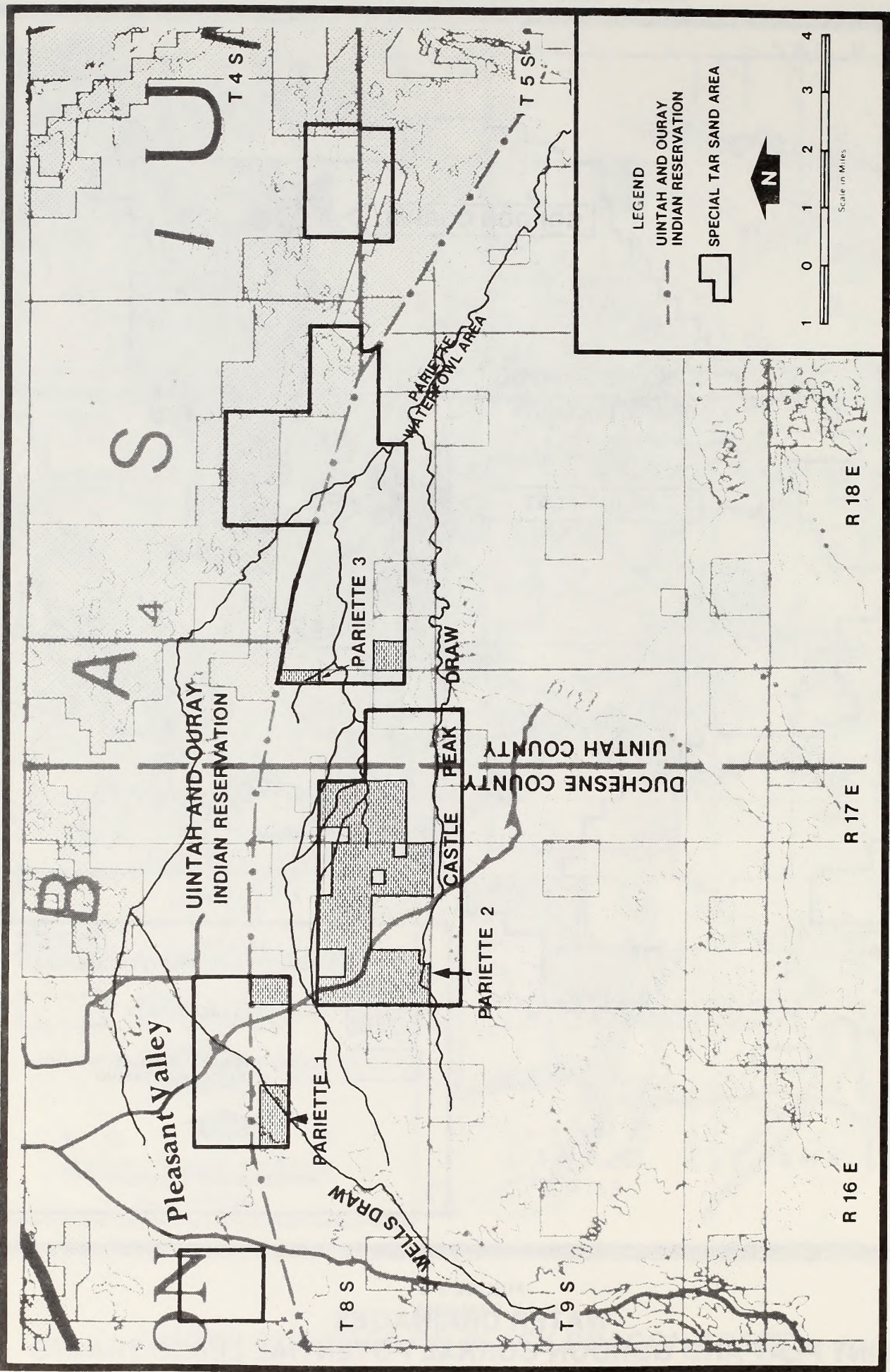


FIGURE 3-4
WATER DRAINAGE ON PARIETTE TRACTS 1, 2, 3

CHAP. 3: AFFECTED ENVIRONMENT

TABLE 3-3
Soils Within Potential Lease Tracts

ST5A	Tract	Soil Unit/Location	Formed in/ Derived From	Textures	Dominant Slopes (%)	Depth (inches)	Erosion Hazard	Estimated Sediment Yield Rates	Other Characteristics
Sunnyside	1	Benches, mesas, canyon rims, escarpments, mountain slopes, and toe slopes.	Residuum and colluvium from Ss and Sh.	L, SL	3-40	8-40	Water--moderate to high Wind--slight	^a <5 tons/ac/yr on <16% slope to >50 tons/ac/yr on <60% slope ^b <1 ton to >10 tons/ac/yr.	--
		Ridgetops, sideslopes.	Residuum and colluvium from Ss and Sh.	V gr FSL & V bldry L.	7-40	8-40	Water--moderate to high Wind--slight		
		Mountain and canyon sideslopes.	Colluvium and alluvium from Ss and Sh.	L & bldry L.	30-80	20-60	Water--moderate to high Wind--slight		
	2	Ridgetops, benches, mesas, canyon rims.	Residuum & colluvium from Ss and Sh.	L, SL	3-40	8-60	Water--moderate to high Wind--slight	^a <5 tons/ac/yr on <20% slopes to >50 tons/ac/yr on >60% slopes.	--
		Mountain slopes, sideslopes.	Residuum and colluvium from Ss and Sh.	V gr FSL V bldry L	40-70	8-60	Water--moderate to high Wind--slight	^a Same as tract 1.	
	3	Mountain sideslopes	Residuum and colluvium from Ss and Sh.	L stny, gr FSL	35-80 (3-15)	10-60 (10-20)	Water--moderate to high Wind--slight	^a <15 tons/ac/yr on <30% slopes to >50 tons/ac/yr on >60% slopes. ^b <3 tons/ac/yr to >10 tons/ac/yr.	--
		Mountain sideslopes, mountaintops.	Residuum and colluvium from Ss and Sh.	FSL, SL, gr L	35-75 1-15	10-60	Water--moderate to high Wind--slight	^a Same as tract 1 ^b Same as tract 1	--
	5	Benches, mesa tops, mesa sideslopes, canyon sideslopes, and small alluvial fans.	Residuum, colluvium, and alluvium from Ss, Sis, and Sh.	SL, gr L, stny L, Bldry L.	1-75	0->40	Water--slight to high Wind--slight	^a <1 ton/ac/yr on <3% slopes to >50 tons/ac/yr on >60% slopes. ^b <0.02 tons/ac/yr to <10 tons/ac/yr.	--
		Ridgetops, benches, canyon rims, ridge and mountain sideslopes.	Residuum, colluvium, and alluvium from Ss and Sh.	SL, FSL, L	1-80	10-60	Water--moderate to high Wind--slight	^a Same as tract 5. ^b Same as tract 5.	--
	7	Mountain and canyon sideslopes, ridge and mountaintops.	Residuum, colluvium, and alluvium from Ss, Sis, and Sh.	FSL, SiL, CL, bldry L.	1-80	20-60	Water--slight to high Wind--slight	^a Same as tract 5. ^b Same as tract 5.	--
Steep south-facing mountain slopes.		--	V stny or bldry L & FSL.	V steep	Shallow-mod deep	Water--slight to high Wind--slight	^a Same as tract 1. ^b Same as tract 1.	--	
9	North-facing slopes.	--	L & CL	Steep	Mod deep-V deep.				
	Benches, ridge lines, mountain and canyon sideslopes.	Residuum and colluvium from Ss, Sis, and Sh.	gr-extremely bldry. Silty, Clayey, and Sandy L.	1-80	9->60	Water--slight to high. Wind--slight	^a Same as tract 5. ^b <0.02 tons/ac/yr to <6 tons/ac/yr. ^c	--	
10	Ridgetops and sideslopes.	Residuum and alluvium from Ss, Sis, and Sh.	gr-extremely bldry, FSL.	8-40	10-20	Water--moderate Wind--slight	^a Same as tract 1. ^b Same as tract 1.	--	
	Sunnyside (continued)	Ridgetops, mountain canyon sideslopes.	Residuum and colluvium from Ss, Sis, and Sh.	gr-V bldry, FSL & L	3-80	10->60	Water--moderate to high Wind--slight	^a Same as tract 1. ^b Same as tract 1.	--
Sec. 4, T. 15 S., R. 15 E.		Residuum, colluvium, and alluvium from Ss, Sis, and Sh.	gr to bldry L.	40-70	16->60	Water--high Wind--slight	^a Same as tract 1 ^b Same as tract 1		
Sec. 31, T. 14 S., R. 14 E.		Residuum, colluvium, and alluvium from Ss, Sis, and Sh.	SiL, SL, FSL	3-15	35-60	Water--moderate Wind--slight			
Gordon Corral	Lithic Ustollic calciorthids on mesas along the Orange Cliffs.	--	Vcb, FSL	--	16-20	Wind--high when disturbed		Nitrogen poor, alkali affected, contains calcium carbonate.	
Flint Flat	Lithic Ustollic calciorthids on mesas along the Orange Cliffs.	--	Vcb, FSL	--	16-20	Wind--high when disturbed		Nitrogen poor, alkali affected, contains calcium carbonate.	
Black Dragon	Mesas, benches, cuetas.	Residuum, alluvium, and eolian from Ss and Sh.	L, C near or on Sh outcrops.	--	Shallow on benches & ledges. Mod deep-V deep on alluvial fans.	Water--slight to high Wind--high		Soils derived from shale having a high content of soluble salts.	
Pariette	1-3	70% of area--Motto, Muff, and Uffens. 30%--badland, rock outcrop, and minor soils.	Rolling hills, alluvial fans, benches, and terraces.	Motto=gr, SL over CL. Muff=gr, SL over SCL or CL. Uffens=gr SL over CL.	2-8	motto=Shal. muff=Mod deep uffens=V deep	Water--moderate Wind--None Water--slight Wind--moderate Water--slight Wind--moderate	Alkali affected. Reclamation potential poor on shallow soils, and poor to fair on deeper soils because of low rainfall and alkali.	

Sources: United States Department of Agriculture (USDA), Soil Conservation Service (SCS), 1979 and 1980; U.S. Department of Interior (USOI), NPS, 1977.

Note: Abbreviations: bldry = bouldery, C = clay, cb = cobbly, CL = clay loam, FSL = fine sandy loam, gr = gravelly, L = loam, SCL = sandy clay loam, Sh = shale, SiL = silt loam, Sis = siltstone, SL = sandy loam, Ss = sandstone, stny = stony, V = very.

^aEstimated sediment yield rates on bare exposed soil.

^bEstimated sediment yield rates for similar slopes where the rock fragment content is greater than 50 percent.

^cMost of Sunnyside tract 9 is less than 40-percent slope; therefore, the extreme erosion rate would only be applicable to a small area.

TRACT 1

Topography

The tract occurs on the dissected western margin of the Tavaputs Plateau. The total relief within the tract is 2,000 feet.

Tar Sand

About 2,635 acres are underlain by bitumen-impregnated rocks at depths ranging to about 500 feet between exposures at cliffs. The tar sand resource is estimated at 477 million barrels of in-place bitumen. The tract could be developed by surface-mining methods.

Other Minerals

The tract has a poor potential for oil and gas. Commercial coal occurs in Cretaceous rocks underlying the tract.

TRACT 2

Topography

The tract occurs on the dissected western margin of the Tavaputs Plateau. The total relief within the tract is 800 feet.

Tar Sand

About 2,715 acres are underlain by tar sand at depths of 100 feet or more. The estimated in-place resource is 116 million barrels. The tract could be developed with adjacent tar sand resources using surface-mining methods. There is a possibility that this tract could be developed using in-situ recovery methods.

Other Minerals

The tract has a poor potential for oil and gas. Commercial coal occurs in Cretaceous rocks underlying the tract.

TRACT 3

Topography

The tract occurs on the dissected western margin of the Tavaputs Plateau. The total relief within the tract is 800 feet.

Tar Sand

One hundred-twenty acres are underlain by tar sand, probably occurring at depths greater than 400 feet. Estimated tar sand resource is 9.5 million barrels of in-place bitumen. The tract could be developed using surface-mining methods.

Other Minerals

The tract has a poor potential for oil and gas. Commercial coal occurs in Cretaceous rocks underlying the tract.

TRACT 4

Topography

The tract occurs on the dissected western margin of the Tavaputs Plateau. The total relief within the tract is 500 feet.

Tar Sand

Forty acres are underlain by tar sand, probably existing at depths greater than 400 feet. Estimated tar sand resource is 11.6 million barrels of in-place bitumen. The tract could be developed with adjacent tar sand resources by use of surface-mining methods.

Other Minerals

The tract has a poor potential for oil and gas. Commercial coal occurs in Cretaceous rocks underlying the tract.

TRACT 5

Topography

The tract occurs on the dissected western margin of the Tavaputs Plateau. The total relief within the tract is 200 feet.

Tar Sand

Six hundred-forty acres are underlain by tar sand, probably occurring at depths greater than 600 feet. Estimated tar sand resource is 21.8 million barrels of in-place bitumen. The tract could be developed using in-situ methods.

Other Minerals

The tract has a poor potential for oil and gas. Commercial coal occurs in Cretaceous rocks underlying the tract.

TRACT 6

Topography

The tract occurs on the dissected western margin of the Tavaputs Plateau. The total relief within the tract is 350 feet.

Tar Sand

About 2,493 acres are underlain by tar sand, probably existing at depths greater than 600 feet. Estimated tar sand resource is 128 million barrels of in-place bitumen. The tract could be developed using in-situ methods.

Other Minerals

The tract has a poor potential for oil and gas. Commercial coal occurs in Cretaceous rocks underlying the tract.

TRACT 7

Topography

The tract occurs on the dissected western margin of the Tavaputs Plateau. The total relief within the tract is 1,100 feet.

Tar Sand

About 840 acres are underlain by tar sand, probably occurring at depths greater than 275 feet. Estimated tar sand resource is 36 million barrels of in-place bitumen. The tract could be developed using in-situ or surface-mining methods.

Other Minerals

The tract has a poor potential for oil and gas. Commercial coal occurs in Cretaceous rocks underlying the tract.

TRACT 8

Topography

The tract occurs on the dissected western margin of the Tavaputs Plateau. The total relief within the tract is 1,600 feet.

Tar Sand

About 1,764 acres are thought to be underlain by tar sand resources existing at depths greater than 700 feet. Estimated tar sand resource is 108 million barrels of in-place bitumen. The tract could be developed using either in-situ or surface-mining methods.

Other Minerals

The tract has a poor potential for oil and gas. Commercial coal occurs in Cretaceous rocks underlying the tract.

TRACT 9

Topography

The tract occurs on the dissected western margin of the Tavaputs Plateau. The total relief within the tract is 600 feet.

Tar Sand

About 596 acres are underlain by tar sand resources occurring at depths greater than 500 feet. Estimated tar sand resource is 24.4 million barrels of in-place bitumen. The tract could be developed by in-situ or surface-mining methods.

Other Minerals

The tract has a poor potential for oil and gas. Commercial coal occurs in Cretaceous rocks underlying the tract.

TRACTS 10, 11, AND 12

Topography

These tracts all occur in the dissected western margin of the Tavaputs Plateau. Total reliefs within these tracts are as follows: tract 10--600 feet; tract 11--1,000 feet; and tract 12--50 feet.

Tar Sand

The Federal government does not own the tar sand resources on these tracts; if considered for leasing, they would be offered for only oil and gas.

Other Minerals

These tracts have a poor potential for oil and gas. Commercial coal could occur in Cretaceous rocks underlying these tracts.

Tar Sand Triangle STSA

The principal bitumen impregnations occur in the White Rim sandstone member of the Cutler formation of Permian age. The estimated thickness and concentration of bitumen vary considerably throughout the STSA. Because of the limited data available, the quantities of in-place bitumen are

estimated. The tracts within this STSA (Gordon Corral and Flint Flat) would be developed by in-situ methods.

FLINT FLAT TRACT

Topography

The tract occurs on a dissected plateau and is incised by Happy Canyon.

Tar Sand

The bitumen-impregnated sandstone occurs at about 1,300 feet. The rocks dip west to northwest at 1° to 3°. The tar sand resource is estimated at 49 million barrels of in-place bitumen. For further information, refer to the *Unit Plan of Operation for Tar Sand Triangle Combined Hydrocarbon Lease Conversion Draft EIS* (USDI, NPS, 1983).

Other Minerals

The tract has a poor potential for oil and gas. Uranium could occur locally in the Shinarump conglomerate, which is located above the bitumen-impregnated rock.

GORDON CORRAL TRACT

Topography

The tract occurs on a nearly level part of a large, dissected plateau.

Tar Sand

The bitumen-impregnated sandstone occurs at about 1,300 feet. The rocks dip west to northwest at 1° to 3°. The tar sand resource is estimated at 8.8 million barrels of in-place bitumen. For further information, refer to the *Unit Plan of Operation for Tar Sand Triangle Combined Hydrocarbon Lease Conversion Draft EIS* (USDI, NPS, 1983).

Other Minerals

The tract has a poor potential for oil and gas. Uranium could occur locally in the Shinarump conglomerate, which is located above the bitumen-impregnated rock.

San Rafael Swell STSA

BLACK DRAGON TRACT

Topography

The tract occurs on mesas that extend about 200 feet above the sloping flats formed on the Kaibab limestone.

Tar Sand

Bitumen-impregnated sandstones occur in the Black Dragon member of the Moenkopi formation. The tar sand resource is estimated at 5.1 million barrels of bitumen. Concentrations are relatively small (i.e., 20-30 feet thick) within the tract, and occur in two separate locations. The overburden is thick, and it could be difficult to surface mine; also, areas underlain by tar sand could be too thin for

practical use of in-situ methods.

Other Minerals

This tract has a poor potential for oil and gas. No other minerals are known to occur in the formations underlying the tract.

Pariette STSA

PARIETTE TRACTS 1, 2, AND 3

Topography

These tracts occur on a dissected plain which has mesas and buttes with a relief of about 200 feet.

Tar Sand

Bitumen impregnations occur in stream channel deposits of the fluvial sediments of the Uinta formation of Tertiary age. Data are limited (Ritzma, 1979) and do not describe the areal distribution of tar sand within the STSA. Available data are insufficient to determine whether any of the tracts are actually underlain by bitumen impregnations.

Other Minerals

Oil and gas wells adjacent to these tracts are on 40-acre spacing and have had a 97-percent success rate. Although the known geologic structure (KGS) (see Glossary) does not extend into potential lease tracts, the STSA is chiefly valuable for oil and gas. Oil shale in the Green River formation underlies the tar sand, which occurs in the Uinta formation. However, the oil shale probably contains too small a concentration of kerogen to be of commercial interest in the foreseeable future.

VEGETATION

General

Vegetation within potential lease tracts is characteristic of the Uinta Basin and Canyonlands sections of the Intermountain region.

SUNNYSIDE TRACTS 1-12

These tracts are located on the Tavaputs Plateau or Book Cliffs within the Uinta Basin floristic section. Vegetation on these 12 tracts (14,813 acres) is about 44 percent sagebrush-grass, 18 percent pinyon-juniper, 14 percent spruce fir-mountain shrub, and 24 percent aspen. Vegetation of this type and composition is typical at mid to upper elevations in the Book Cliffs.

BLACK DRAGON TRACT

This tract is located in the Canyonlands floristic section. Vegetation is about 9 percent pinyon-juniper, 41 percent shadscale-grass, 31 percent grass, and 19 percent barren talus. These vegetation types are common throughout

most of the San Rafael and Castle Valley areas.

FLINT FLAT AND GORDON CORRAL TRACTS

These tracts are located in the Canyonlands floristic section. Vegetation on both these tracts is typical of the slickrock, sand substrate areas of the Colorado Plateau. Vegetation is predominantly pinyon-juniper, Mormon tea, blackbrush, galleta grass, blue grama, and Indian ricegrass.

PARIETTE TRACTS 1-3

These tracts are vegetated with low-growing shadscale, horsebrush, little rabbitbrush, galleta grass, and cheat-grass. This type of vegetation is widespread and typical of lower elevation areas in the Uinta Basin.

Threatened, Endangered, and Sensitive Plant Species

Appendix 4 lists all threatened, endangered, and sensitive plant species known to occur within STSAs.

SUNNYSIDE STSA

The Fish and Wildlife Service (FWS) advises that the Federally listed threatened plant species *Sclerocactus glaucus* (Uinta Basin hookless cactus) and the sensitive plant species *Hedysaurum occidentale* var. *canone* and *Festuca dasyclada* may occur within the Sunnyside STSA. However, their occurrence has not been documented.

SAN RAFAEL SWELL STSA

BLM land use plans document the occurrence of the Federally listed endangered plant species *Sclerocactus wrightiae* (Wright's fishhook cactus) and the sensitive plant species *Astragalus rafaensis*, *Cryptantha jonesiana*, *Cryptantha jonstonii*, *Gaillardia flava*, and *Psoralea polyadenia* var. *jonesii*. The FWS advises that the sensitive plant species *Pedidactus despainii*, *Hymenoxys depressa*, *Asclepias ruthiae*, *Cycladenia humilis* var. *jonesii*, *Erogon maguirei*, and *Phacelia indecora* may occur within this STSA (see Appendix 4). However, their occurrence has not been documented. The FWS presently has sufficient information on sensitive plant species to support their biological appropriateness of being listed as threatened or endangered.

TAR SAND TRIANGLE STSA

The FWS advises that the Federally listed endangered plant species *Sclerocactus wrightii* (Wright's fishhook cactus) and the sensitive plant species *Eriogonum smithii*, *Astragalus monumentalis*, *Cycladenia humilis* var. *jonesii*, *Astragalus rafaensis*, and *Phacelia indecora* may occur within this STSA (see Appendix 4). However, the presence of these species has not been documented.

The plant species *Astragalus nidularis* occurs on Flint

Flat tract and may be sensitive; however, it is currently not a candidate species for listing as threatened or endangered. The FWS has placed this plant with those plants proven to be more abundant or widespread than was previously believed and/or plants not subject to any identifiable threat (USDI, FWS, 1983).

PARIETTE STSA

BLM land use plans document the occurrence of the Federally listed threatened plant species *Sclerocactus glaucus* (Uinta Basin hookless cactus) within this STSA. This plant is most likely to occur on dry, gravelly soils on hills and benches near Pariette Draw. No other threatened, endangered, or sensitive species have been documented.

ANIMAL LIFE

Terrestrial Animals

SUNNYSIDE TRACTS 1-12

Big Game

MULE DEER: All 12 Sunnyside tracts lie within the Utah Division of Wildlife Resources (UDWR) mule deer herd unit 27B. Summer range is believed to be a limiting factor for mule deer in this herd unit, and these tracts include 10,954 acres of this range. There are approximately 3,500 acres of crucial winter deer range (see Glossary) within Sunnyside tracts 2, 5, and 6. (Distribution of crucial deer habitat is shown for each of the potential lease tracts in Table 3-4.)

Mule deer populations for this herd unit are presently below prior stable levels of the 1960s; however, the population appears to be increasing. The current deer population for herd unit 27B is estimated at 11,400 animals (Dalton, 1982).

ELK: All 12 Sunnyside tracts lie within the Range Creek elk herd unit. Summer range is believed to be a limiting factor for elk in this herd unit, and approximately 10,954 acres of crucial elk summer range occur on these tracts (see Table 3-4). There are also approximately 3,500 acres of crucial winter elk range within Sunnyside tracts 2, 5, and 6. Elk in the Range Creek herd unit are becoming reestablished after being absent since the early 1900s. The Range Creek elk herd population is estimated at 40 to 60 animals.

Small Game

Important small game mammals present in all 12 Sunnyside tracts, as identified by UDWR, include the black bear and mountain lion. Both of these species are considered common residents and are seen periodically. It is estimated that there are fewer than 50 mountain lion and black bear in these tracts. There are approximately 14,450 acres of habitat for these species on these 12 lease tracts. Distribution of these acres is shown by tract in Table 3-4.

Upland Game

SAGE GROUSE: With the exception of Sunnyside tract 4, these tracts have approximately 6,800 acres of yearlong sage grouse habitat. In addition, tracts 6, 8, 9, and 12 contain approximately 1,850 acres of nesting habitat, and tracts 6 and 9 contain two known strutting ground areas. However, a comprehensive inventory on these tracts has not been completed, and it is possible that there are additional strutting areas. Distribution of these acres is shown by tract in Table 3-4. Census data for sage grouse populations within these tracts are insufficient to determine exact population levels or trends. It is estimated that there are fewer than 200 birds in this area, and limited census data do show that sage grouse populations in Carbon County are declining. Therefore, all sage grouse hunting in Carbon County has been discontinued until populations stabilize.

Threatened, Endangered, and Sensitive Animal Species

The only Federally listed endangered species that may occur within the Sunnyside tracts are the northern bald eagle, peregrine falcon, and black-footed ferret (see Appendix 4). There are no officially designated critical habitats (as defined by the Endangered Species Act), concentration use areas, or nest sites on any of the tracts. The golden eagle, a sensitive species, is a yearlong resident on all Sunnyside tracts (USDI, BLM and USDI, NPS, 1983). However, because a nesting inventory of these tracts has never been conducted, no known active golden eagle nests have been located.

The FWS advises that the following candidate species may occur within the STSA: the long-billed curlew, the ferruginous hawk, and the spotted bat (see Appendix 4). The occurrence of these species within the STSA has not been documented.

Unique and Limited High-Value Wildlife Habitat

ASPEN COMMUNITIES: Aspen provides important habitat for an exceptionally large diversity of wildlife species, particularly nongame birds. Aspen is also valuable for providing forage and cover for big game species during summer and fall (Julander et al., 1965). When combined, all Sunnyside tracts contain 3,517 acres (about 14 percent) of the aspen in the Sunnyside STSA (see Table 3-4). About 25,000 acres of relatively pure aspen stands occur in the STSA, along with many intermixed aspen stands.

RIPARIAN HABITAT: A combination of available water, lush vegetation, diversified cover types, microclimate, increased edge effect, and generally accessible terrain make riparian communities extremely valuable wildlife habitat (Thomas et al., 1979). Six of the Sunnyside lease tracts contain a total of 7 miles of this high-value limited habitat. Table 3-4 identifies these tracts and gives riparian mileage figures for each. Assuming an average width of 100 feet of riparian habitat for each mile of stream, each mile contains 12.4 acres of riparian habitat.

RAPTOR HABITAT: All 12 Sunnyside tracts contain suitable yearlong habitat for numerous raptor species, such

CHAP. 3: AFFECTED ENVIRONMENT

TABLE 3-4

Significant Wildlife Resources Within Potential Lease Tracts

Potential Lease Tract	Total Acreage	Crucial Oer Habitat (Acres) ^a	Crucial Elk Habitat (Acres) ^a	Threatened, Endangered and Sensitive Species	Riparian Habitat (miles)	Sage Grouse Habitat (Acres) ^b	High-Value Aspen Habitat (Acres)	Small Game Habitat (Acres) ^c	Yearlong Raptor Habitat (Acres)	Bighorn Sheep Habitat (Acres)	Antelope Habitat (Acres)
Sunnyside 1	3,202	3,202 (S)	3,202 (S)	Black-footed Ferret, Peregrine, Bald Eagle, & Golden Eagle	1.25	1,600 YL	1,402	3,202	3,202		
Sunnyside 2	2,716	1,000 (S) 1,356 (W)	1,000 (S) 1,356 (W)	Black-footed Ferret, Peregrine, Bald Eagle, & Golden Eagle	1.50	1,300 YL	25	2,356	2,716		
Sunnyside 3	120	120 (S)	120 (S)	Black-footed Ferret, Peregrine, Bald Eagle, & Golden Eagle	0.25	20 YL	80	120	120		
Sunnyside 4	40	40 (S)	40 (S)	Black-footed Ferret, Peregrine, Bald Eagle, & Golden Eagle			2	40	40		
Sunnyside 5	640	320 (S) 320 (W)	320 (S) 320 (W)	Black-footed Ferret, Peregrine, Bald Eagle, & Golden Eagle		40 YL	0	640	640		
Sunnyside 6	2,494	671 (S) 1,823 (W)	671 (S) 1,823 (W)	Black-footed Ferret, Peregrine, Bald Eagle, & Golden Eagle	2.50	1,018 N 1 SG	530	2,494	2,494		
Sunnyside 7	960	960 (S)	960 (S)	Black-footed Ferret, Peregrine, Bald Eagle, & Golden Eagle	1.00	320 YL	190	960	960		
Sunnyside 8	1,764	1,764 (S)	1,764 (S)	Black-footed Ferret, Peregrine, Bald Eagle, & Golden Eagle		660 YL 160 N	513	1,764	1,764		
Sunnyside 9	596	596 (S)	596 (S)	Black-footed Ferret, Peregrine, Bald Eagle, & Golden Eagle	0.50	596 YL 1 SG 556 N	25	596	596		
Sunnyside 10	120	120 (S)	120 (S)	Black-footed Ferret, Peregrine, Bald Eagle, & Golden Eagle		120 YL	0	120	120		
Sunnyside 11	2,040	2,040 (S)	2,040 (S)	Black-footed Ferret, Peregrine, Bald Eagle, & Golden Eagle		2,040 YL	715	2,040	2,040		
Sunnyside 12	121	121 (S)	121 (S)	Black-footed Ferret, Peregrine, Bald Eagle, & Golden Eagle		121 YL 121 N	35	121	121		
Black Oregon	879			Black-footed Ferret				879	879		
Flint Flat	2,684			Black-footed Ferret and Peregrine Falcon				2,684	2,684	2,684 ^d	
Gordon Corral	485			Black-footed Ferret and Peregrine Falcon				485	485		
Pariette 1	513			Bald Eagle and Black-footed Ferret					513		513 ^d
Pariette 2	3,823			Bald Eagle and Black-footed Ferret					3,823		3,823 ^d
Pariette 3	277			Bald Eagle and Black-footed Ferret					277		277 ^d
Totals	23,474	10,954(S) 3,499(W)	10,954 (S) 3,494 (W)		7.0	6,817 (YL) 1,855 (N) 2 (SG)	3,517	18,501	23,474	2,684 ^d	4,613 ^d

Source: USOI, FWS, 1983.

^aS = Summer
W = Winter.

^bN = Nesting
YL = Yearlong
SG = Strutting Ground.

^cBlack bear and/or mountain lion.

^dNot considered crucial habitat.

as red-tailed hawks, goshawks, sharp-skinned hawks, and rough-legged hawks (USDI, BLM and USDI, NPS, 1983). Distribution of this habitat is shown by tract in Table 3-4.

BLACK DRAGON TRACT

Big Game

There is no crucial big game habitat within the tract, although a few mule deer may inhabit this area.

Small Game

The only important small game mammal, as defined by UDWR, is the mountain lion. This tract contains approximately 879 acres of suitable habitat for this species.

Threatened, Endangered, and Sensitive Animal Species

The only Federally listed endangered species that may occur within the Black Dragon tract is the black-footed ferret. There is no officially designated critical habitat (as defined by the Endangered Species Act) for this species on the Black Dragon tract. In addition, there are no known concentration use areas or nest sites for any sensitive species.

The FWS advises that the following candidate species may occur within the STSA: the long-billed curlew, the ferruginous hawk, and the spotted bat (see Appendix 4). The occurrence of these species within the STSA has not been documented.

Upland Game

There are no upland game species in this tract.

Unique and Limited High-Value Wildlife Habitat

RAPTOR HABITAT: The Black Dragon tract contains 879 acres of suitable yearlong habitat for numerous raptor species such as prairie falcons, red-tailed hawks, and rough-legged hawks (USDI, BLM and USDI, NPS, 1983).

FLINT FLAT TRACT

Big Game

This tract contains limited-value desert bighorn sheep habitat.

Small Game

The only important small game mammal, as defined by UDWR, is the mountain lion. This tract contains approximately 2,684 acres of suitable habitat for this species.

Upland Game

There are no important upland game species in this tract.

Threatened, Endangered, and Sensitive Animal Species

The only Federally listed endangered species that may occur within the Flint Flat tract are the black-footed ferret and peregrine falcon. There are no officially designated critical habitats (as defined by the Endangered Species

Act), known concentration use areas, or nest sites for any threatened, endangered, or sensitive species on the Flint Flat tract.

The FWS advises that the following candidate species may occur within the STSA: the ferruginous hawk and the spotted bat (see Appendix 4). The occurrence of these species within the STSA has not been documented.

Unique and/or Limited High-Value Wildlife Habitat

RAPTOR HABITAT: The Flint Flat tract contains 2,684 acres of suitable yearlong habitat for numerous raptor species such as red-tailed and rough-legged hawks.

GORDON CORRAL TRACT

Big Game

This tract contains limited-value desert bighorn sheep habitat.

Small Game

The only important small game mammal, as defined by UDWR, is the mountain lion. This tract contains approximately 485 acres of suitable habitat for this species.

Upland Game

There are no important upland game species in this tract.

Threatened, Endangered, and Sensitive Animal Species

The only Federally listed endangered species that may occur within the Gordon Corral tract are the black-footed ferret and peregrine falcon. There are no officially designated critical habitats (as defined by the Endangered Species Act), known concentration use areas, or nest sites for any threatened, endangered, or sensitive species on the Gordon Corral tract.

The FWS advises that the following candidate species may occur within the STSA: the ferruginous hawk and the spotted bat (see Appendix 4). The occurrence of these species within the STSA has not been documented.

Unique and/or Limited High-Value Wildlife Habitat

RAPTOR HABITAT: The Gordon Corral tract contains 485 acres of suitable yearlong habitat for numerous raptor species, including owls and hawks.

PARIETTE TRACTS 1-3

Big Game

ANTELOPE: These tracts lie within Antelope herd unit 8 and provide limited-value antelope habitat. It is estimated that this habitat supports less than 20 animals.

Small Game

WATERFOWL: These tracts contain approximately 80 acres of waterfowl habitat.

Threatened, Endangered, and Sensitive Animal Species

The only Federally listed threatened or endangered spe-

cies that may occur in the Pariette tracts are the northern bald eagle and black-footed ferret (see Appendix 4). There are no officially designated critical habitats (as defined by the Endangered Species Act), known concentration use areas, or nest sites for any threatened, endangered, or sensitive species on the Pariette tracts.

The FWS advises that the following candidate species may occur within the STSA: the western yellow-billed cuckoo, mountain plover, white-faced ibis, Swainson's hawk, ferruginous hawk, and long-billed curlew (see Appendix 4). The occurrence of these species within the STSA has not been documented.

Upland Game

There are no important upland game species on this tract.

Unique and/or Limited High-Value Wildlife Habitat

RAPTOR HABITAT: The Pariette tracts contain 4,613 acres of suitable yearlong habitat for numerous raptors. Distribution of this habitat is shown by tract in Table 3-4.

Aquatic Species

SUNNYSIDE STSA

Only Range Creek, located in tract 7, and Rock Creek, located near tract 8, sustain trout fisheries. Three creeks (i.e., Left Fork of Dry Creek, tract 3; and Dry and Cottonwood creeks, adjacent to tract 11) are recognized as potential cold-water fisheries.

Fishery habitat is inventoried and classified on a state-wide basis by UDWR using the following four criteria: physical inventory, aesthetics, availability, and productivity. Based on the numerical ratings given for each criterion, a class value of I to VI is assigned, with Class I being the top quality fishing waters of the state. Class III streams comprise approximately half of the total stream fishery habitat in Utah and support the bulk of stream fishing pressure. Range Creek is rated as a Class III-B fishery with B indicating reproductive and nursery habitats for rainbow, brown, and cutthroat trout. Range Creek flows for a total of 14.25 miles, 2.25 on public land and 12 on private land within the STSA; however, only the upper reaches cross a portion of Sunnyside tract 7.

Rock Creek is rated as a Class III-B fishery for rainbow and cutthroat trout. This stream flows for a total of 29.25 miles, 25.75 on public land, 2.25 miles on State land, and 1.25 miles on private land within the STSA, but only the Rock Creek watershed is located in Sunnyside tract 8. UDWR has not inventoried or classified Dry Creek, Left Fork of Dry Creek, and Cottonwood Creek for fishery habitat.

Threatened, Endangered, and Sensitive Aquatic Species

SUNNYSIDE, SAN RAFAEL SWELL, AND PARIETTE STSAS: Colorado squawfish and humpback

chub, two endangered species, and the razorback sucker, a sensitive species, inhabit the Green River. This river is the major receiving drainage for all streams in the Sunnyside, San Rafael Swell, and Pariette STSAs and provides important reproductive and nursery habitat for all three species.

TAR SAND TRIANGLE STSA: Dirty Devil and Colorado rivers, located near Gordon Corral and Flint Flat tracts, also provide habitat for the endangered Colorado squawfish and sensitive razorback sucker.

Wild and Free-Roaming Horses and Burros

SUNNYSIDE TRACTS 2, 5, 6, and 11

These tracts fall within an area identified as important range for 25 to 30 wild horses.

BLACK DRAGON TRACT

A herd of 10 to 15 wild burros also frequent the Black Dragon tract. Because these areas were used by free-roaming horses or burros prior to December 15, 1971, they are designated as specific ranges and herd management areas by BLM.

RECREATION

No developed recreational facilities occur within any of the tracts; however, most tracts provide undeveloped dispersed recreational opportunities. Recreational opportunities for all potential lease tracts are shown in Table 3-5.

Sunnyside Tracts 1-12

Recreation constitutes one of the primary land uses in the Roan Cliffs/Tavaputs Plateau area, which encompasses the Sunnyside tracts. The area is popular for hunting black beär, mountain lion, grouse, and other small game species and mule deer. Numerous sightseers are drawn to the area by the exceptional scenery, which constitutes one of the primary recreational values. Numerous primitive, undeveloped campsites are used yearlong, especially during the hunting season. The area is also popular for picnicking and hiking. In the winter, snowmobiling and cross-country skiing are popular. However, the rugged terrain limits recreational use of some areas and generally restricts off-road vehicles (ORVs) to existing roads and trails. Also, portions or all of the surface ownership in some tracts are in private ownership and may be closed to public access/recreational use. Sunnyside tracts possessing special recreational values and/or uses are described below.

Tract 1: Mount Bartles provides excellent vistas of the Price River Valley and the West Tavaputs Plateau.

Tract 4: This tract is part of Bruin Point, which provides excellent vistas of Tavaputs Plateau, Price River Valley, and the San Rafael Swell. It is also a popular camping/picnicking area.

TABLE 3-5

Recreational Opportunities Within Potential Lease Tracts

Potential Lease Tract	Sightseeing ^a	Camping (C)/ Picnicking (P)	Hiking (H)/ Backpacking (B)	Hunting ^b	Winter Sports	ORV Use	Horseback Riding	Estimated Annual Visits
Sunnyside Tract 1	Gen ^g , S ^h , Z	C	H	B, D, S	Cross-country skiing, snowmobiling	Jeep trails	Pack trail	<500
2	Gen ^g	C	H	B, D, S	Cross-country skiing, snowmobiling	Dirt road	Limited	<500
3	Gen ^g			B, D, S				Unknown (slight on tract)
4	Gen ^g , S ^j	C, P	H	D, S				1,000
5				B, D, S	Cross-country skiing, snowmobiling			<200
6	Gen, Z ^k			B, D, S	Cross-country skiing, snowmobiling	Dirt roads		<500
7	Gen ^g	C, P	H	B, F, D, S	Cross-country skiing, snowmobiling	Jeep trails	Generally hunting-related	1,000
8	Gen ^l	C, P	H	B, D, S	Cross-country skiing	Jeep trails	Generally hunting-related	1,000
9 ^f			H	B, D, S ^m	Cross-country skiing, snowmobiling	Dirt roads		Unknown
10 ^f				B, D, S ^m	Cross-country skiing, snowmobiling			<500
11 ^f	Z ^k			B, D, S	Cross-country skiing, snowmobiling	Jeep trails, dirt roads		<500
12 ^f	Gen ^g	C, P		B, D, S	Cross-country skiing, snowmobiling			1,000
Black Dragon	G ^e							Unknown (slight on tract)
Flint Flat	G, S		H, B			Primitive trails and dirt roads	Limited	Unknown (limited on tract)
Gordon Corral	G, S		H, B			Primitive trails and dirt roads	Limited	Unknown (limited on tract)
Pariette Tract 1	B ^c , Z			A, S		Slight		Unknown (limited on tract)
2	B ^c , C ^d , Z			A, S		Slight		Unknown (limited on tract)
3	B ^c , Z			A, S		Slight		Unknown (limited on tract)

Source: USOI, BLM and USOI, NPS, 1983.

^aB = Botanical
 C = Cultural
 G = Geological
 Gen = General
 S = Scenic Overlook
 Z = Zoological

^bA = Antelope
 B = Black bear and mountain lion
 D = Mule deer
 F = Fishing
 G = Grouse (blue, ruffed, or sage)
 S = Other small game.

^cWildflowers in spring.^dGilsonite mines.^eExceptional bench/butte scenery visible from I-70.^fMost or all of the surface is in private ownership; therefore, public access could be denied on some portion or all of the tract.^gHigh scenic qualities.^hOverlook on Mt. Bartles and western portion visible from U.S. Highway 6 (4,325 ADT).ⁱSteep slopes limit on-site use.^jPart of Bruin Point, which receives an estimated 1,000 visits per year.^kBig game animals, wild horses, and wild burros.^lExceptional scenery, some portions visible from the Price River Valley (background visual distance zone) in addition to numerous visitors to the Tavaputs Plateau.^mHunting is the primary use.ⁿIncludes ranch and commercial outfitter/hunting guide service visits.

Tracts 7, 8, and 12: The access road to two commercial hunting lodges near the head of Rock Creek passes through these tracts. These tracts are highly scenic and provide popular areas for camping, especially during the hunting season.

Black Dragon Tract

There is no significant recreational use within this tract. Portions of this tract are visible from Interstate 70 (I-70) and constitute part of the scenic corridor. Average daily traffic (ADT) is 1,620 vehicles (USDI, BLM and USDI, NPS, 1983).

Gordon Corral and Flint Flat Tracts

Recreation constitutes the predominant land use in both these tracts, which are located within the Glen Canyon National Recreation Area (NRA). Most use occurs in the late spring, early summer, and fall when temperatures are moderate and insect populations are low. Because the tracts are in the Glen Canyon NRA Recreation and Resource Utilization (RRU) Zone (see Glossary), recreational opportunities range from primitive/backcountry activities to ORV use on existing dirt roads and primitive trails. The road from the Hans Flat Ranger Station to Flint Trail is a principal access route to the backcountry west of the Green and Colorado rivers within Canyonlands National Park. This road passes within 0.5 mile of both tracts. Other recreational uses of the area include sightseeing, hiking, and horseback riding.

Pariette Tracts 1-3

Very little recreation use occurs in the area; however, the principal recreational use for these tracts is hunting for antelope and small game (i.e., rabbits). Five to 15 buck antelope permits have been issued annually for the herd unit which includes, but is not limited to, these tracts. This accounts for an estimated 48 hunter days each year (USDI, BLM, 1980). Driving for pleasure/sightseeing is the second most popular activity: antelope and abandoned gilsonite mines draw some visitors. The route to the Pariette Draw Waterfowl Area passes through tract 2. Other recreational activities include a slight amount of ORV use.

WILDERNESS

Under provisions of Section 603(c) of the Federal Land Policy and Management Act of 1976 (FLPMA), all public lands were inventoried to determine which lands possessed wilderness characteristics, as specified in the Wilderness Act of 1964. Those lands which met the criteria have been designated as Wilderness Study Areas (WSAs). Criteria are that the area: (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or primitive and unconfined types of recreation; (3) has at least 5,000 acres of land or is of

sufficient size to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical values.

The wilderness study phase, now in progress, will determine the suitability of each WSA for addition to the National Wilderness Preservation System (NWPS). In Utah, study findings for all WSAs on public lands will be published in one EIS. That EIS is scheduled for completion during 1984. Based on the findings and public comments for that EIS, the BLM State Director will make recommendations on each WSA. Congress will decide which WSAs will be designated for addition to the NWPS.

In accordance with the Wilderness Act of 1964, NPS lands in Glen Canyon NRA and Capitol Reef National Park were surveyed, and qualifying areas have been proposed for addition to the NWPS. The Glen Canyon NRA proposed wilderness areas include lands which are scenically outstanding, relatively undisturbed, isolated, and remote from the activities of man, or bordering areas with complimentary land-use practices. Management of these areas generally conforms to the BLM's Interim Management Policy (IMP) to protect the wilderness values present.

Sunnyside tracts 5-9, 11, and 12 are within 1 to 6 miles of Desolation Canyon WSA. Tract 9 is adjacent to the Desolation Canyon WSA. Mexican Mountain WSA is located about 0.25 mile from the Black Dragon tract. Gordon Corral and Flint Flat tracts are within 1 and 1.3 miles, respectively, of the French Spring/Happy Canyon WSA. The Orange Cliffs and the area east of these cliffs are also proposed as wilderness by NPS. This area is contiguous to Gordon Corral and Flint Flat tracts.

VISUAL RESOURCES

Generally, potential lease tracts are in areas with high scenic values which constitute, in many cases, a prime recreational appeal. For management purposes, public and private lands were inventoried in accordance with BLM Manual 8400. Based on scenic quality, visual sensitivity, and visual distance zone (see Glossary), these areas were assigned visual resource management (VRM) classes. Table 3-6 lists VRM classes for BLM and private lands.

VRM classes specify the objectives for managing the visual resources (i.e., objectives for limiting the amount of contrast created by development/management activities) and provide a basis for land-use planning decisions. The management objectives for each class are as follows: *Class II:* Management activities/modifications of the environment should not be evident in the characteristic landscape. Changes may be visible but should not attract attention. *Class III:* Changes caused by management activities may be evident but should remain subordinate to the existing landscape. *Class IV:* Changes may attract attention and be dominant landscape features but should reflect the basic elements (form, line, color, and texture) of the existing landscape.

CHAP. 3: AFFECTED ENVIRONMENT

TABLE 3-6

VRM Classes for Potential Lease Tracts

Potential Lease Tract	Approximate Acreage		
	Class II	Class III	Class IV
Sunnyside Tract 1 ^a			
2	2,037	543	136
3	120		
4	40		
5		128	512
6		2,120	375
7	576	384	
8	1,764		
9	60		536
10		120	
11	163	1,755	122
12	121		
Black Dragon	680	160	39
Pariette Tract 1			513
2			3,823
3			277

Source: USDI, BLM and USDI, NPS, 1983.

^aClasses for this tract are not available; however, all classes are present. Scenic values are high in much of the area and the western portions are visible (background visual distance zone) from U.S. 6 (ADT of 4,325).

CULTURAL RESOURCES

None of the potential lease tracts on BLM-administered land have been inventoried for cultural resources. However, a small percentage of area surrounding the tracts has received project-oriented inventories: this description is largely based on information obtained from these inventories.

Sunnyside Tracts 1-12

Cultural resources are not well documented in the Sunnyside tracts. These areas probably contain concentrations of San Rafael Fremont sites including rock art (both petroglyph and pictograph), dry masonry fortresses, pit houses, several styles of granaries, and caves or overhangs used for shelters. Formative period cultures such as the Fremont and Anasazi have been identified. Graves, ceremonial, agricultural, and residential sites are reputed to be located in the canyons.

Sites have been documented only in the northern and eastern part of the Sunnyside STSA. Documented sites include the proposed Nine Mile Canyon Archaeological District, northeast of Price, and the proposed Flat Canyon Archaeological District, in and along Desolation and Gray canyons on the Green River. Because of these nearby districts, one could reasonably expect to find similar sites in these tracts.

The Nine Mile Canyon bottom contains several ranch headquarters and has historically been used for livestock grazing and agriculture.

Black Dragon Tract

Although no cultural resources are known to occur within the tract, the San Rafael Swell STSA contains both prehistoric and historic sites. Only one site has been nominated to the National Register of Historic Places on Federal lands in the San Rafael Swell STSA: a historic site locally known as Swasey's Leap (a site on the San Rafael River). This site is located 5 to 6 miles from the Black Dragon tract.

Black Dragon Canyon, adjacent to the STSA, contains a National Register pictograph panel. Two more National Register sites are located in the vicinity. The Buckhorn Archaeological District is within 2 miles of the STSA in Buckhorn Wash, and the Temple Mountain pictograph panel is located on State land within the STSA.

Three other sites in the vicinity of the San Rafael Swell STSA are eligible for the National Register: the Lone Warrior pictograph, located 1 mile south of the Ghost Rock overlook on I-70; the Head of Sinbad pictograph panel, located 2 miles north of I-70; and the Swasey's Cabin his-

toric site, also located near Ghost Rock.

Flint Flat and Gordon Corral Tracts

Little is known about the historic resources present in these two tracts. An old cabin in the Flint Flat area is referred to locally as the Wolverton Cabin, but little is known about its history. It is of local significance and of interest to visitors as an example of life in an earlier time. The eligibility of the cabin and its surroundings to the National Register has not been determined.

Several inventories have been conducted in and around the general area of the two tracts. Many sites have been recorded in the area, and indications are that there are many more. The probability of sites occurring in the two tracts is good. Recorded sites include quarries, rock art, temporary campsites, and rock shelters. The majority of these are from the Archaic tradition, a highly mobile prehistoric lifestyle based on hunting and gathering, which dates from approximately 10,000 years ago to the historic period. There is also evidence of Anasazi agriculturalists' use of the uplands and of Numic (prehistoric Ute) occupation.

Sixteen sites have been recommended to the National Register on an individual basis, and a formal determination of eligibility is being sought for the Orange Cliffs Archaeological District. This District is significant because the numerous pristine sites there represent the clearest picture of prehistoric occupation and use found for the Archaic period.

Pariette Tracts 1-3

Although no sites are known to occur within these tracts, overall site density is estimated at 0.2/square mile. Sites in the area are normally located on sand dunes, cobble fields, and elevated rock monoliths. The following types of sites are present: (1) lithic scatters; (2) quarries; (3) camps; (4) rock art; (5) burials; (6) special activity sites; and (7) randomly located hearths.

LIVESTOCK GRAZING

Portions of eleven grazing allotments and one unallotted area fall within the potential lease tracts. Eleven livestock operators have permits to run cattle on these allotments.

Total annual forage production within potential lease tracts is about 1,745 Animal Unit Months (AUMs) on Federal land and about 617 AUMs on privately owned land. (This forage would feed 2,362 cattle for 1 month or 197 cattle for 1 year.)

The following shows grazing allotments and the number of AUMs within tracts.

Potential Lease Tract	Allotments	AUMs Within Tract	
		Federal	Private
Sunnyside 1	Stone Cabin, Dry Canyon, and Sheep Canyon	199	323
Sunnyside 2	Stone Cabin and Dry Canyon	395	103
Sunnyside 3	Green River North	15	0
Sunnyside 4	Dry Canyon	5	0
Sunnyside 5	Green River North	56	0
Sunnyside 6	Green River North	497	0
Sunnyside 7	Green River North	107	0
Sunnyside 8	Green River North, Rock Creek, and Range Creek	113	132
Sunnyside 9	Green River North	61	59
Black Dragon	Black Dragon	37	0
Flint Flat	Flint Trail (unallotted)	0	0
Gordon Corral	Robbers Roost	11	0
Pariette 1	Wells Draw and Snyder Spring-Step Ant	29	0
Pariette 2	Wells Draw and Snyder Spring-Step Ant	203	0
Pariette 3	Hungry Hollow-Pete's Ridge	17	0
Total		1,743	617

County	Year	Plan
Carbon	1976	Overall Economic Development Program
Duchesne	1979	Uintah Basin Development Plan
Emery	1976	Overall Economic Development Program
Garfield	1979	Garfield County, Utah: A Master Plan for Development
Grand	1979	Grand County, Utah: A Master Plan for Development
Uintah	1979	Uintah Basin Development Plan
Wayne	1979	Six County Development Plan

SOCIOECONOMICS

Introduction

Unless otherwise stated, the information in this section is derived from a socioeconomic report prepared by Argonne National Laboratories (1983).

This discussion covers only Carbon and Emery counties in east-central Utah because most of the expected development would occur in this region. Much of this region is sparsely populated. Traditionally, these counties have been dependent on agriculture or energy development and are well acquainted with the cyclical nature of energy-related growth. The coal industry has experienced frequent 'boom-and-bust' periods.

Population Trends

The State of Utah grew from a population of 1,059,273 in 1970 to a population of 1,461,037 in 1980. The growth rate in Utah was 37.9 percent (3.27 percent annually) in the 1970s, making it the fifth fastest-growing state in the United States. This population increase fluctuated considerably from county to county throughout the State. Table 3-8 presents 1970 and 1980 population levels for Carbon and Emery counties and communities.

CARBON COUNTY

Carbon County grew 42 percent between 1970 and 1980. Price, the largest city in the county and the region, has been a coal center since the 1890's. The neighboring towns of Helper, East Carbon, and Sunnyside were developed to provide commercial and residential services for the coal miners in the area. Of the 22,179 residents of Carbon County in 1980, 20 percent were of school age and 58 percent were of work age. There were 7,242 households with an average of 3.06 people per household in the county in 1980 (U.S. Department of Commerce [USDC], Bureau of the Census, 1982).

EMERY COUNTY

Emery County's population increased by 125 percent between 1970 and 1980. Much of this growth was related to the construction of the Hunter and Huntington power plants. Green River was the largest city in the county in 1970; however, its location on the eastern border of the

LAND USES

Existing land uses within potential lease tracts include recreation, mineral exploration and development, and livestock grazing. These activities are analyzed in separate sections in this EIS. Table 3-7 shows land surface ownership for each potential lease tract.

STATE AND LOCAL LAND USE PLANS, PROGRAMS, AND CONTROLS

The State Land Board manages State section inholdings within Federal lands. The State of Utah administers these sections without formal land use plans. Tar sand development on State sections can be made under oil and gas leases issued by the Utah Department of Natural Resources and Energy.

County land use plans emphasize planning for private lands and local communities. However, multiple use of Federal lands is recognized as important to the local economy. Not all county land use plans specifically address tar sand, but some plans acknowledge that Federal leasing policies play a significant role in the location, timing, and extent of energy development. Conversely, these plans also recognize the value of scenic and recreational values found on Federal lands. The following shows county development land use plans encompassing potential lease tracts.

TABLE 3-7

Land Surface Ownership
Within Potential Lease Tracts

Potential Lease Tract	Total (Acres)	Federal (Acres)	Private (Acres)
Sunnyside 1	3,202	1,481	1,721
2	2,716	2,196	520
3	120	120	
4	40	40	
5	640	640	
6	2,494	2,494	
7	960	960	
8	1,764	1,081	683
9	406	88	318
10	120	120	
11	2,040		2,040
12	121		121
Black Dragon	880	880	
Flint Flat	2,684	2,684 (NPS)	
Gordon Corral	485	485 (NPS)	
Pariette 1	513	513	
2	3,560	3,560	
3	277	277	

Source: USDI, BLM, and USDI, NPS, 1983.

TABLE 3-8

Historical Population Levels for
Carbon and Emery Counties and Communities
(1970 and 1980)

County/Community	1970 Population	1980 Population	Average Annual Compound Percent Change
State of Utah	1,059,273	1,461,037	3.27
<u>Carbon County</u>	15,647	22,179	3.55
East Carbon	1,808 ^a	1,942	0.72
Helper	1,964	2,724	3.33
Hiawatha	166	249	4.14
Price	6,218	9,086	3.87
Scofield	71	105	3.99
Sunnyside	485	611	2.34
Wellington	922	1,406	4.31
<u>Emery County</u>	5,137	11,451	8.35
Castle Dale	541	1,910	13.44
Clawson	-- ^a	88	--
Cleveland	244	522	7.90
Elmo	141	300	7.84
Emery	216	372	5.59
Ferron	663	1,718	10.00
Green River	969	956	-0.13
Huntington	857	2,316	10.45
Orangeville	511	1,309	9.86

Source: U.S. Department of Commerce (USDC), Bureau of the Census, 1982.

^aNot incorporated in 1970.

county isolated it from development activities. Consequently, it was the only city in the region to lose population between 1970 and 1980.

Employment Trends

Table 3-9 shows the historical employment levels by industrial sector for Carbon and Emery counties.

Total employment in Carbon County increased from 5,390 in 1970 to 9,385 in 1980. Growth in the number of employed workers was more than twice as rapid between 1975 and 1980 than between 1970 and 1975. Employment in the finance, insurance, and real estate sector increased most rapidly between 1970 and 1975, while employment in the services sector increased most rapidly between 1975 and 1980. The number of workers in the mining, construction, and manufacturing sector grew 126 percent between 1970 and 1980. Mining was the largest sector in 1980, followed by government and wholesale and retail trade.

The total employment of 5,452 in Emery County in 1980 was a 199-percent increase since 1970. The number of workers grew over 10 percent annually throughout that period. The most rapid growth was in the transportation, communication, and utilities sectors, which increased 35 percent annually between 1970 and 1975 and 28 percent annually between 1975 and 1980. Employment in the mining sector jumped from 366 in 1970 to 2,105 in 1980.

ATTITUDES AND LIFESTYLES

Originally, the communities near the affected area were established as Mormon farming settlements. Historically, these communities have been culturally homogenous and have valued their small-town way of life, community solidarity, and aesthetic and recreational opportunities as important lifestyle features. Energy development has gradually weakened this cultural homogeneity, particularly in the Castle Valley and Uinta Basin portions of the affected area. Most communities in Emery, Carbon, Duchesne, and Uintah counties have experienced growth from oil and gas or

coal. Of all of the communities in the affected area, Hanksville (Wayne County), has been the least affected by energy-related growth.

In those communities where energy-related growth has been controlled, residents would generally support additional moderate growth, providing that the population increase was carefully accommodated by adequate planning and mitigation. Green River, Price, and Sunnyside generally agree that additional growth would be good and that the quality of the surrounding environment is now either good or fair (Southeastern Utah Association of Governments and Economic Development District, 1980). Uinta Basin communities, such as Roosevelt and Vernal, also would support additional resource development and growth; however, residents generally perceived the need for enhancement of the existing urban infrastructure coupled with local government planning to mitigate additional growth (Skinner, 1980). The Ute Tribe, on the Uintah and Ouray Indian Reservation, is more cautious in its support of tar sand development. The tribe recognizes the importance of increased employment opportunities but expresses concerns about the cultural and environmental impacts and possible alternatives of mitigation (Duncan, 1983). Wayne County, including Hanksville, similarly acknowledges potential conflicts between existing cultural values and energy-induced population growth. However, the populace is generally supportive of tar sand development (Fawcett, 1979).

TRANSPORTATION

Vehicular traffic throughout the affected area would be increased on most State and Federal highways in the eastern half of Utah. Annual ADT values are depicted in Table 3-10. The Denver & Rio Grande Western Railroad mainline passes through the Salt Lake Valley southward through Spanish Fork Canyon to Price, Green River, then eastward to Grand Junction, Colorado. Present access roads into STSAs are county-graded surface or dirt roads having minimal maintenance.

TABLE 3-9

Historical Employment Levels for Carbon and Emery Counties

Industry Sector	Carbon County					Emery County				
	Sectoral Employment By Year			Average Annual Compound Percent Change		Sectoral Employment By Year			Average Annual Compound Percent Change	
	1970	1975	1980	1970-1975	1975-1980	1970	1975	1980	1970-1975	1975-1980
Agriculture	249	214	226	-2.98	1.10	452	468	464	0.70	-0.17
Mining	987	1,350	2,325	6.46	11.49	366	1,061	2,105	23.72	14.69
Contract Construction	128	220	338	5.57	8.97	NA ^a	587	522	b	-2.32
Manufacturing	187	276	281	8.10	0.36	NA	NA	22	b	b
Transportation, Communication, and Utilities	460	455	650	-0.22	7.39	34	152	513	34.92	57.54
Wholesale and Retail Trade	922	1,190	1,762	5.24	8.17	161	245	335	8.76	6.46
Finance, Insurance, and Real Estate	135	277	242	15.46	-2.67	NA	NA	65	b	b
Services	464	567	1,083	4.09	13.82	63	205	225	26.61	1.88
Government	1,388	1,408	1,828	0.29	5.36	370	350	716	-1.11	15.39
Nonfarm	470	508	650	1.57	5.05	204	233	485	2.69	15.79
Total ^c	5,390	6,465	9,385	3.70	7.74	1,825	3,326	5,452	12.75	10.39

Source: Utah Department of Employment Security, 1983 and USDC, Bureau of Economic Analysis, 1982.

^aNA = not available.

^bUndefined.

^cTotals may not add because of rounding.

TABLE 3-10

Annual ADT Within STSAs

STSA	Highway	Segment Description	Annual ADT (1981)	Affected Communities
San Rafael Swell	U.S. Hwy 70	Head of Sinbad to Green River.	2,498	Green River ^a
Sunnyside	U.S. Hwy 6	Price to Utah Hwy. 123	6,458	Price ^a Wellington ^a
	U.S. Hwy 123	Utah Hwy. 6 to Sunnyside	2,833	Sunnyside ^a East Carbon City ^a
Tar Sand Triangle	Utah Hwy 24	Temple Junction to U.S. Hwy. 70.	500	Green River ^a
	U.S. Hwy 70	Utah Hwy. 24 to Green River.	2,938	
Pariette	U.S. Hwy 40	Myton to Roosevelt	5,240	Myton ^a Roosevelt ^a

Source: UDOT, 1981.

^aCommunity is currently experiencing energy-related traffic.

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter analyzes anticipated impacts from tar sand development on 18 potential lease tracts within Utah. Five different alternatives are considered in this volume.

Only impacts to resources which would be most significantly affected are described. The majority of physical impacts to resources (i.e., vegetation, soil, water, animal life, etc.) would be restricted to potential lease tracts. However, other resources (i.e., air quality, socioeconomics, transportation, recreation, and visual resources) would also be affected. Because impacts to these resources would affect the entire region, only a general impact discussion is included in this volume. Volume I, which contains the regional impact assessment, includes a detailed discussion of impacts to these resources

Additional site-specific environmental analyses considering specific on-the-ground locations and detailed impact assessments will be required prior to development on each potential lease tract. This assessment will be required upon the lessee's submission of a plan of operation.

The first section of this chapter describes general assumptions and guidelines used in analyzing impacts. Development assumptions used for analyzing impacts to each potential lease tract appears next. This section is followed by an impact assessment for each tract by alternative. Also included are descriptions of the short-term use of man's environment, maintenance and enhancement of long-term productivity, and irretrievable or irreversible commitments of resources.

ANALYSES ASSUMPTIONS AND GUIDELINES

The following assumptions and/or estimates were made to determine environmental impacts resulting from hydrocarbon (i.e., oil and gas and tar sand) development:

1. Appropriate laws, regulations, and mitigating measures (i.e., stipulations) will be applied and enforced.
2. Impacts from conventional oil and gas development are not discussed in this environmental impact statement (EIS). Bureau of Land Management (BLM) District Environmental Assessments (EAs) have analyzed impacts resulting from oil and gas development. Because only oil and gas development is expected on Sunnyside tracts 10, 11, and 12 and Pariette tracts 1, 2, and 3, potential impacts to these tracts are not assessed in this volume of the EIS.

3. Surface disturbance in this volume refers only to the area within potential lease tracts. Surface disturbance from surface mining would require area for the pit and additional area for sideslopes and roads. Surface disturbance from in-situ development would require 40 percent of each potential lease tract for drill pads, pipelines, and roads, assuming that vegetation would be removed and soil were either leveled or moved.
4. Sunnyside tract 1 is analyzed as if it were developed as an independent tract; analyses for the remaining tracts assume that they would be developed with adjacent tracts. Impact analyses consider only potential lease tracts, not adjacent or conversion lease tracts. Impacts to adjacent tracts would be described in detail if a plan of operation for tar sand development were submitted to BLM for review. Impacts from tar sand development on five tracts proposed for lease conversions at Sunnyside are analyzed in the *Sunnyside Combined Hydrocarbon Lease Conversion Draft EIS* (U.S. Department of Interior [USDI], BLM, 1983) and the *Unit Plan of Operation for Tar Sand Triangle Combined Hydrocarbon Leasing Conversion Draft EIS* (USDI, NPS, 1983).
5. A worst-case situation is assumed when two possible development options are possible. For example, the worst-case impact to soils would be to use surface-mining methods, which result in higher levels of surface disturbance. Conversely use of surface-mining methods would be best for the tar sand resource because more of the tar sand would be recovered. In-situ development would result in the worst-case situation for the tar sand resource because 70 percent of the bitumen would not be recovered.
6. The schedule for development of potential lease tracts is as follows:
 - 1984 - Leases issued on potential tracts.
 - 1985 - Plans of operation submitted by lessee.
 - 1986 - Additional environmental review and reporting required.
 - 1987 - Impacts begin, mainly from exploration. Construction begins on some tracts, while production begins on other tracts.
 - 1988 - Exploration period ends and construction period continues.
 - 1994 - All production on leases reviewed to prove diligence. Significant impacts still accumulating.

2005 - Maximum impacts continue through project's life.

Site development could begin as early as 1984, and full production would be reached by 2005. Impacts are only analyzed to the year 2005, because it is assumed that operation activities on tracts would reach a steady level of production by that time.

7. Bitumen production figures are based on a 30-percent recovery rate from in-situ development and a 90-percent recovery rate from surface mining.
8. Lands used for community development and/or community or mine water would not be reclaimed or returned to original uses.

DEVELOPMENT ASSUMPTIONS

Assumptions for tar sand development within each potential lease tract are described below.

Sunnyside Tracts 1-12

Tract 1 contains a large tar sand resource (estimated at 477 million barrels of in-place bitumen). Because of its size, this tract is analyzed as if it were developed as a separate unit. Tracts 2 through 9 generally include small or scattered parcels of land.

Five applications for conversions near these lease tracts have been submitted by industry. Because of their size and shape, it is assumed that these tracts would be developed with conversion lease tracts or adjacent private- or State-owned lands.

The Federal Government does not own the tar sand resource on tracts 10, 11, and 12. Federal leasing on these tracts would be only for oil and gas.

Black Dragon Tract

The Black Dragon tract is small, with a limited tar sand resource. The original Expression of Interest proposed leasing of a much larger area, which was later reduced in size because of a conflict with two BLM Wilderness Study Areas (WSAs). The remaining area has an estimated reserve of only 5.1 million barrels. Therefore, development would likely occur with a conversion of an existing lease (no applications have been filed to date) or additional Federal leasing at a later date. If no conversion applications are filed by November 15, 1983, the existing oil and gas lease will expire and could be available for nomination to a potential lease tract.

Flint Flat and Gordon Corral Tracts

Flint Flat and Gordon Corral tracts are within the boundaries of a proposed unit plan submitted to BLM for lease conversion. (A unit plan is a plan of operations submitted by more than one lessee on two or more tracts to combine development on those tracts.) Because both of these tracts

are surrounded by that plan, it is assumed that, if the two tracts were leased, they would be developed with the unit and would not be developed separately. Production from the tracts would supplement the unit plan. However, any developer could bid on the tracts and negotiate to participate in the plan.

Pariette Tracts 1-3

Data on the tar sand resource in the Pariette Special Tar Sand Area (STSA) are lacking. Existing information suggests that the resource is small, discontinuous, and not of commercial value. However, the general area is valuable for oil and gas development, and producing wells occur within 0.5 mile of the closest potential lease tract. Therefore, it is assumed that tracts would be developed only for oil and gas, even though Combined Hydrocarbon Leases (CHLs) would be issued.

RESOURCES WITH LIMITED DATA OR NO IMPACTS

Air quality, cultural resources, and socioeconomics are discussed here because sufficient data are not detailed enough to discuss impacts for each potential lease tract by alternative.

Air Quality

General conclusions for impact to potential lease tracts in this volume are based on the air quality analyses in Volume I. For detailed emissions data and modeling results for each STSA, refer to Volume I.

SUNNYSIDE TRACTS 1-9

Surface-mining activities would have a high potential to violate allowable and total suspended particulates (TSP) for Prevention of Significant Deterioration (PSD) Class II and National Ambient Air Quality Standards (NAAQS), respectively. Particulate impacts resulting from in-situ development would be less severe. Sulfur dioxide (SO₂) and nitrogen dioxide (NO₂) impacts from development of individual tracts would not cause significant impacts. However, cumulative SO₂ and NO₂ impacts resulting from undispersed development within the STSA could violate PSD Class II SO₂ increments and the annual NAAQS for NO₂. Cumulative impacts from nitrogen oxide (NO_x) emissions could cause atmospheric discoloration at the Uintah and Ouray Indian Reservation. No significant impacts would be expected at any Class I areas because of the distances to these areas.

BLACK DRAGON TRACT

Air quality impacts would be expected to be within all PSD incremental limitations and the NAAQS. Visibility impacts would not be significant at any Class I areas because of the distances to these areas.

FLINT FLAT AND GORDON CORRAL TRACTS

Development of these tracts could cause or contribute to violations of PSD Class II SO₂ and TSP increments and the Class I SO₂ increment at Canyonlands National Park. The secondary 24-hour NAAQS for TSP could also be exceeded. Atmospheric discoloration resulting from NO_x emissions could also occur at Canyonlands National Park.

Cultural Resources

Tar sand development could result in various activities which would damage or destroy cultural resources. These include: (1) surface mining; (2) construction of drill pads and support facilities; (3) rights-of-way for access, pipelines, powerlines, etc.; and (4) waste disposal. Secondary impacts could be expected through vandalism and increased human activity. Conversely, the inventories required for mitigation would produce new cultural resource data.

Prior to entry upon the land or surface disturbance for mining, drilling, or other purposes, the lessee shall be required to submit for approval an Application for Permit to Drill (APD), exploration plan, or plan of operation which shall contain the methods and actions proposed for cultural resource clearance and protection. This will be in accordance with Title 36 of the Code of Federal Regulations (CFR), Part 800. Appendix 5 is the Memorandum of Understanding between the State Historic Preservation Officer and BLM which outlines BLM's responsibility for mitigation.

Socioeconomics

Unless otherwise stated, the information for this section is derived from a socioeconomic report prepared by Argonne National Laboratories (1983).

This analysis assumes that, with the exception of Sunnyside tract 1, all tracts would be developed with conversion lease tracts or adjacent private- or State-owned lands. In addition, it is assumed that all potential lease tracts would be developed if leased. Socioeconomic impacts for all tracts except Sunnyside 1 would, therefore, occur on a regional basis and are analyzed in the regional impact analysis (Volume I).

Only impacts resulting from development of Sunnyside tract 1, which could be developed as a separate project, are discussed in this volume. It is assumed that development on this tract would be at the 5,000-barrel/day level.

Analysis in this section addresses only the employment and population impacts attributable to the independent development of Sunnyside tract 1. Development on Sunnyside tract 1 is not projected to begin until 1992. Peak employment and population would be expected during the construction period in 1994 as operation activities began. Projected population and employment figures for tar sand development in 1994, 1995, 2000, and 2005 are presented in Table 4-1. Populations for Carbon and Emery counties are projected to decline slightly from 656 above the baseline

figures in 1995 to 609 in 2005. (Baseline is a projection of growth, employment, etc., without tar sand development.) This would occur as the construction phase ended and the more stable production phase began. This change would represent an average annual decrease of about 0.7 percent per year for the two-county area.

Total regional employment would decrease more rapidly than population with tar sand development. Employment is projected to decline by about 2.2 percent annually from 1995-2005, again reflecting the smaller, steadier work force requirement of the production phase.

IMPACT ANALYSES

This section describes impacts to affected resources by alternative. As stated previously, only significant impacts are discussed.

Threatened, Endangered, and Sensitive Species

Development of potential lease tracts could have an effect on threatened, endangered, or sensitive species. However, the current project descriptions and analyses do not contain sufficient information to determine whether or not development of potential lease tracts would jeopardize the continued existence of any threatened, endangered, or sensitive species found in the region. Section 7 (Endangered Species Act) consultation with the Fish and Wildlife Service (FWS) would be required on a project-by-project basis as each plan of operation was reviewed. The lease for each potential tract would contain the following special provision to avoid a Section 7 jeopardy biological opinion:

"The lessee shall develop a plan of operation which will fully protect listed or proposed threatened or endangered species and shall submit the plan to BLM for formal consultation with FWS as required by Section 7 of the Endangered Species Act. The plan must cover species occurring on site as well as those off-site species which may be adversely impacted. Consultation must be completed prior to the irreversible or irretrievable commitment of resource or funds for on-the-ground development.

"This lease is issued and accepted with the express agreement that such consultation may require adjustments to the plan of operation, additions of special conservation measures, or limitations to the project in order to assure compliance with such provisions of the Endangered Species Act as may be applicable as determined by FWS at the time of development." (USDI, FWS, 1983).

In addition, FWS, in coordination with the Utah Division of Wildlife Resources (UDWR), will evaluate fish and wildlife

CHAP. 4: ENVIRONMENTAL CONSEQUENCES

TABLE 4-1

Employment and Population Projections
for Carbon and Emery Counties
Related to Sunnyside Tract 1^a

Population	1994 ^b	1995		2000		2005	
		Baseline	Tract 1	Baseline	Tract 1	Baseline	Tract 1
<u>Carbon County</u>	769	36,500	582	36,790	518	37,280	549
Helper CCD	82	6,750	51	6,750	40	8,910	43
Price CCD	439	28,250	326	28,650	288	29,050	305
East Carbon CCD	248	1,500	205	1,390	190	1,320	201
<u>Emery County</u>	122	15,080	74	14,730	58	14,550	60
Castle Dale CCD	84	10,600	56	10,380	47	10,200	48
Emery-Ferron CCD		3,310	0	3,180	0	3,180	0
Green River CCD	38	1,170	18	1,170	11	1,170	12
Regional Total	891	51,580	656	51,520	576	51,830	609
<u>Employment</u>							
<u>Carbon County</u>	409	15,000	293	15,510	234	16,020	241
Helper CCD	15		9		8		8
Price CCD	82		63		58		62
East Carbon CCD	312		221		168		171
<u>Emery County</u>	22	6,770	14	6,800	11	6,880	12
Castle Dale CCD	15		11		9		10
Green River CCD	7		3		2		2
Two-County Total	431	21,770	307	22,310	245	2,900	253

Source: Utah Office of the State Planning Coordinator, 1983.

^aAll numbers are above the projected baseline.

^b1994 is the highest projected year of employment and population.

resources and issue a technical assistance report to prevent loss and damage to wildlife resources. This will also be completed under provisions of the Fish and Wildlife Coordination Act.

Threatened, endangered, and sensitive plant, animal, and aquatic species are discussed on a site-specific basis under each alternative.

Alternative 1: Lease 18 Tracts Under Maximum Development, Subject to BLM Categories 1 and 4 and NPS Stipulations

WATER RESOURCES

Surface disturbance by construction and operation on potential lease tracts would increase erosion and sediment yield. This could enter local water courses, increasing turbidity and sediment load, and could eventually impact the Green and Colorado rivers. Streams, springs, and groundwater resources are shown by tract in Table 3-2.

The amount of sediment entering streams would be determined by the amount of area disturbed, climatic conditions during soil exposure, and the effectiveness of erosion control measures. Some salt leaching of overburden and leaching of tar sand could raise total dissolved solid (TDS) levels, thereby impacting surface and groundwater qualities. Other potential contaminants include oil, drilling muds, process waters, acids, fracturing fluids, trace elements, and human wastes. The most critical time for soil and salt loss from leaching and water erosion would be during the summer thundershower season.

Surface mining could remove geologic formations acting as aquifers or recharge areas for aquifers. This could reduce or eliminate flow in more than 11 springs in potential lease tracts and, possibly, in adjacent areas. However, replacement of water lost or degraded during mining would be required.

In-situ extraction through injection of fluids or other methods could contaminate or degrade aquifers and springs. Impacts from in-situ development would be less severe than with surface mining, but could still result in loss or damage to water resources.

Impacts to the water resource interrelate closely with soils and vegetation. Where surface disturbance and reduced vegetation occur, soil erosion rates and sediment yield are increased; this, in turn, affects water quality and yield. Up to 12,582 acres of BLM lands in leasing category 1, and 3,169 acres of National Park Service (NPS) land could be subjected to surface disturbance. Higher runoff flows and sediment loads would occur until reclamation was completed.

In analyzing water requirements for each tract except Sunnyside 1, it was assumed that tar sand would be recovered by the year 2005, a 20-year period. Water require-

ments would be approximately 25 percent of the barrel/day bitumen production for surface mining and 23 percent for in-situ development. It is projected that 12,594 acre-feet of water annually would be required to produce the estimated 50,704 barrels/day on the 12 potential lease tracts discussed below.

Sunnyside Tract 1:

This is the only tract which could be developed as a separate project and in which project life would be expected to exceed 20 years. Development on this tract would be by surface-mining methods and could impact five springs. Estimated water consumption for a plant producing 5,000 barrels/day of bitumen would be 1,250 acre-feet annually.

Sunnyside Tracts 2-9:

Tracts 2-4 would be developed by surface-mining methods. The worst-case analysis for impacts to water resources on tracts 7-9 assumes surface-mining methods would be used, even though these tracts could be developed by in-situ methods. Development on tracts 5 and 6 would be by in-situ methods. Within some tracts, mining would occur on possible groundwater recharge areas and could affect groundwater supply and quality and six springs. The stipulation for the Sunnyside municipal water supply reserve would not allow development on 640 acres on Sunnyside tract 7. Estimated water consumption for producing between 217 and 320 million barrels of bitumen would require 215 thousand acre-feet of water. Should this occur during the 20-year production period, 43,000 barrels/day of bitumen would be produced, and 10,750 acre-feet of water would be required annually.

Black Dragon Tract

Development on this tract would be by in-situ methods. Estimated water consumption for a plant producing 209 barrels/day would be 48 acre-feet annually. (Calculation: 5.1 million barrels of in-place bitumen × 30-percent recovery rate = 1,530,000 recoverable resource ÷ 20 years = 76,500 barrels/year ÷ 365 days = 209 barrels/day.)

Flint Flat Tract

Development on this tract would be by in-situ methods. Water consumption for a plant producing 2,013 barrels/day for 20 years is estimated at 463 acre-feet annually. (Calculation: 49 million barrels of in-place bitumen × 30-percent recovery rate = 14,700,000 [see Table 4-2]. Recoverable resources ÷ 20 years = 735,000 barrels/year ÷ 365 days = 2,013 barrels/day.)

Gordon Corral Tract

This tract would also be developed using in-situ methods. Estimated water consumption for a plant producing 492 barrels/day for 20 years would be 83 acre-feet annually. (Calculation: 8.8 million barrels of in-place bitumen × 30-percent recovery rate = 2,640,000 recoverable resources ÷ 20 years = 132,000 barrels/year ÷ 365 days = 362 barrels/day.)

ALTERNATIVE 1

TABLE 4-2

Alternative 1
Estimated Recoverable and Unrecoverable
Tar Sand Resources

Potential Lease Tract	Estimated In-Place Resources (Million Barrels)	Estimated Recoverable Resources (Million Barrels)	Estimated Unrecoverable Resources (Million Barrels)
Sunnyside 1	477	439.3	47.7
2	116	104.4	11.6
3	9.5	8.5	1.0
4	11.6	10.4	1.2
5	21.8	6.5	15.3
6	128	38	90
7	36	10	26
8	108	32.4	75.6
9	24.4	7.3	17.1
Black Dragon	5.1	1.5	3.6
Flint Flat	49	14.7	34.3
Gordon Corral	8.8	2.6	6.2
Total	995.2	675.6	319.6

Source: USDI, Minerals Management Service (MMS), 1982; Hubbard, 1983.

Note: Under the worst-case analysis for tar sand development, Sunnyside tracts 7, 8, and 9 would be mined using in-situ methods because that method would result in a greater loss than surface mining. However, those tracts could be developed by surface mining.

SOILS

Surface disturbance from construction of roads, drill pads, and mine development on 12 tracts would increase erosion. Up to 12,582 acres in BLM leasing category 1 and 3,169 acres of NPS-administered land could be disturbed. The amount of soil lost would depend on the physical characteristics of the soil, the degree and length of slope, climatic conditions during soil exposure, and the effectiveness of erosion control measures. Because of such variables, an exact quantification of erosion cannot be made. Table 3-3 shows estimated sediment yield rates and erosion hazard for soils in potential lease tracts.

Sunnyside Tracts 1-9

Because of the steep terrain within most tracts, it would be difficult to stockpile and protect all soil from water erosion. Resultant soil loss would reduce the amount available for revegetation and could cause siltation problems in downstream channels. This would occur until reclamation was complete and soil stabilized.

Black Dragon Tract

With stipulations to control soil loss from water erosion, most of the soil would probably remain on site. However, some soil loss would occur, especially on steeper slopes. Wind erosion of disturbed areas could exceed 50 tons/acre/year. Soil loss could impact sediment deposits in local drainages and on two off-site reservoirs (see Figure 3-2).

Gordon Corral and Flint Flat Tracts

Construction-related surface disturbance would remove vegetation and increase erosion and fugitive dust. Eolian (wind-laid) deposits occur locally as blow sands and dunes; therefore, wind erosion would occur. Road construction, including new construction and improvements to existing roads, would compact soils. In some areas, vehicle traffic would pulverize sandy soils, resulting in soil blowing and drifting. Cryptogamic soils (soils with a crust of associated lichens [algae, and fungi]) are especially vulnerable to disturbance (USDI, NPS, 1977). Increased wind erosion would result if cryptogamic soils were disturbed.

TOPOGRAPHY, TAR SAND, AND OTHER MINERALS

Table 4-2 estimates recoverable bitumen on all potential lease tracts at 675.6 million barrels and unrecoverable tar sand resources at 319.6 million barrels. These estimates assume that all tracts except Flint Flat, Gordon Corral, and Sunnyside tracts 5-9 would be developed by surface-mining methods. Using in-situ processes, only 30 percent or less of the bitumen could be recovered; the remaining resource would be unrecoverable using present technology. Using surface-mining methods, 90 percent of the bitumen would be removed.

Sunnyside Tracts 1-4

TOPOGRAPHY: Significant irreversible changes would occur to the topography and geology of these potential lease tracts if they were developed by surface-mining

methods. Geology and topography above the tar sand deposit would be changed.

Landforms would be more rounded and subdued than those existing before development. Elevations could be several hundred feet lower unless waste sand from the plant was added to the pit. In that case, elevations could be higher. Headwater valleys of streams near development activities could be filled with waste rock.

TAR SAND: Ninety percent of the bitumen would be removed from tracts developed by surface-mining methods (about 562.6 million barrels).

OTHER MINERALS: Any underlying coal or oil and gas could be developed after tar sand recovery. However, any mineral deposit overlying surface-mined tar sand would be destroyed.

Sunnyside Tracts 5-9

TOPOGRAPHY: Impacts from in-situ development would include cuts and fills, which would disturb rocks near the surface and create breaks in slope. Minor subsidence could also occur.

TAR SAND: Using in-situ processes, 30 percent or less of the bitumen could be recovered (about 94 million barrels); the remaining resource would be unrecoverable (about 224 million barrels) and probably could not be recovered in the future.

OTHER MINERALS: Any underlying coal or oil and gas could be developed after tar sand development.

Black Dragon Tract

TOPOGRAPHY: Significant irreversible changes would occur if the tracts were developed by surface-mining methods. Geology and topography above the tar sand deposit would be changed. Landforms would be more rounded and subdued than those existing before development. Impacts from in-situ methods would include cuts and fills, which would disturb rocks near the surface and create breaks in slope. Minor subsidence (a few feet) could occur.

TAR SAND: Ninety percent of the bitumen would be removed if the tract were developed by surface-mining methods. If the tar sand were developed by in-situ methods, 30 percent or less could be recovered (1.5 million barrels); the remaining resource would be unrecoverable (about 3.6 million barrels) and probably could not be recovered in the future.

OTHER MINERALS: Any oil and gas in rocks underlying tar sand deposits could be recovered after tar sand development.

Gordon Corral and Flint Flat Tracts

TOPOGRAPHY: Impacts would include cuts and fills, which would disturb rock near the surface and create breaks in slope.

TAR SAND: Tar sand development would be by in-situ methods, and 30 percent or less of the bitumen could be recovered (about 16 million barrels). The remaining

ALTERNATIVE 1

resource would be unrecoverable (about 40 million barrels) and probably could not be recovered in the future.

OTHER MINERALS: Any underlying uranium or oil and gas could be developed after extraction of tar sand.

VEGETATION

Impacts to vegetation would result from surface clearing, contour modification, and removal and mixing of topsoil. The duration of impacts would range from short term (rehabilitation to current composition and cover within 20 years) to permanent. Permanent impacts would result from changing the potential of a site by altering soil and/or contour characteristics.

Sunnyside 1-4 and 7-9 and Black Dragon Tracts

Surface mining would cause the most intensive impacts to vegetation and would result in the most extensive permanent changes in vegetation cover and composition. Total surface-mined acreage would be about 9,638 acres. Township 14 South, Range 14 East, Section 13 (640 acres) on Sunnyside tract 7 would not be mined because it is within a water supply reserve and would be placed in category 4.

Sunnyside Tracts 5-6, Flint Flat, and Gordon Corral Tracts

In-situ mining would result in surface clearing and topsoil removal on about 40 percent of the surface area within a potential lease tract. In-situ mining would cause less extensive and fewer permanent changes in vegetation cover, composition, and range site potential than surface mining. Clearing of access ways and pads for in-situ development would require less deep removal of soil and, thus, less mixing of surface and subsurface soils, parent material, and rock strata. Assuming that in-situ development would affect 40 percent of the surface area in these tracts, about 2,522 acres would be cleared of vegetation.

The most important impacts to vegetation would be the loss of an estimated 64 percent (56 acres from a total of 87) of the riparian vegetation on the potential lease tracts. The next most important impact would be the loss of aspen, spruce fir, and mountain shrub. These vegetation types are important because they provide high-value habitat and forage for deer, elk, and livestock.

Threatened, Endangered, and Sensitive Plant Species

There would be no impact to listed threatened or endangered plant species from tar sand development. Prior to taking any action that could jeopardize the continued existence of a listed threatened or endangered species, Section 7 consultation would be initiated with the FWS and a biological opinion issued. This is required under provisions of the Endangered Species Act.

Black Dragon Tract

Habitat for the sensitive plant species Jones' catseye, *Cryptantha jonesiana*, would likely be lost by surface min-

ing. However, BLM policy manages sensitive or candidate plant species and their habitat as if they were listed as threatened or endangered. This guards against declines in population and habitat reductions, preventing possible future listing as threatened or endangered.

Flint Flat Tract

Impacts to *Astragalus nidularis* could be similar to those described above for *Cryptantha jonesiana*. However, this tract would probably be mined by in-situ methods. Because in-situ development has less extensive and fewer intensive impacts than surface mining, impacts would not be as great.

ANIMAL LIFE

Tar sand development could impact wildlife populations directly (i.e., loss of habitat) and indirectly (i.e., human activity such as increased hunting pressure, harassment, poaching, and off-road vehicle [ORV] use). Because there are insufficient data to quantify secondary impacts, only impacts associated with the direct loss of habitat are discussed.

Terrestrial Animals

BIG GAME

Mule Deer: Approximately 6,918 acres of crucial summer range (3 percent of the crucial summer range for herd unit 27B) and 3,307 acres of crucial deer winter range (less than 1 percent of the crucial deer winter range in herd unit 27B) could be destroyed from surface-disturbing activities associated with tar sand development. Distribution of these acres is shown by potential lease tract in Table 4-3. Because summer range is considered the limiting factor for deer in this herd unit, populations could decline. Assuming that deer are evenly distributed over crucial summer range, it is estimated that destruction of 6,918 acres of this range would reduce deer numbers on herd unit 27B by 285 animals. This represents approximately 3 percent of the deer on this herd unit.

Elk: Approximately 6,918 acres of crucial summer range and 3,307 acres of crucial winter range could be destroyed from surface-disturbing activities associated with tar sand development. Distribution of these acres is shown by tract in Table 4-3. Because this herd was recently introduced into this area, direct impacts cannot be quantified. However, because elk use summer range for calving, tar sand development could prevent and/or retard the reestablishment of elk in the area.

SMALL GAME: Approximately 11,717 acres of mountain lion and black bear habitats could be destroyed from surface-disturbing activities associated with tar sand development. Distribution of these acres is shown by tract in Table 4-3. Because these species are extremely sensitive to human encroachment, existing populations could be reduced (U.S. Department of Interior [USDI], BLM and USDI, NPS, 1983). However, because of a lack of census data, exact numbers cannot be quantified.

TABLE 4-3

Alternative 1
Summary of Impacts to Wildlife^a

Potential Lease Tract	Crucial Deer Range (Acres) ^b	Elk Range (Acres) ^b	Riparian Habitat (Miles)	Sage Grouse Habitat (Acres) ^c	Aspen Habitat (Acres)	Small Game Habitat (Acres)	Yearlong Raptor Habitat (Acres)
Sunnyside 1 ^d	2,635 (S)	2,635 (S)	1.25	1,600 (YL)	1,402	2,635	2,635
Sunnyside 2 ^d	1,000 (S) 1,356 (W)	1,000 (S) 1,356 (W) ^d	1.50	1,300 (YL)	25	2,356	2,356
Sunnyside 3 ^d	120 (S)	120 (S)	0.25	20 (YL)	80	120	120
Sunnyside 4 ^d	40 (S)	40 (S)		0	2	40	40
Sunnyside 5 ^e	128 (S)	128 (S)		16 (YL)	0	128	128
Sunnyside 6 ^e	671 (S) 1,823 (W)	671 (S) 1,823 (W)	1.00	1 (SG) 400 (N)	530	2,494	2,494
Sunnyside 7 ^d	320 (S)	320 (S)		320 (YL)	190	320	320
Sunnyside 8 ^d	1,764 (S)	1,764 (S)		660 (YL) 160 (N)	513	1,764	1,764
Sunnyside 9 ^e	240 (S)	240 (S)	0.50	1 (SG) 240 (YL) 220 (N)	25	240	240
Black Dragon ^{e, f}						352	352
Flint Flat ^{e, f}						1,074	1,074
Gordon Corral ^{e, f}						194	194
Total	6,918 (S) 3,307 (W)	6,918 (S) 3,307 (W)	4.5	2 (SG) 4,156 (YL) 780 (N)	2,767	11,717	11,717

Source: USDI, BLM and USDI, NPS, 1983.

^aNo significant impacts to threatened, endangered, or sensitive species are expected.

^bS = Summer
W = Winter.

^cYL = Yearlong
N = Nesting
SG = Strutting Ground

^dImpacts from surface mining.

^eImpacts would result from in-situ development.

^fDesert bighorn sheep habitat exists on these tracts; however, no use of these areas has been documented.

UPLAND GAME

Sage Grouse: Two sage grouse strutting grounds, 4,156 acres of yearlong habitat, and 780 acres of nesting habitat could be destroyed from surface-disturbing activities associated with tar sand development (see Table 4-3). This development level could eliminate sage grouse populations on the potential lease tracts (USDI, BLM and USDI, NPS, 1983).

UNIQUE AND LIMITED HIGH-VALUE WILDLIFE HABITAT

Aspen Communities: Approximately 2,800 acres (about 8 percent of the aspen in the Sunnyside STSA) of aspen could be lost from tar sand development (see Table 4-3). Wildlife populations dependent upon this habitat could be reduced (USDI, BLM and USDI, NPS, 1983).

Riparian Habitat: Approximately 4.5 miles or 64 percent of the riparian habitat within potential lease tracts could be destroyed from surface-disturbing activities associated with tar sand development (see Table 4-3). Wildlife populations dependent upon this habitat could be reduced (USDI, BLM and USDI, NPS, 1983).

Raptor Habitat: Approximately 11,700 acres (50 percent of the habitat within tracts) of yearlong raptor habitat could be destroyed from surface-disturbing activities associated with tar sand development. Distribution of these acres is shown by tract in Table 4-3. Raptor populations (e.g., red-tailed hawks, goshawks, sharp-shinned hawks, and rough-legged hawks) dependent on this habitat could be reduced on this area (USDI, BLM and USDI, NPS, 1983). However, because of a lack of census data, exact numbers cannot be quantified.

THREATENED, ENDANGERED, AND SENSITIVE ANIMAL SPECIES: Because there are no officially designated critical habitats or known concentration use areas or nest sites on any of the potential lease tracts, no significant impacts to the northern bald eagle, peregrine falcon, black-footed ferret, or golden eagle would be expected.

Aquatic Species

SUNNYSIDE TRACTS 3, 7, 8, AND 11: Fish habitat would be impacted by alteration in stream channels, an increase in turbidity and sedimentation, a reduction in instream flows, and a degradation of water quality by leaching and contamination. Habitat components (i.e., temperature, cover, and stabilized streambanks) are provided primarily by the adjacent riparian vegetation. Reducing or destroying riparian vegetation would eliminate or reduce fisheries quality, depending on the extent and location of tar sand development; consequently, fish populations would be kept below their biotic potential.

Potential fisheries associated with the Left Fork of Dry Creek (Sunnyside tract 3) and Dry and Cottonwood creeks (Sunnyside tract 11) could be lost. Impacts to the Left Fork of Dry Creek could significantly affect the suitability of the entire headwaters area for fish habitat.

Impacts to Range Creek (tract 7) and Rock Creek (near tract 8) would be similar to those mentioned above. Although Township 14 South, Range 14 East, Section 13 on Sunnyside tract 7 would not be open to any kind of development, impacts such as altered flow, increased sediment yield, etc., could occur. These types of impacts, depending on the degree to which they occur, could result in total elimination of the fisheries, especially in the upper reaches (3 to 4 miles) of Range Creek. Even after reclamation, it might not be possible to restore fisheries to their present condition.

Degradation of fish habitat would also result from increased human disturbance (cutting firewood, polluting streams, and destroying vegetation). These secondary impacts could result in a greater loss of fish than impacts resulting from increased fishing pressure.

Threatened, Endangered, and Sensitive Aquatic Species

Impacts to the endangered Colorado squawfish and humpback chub and the sensitive razorback sucker could occur from degradation of water quality and reduction of instream flows in the Green River and its tributaries. Both the Green and Colorado rivers have experienced significant peak flow reductions because of existing reservoir operations and water depletion for various other uses. Levels, magnitude, and duration of peak flows primarily determine river morphology and habitat conditions. Peak flows have been drastically reduced in the Colorado River system, resulting in sediment buildup, changes in water temperature, and other chemical changes (USDI, FWS, 1982).

Tar sand development could change peak flow regimes in tributaries to the Green and Colorado rivers during spring runoff; development could also reduce the amount of water reaching these rivers during this period. This would further add to the chemical and physical changes occurring in the Green and Colorado rivers. Population declines of Colorado squawfish correlate closely with dam and reservoir construction and the removal of water from the Colorado River system (USDI, FWS, 1982). Tar sand development could adversely affect essential habitat requirements for squawfish in the Green and Colorado rivers by reducing peak spring and annual flows and increasing turbidity and silt load.

Impacts to the Green River (i.e., degraded water quality and reduced flows) would adversely affect humpback chub habitat in Desolation and Gray canyons. Flow reductions could significantly alter habitat needed for spawning and rearing, consequently reducing reproductive success (USDI, FWS, 1979).

Wild and Free-Roaming Horses and Burros

SUNNYSIDE 2, 5, AND 6 AND BLACK DRAGON TRACTS: Historic wild horse range occurs on these Sunnyside tracts; historic wild burro range occurs on the Black Dragon tract. These ranges would be lost if tar sand were developed. Although wild horses and burros would be displaced for the project's life, total herd size or productivity

would probably not be affected because only a small portion of the total range would be impacted. Increased vehicular traffic (on and off-road) caused by improved access would increase harassment to these animals.

RECREATION

Recreational uses and values would be degraded by tar sand development on potential lease tracts. Surface mining would affect the uses and values identified in Table 3-5. Sightseeing values on potential lease tracts would be permanently impaired. During operation and rehabilitation, camping/picnicking, hiking/backpacking, and hunting opportunities would be lost throughout most of the affected tracts; impacts to these opportunities would last until rehabilitation was completed (up to several decades). During operation and rehabilitation, some winter sports, ORV use, and horseback riding opportunities would be available, although their quality would be degraded. Recreational visits for all uses would be expected to decline on developed tracts.

In-situ development would generally result in loss of visual quality and camping/picnicking, hiking/backpacking, hunting, winter sports, and horseback riding opportunities during operation and rehabilitation. Improved access could result in a slight increase in ORV use in developed tracts. Following rehabilitation, most recreational uses and values would return. However, there would be some permanent loss of scenic/sightseeing values in highly scenic areas of the Roan Cliffs and West Tavaputs Plateau.

Sunnyside Tracts

TRACTS 1, 2, 3, AND 4: As indicated in Table 3-5, recreational values and uses on these tracts are similar. Under this alternative, each tract would be surface mined, which would degrade or destroy present recreational values; impacts would be similar to those described for surface mining above. Rehabilitation from most impacts would be possible in the long term, although primitive recreation and sightseeing values would be permanently altered. Fishing values in tract 3 would be lost. Improved access could increase vehicular traffic in the area.

TRACTS 5, 6, AND 9: These tracts have similar terrain and recreational values and uses. Tracts 5 and 6 would probably be developed by in-situ methods, while tract 9 would probably be surface mined. Recreational impacts would be similar to those described in the introduction to this section. Development would reduce scenic/sightseeing values, hunting opportunities, and increase vehicular traffic. However, rehabilitation would restore most values. Primitive recreation values in Desolation Canyon WSA (UT-060-068A) would be degraded by visual intrusions and sounds for the duration of operations. The impacts would be greatest from development of tract 9 and less on tracts 5 and 6 (5 and 1 miles from the WSA, respectively).

TRACTS 7 AND 8: Both of these tracts are in similar areas of the Roan Cliffs and have similar scenic values and recreational uses. These tracts would probably be developed by surface mining. (Impacts resulting from surface

mining are described above in the introduction to this section.) Significant scenic and hunting values and uses in these tracts would be lost during development activities. Fishing values on tract 7 would be impacted. Rehabilitation could restore hunting and some fishing values in the long term; however, scenic/sightseeing values would be permanently altered.

Black Dragon Tract

Tar sand surface mining of this tract would create visual intrusions in the Interstate 70 (I-70) visual corridor and could be seen from the Mexican Mountain WSA (UT-060-054).

Gordon Corral and Flint Flat Tracts

In-situ tar sand development on these tracts would affect primitive recreation values both on and off tract. Noise, odor, and dust would probably affect visitation patterns in the affected portions of Glen Canyon National Recreation Area (NRA). Road improvements could increase vehicular traffic in the area. Recreational values and uses of the flats above the Orange Cliffs could be restored on completion of rehabilitation of the affected areas, but this would require several years.

WILDERNESS

Tar sand development in areas contiguous or adjacent to WSAs would impact wilderness values because of impacts to solitude from visual intrusions and sounds. Impacts would be greatest from surface mining because visual intrusions and sounds would be greater than those resulting from in-situ mining. However, sights, sounds, and odors caused by in-situ development would be significant, especially during the time of lease development. During the production phase, vehicular traffic on graveled roads would also affect wilderness values in adjacent areas.

None of the potential lease tracts are in designated wilderness areas. However, Sunnyside tract 9 is adjacent to the Desolation Canyon WSA; the Black Dragon tract is about 0.25 miles from the Mexican Mountain WSA, and the Gordon Corral and Flint Flat tracts are approximately 1 mile from the French Spring/Happy Canyon WSA and are also contiguous with NPS-proposed wilderness.

VISUAL RESOURCES

Significant adverse impacts would result from tar sand development. On-site impacts would vary according to the method used for development (i.e., surface-mining or in-situ methods). Strip mining, roads, pipelines, drill pads, tanks, and other facilities would affect the landform, vegetation, and structural components of the landscape.

The degree of impact (contrast created) would depend on how facilities were designed, located, and constructed. Visual impacts resulting from an activity are a function of size and contrast (form, color, texture, and line) with the existing landscape. Therefore, design and construction minimizing changes to these elements would substantially reduce the degree of visual impact.

In most cases, contrast created by tar sand development would be high and probably would exceed Visual Resource Management (VRM) class standards. However, prompt recontouring and revegetation of disturbed areas could significantly reduce impact durations. Visual impacts resulting from construction of drill pads, pipelines, tanks, etc., would be noticeable until these structures were removed and reclamation efforts successful. The time required would vary, depending on soil, moisture, and existing vegetation conditions. Impacts would last into the long term, especially in desert and forest areas, where recovery would require several years.

In-situ tar sand development would result in surface disturbance (vegetation and soil removal) on 40 percent of the area. This would cause significant changes in scenic quality (i.e., strong contrasts), and impacts would require rehabilitation. Until rehabilitation was complete, these areas would be rated in VRM Class V and would be out of character with surrounding areas. In VRM Class IV and possibly some Class III areas, existing scenic values could be substantially recovered. In VRM Class II and some III areas, a permanent degradation of scenic values would occur from in-situ development.

Surface mining would cause permanent degradation of scenic values in all VRM Class II and III areas. Rehabilitation to a condition harmonious with the natural landscape would not be feasible. Angular landforms and color diversity not blending with existing landscapes would be permanent. However, with extensive rehabilitation, recovery of scenic values to VRM Class IV would be possible.

Sunnyside Tracts

TRACT 1: The 2,635 acres underlain by tar sands would be surface mined, and high scenic values would be permanently degraded on the west face of Roan Cliffs. This disturbance would lower the elevation and would be visible from U.S. Highway 6. After reclamation, all present VRM Class II and III areas would probably become Class IV.

TRACT 2: Surface mining would permanently degrade visual values in a highly scenic area on West Tavaputs Plateau; scenery constitutes the primary recreational value in this area. Reclamation would require 10 years after development activities. Present VRM Class II and III areas would be reduced to Class IV because of the permanent loss in scenic quality.

TRACTS 3 and 4: Surface mining would permanently degrade high scenic values in highly visible/sensitive VRM Class II areas in Roan Cliffs. Part of Bruin Point (tract 4, 40 acres) and tract 3, 120 acres would be lowered. Even after reclamation and reforestation, which would require several decades, impacts would reduce these areas to VRM Class IV.

TRACTS 5 and 6: Development of tar sand resources on both of these tracts would probably be by in-situ methods. Construction of roads, drill pads, pipelines, tanks, and other facilities would considerably change scenic quality in both tracts. Impacts would require rehabilitation and would be rated as VRM Class V until rehabilitation was complete. Even after rehabilitation in VRM Class III areas

(128 acres in tract 5 and 2,120 acres in tract 6), degradation of scenic quality would probably result in the area becoming VRM Class IV. Surface disturbance in VRM Class IV areas, with the possible exception of steep slopes, could be successfully rehabilitated in 10 years after cessation of development activities.

TRACTS 7 and 8: The majority of both tracts lie in or along the Range Creek drainage, where scenic quality is high. All of tract 8 (1,764 acres) and 60 percent of tract 7 (960 acres) are in VRM Class II areas. The remainder of tract 7 is Class III. Both of these tracts could be surface mined, which would permanently degrade scenic quality.

TRACT 9: This tract is located in the West Tavaputs Plateau and, generally, has low visual resource values. Surface mining would degrade scenic values and require rehabilitation (VRM Class V). VRM Class IV areas could be successfully rehabilitated, with the possible exception of disturbances on steep slopes where reclamation might not be possible. Even after rehabilitation, visual values in Class II areas would be permanently degraded and would become VRM Class IV areas.

Black Dragon Tract

Most of this tract offers bench and butte scenery in an area of high visual sensitivity (the I-70 scenic corridor). Strip mining of all mineable areas would cause severe permanent degradation of high scenic values.

Gordon Corral and Flint Flat Tracts

Both tracts are in Glen Canyon NRA and would be mined by in-situ methods. Surface disturbance would cause long-term to permanent degradation of scenic quality. After several decades, recovery to a condition substantially harmonious with the existing surrounding environment would be possible in the pinyon-juniper flats above the Orange Cliffs on Gordon Corral tract and the eastern portion of Flint Flat tract. (Both areas are scenic overlooks to the Maze in Canyonlands National Park.) In the Happy Canyon cliff and canyon bottom areas of the west portion, such recovery would probably not be feasible. That area is, however, shielded from the view of most travelers in the area. Dust from developments on either tract would be visible from and create off-site impacts in Canyonlands National Park and proposed wilderness areas of Glen Canyon NRA.

LIVESTOCK GRAZING

Both in-situ and surface-mining methods would eliminate or greatly reduce suitability for livestock grazing. Tar sand development would result in loss of forage, loss of water or access to water, loss of trails, and disruptions in patterns of use. Vehicle traffic, on and off-road, would increase harassment of livestock, accidents, and vandalism. Livestock grazing loss would likely last into the long term (more than 20 years). A provision in category 1 standard lease stipulations requires that livestock be protected by fencing or otherwise excluding them from active mining areas. However, there is no provision requiring the lease holder to honor any grazing preference a permittee may have on an allotment. Furthermore, it is assumed that no existing water

developments, accesses, fences, or other range improvements would be preserved for livestock grazing on Federally controlled surface. Therefore, all livestock grazing on Sunnyside 1-9, Black Dragon, Gordon Corral, and Flint Flat potential lease tracts would be lost to tar sand development. Livestock use on these tracts is estimated to total 2,362 Animal Unit Months (AUMs). See Chapter 3 Livestock Grazing section for loss by allotment.

Alternative 2: Lease 18 Tracts Under Multiple Use, Subject to BLM Categories 2, 3, and 4 and NPS Stipulations

This alternative proposes to lease the same potential lease tracts as Alternative 1; however, different categories and stipulations would be applied. The primary difference between this alternative and Alternative 1 is that 8,820 acres would have special stipulations and/or be placed in categories 3 and 4 to protect other resource values. This alternative assumes that the multiple use (preferred category amendments would be implemented (see Volume II). Special resource values would be protected by categories and special stipulations when considering tar sand development (e.g., a special stipulation for some areas would allow development on only 25 percent of a tract at a time).

WATER RESOURCES

Sediment yield would increase from construction and operation activities on the 18 potential lease tracts. Increased stream turbidity, sediment load, TDS levels, and impacts to 11 springs would be similar to those described in Alternative 1, except less surface disturbance would occur on 8,464 acres placed in BLM category 2. Eight hundred thirty-six acres would be placed in category 3 (640 acres moved from category 4) and would receive less protection (see Table 2-1).

An estimated 12,594 acre-feet of water would be required annually for tar sand development, as discussed in Alternative 1. Water use calculation for individual tracts are the same as those shown in Alternative 1.

Degradation of water quality would be less than Alternative 1 during the 20-years analysis period because of special stipulations which would allow only 25 percent of the area to be disturbed at one time. The nature and number of acres of these stipulations are shown in Table 2-1.

SOILS

Increased erosion and sediment yield would occur as described under Alternative 1, although to a smaller extent. Up to 3,922 acres could be disturbed on category 1 lands, up to 8,654 acres on category 2 lands, and 3,169 acres on NPS-administered lands. Flint Flat and Gordon Corral tracts could be disturbed, but to a lesser degree because special stipulations would limit impacts, as shown in Table 2-1. Eight hundred thirty-six acres would be designated category 3 to protect other resources in Sunnyside tracts 2, 6, and 9.

TOPOGRAPHY, TAR SAND, AND OTHER MINERALS

Sunnyside Tracts 1-4

TOPOGRAPHY: Changes would occur to the topography and geology of these potential lease tracts if they were developed by surface-mining methods. Geology and topography above the tar sand deposit would be changed. Landforms would be more rounded and subdued than those existing before development. Elevations could be lower than original elevations unless waste sand from the plant was added to the pit. In that case, elevations could be higher than original elevations. The headwater valleys of streams near development activities could be filled with waste rock.

TAR SAND: Ninety percent of the bitumen would be removed from these tracts by surface-mining methods except for 360 acres in tracts 2, 6, and 9, which would be placed in category 3 and would not be developed. About 562 million barrels could be recovered from these four tracts. Table 4-2 shows estimates of recoverable and unrecoverable tar sand resources.

OTHER MINERALS: Any underlying coal or oil and gas could be developed after tar sand recovery.

Sunnyside Tracts 5-9

TOPOGRAPHY: These tracts have category 2 restrictions except for 316 acres in category 3 (no surface occupancy). Should these tracts be developed by in-situ methods. Topography and geology would not be significantly altered except in the tar sand deposit areas.

TAR SAND: Of the approximate 318 million barrels of estimated in-place bitumen, 94 million would be recovered. About 224 million barrels would not be developed because of category 2 and 3 restrictions.

OTHER MINERALS: Any underlying coal or oil and gas could be developed after tar sand development.

Black Dragon Tract

TOPOGRAPHY: Impacts from in-situ development would include cuts and fills, which would disturb rocks near the surface and create breaks in slope. Minor subsidence could also occur.

TAR SAND: In-situ development would recover about 30 percent (1.5 million barrels) of the bitumen. The remaining resource (3.6 million barrels) would be unrecoverable with present technology and probably could not be recovered in the future.

OTHER MINERALS: Any coal or oil and gas in the rocks underlying tar sand deposits could be developed after extraction of tar sand.

Gordon Corral and Flint Flat Tracts

TOPOGRAPHY: Impacts would include cuts and fills, which would disturb rock near the surface and create breaks in slope.

ALTERNATIVE 2

TAR SAND: If the tar sand were developed by in-situ methods, 30 percent (17.3 million barrels) of the bitumen could be recovered; the remaining resource (40.5 million barrels) would be unrecoverable with present technology and probably could not be recovered in the future.

OTHER MINERALS: Any underlying oil and gas could be developed after extraction of tar sand.

VEGETATION

Vegetation loss would be similar to Alternative 1 on 7,091 acres; however, loss on 9,489 acres would be less because more restrictive categories would be applied. These acreages are 43 percent and 57 percent, respectively, of the total acreage for all 12 potential lease tracts.

Sunnyside Tract 1

Impacts to vegetation on this tract would be identical to those occurring under Alternative 1 because surface mining would be constrained only by category 1 stipulations. Therefore, it is expected that 3,202 acres of vegetation comprised of 1,223 acres of sagebrush-grass, 577 acres of pinyon-juniper, and 1,402 acres of aspen would be lost.

Vegetation loss would result from surface clearing, contour modification, and removal and mixing of topsoil. The duration of impacts would range from short term (rehabilitate to current composition and cover within 20 years) to permanent. Permanent impacts would result from changing the potential of a site by altering soil and/or contour characteristics.

Sunnyside Tracts 2-9

Category 2 special stipulations and category 3 and 4 designations would diminish or eliminate impacts to vegetation on these tracts. The following stipulations, which cover 92 percent of these tracts, would be required: (1) no more than 25 percent of the tract could be developed at any one time; (2) additional mining would not be allowed until vegetation was re-established on the previously disturbed area; (3) development would not be allowed on slopes greater than 50 percent; and (4) protection would be provided for aquifers, water sources, etc.

Although these stipulations do not protect existing vegetation, they would reduce impacts to range site potential and forage production. To protect sage grouse strutting and nesting areas, only in-situ extraction methods would be allowed on 400 acres of Sunnyside tract 6 and 280 acres of tract 9. Although this stipulation would not affect development plans for tract 6, it could reduce the area of surface clearing by about 168 acres on tract 9.

Categories 3 and 4 would protect 1.5 miles of riparian vegetation on tract 2 and about 10 percent on tracts 2, 6, and 9. However, the remaining 5.5 miles of riparian vegetation on tracts 1, 3, 6, 7, and 9 would not be protected. It is expected that destruction of riparian vegetation and habitat would occur on these tracts from tar sand recovery processes. Stipulations in this alternative would, however, provide for rehabilitation of disturbed areas, protection of steep

slopes, and protection of water quality and quantity. Also, impacts to riparian habitat and vegetation would not be as extensive at any one time as those occurring under Alternative 1.

Black Dragon Tract

Vegetation would be protected by category 3 and 4 designations on 160 acres. There would be no on-site impact to vegetation on these areas. However, vegetation loss could occur on about 720 acres open to development under category 1. Assuming a worst-case situation vegetation loss would occur as a result of surface mining. The impacts would be as described for Sunnyside tract 1 of this alternative.

Gordon Corral and Flint Flat Tracts

Impacts to vegetation on these tracts would be identical to those occurring under Alternative 1 because in-situ development would be constrained only by general and special stipulations. Therefore, it is expected that about 1,268 acres of pinyon-juniper, Mormon tea, blackbrush, and galleta-three awn vegetation would be lost to tar sand development. In-situ development would result in surface clearing and topsoil removal on about 40 percent of the surface area within a potential lease tract. In-situ development would cause less extensive and fewer permanent changes in vegetation cover, composition, and range site potential than surface mining. Clearing of access roads and pads for in-situ development would require less deep removal of soil and, thus, less mixing of surface and subsurface soils, parent material, and rock strata. Assuming that in-situ development would affect 40 percent of the surface area in these tracts, about 2,522 acres would be cleared of vegetation.

THREATENED, ENDANGERED, AND SENSITIVE PLANT SPECIES

Black Dragon Tract

One hundred sixty acres would be placed in category 3 to protect populations and habitat of the sensitive species *Cryptantha jonesiana*. It should be noted that data are not available to indicate the occurrence of this plant or its habitat in category 3 areas.

BLM policy states that sensitive or candidate plant species and their habitat will be managed as if they were listed as threatened or endangered. This policy guards against population declines and habitat reductions to prevent possible future listing as threatened or endangered. There are no category 2 special stipulations or category 3 or 4 protections written specifically to preserve this plant or its habitat.

Flint Flat Tract

Impacts to the sensitive species *Astragalus nidularis* could result from in-situ development. There is potential for destruction and loss of population and habitat. However, as analyzed in the Vegetation section, in-situ development would have less extensive and fewer intensive impacts than surface mining.

ANIMAL LIFE

Tar sand development could impact wildlife populations directly (i.e., loss of habitat) and indirectly (i.e., human activity such as increased hunting pressure, harassment, poaching, and ORV use). Because there are insufficient data to quantify secondary impacts, only impacts associated with the direct loss of habitat are discussed.

Terrestrial Animals

BIG GAME

Mule Deer: Approximately 2,960 and 3,050 acres of crucial summer and winter range (less than 1 percent of these crucial ranges in herd unit 27B), respectively, would be protected by special stipulations (see Table 2-1). However, surface-disturbing activities associated with tar sand development could still occur on portions of these protected areas, as well as on unprotected areas. Because summer range is considered the limiting factor for deer in this herd unit, populations could decline. Based on the assumption that deer are evenly distributed over crucial summer range, it is estimated that destruction of approximately 4,000 acres of deer summer range (approximately 2 percent of the crucial summer range in herd unit 27B) would reduce deer numbers on herd unit 27B by 162 animals. This represents approximately 1 percent of the deer on this herd unit.

Elk: Approximately 2,960 and 3,050 acres of crucial summer and winter range for 40 to 60 elk, respectively, would be protected by special stipulations (see Table 2-1). However, surface-disturbing activities associated with tar sand development could still occur on portions of these protected areas, as well as on unprotected areas. Tar sand development could prevent or retard the reestablishment of elk in the area because of loss of summer range. However, impacts to elk would be less than those occurring under Alternative 1.

SMALL GAME: Approximately 8,654 acres of mountain lion and black bear habitats would be protected by special stipulations (see Table 2-1). In addition, 836 acres would be protected under category 3 stipulations. However, surface-disturbing activities could still occur on portions of these protected areas, as well as on unprotected areas. Because these species are extremely sensitive to human encroachment, existing populations dependent upon this habitat could be reduced (USDI, BLM and USDI, NPS, 1983). Loss of small game habitat would be less than that occurring under Alternative 1.

Upland Game: Two sage grouse strutting grounds and 680 acres of crucial nesting habitat would be protected by special stipulations (see Table 2-1). However, 4,156 and 100 acres of sage grouse yearlong and nesting habitats, respectively, could be destroyed by surface-disturbing activities. This level of development could reduce sage grouse populations in the area. Because of a lack of census data, the number of sage grouse lost cannot be quantified.

UNIQUE AND LIMITED HIGH-VALUE WILDLIFE HABITAT

Aspen Communities: Approximately 2,800 acres (8 percent) of the aspen in the STSA could be lost from tar sand development. Wildlife populations dependent upon this habitat could be reduced (USDI, BLM and USDI, NPS, 1983).

Riparian Habitat: Approximately 4 miles (57 percent) of the riparian habitat in all potential lease tracts would be subject to surface-disturbing activities. Wildlife populations dependent on this habitat could be reduced (USDI, BLM and USDI NPS, 1983).

Raptor Habitat: Approximately 8,654 acres of raptor habitat would receive some degree of protection from special stipulations (see Table 2-1). In addition, 836 acres would be protected by category 3 stipulations. However, surface-disturbing activities could still occur on portions of these areas, as well as on unprotected areas. Raptor populations (e.g., red-tailed hawks, goshawks, sharp-shinned and rough-legged hawks) habitat could be reduced (USDI, BLM and USDI, NPS, 1983). However, because of a lack of census data, exact numbers cannot be quantified.

THREATENED, ENDANGERED, AND SENSITIVE ANIMAL SPECIES: Because there are no officially designated critical habitats, known concentration use areas, or nest sites on any of the potential lease tracts, no significant impacts to the northern bald eagle, peregrine falcon, black-footed ferret, or golden eagle would be expected to occur.

Aquatic Species

SUNNYSIDE TRACTS 7 AND 8: Fish habitat would be impacted by alteration of stream channels, increase in turbidity and sedimentation, reduction in streamflows, and degradation of water quality, as described in Alternative 1. However, these impacts would occur to a lesser extent than Alternative 1 because of the special stipulations on 640 acres of Range Creek to protect the Sunnyside water supply reserves (tract 7) and an additional 1,324 acres placed in category 2 with special stipulations to protect the Range Creek watershed (tract 8).

Threatened, Endangered, and Sensitive Aquatic Species

SUNNYSIDE 1-9, GORDON CORRAL, AND FLINT FLAT TRACTS: Impacts to the endangered Colorado squawfish, humpback chub, and sensitive razorback sucker could occur from degradation of water quality and reduction of instream flows in the Green and Colorado rivers, as discussed in Alternative 1. However, these impacts would occur to a lesser extent. Because of the special stipulations in tracts 7 and 8, the magnitude of tar sand development would not be as great as under Alternative 1; therefore, water requirements and instream flow reductions would be less extensive. Consequently, loss of fish habitat and reductions in populations would not be as severe.

Wild and Free-Roaming Horses and Burros

Historic wild horse range occurs on Sunnyside tracts 2, 5 and 6; and historic wild burro range occurs on the Black

ALTERNATIVE 2

Dragon tract. Some areas of range would be lost if tar sand were developed. Although wild horses and burros would be displaced for the project's life, total herd size or productivity would probably not be affected. Increased vehicular traffic (on and off-road) caused by improved access would increase harassment to these animals.

RECREATION

Sunnyside Tracts 1-4

Recreational values and uses shown in Table 3-5 would be lost or degraded on potential lease tracts during development and operation as in Alternative 1; camping/picnicking, hiking/backpacking, and hunting opportunities would be lost throughout most of the tracts. However, stipulations for tract 2 would place 338 acres in category 3, which would result in less impacts than Alternative 1. Rehabilitation from most impacts would be possible in the long term; however, scenic values would be permanently degraded.

Sunnyside Tracts 5, 6, and 9

Impacts from in-situ development would be similar to those described in the introduction to the Recreation section in Alternative 1. However, impacts to hunting would be less than Alternative 1 because big game habitat would be protected. Development would reduce scenic/sightseeing values, hunting opportunities, and primitive recreation values in these tracts and in Desolation Canyon WSA.

Sunnyside Tracts 7 and 8

Surface-mining development would be similar to Alternative 1 (i.e., loss of scenic, fishing, and hunting values) except that the timing and duration of impacts would be altered. Visual intrusions and sounds from tracts 7 and 8, 6 and 3 miles east, respectively, of Desolation Canyon WSA, would affect wilderness values. Rehabilitation would restore hunting and fishing values; however, scenic values would be permanently degraded.

Black Dragon Tract

One hundred sixty acres of the visual corridor of I-70 would be placed in category 3, thereby limiting visual intrusion effects. No significant effect on off- or on-site recreational use would be expected, although improved access would probably increase vehicular traffic in the area. The area could be successfully rehabilitated and recreational values restored upon completion of operations.

Gordon Corral and Flint Flat Tracts

Impacts to recreation would be essentially the same as those described in Alternative 1.

WILDERNESS

As under Alternative 1, tar sand development in areas adjacent to WSAs would impact wilderness values because of impacts to solitude from visual intrusion and sounds. Impacts would be greatest from surface mining because visual intrusions and sounds would be greater than those resulting from in-situ development. However, sights and

sounds caused by in-situ processes would be significant, especially during the time of lease development. During the production phase, vehicular traffic on graveled roads and dust would also affect wilderness values in adjacent areas.

Potential wilderness areas close to potential lease tracts are as follows: Sunnyside tract 9 is contiguous with Desolation Canyon WSA; the Black Dragon tract is about 0.25 mile from the Mexican Mountain WSA, and the Gordon Corral and Flint Flat tracts are adjacent to the French Spring/Happy Canyon WSA and contiguous with NPS-proposed wilderness.

VISUAL RESOURCES

Impacts from surface mining and in-situ development would be as described in the Introduction to Visual Resources in Alternative 1.

Sunnyside Tract 1

Impacts would be similar to Alternative 1, except development would be limited to 25 percent of the potential lease tract at any one time in category 2 areas. This would require that development of a tract would need to be rehabilitated before more area could be disturbed. Surface mining would permanently degrade all Class II and III areas (see Table 3-6). After rehabilitation, all affected areas would be Class IV.

Sunnyside Tract 2

Surface mining of 1,427 acres would permanently degrade scenic quality in VRM Class II and III areas. In-situ development of the remaining 951 acres would disturb up to 380 acres. Disturbances could be successfully rehabilitated in VRM Class IV and some Class III areas; however, degradation of scenic values in Class II areas would occur.

Sunnyside Tracts 3 and 4

Surface mining would degrade these tracts, although development would be limited to 25 percent of the tracts at any one time. High visual values would be permanently degraded throughout these tracts.

Sunnyside Tracts 5 and 6

The stipulation restricting disturbance on steep slopes would significantly reduce the degree of impact, and rehabilitation of disturbed areas would probably be successful in most areas. Scenic quality in some Class III areas could be permanently degraded.

Sunnyside Tracts 7 and 8

All 960 acres on tract 7 would be surface mined. Permanent degradation would occur throughout both tracts, although development could not occur on the entire tract at any one time because of the 25-percent surface disturbance limitation. Impacts to tract 8 would be the same as under Alternative 1 (i.e., permanent degradation of high scenic values).

Sunnyside Tract 9

Most of the tract has low scenic values which could be

successfully rehabilitated from the impacts of surface mining or in-situ development. However, the Class II portion of the tract could be permanently degraded and become Class IV after rehabilitation.

Black Dragon Tract

Alternative 2 would protect 160 acres (category 3) of the I-70 scenic corridor. Surface mining would permanently degrade scenic values on 398 acres until rehabilitation. Reduced scenic quality would result in some areas becoming VRM Class IV.

Gordon Corral and Flint Flat Tracts

Impacts to visual values would be the same as Alternative 1. Successful rehabilitation of visual values would be possible in the flats above the Orange Cliffs; however, degradation of scenic values could occur in the western portion of Flint Flat tract.

LIVESTOCK GRAZING

No special stipulations or designations are proposed to preserve suitability for livestock grazing. Therefore, it is assumed that access, loss, or contamination to water; loss of stock trails; changes in fencing; and disruptions in patterns of use from tar sand development would greatly reduce suitability for livestock grazing in potential lease tracts.

Preservation of livestock forage could be possible on about 75 percent of potential lease tracts because only 25 percent of a tract could be developed at any one time. However, it is not known if stock water, trails, or patterns of use could be maintained so as to permit livestock grazing. There are an estimated 1,995 AUMs of livestock use on areas with special stipulations and category 3 protection. This is 84 percent of the AUMs produced on the tracts; therefore, the majority of the forage resource would be preserved even though the tracts' general suitability for grazing would be lost (see the Livestock Grazing section in Chapter 3).

Alternative 3: Lease Seven Tracts Under Maximum Development, Subject to BLM Category 1

Sunnyside tracts 1-4 and Pariette tracts 1-3 would be leased under this alternative. Development on the Pariette tracts is expected for only oil and gas (this development has already been analyzed in BLM Districtwide EAs). Therefore, these tracts are not discussed here. For the four Sunnyside tracts, this alternative would have the same impacts as described in Alternative 1. The following discussion addresses these four tracts as opposed to the nine Sunnyside tracts described in Alternative 1. All tracts would be leased with category 1 general stipulations (see Table 2-1).

WATER RESOURCES

Sediment yield would increase as described in Alternative

1. However, these impacts would occur only on acres in Sunnyside tracts 1-4 which would be subject to surface disturbance. Water flow and quality could be affected in five streams and seven springs as shown in Table 3-2.

Consumptive water requirements for tar sand development under this alternative would be less than Alternatives 1 and 2, because only Sunnyside tracts 1-4 would be developed. Using the same assumptions described in Alternative 1, an estimated 7,510 acre-feet of water would be required annually for producing 562.6 million barrels/day of bitumen for recoverable tar sand resources (see Table 4-2).

Sunnyside tract 1 would be developed recovering 5,000 barrels/day of bitumen requiring 1,250 acre-feet of water per year. Sunnyside tracts 2, 3, and 4 would have recoverable reserves of 123.3 million barrels of bitumen. Should these tracts be developed in a 20-year period, 16,890 barrels/day could be recovered with an estimated water requirement of 4,222 acre-feet of water annually.

SOILS

Erosion and sediment yield impacts would be similar although less than impacts described in Alternative 1. Up to 6,078 acres on Sunnyside tracts 1-4 could receive surface disturbance.

TOPOGRAPHY, TAR SAND, AND OTHER MINERALS

Sunnyside Tracts 1, 2, 3, and 4

TOPOGRAPHY: Geology and topography above the tar sand excavation would be altered by surface mining. Landforms would be more rounded and subdued than those existing before development. Elevations could be lower than original elevations unless waste sand from the plant was added to the pit. In that case, elevations could be higher. The headwater valleys of streams near development activities could be filled with waste rock.

TAR SAND: Ninety percent of the bitumen would be removed (553 million barrels) from tracts developed by surface-mining methods. Table 4-2 shows estimates of the tar sand resources in tracts.

OTHER MINERALS: Any coal or oil and gas in the rocks underlying a tar sand tract could be developed after mining and reclamation were complete.

VEGETATION

Sunnyside Tracts 1-4

Vegetation loss would be of the same intensity and extent as Alternative 1 (6,078 acres disturbed on four tracts). It is assumed that surface mining would result in vegetation clearing and topsoil removal and mixing on nearly 100 percent of the surface area of potential lease tracts. Three miles of riparian vegetation/habitat, over 1,500 acres of aspen, and over 300 acres of mountain brush/spruce-fir would be destroyed. These vegetation types are important for deer,

ALTERNATIVE 3

TABLE 4-4

Alternative 3
Summary of Impacts to Wildlife^a

Potential Lease Tract	Crucial Deer Range (Acres) ^b	Elk Range (Acres) ^b	Riparian Habitat (Miles)	Sage Grouse Habitat (Acres) ^c	Aspen Habitat (Acres)	Small Game Habitat (Acres)	Yearlong Raptor Habitat (Acres)
Sunnyside 1 ^d	2,635 (S)	2,635 (S)	1.25	1,600 (YL)	1,402	2,635	2,635
Sunnyside 2 ^d	1,000 (S) 1,356 (W)	1,000 (S) 1,356 (W) ^d	1.50	1,300 (YL)	25	2,356	2,356
Sunnyside 3 ^d	120 (S)	120 (S)	0.25	20 (YL)	80	120	120
Sunnyside 4 ^d	40 (S)	40 (S)		0	2	40	40
Total	3,795 (S) 1,356 (W)	3,795 (S) 1,356 (W)	3.00	2,920 (YL)	1,509	5,151	5,151

Source: USDI, BLM and USDI, NPS, 1983.

^aNo significant impacts to threatened, endangered, or sensitive species are expected.

^bS = Summer
W = Winter.

^cYL = Yearlong

^dImpacts would result from surface mining.

elk, and livestock forage and shelter; they also provide watershed protection.

Threatened, Endangered, and Sensitive Plant Species

No impact to any Federally listed threatened, endangered, or sensitive plant species would occur.

ANIMAL LIFE

Tar sand development could impact wildlife populations directly (i.e., loss of habitat) and indirectly (i.e., human activities such as increased hunting pressure, harassment, poaching, and ORV use). Because there are insufficient data to quantify secondary impacts, only direct impacts are analyzed.

Terrestrial Animals

BIG GAME

Mule Deer: Approximately 3,795 acres of crucial summer range and 1,356 acres of crucial winter range could be destroyed from surface-disturbing activities. Distribution of these acres is shown by tract in Table 4-4. Based on the assumption that deer are evenly distributed over crucial summer range, it is estimated that destruction of 3,795 acres of deer summer range would reduce deer numbers on herd unit 27B by 156 animals, or about 1 percent of the deer on this herd unit.

Elk: Approximately 3,795 acres of crucial summer range and 1,356 acres of crucial winter range could be destroyed from surface-disturbing activities. Distribution of these acres is shown by tract in Table 4-4. Development on this range could prevent and/or retard the reestablishment of elk because of loss of summer range.

SMALL GAME: Approximately 5,150 acres of mountain lion and black bear habitats could be destroyed from surface-disturbing activities. Distribution of these acres is shown by tract in Table 4-4. Because these species are extremely sensitive to human encroachment, existing populations could be reduced (USDI, BLM and USDI, NPS, 1983). These impacts, however, cannot be quantified because of a lack of census data.

UPLAND GAME: Approximately 2,920 acres of year-long sage grouse habitat could be destroyed from surface-disturbing activities (see Table 4-4). This level of tar sand development could reduce existing sage grouse populations (USDI, BLM and USDI, NPS, 1983). However, because of a lack of census data, exact numbers cannot be quantified.

Unique and Limited High-Value Wildlife Habitat

Aspen Communities: Approximately 1,500 acres of aspen habitat could be destroyed from tar sand development (see Table 4-4). Wildlife populations dependent upon this habitat could be reduced (USDI, BLM and USDI, NPS, 1983).

Riparian Habitat: Three miles (43 percent) of the riparian habitat could be destroyed from surface-disturbing activities (see Table 4-4). Wildlife populations dependent upon

this habitat could be reduced (USDI, BLM and USDI, NPS, 1983).

Raptor Habitat: Approximately 5,150 acres of yearlong raptor habitat could be destroyed from surface-disturbing activities. Distribution of these acres is shown by tract in Table 4-4. Raptor populations (e.g., red-tailed, rough-legged, sharp-shinned, and goshawks) dependent upon this habitat could be reduced (USDI, BLM and USDI, NPS, 1983). However, because of a lack of census data, exact numbers cannot be quantified.

THREATENED, ENDANGERED, AND SENSITIVE ANIMAL SPECIES: Because there are no officially designated critical habitats, known concentration use areas, or nest sites on any of the potential lease tracts, no significant impacts to northern bald eagle, peregrine falcon, black-footed ferret, or golden eagle would be expected.

Aquatic Species

The potential fishery associated with the Left Fork of Dry Creek could be lost: fish habitat would be lost or degraded by altering stream channels, increasing sedimentation and turbidity, reducing instream flows, and degrading water quality. This stream crosses a portion of Sunnyside tract 3. No other fisheries were identified in the other potential lease tracts under this alternative.

Threatened, Endangered, and Sensitive Aquatic Species

Tar sand development on Sunnyside tracts 1-4 would impact the Green River by reducing in-stream flows and degrading water quality. This could cause a loss or degradation of essential habitat to the endangered Colorado squawfish and humpback chub and sensitive razorback sucker.

Wild and Free-Roaming Horses and Burros

Historic wild horse range on Sunnyside tract 2 would be lost by surface-mining activities. However, this would probably not affect total herd size or productivity. Increased vehicular traffic (on-and off-road) caused by generally improved access would increase harassment to these animals.

RECREATION

Sunnyside Tracts 1-4

Impacts of surface mining would be the same as those described under Alternative 1. Development would result in significant impacts; however, Roan Cliffs and West Tavaputs Plateau would receive substantially less impacts than under Alternatives 1 and 2. Recreation values (see Table 3-5), especially hunting and sightseeing, would be affected in an area approximately one township in size.

WILDERNESS

Leasing and development of potential lease tracts would not be expected to impact opportunities for solitude in any potential wilderness area.

VISUAL RESOURCES

Sunnyside Tracts 1-4

Degradation of visual resources would be the same as described in Alternative 1. Tar sand development would result in significant permanent degradation of visual values in highly scenic areas (predominantly VRM Class II) of the Roan Cliffs and West Tavaputs Plateau. Areas included would be visible from U.S. Highway 6 and popular sightseeing areas (Mt. Bartles and Bruin Point) where scenic values are important recreation assets. Tracts 1 (3,202 acres), 2 (2,716 acres), 3 (120 acres), and 4 (40 acres) would all be surface mined. Surface mining would permanently degrade scenic quality in all VRM Class II and III areas. After rehabilitation, all affected areas would become Class IV. Successful rehabilitation of areas developed by in-situ methods would be possible in some Class III and in VRM Class IV areas. All Class II and most Class III areas would probably experience permanent degradation of scenic values.

Since tracts 2, 3, and 4 would probably be developed with adjacent conversion lease tracts or State and private lands, impacts would be incremental, depending on the total operation.

LIVESTOCK GRAZING

It is expected that surface-mining methods would eliminate or greatly reduce suitability for livestock grazing. Livestock grazing would be eliminated by loss of forage, loss of water or access to water, loss of trails, and disruptions in patterns of use. Vehicle traffic, (on and off-road) would increase, thus increasing harassment of livestock, accidents, and vandalism. The duration of the loss of livestock grazing would likely be long term (greater than 20 years). The single provision in standard category 1 lease stipulations concerning livestock requires that livestock be protected by fencing or otherwise excluding them from active mining areas. There is no provision that requires the lease holder to honor any grazing preference a permittee may have on an allotment. Furthermore, it is assumed that no existing water, access, fence, or other range improvement would be preserved for the purpose of livestock grazing on Federally controlled areas. Based on these assumptions, all livestock use on Sunnyside tracts 1, 2, 3, and 4 would be lost to tar sand development. Livestock use on these allotments is estimated at about 1,040 AUMs.

Alternative 4: Lease Seven Tracts Under Multiple Use, Subject to BLM Categories 2 and 3 (Preferred Alternative)

Sunnyside tracts 1-4 and Pariette tract 1-3 would be leased under this alternative. Because Pariette tracts are expected to be developed for only oil and gas and the limited data available suggest that tar sand deposits are small and discontinuous, these tracts are not discussed under this alternative.

Sunnyside tracts 1-4 would be developed using the multi-

ple use (preferred) categories appearing in Volume II. Only Sunnyside tract 1 would remain in category 1. The three remaining tracts would be category 2 except for 360 acres in category 3 to protect public water reserves and riparian areas.

WATER RESOURCES

Because of increased sediment yield from surface disturbance, stream turbidity, sediment load, and increased TDS levels would occur on up to 3,202 acres (category 1) on Sunnyside tract 1 and up to 2,516 acres (category 2) on Sunnyside tracts 2-4. Water flow and quality could be affected in five springs in tract 1 and in two springs in tract 2. However, impacts on tracts 2-4 would be less significant because of special stipulations. There would be no surface disturbance on 360 acres (category 3) to protect public water reserves and assure a good quality water supply for the public.

Consumptive water requirements for tar sand development would be the same as Alternative 3 (5,472 acre-feet annually).

Development on Sunnyside tract 1 is based on a 5,000-barrel/day recovery rate. This would require 1,250 acre-feet of water per year. It is assumed that Sunnyside tracts 2, 3, and 4 would have recoverable reserves of 123.3 million barrels of bitumen. However, these tracts contain resources protected by category 2 stipulations; therefore, tar sand development would be affected. The impacts on development of these tracts cannot be determined until plans of operation are submitted and on-the-ground surveys are completed. Should these tracts be developed in the 20-year production period, less than 16,890 barrels/day could be recovered, with an estimated water requirement of less than 4,222 acre-feet annually.

SOILS

Surface disturbance from construction of roads, drill pads, and mine development would increase erosion and sediment yield on up to 3,202 acres (category 1) on Sunnyside tract 1. Similar impacts would also occur on up to 2,516 acres (category 2), although to a lesser degree on Sunnyside tracts 2-4 because of special stipulations. There would be no surface disturbance on 360 acres (category 3) to protect public water reserves.

TOPOGRAPHY, TAR SAND, AND OTHER MINERALS

TOPOGRAPHY: Topography and geology of Sunnyside tracts 1-4 would be altered if these tracts were developed by surface-mining methods. Landforms would be more rounded and subdued. Elevations could be lower unless waste sand from the plant was added to the pit. In that case, elevations could be higher than original elevations. The headwater valleys of streams near development activities could be filled with waste rock.

TAR SAND: Ninety percent of the bitumen (449 million

barrels) would be removed from tracts 1, 3, and 4 if they were developed by surface-mining methods. Category 2 restrictions on tract 2 would limit recovery to 104 million barrels. Table 4-2 shows estimates of the tar sand resource for each tract.

OTHER MINERALS: Any underlying coal or oil and gas could be developed after tar sand recovery.

VEGETATION

The category 2 special stipulations and category 3 protection would be the same as those described in Alternative 2 for Sunnyside tracts 1-4. Impacts would be identical to Alternative 2 except for 360 acres in category 3 protection. As much as 5,718 acres would be disturbed on these four tracts.)

Sunnyside Tract 1

This tract would not be covered by any protective category or special stipulation. Therefore, it is assumed that all vegetation on this 3,202-acre tract would be stripped in the surface-mining process. The impacts to range site potential (i.e., natural vegetation, species cover, and composition) would most likely be severe and permanent on this tract.

Sunnyside Tracts 2, 3, and 4

Vegetation on the remaining acreage of Sunnyside tracts 2, 3, and 4 would be protected to some degree. Special stipulations would cover 2,516 acres and category 3 would protect 360 acres. Although most of the vegetation on areas with special stipulations would eventually be stripped, surface-mining effects on vegetation would be lessened. This is because no strip mining would be allowed on slopes greater than 50 percent, and no more than 25 percent of a potential lease tract could be stripped at one time. Before mining could proceed, vegetation would have to be reestablished to the degree required by the special stipulations. This would require careful stockpiling of topsoils, contouring, and seeding. These requirements would, to some extent, help preserve natural range site potential. Vegetation would remain unchanged on the 360-acre category 3 area on Sunnyside tract 2.

There are 3 miles of riparian vegetation/habitat. None of the stipulations under this alternative specifically protect this riparian area. Therefore, a worst-case analysis indicates at least short-term (a period of 20 years or less) loss of all riparian vegetation on these potential lease tracts.

Threatened, Endangered, and Sensitive Plant Species

There would be no impact to officially listed threatened, endangered, or sensitive plant species from tar sand development.

ANIMAL LIFE

Tar sand development could impact wildlife populations directly (i.e., loss of habitat) and indirectly (i.e., human activities such as hunting pressure, harassment, poaching, and ORV use). However, because there are insufficient data to quantify secondary impacts, only direct impacts are analyzed.

Terrestrial Animals

BIG GAME

Mule Deer: Approximately 1,160 and 1,356 acres of crucial deer summer and winter range, respectively, would receive some degree of protection from special stipulations (see Table 2-1). However, surface disturbance could still occur on portions of these protected areas as well as on unprotected areas. Because summer range is considered the limiting factor for deer in this herd unit, populations could decline. Based on the assumption that deer are evenly distributed over crucial summer range, it is estimated that destruction of approximately 2,635 acres of deer summer range would reduce deer numbers on herd unit 27B by 100 animals or about 1 percent of the deer on this herd unit. It is expected that impacts to mule deer from this alternative would be somewhat less than those associated with Alternative 3.

Elk: Approximately 1,160 and 1,356 acres of crucial summer and winter range, respectively, would receive some protection from special stipulations (see Table 2-1). However, surface disturbance could still occur on portions of these protected areas, as well as on unprotected areas. Tar sand development could prevent or retard reestablishment of elk in the area because of loss of summer range. It is expected that impacts to elk from this alternative would be somewhat less than those associated with Alternative 3.

SMALL GAME: Approximately 2,516 acres of mountain lion and black bear habitats would receive some protection from special stipulations (see Table 2-1). In addition, 360 acres on Sunnyside tract 2 would be protected by a category 3 designation. However, surface-disturbing activities associated with tar sand development could still occur on portions of these protected areas as well as on unprotected areas. It is expected that impacts under this alternative would be less severe than those associated with Alternative 3. However, because of a lack of census data, exact numbers cannot be quantified.

UPLAND GAME: Because there are no special stipulations providing adequate protection, 2,920 acres of year-long sage grouse habitat could be destroyed from tar sand development (see Table 4-4). This level of development could reduce existing sage grouse populations in the area (USDI, BLM and USDI, NPS, 1983). However, because of a lack of census data, exact numbers cannot be quantified.

UNIQUE AND LIMITED HIGH-VALUE WILDLIFE HABITAT

Aspen Communities: Because there are no special stipulations providing adequate protection, approximately 1,500 acres of aspen habitat could be destroyed from tar sand development (see Table 4-4). Wildlife populations dependent upon this habitat could be reduced (USDI, BLM and USDI, NPS, 1983).

Riparian Habitat: Because there are no special stipulations providing adequate protection, approximately 3 miles (43 percent of the riparian habitat) could be destroyed from surface-disturbing activities (see Table 4-4). Wildlife populations dependent upon this habitat could be reduced (USDI,

BLM and USDI, NPS, 1983).

Raptor Habitat: Approximately 2,516 acres of yearlong raptor habitat would receive some protection from special stipulations (see Table 2-1). However, surface-disturbing activities associated with tar sand development could still occur on portions of these protected areas as well as on unprotected areas. In addition, 360 acres on Sunnyside tract 2 would be protected by a category 3 designation. Raptor populations (e.g., red-tailed, sharp-shinned, rough-legged and goshawks) dependent on this habitat could be reduced (USDI, BLM and USDI, NPS, 1983). However, it is expected that impacts would be less severe than those occurring under Alternative 3.

THREATENED, ENDANGERED, AND SENSITIVE ANIMAL SPECIES: Because there are no officially designated critical habitat, known concentration use areas, or nest sites on Sunnyside tracts 1-4, no significant impacts to the northern bald eagle, peregrine falcon, black-footed ferret, or golden eagle would be expected to occur.

Aquatic Species

There are no special stipulations protecting the potential fishery associated with the Left Fork of Dry Creek in Sunnyside tract 3. Therefore, fish habitat could be degraded or lost by altering the stream channel, increasing sedimentation and turbidity, reducing flows, and degrading water quality.

Threatened, Endangered, and Sensitive Aquatic Species

Tar sand development on Sunnyside tracts 1-4 would impact the Green River, principally by reduction of instream flow and degradation of water quality. This would cause a decrease or loss of the quality of essential habitat for the threatened Colorado squawfish and humpback chub and the sensitive razorback sucker.

Wild and Free-Roaming Horses and Burros

Historic wild horse range on Sunnyside tract 2 would be lost to surface-mining activities. However, this would probably not affect total herd size or productivity. Increased vehicular traffic (on- and off-road) caused by generally improved access throughout the potential lease tracts would increase harassment to these animals.

RECREATION

Impacts of surface mining to the recreational values identified in Table 3-5 on Sunnyside tracts 1, 2, 3, and 4, would be similar to those described under Alternative 2. The affected area of the Roan Cliffs and West Tavaputs Plateau would be substantially less than under Alternatives 1 and 2. Recreation values and uses, especially hunting and sightseeing, would be affected in an area approximately one township in size. Rehabilitation would restore hunting values, but sightseeing values would be permanently degraded.

WILDERNESS

Leasing and development of Sunnyside tracts 1-4 would

not be expected to impact opportunities for solitude in any potential wilderness area. However, developing water sources for tar sand processing in the area of Sunnyside could significantly affect tributary flows of the Green River in the Desolation Canyon WSA.

VISUAL RESOURCES

Impacts would be as described in Alternative 3, except 1,427 acres would be surface mined and 1,129 acres would be developed by in-situ methods, which could disturb up to 452 acres. Stipulations would reduce the area and magnitude of degradation of visual values, especially in Sunnyside tract 2. However, surface mining in tracts 1, 3, and 4 would permanently degrade high scenic values.

LIVESTOCK GRAZING

There are no category 2 special stipulations or category 3 or 4 protections written specifically to preserve livestock grazing suitability under this alternative. Therefore, it is assumed, that on Sunnyside tracts 1, 2, 3, and 4, loss of access to water, loss of stock trails, loss or contamination of water, changes in fencing, and disruptions in patterns of use would eliminate livestock grazing.

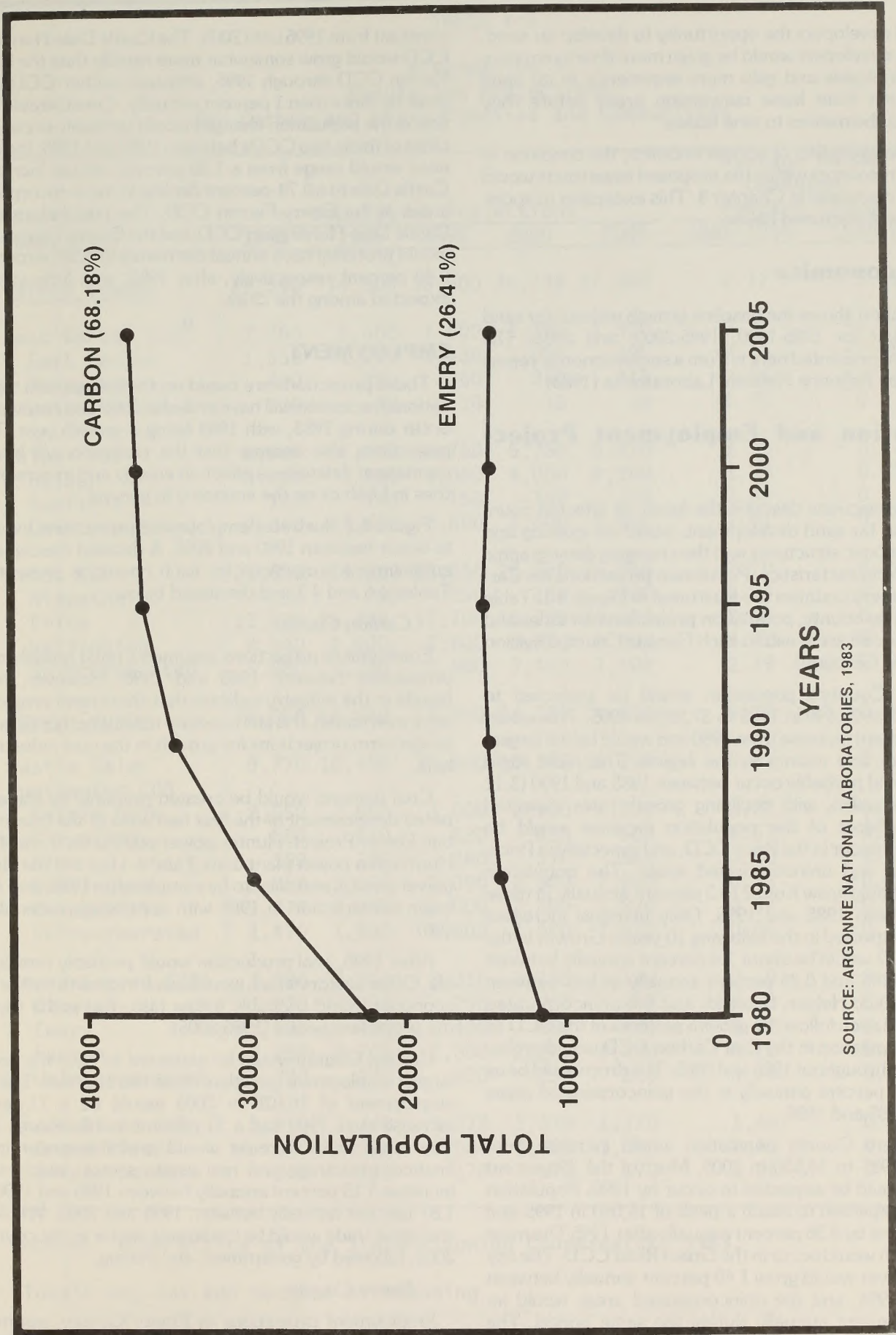
The primary difference between this alternative and Alternative 1 is that 2,876 acres (47 percent) (all of Sunnyside tracts 2, 3, and 4) would be under special stipulations or category 3 or 4. It might be possible to preserve livestock forage on about 75 percent of this area because only 25 percent of a tract could be developed at any one time.

It is not known if stock water, trails, or patterns of use could be maintained to permit livestock grazing. There are an estimated 518 AUMs of livestock use on areas under special stipulation or categories 3 or 4. This is 49 percent of the estimated livestock use on Sunnyside tracts 1, 2, 3, and 4. Therefore, about half of the forage resource would be preserved, although these tracts' general suitability for grazing would be lost.

Alternative 5: No Action (No Competitive Federal Leasing In 1984)

This alternative would not offer any of the 18 potential lease tracts for sale in 1984. However, combined hydrocarbon development could occur on conversion lease tracts and on State and private lands within and/or near potential lease tracts. This alternative would reduce the efficiency and flexibility of extracting the tar sand resource and would increase development costs. Leasing solid blocks of land would avoid passing by reserves that could have to be mined differently at a later date. Also, opportunities for developing potential new reserves would be foregone.

This alternative could prevent the mining of logical production areas to make maximum use of present reserves. Potential lease tracts could not be used in combination with conversion lease tracts to increase tar sand production or leasing reserves of oil companies. This alternative would not



SOURCE: ARGONNE NATIONAL LABORATORIES, 1983

FIGURE 4-1
ALTERNATIVE 5
POPULATION PROJECTIONS FOR CARBON AND EMERY COUNTIES

allow new developers the opportunity to develop tar sand. However, developers would be given more time to improve their technologies and gain more experience in tar sand development from lease conversion areas before they committed themselves to new leases.

With the exception of socioeconomics, the condition of individual resources within the proposed lease tracts would remain as discussed in Chapter 3. This exception to socioeconomics is discussed below.

Socioeconomics

This section shows the baseline growth without tar sand development for 1985-1990, 1995-2000, and 2005. The information presented here is from a socioeconomic report prepared by Argonne National Laboratories (1983).

Population and Employment Projections

These projections describe the future of affected counties without tar sand development, based on existing and future economic structures and the changing demographic population characteristics. Population projections for Carbon and Emery counties are illustrated in Figure 4-1. Table 4-5 shows, by county, population projections for cities and unincorporated areas within each Census County Division (CCD) (see Glossary).

Carbon County's population would be projected to increase from 29,590 in 1985 to 37,280 in 2005. This would be a 68-percent increase from 1980 and would be the largest increase for any county in the region. The most rapid growth would probably occur between 1985 and 1990 (3.11 percent annually), with declining growth rates expected thereafter. Most of the population increase would be expected to occur in the Price CCD, and especially in Price, Wellington, and unincorporated areas. The population would probably grow from 2 to 3 percent annually in these areas between 1985 and 1995. Only marginal increases would be expected in the following 10 years. Growth in the Helper CCD would be about 1.4 percent annually between 1985 and 1995 and 0.25 percent annually or less between 1995 and 2005. Helper, Scofield, and the unincorporated areas would each follow the growth patterns of the CCD as a whole. Population in the East Carbon CCD would probably decline throughout 1985 and 2005. The drop would be as high as 6.7 percent annually in the unincorporated areas between 1985 and 1995.

The Emery County population would increase from 14,060 in 1985 to 14,550 in 2005. Most of the 27-percent increase would be expected to occur by 1990. Population would be expected to reach a peak of 15,080 in 1995 and would decline by 0.36 percent annually after 1995. The most rapid growth would occur in the Green River CCD. The city of Green River would grow 1.40 percent annually between 1985 and 1995, and the unincorporated areas would increase 2 percent annually during the same period. The population of the Green River CCD would probably remain

constant from 1995 until 2005. The Castle Dale-Huntington CCD would grow somewhat more rapidly than the Emery-Ferron CCD through 1995, although neither CCD would grow by more than 1 percent annually. Considerable variation in the population changes would probably occur in the cities of these two CCDs between 1985 and 1995; the difference would range from a 1.25-percent annual increase in Castle Dale to a 0.74-percent decline in the unincorporated areas of the Emery-Ferron CCD. The populations of the Castle Dale-Huntington CCD and the Emery-Ferron CCD would probably have annual decreases of 0.38 percent and 0.40 percent respectively, after 1995, with little variation expected among the cities.

EMPLOYMENT

These projections are based on the assumption that the national recession will have ended in 1982 and recovery will occur during 1983, with 1983 being a growth year. These projections also assume that the recession will have no permanent deleterious effect on energy and mineral industries in Utah or on the economy in general.

Figure 4-2 illustrates employment projections expected to occur between 1980 and 2005. A detailed description of employment projections for each county is presented in Tables 4-6 and 4-7 and discussed below.

Carbon County

Employment projections assumed a rapid growth in coal production between 1980 and 1990. However, recent layoffs in the industry indicate that short-term projections were overstated. It is still too early to tell whether or not the longer term projections for growth in the coal industry are high.

Coal demand would be created primarily by the anticipated development of the first two units of the Intermountain Power Project, Hunter power plant units 3 and 4, and Huntington power plant units 3 and 4. Unit 3 of the Hunter power plant is assumed to be completed in 1983; unit 4 is to begin construction in 1985 with completion scheduled in 1987.

After 1990, coal production would probably remain stable. Other sectors which would result in growth for the local economy would probably follow historical paths through the projection period (1985-2005).

Carbon County would be expected to have the second largest employment growth of these two counties. The total employment of 16,020 in 2005 would be a 71-percent increase over 1980 and a 31-percent increase over 1985. The most rapid increase would probably occur in the finance, insurance, and real estate sector, which would increase 3.13 percent annually between 1985 and 1995 and 1.87 percent annually between 1995 and 2005. Wholesale and retail trade would be the largest sector in the county in 2005, followed by government and mining.

Emery County

Employment projections in Emery County assumed a 71-percent increase in coal projection between 1980 and

TABLE 4-5

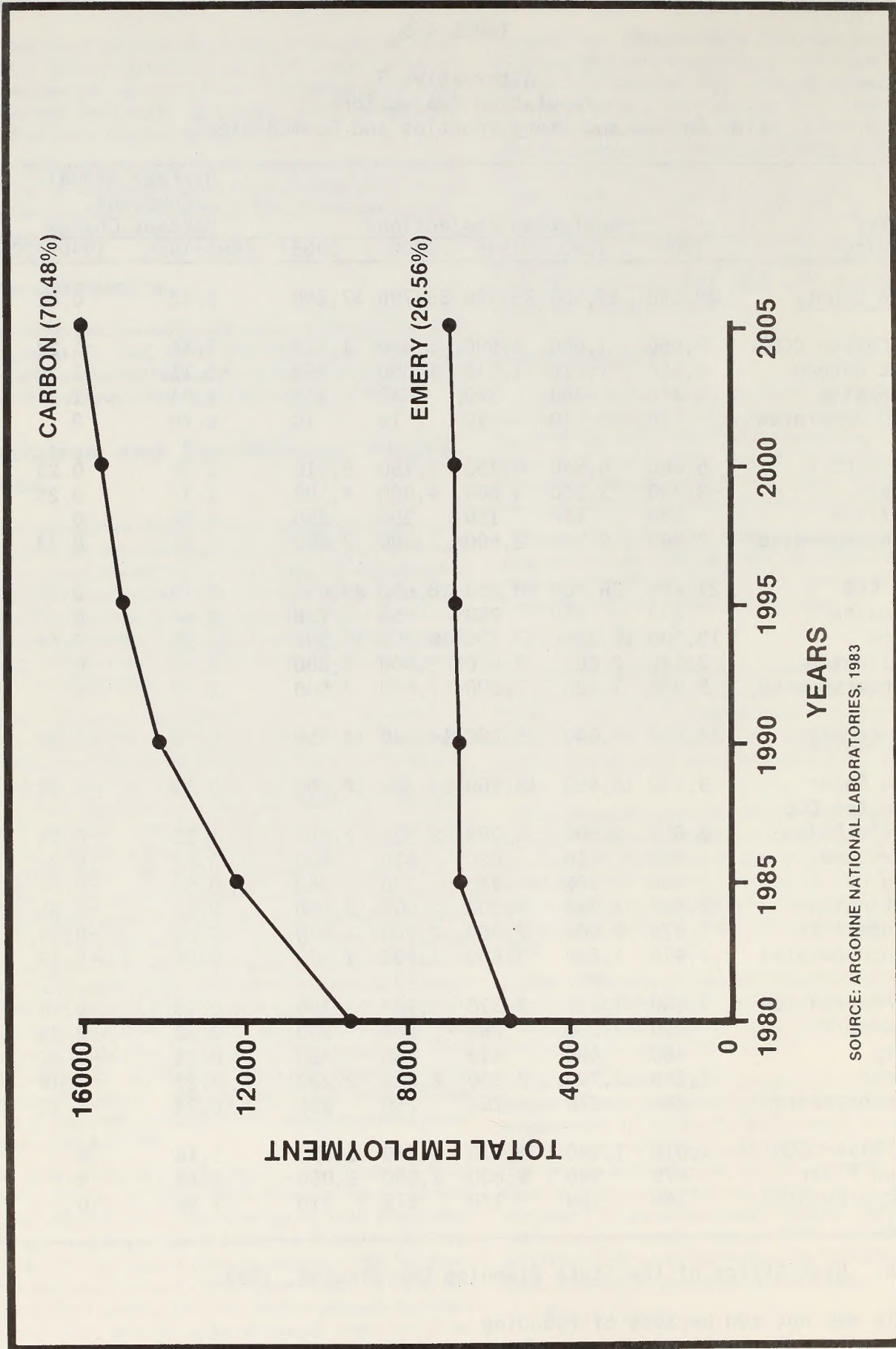
Alternative 5
Population Projections
for Carbon and Emery Counties and Communities^a

County/ Community	Population Projections					Average Annual Compound Percent Change	
	1985	1990	1995	2000	2005	1985-1995	1995-2005
<u>Carbon County</u>	29,590	34,500	36,500	36,790	37,280	2.12	0.21
East Carbon CCD ^b	2,060	1,600	1,500	1,390	1,320	-3.31	-1.27
East Carbon	1,550	1,210	1,130	1,050	995	-3.11	-1.26
Sunnyside	490	380	360	330	315	-3.04	-1.33
Unincorporated	20	10	10	10	10	-6.70	0
Helper CCD	5,880	6,540	6,750	6,750	6,910	1.39	0.23
Helper	3,490	3,900	4,000	4,000	4,100	1.37	0.25
Scofield	130	140	150	150	150	1.44	0
Unincorporated	2,260	2,500	2,600	2,600	2,660	1.41	0.23
Price CCD	21,650	26,360	28,250	28,650	29,050	2.70	0.28
Hiawatha	230	260	250	250	250	0.84	0
Price	13,300	16,300	17,700	18,200	18,500	2.90	0.44
Wellington	2,140	2,600	2,800	2,800	2,800	2.72	0
Unincorporated	5,980	7,200	7,500	7,400	7,500	2.29	0
<u>Emery County</u>	14,060	14,840	15,080	14,730	14,550	0.70	-0.36
Castle Dale- Huntington CCD	9,770	10,490	10,600	10,380	10,200	0.82	-0.38
Castle Dale	2,650	2,900	3,000	2,900	2,850	1.25	-0.51
Cleveland	580	610	620	610	600	0.67	-0.33
Elmo	350	380	380	370	360	0.83	-0.54
Huntington	2,850	3,000	3,000	2,900	2,850	0.51	-0.51
Orangeville	1,870	2,000	2,000	2,000	1,970	0.67	-0.15
Unincorporated	1,470	1,600	1,600	1,600	1,570	0.85	-0.19
Emery-Ferron CCD	3,280	3,210	3,310	3,180	3,180	0.10	-0.40
Clawson	270	260	260	250	250	-0.38	-0.39
Emery	480	480	490	480	480	0.21	-0.21
Ferron	2,250	2,200	2,300	2,200	2,200	0.22	-0.44
Unincorporated	280	270	260	250	250	-0.74	-0.39
Green River CCD	1,010	1,140	1,170	1,170	1,170	1.48	0
Green River	870	980	1,000	1,000	1,000	1.40	0
Unincorporated	140	160	170	170	170	1.96	0

Source: Utah Office of the State Planning Coordinator, 1983.

^aTotals may not add because of rounding

^bCensus County Division (CCD).



SOURCE: ARGONNE NATIONAL LABORATORIES, 1983

FIGURE 4-2
ALTERNATIVE 5
EMPLOYMENT PROJECTIONS FOR CARBON AND EMERY COUNTIES

TABLE 4-6

Alternative 5
Employment Projections for Carbon County

Industry Sector	Sectoral Employment (Year)					Average Annual Compound Percent Change (Year)	
	1985	1990	1995	2000	2005	1985-1995	1995-2005
Agriculture	230	230	230	240	240	0	0.43
Mining	2,460	2,860	2,860	2,860	2,860	1.52	0
Contract Construction	490	550	590	610	630	1.87	0.66
Manufacturing	320	360	390	420	450	2.00	1.44
Transportation, Communication, and Utilities	920	970	1,100	1,200	1,250	1.80	1.29
Wholesale and Retail Trade	2,260	2,590	2,890	3,090	3,300	2.49	1.34
Finance, Insurance, and Real Estate	360	430	490	540	590	3.13	1.87
Services	1,580	1,890	2,090	2,190	2,300	2.84	0.96
Government	2,470	2,880	2,970	2,970	3,000	1.86	0.10
Nonfarm Proprietors	1,150	1,290	1,390	1,390	1,400	1.91	0.07
Total ^a	12,240	14,050	15,000	15,510	16,020	2.05	0.66

Source: Utah Office of the State Planning Coordinator, 1983.

^aTotals may not add because of rounding.

ALTERNATIVE 5

TABLE 4-7

Alternative 5
Employment Projections for Emery County

Industry Sector	Sectoral Employment (Year)					Average Annual Compound Percent Change (Year)	
	1985	1990	1995	2000	2005	1985-1995	1995-2005
Agriculture	360	360	360	370	370	0	0.27
Mining	2,460	2,500	2,500	2,500	2,500	0.16	0
Contract Construction	850	440	470	480	500	-5.75	0.62
Manufacturing	40	50	50	50	50	2.26	0
Transportation, Communication, and Utilities	720	820	840	860	880	1.55	0.47
Wholesale and Retail Trade	630	670	700	700	730	1.06	0.42
Finance, Insurance, and Real Estate	60	60	70	70	70	1.55	0
Services	340	380	400	430	450	1.64	1.18
Government	770	840	840	810	800	0.87	-0.49
Nonfarm Proprietors	500	530	540	530	530	0.77	-0.19
Total ^a	6,730	6,650	6,770	6,800	6,880	0.06	0.16

Source: Utah Office of the State Planning Coordinator, 1983.

^aTotals may not add because of rounding.

1990. However, recent layoffs in the industry indicate that the short-term projections were overstated. It is not yet possible to determine whether or not long-term projections for growth in the coal industry are high. Projects creating a demand for coal are described in Carbon County employment projections above. Other sectors of the local economy would probably follow historical paths throughout the projection period (1985-2005).

SUMMARY OF UNAVOIDABLE ADVERSE IMPACTS, IRREVERSIBLE/IRRETRIEVABLE COMMITMENTS OF RESOURCES

AND THE RELATIONSHIP OF SHORT-TERM USE OF THE ENVIRONMENT TO MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY.

Table 2-5 summarizes and compares unavoidable adverse impacts, irreversible/irretrievable commitments of resources, and the relationship of short-term use of the environment to maintenance and enhancement of long-term productivity.

OIL AND GAS CATEGORY

1. Unavoidable adverse impacts of short-term use of the environment include... (faded text)

2. The relationship of short-term use of the environment to maintenance and enhancement of long-term productivity... (faded text)

APPENDIX 1

GENERAL POLICY GUIDELINES

OIL AND GAS LEASING

The following general policy guidelines have been developed for review of the oil and gas categories. The guidelines form the foundation for a consistent statewide approach to meeting the Bureau's objective of making public lands available for oil and gas leasing while at the same time adequately protecting resource values. Adherence to these guidelines is desirable, but management must fit the specific situation. It is recognized that there are exceptions to any guideline, since it is impossible to include all situations and because there is a wide range in the significance of resource values. These guidelines are not intended to limit the alternatives that can be considered during planning.

OIL AND GAS CATEGORY GUIDELINES

1. Unless special or significant other natural resource values are involved, public lands will be in category 1. Standard surface disturbance stipulations which are a part of an oil and gas lease will generally provide adequate protection for the resource values. BLM has the responsibility and the authority to implement additional surface management necessary to protect common resource values when specific proposals for oil and gas development are considered under the operating plan. As an example, study exclosures can normally be protected in this manner.
2. Areas should not be in categories 2, 3 and 4 to protect known or suspected occurrences of other mineral values. Laws and regulations governing multiple mineral development are adequate to allow placing these areas in category 1. If there is considerable disparity of values between mineral resources, conflicts will be handled in the State Office.
3. Generally, areas under wilderness review should be in category 1 with utilization of the of the wilderness stipulation and Interim Management Policy (IMP) management of wilderness values. However, in cases where an area has values incidental or in addition to wilderness values such as high scenic qualities, wildlife habitat, scientific, educational, historical, ecological or geological values that may be unavoidable and irreparably impacted, an area may logically be placed in categories 2, 3 and 4. However, if the area of concern is being protected primarily for wilderness values, it cannot logically be justified as a category 3 or 4 designation in lieu of the policy to allow leasing and exploration in areas under wilderness review.
4. Known geologic structures are to be in categories 1 or 2. Exceptions, such as small recreation sites which fall within a KGS, could be in category 3. Unitized areas are not given any special consideration as to category designation.
5. Cultural values (archaeological and historic) are normally placed in category 1, but known significant values, such as National or State Register sites or sites eligible for inclusion on a register may be in category 2 or 3 if they would be adversely affected by oil and gas related activities. Such values identified after lease issuance can be protected as appropriate through the plans of operation.
6. Paleontological or geological sites of scientific or educational value are normally included in category 2. However, due to the size of the area or other special circumstances, may be placed either in categories 1 or 3.
7. Travel influence zones should be in categories 1 or 2 unless they are designated scenic travel areas or have unusual values that could be permanently damaged by access roads or drill pads. In this case they may be in category 3 or 4 to protect the visual corridor.
8. All springs, perennial streams, and reservoirs are important for water quality and riparian habitat purposes and are to be protected. Generally, categories 1 and 2 will provide sufficient protection, but depending on size, location, and significance they may need to be in categories 3 or 4.
9. Critical big game winter ranges and fawning areas or other critical habitat areas are to be in category 2 with a seasonal restriction on exploration and drilling activities. However, this does not mean that, just because an area is identified as winter range, it automatically is a category 2 area. Category 2 seasonal limitations are to be applied only where: 1) populations and/or habitats are so sensitive or fragile in nature that oil and gas activities may prevent maintenance of existing population levels over an extended period of time; 2) the habitat provides high economic or social value; and 3) where big game and/or habitat requires special management. Cer-

tain species such as the desert bighorn sheep may require yearlong habitat protection under categories 3 and 4.

10. Habitat for threatened and endangered species and raptor nesting should be placed in category 2 with an appropriate seasonal limitation on surface occupancy when the seasonal occupancy situation is present. If the habitat and/or species is considered to be jeopardized (unavoidably impacted) at the time of surface occupancy of the lease, authority is provided by the "Surface Disturbance Stipulations" to adjust the location of well sites, roads, and other facilities. Yearlong habitat areas for T/E species should be in categories 3 and 4. Undefined habitat areas and known habitat for candidate species are to be in category 1 and managed for protection under the open end stipulations. There is no official State list of T/E species.
11. Bald and golden eagle seasonal roost and concentration areas are to be in category 2 with appropriate seasonal restrictions on exploration and drilling activities (or under special circumstances may be placed in category 3 or 4).
12. Known critical and traditional sage grouse strutting and brooding areas and possibly other similar critical wildlife and aquatic habitat are to be in category 3. Other general sage grouse or other wildlife areas can be protected by category 2.
13. Municipal watersheds and important lakes and reservoirs should be in category 2, 3, or 4, depending on the size and significance. However, some of these areas were withdrawn by special legislation which may preclude leasing. These should not be included in the category system.
14. Identified floodplains (100-year storm recurrence interval) are to be in either categories 1 or 2 depending on size and significance of floodplain area.
15. All areas of concern that need additional protection and which are less than 1 mile wide are to be in category 3, assuming that directional drilling can occur from opposite sides of the area. If directional drilling can occur from only one side, the width limitation is one half mile.
16. It is optional as to what category small tracts, airport leases, R&PP leases, etc., can be placed. Depending on the individual circumstances (as determined on a case by case basis) such areas may be placed in any of the four categories. If placed in category 2, the following stipulations may be used in lieu of other stipulations on the special stipulation list).
The following described lands are contained with a (R&PP lease, airport lease etc.). No occupancy or other activities will be allowed within (legal subdivision) unless it can be demonstrated that the proposed activities do

not interfere with the current surface uses. Occupancy of the surface will be subject to specific written permission of the authorized officer of the surface management agency.

17. Designated wild and scenic study rivers should be categories 3 and 4, depending on the individual circumstances.
18. Designated and proposed research natural areas, recreation sites, and potential ACECs may be in categories 2, 3, or 4, depending on the individual circumstances.
19. In any cases where lands in category 4 are adjacent to lands in categories 1 or 2, the outermost half mile of the category 4 area is to be placed in category 3. This will decrease the acreage in the no lease category without decreasing protection of surface values.

SPECIAL TAR SAND GUIDELINES

General

Only one category designation is to be assigned to an area regardless of differences between conventional oil and gas and tar sands development and the respective resource potentials. *A separate category designation for tar sand is not to be made.*

The following stipulation is currently attached automatically to all oil and gas leases issued outside STSAs in categories 1 and 2 and will continue to be used in these areas where planning has not been updated to include tar sand.

Oil and Gas Lease Stipulations for Non-Conventional Oil Recovery

Under the provisions of Public Law 97-78, this lease includes all deposits of nongaseous hydrocarbon substances other than coal, oil shale, or gilsonite (including all vein-type solid hydrocarbons). Development methods not conventionally used for oil and gas extraction such as fire flooding, underground, and surface mining will require the lessee to submit a plan of operations and will be subject to regulations governing such development by these methods when those rules are issued by the Bureau of Land Management (BLM) and the rules or procedures of the surface managing agency, if other than BLM. Development may proceed only if the plan of operations is approved.

Category 1

The stipulations applied are the same as those used for all oil and gas leases.

Category 2

Special stipulations numbers 2 and 4 through 10 as contained on enclosures 3-1 and 3-2 can be applied to tar sand in the same manner as applied to conventional oil and gas. In addition, the following stipulations specific to tar sand development may be used either separately or in conjunction with special stipulations contained in enclosure 3. Under these circumstances two sets of stipulations may be attached to the same oil and gas lease. If two sets of stipulations are used, they will be identified on the lease form as follows:

1. The following stipulation(s) applies to all oil and gas operations including the exploration for and extraction of tar sand.
2. The following stipulation(s) applies to the development and extraction of any tar sand on this lease.

Category 2 Tar Sand Stipulations

1. No surface mining of tar sand deposits are allowed on this lease. The tar sand may be extracted by in-situ or underground-mining methods only.
2. Oil and gas resources may be extracted by conventional methods only; no in-situ or mining methods will be employed to extract tar sand deposits. Secondary recovery of liquid hydrocarbons and underground mining methods may be employed only upon approval by the authorized officer.

Additional stipulations specific to tar sand development may be proposed based on the environmental assessment. These stipulations are to address site specific conditions that cannot be adequately covered by existing oil and gas stipulations in enclosure 3 or the special tar sands stipulations.

Category 3

The potential for offsite exploitation of tar sand deposits is virtually non-existent compared to conventional oil and gas exploration and development. Although underground mining and offsite in situ extraction may be considered as alternative methods employable to tar sand development, the use of these methods is expected to be highly improbable because of technical and economic limitations. In most cases a no surface occupancy stipulation will render a lease unusable for tar sand development. In order to retain an area in category 3 within a potential tar sand area, it must be documented that the resource potential and less stringent alternatives were given consideration in the decision. When tar sand potential of high value exists, a category 3 designation may be difficult to sustain where there is no possibility of utilizing the resource.

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 of the surface thereof for drilling, or other purposes, lessee shall submit for approval two (2) copies of a map and explanation of the nature of the anticipated activity and surface disturbance to the BLM, as appropriate and will also furnish the appropriate surface management agency named above, with a copy of such map and explanation. An environmental analysis will be made by BLM 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 conditions 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;
- B. Types of vehicles that may be used and areas in which they may be used; and
- C. Manner or location in which improvements such as roads, buildings, pipelines, or other improvements are to be constructed.

SPECIAL STIPULATIONS

The following special stipulations are in addition to the lease terms and standard stipulations, and are necessary to protect specific resource values on the lease area. If found to be in the public interest, these stipulations may be made less restrictive when specifically approved in writing by the authorized officer of the Federal surface management agency.

1. All of the land in this lease is included in (recreation or special area, etc.). Therefore, no occupancy or disturbance of the surface of the land described in this lease is authorized. The lessee, however, may exploit the oil and gas resources in this lease by directional drilling from sites outside this lease. If a

proposed drilling site lies on land administered by the Bureau of Land Management, or by the Forest Service, a permit for use of the site must be obtained from the BLM District Manager, or the Forest Service District Ranger, before drilling or other development begins.

2. No access or work trail or road, earth cut or fill, structure or other improvement, other than an active drilling rig, will be permitted if it can be viewed from the (road, lake, river, etc.).
3. No occupancy or other activity on the surface of (legal subdivision) is allowed under this lease.
4. No occupancy or other surface disturbance will be allowed within _____ feet of the _____ (road, trail, river, creek canal, etc.). This distance may be modified when specifically approved in writing by the authorized officer of the Federal surface management agency.
5. No drilling or storage facilities will be allowed within _____ feet of (live water, the reservoir, the archaeological site, the historical site, the paleontological site, etc.) located in (legal subdivision). This distance may be modified when specifically approved in writing by the concurrence of the authorized officer of the Federal surface management agency.
6. No occupancy or other surface disturbance will be allowed on slopes in excess of _____ percent, without written permission from the authorized officer of the Federal surface management agency.
7. In order to (minimize watershed damage, protect important seasonal wildlife habitat, etc.) exploration, drilling, and other development activity will be allowed only (during the period from _____ to _____ during dry soil period, over a snow cover, frozen ground). This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically approved by the authorized officer of the Federal surface management agency.
8. In order to minimize watershed damage during muddy and/or wet periods the authorized officer of the Federal surface management agency may prohibit exploration, drilling, or other development. This limitation does not apply to maintenance and operation of producing wells.
9. The _____ (trail/road) will not be used as an access road for activities on this lease, except as follows: (No exceptions, weekdays during recreation season, etc.).
10. To maintain esthetic values, all semi-permanent and permanent facilities may require painting or camouflage to blend with the natural surroundings. The paint selection or method of camouflage will be subject to approval by the authorized officer of the Federal surface management agency.

11. No occupancy or other activity on the surface of the following described lands is allowed under this lease: Reasons for this restriction are: Examples of appropriate reasons for this restriction are:

1. Steep slope
 2. Specific ecosystem, ecological land unit, landtype, or eologic formation which present hazards such as mass failure
 3. Roadless or essentially roadless area (includes Chevron and Rainbow stipulations)
 4. Special management units such as: Recreation Type I, water supply, administrative site, etc.
- () Approximately _____ % if lease

Note: This stipulation could be used in place of Nos. 1, 3, and 6.

12. No _____ will be allowed within _____ feet of the _____. This area contains _____ acres and is described as follows:

- Reasons:
- First blank to be filled in with one or more of the following: drilling, storage facilities, surface disturbance or occupancy. Second and third blanks to be filled in with one or more of the following:
1. _____ feet wildlife habitat essential to specific species
 2. _____ feet peripheral or unique vegetative type
 3. 200 feet either side of centerline of roads or highways
 4. 500 feet of normal high water line on all streams, reservoirs, lakes
 5. 600 feet of all springs
 6. 400 feet of any improvements

Note: Stipulation No. 12 could be used in place of Stipulation Nos. 4 and 5.

13. In order to (minimize) (protect) _____ will be allowed only during _____

This does not apply to maintenance and operation of producing wells and facilities. Lands within leased area to which this stipulation applies are described as follows:

- Reasons:
- First blank to be filled in with one or more of the following:
1. Watershed damage
 2. Soil erosion
 3. Seasonal wildlife habitat (winter range, calving/lambing area, etc.)
 4. Conflict with recreation

Second blank to be filled in with one or more of the following:

1. Surface disturbing activities
2. Exploration
3. Drilling
4. Development

Third blank to be filled in with one or more of the following:

1. Period from _____ to _____.
2. Dry soil periods
3. Over the snow
4. Frozen ground.

Note: Stipulation No. 13 could be used in place of Stipulation No. 4, giving greater definition as to restriction.

14. The lessee is given notice that all or portions of the lease area contain special values, are needed for special purposes or require special attention to prevent damage to surface resources. Any surface use or occupancy within such areas will be strictly controlled. Use or occupancy will be authorized only when the lessee/operator demonstrates that the area is essential for operations and when the lessee/operator submits a surface use and operations plan, which is satisfactory to the Federal surface management agency, for the protection of these special values and existing or planned uses. Appropriate modifications to the imposed restrictions will be made for the maintenance and operations of producing oil and gas wells.

After the Federal surface management agency has been advised of the proposed surface use or occupancy on these lands, and on request of the lessee/operator, the Federal surface management agency will furnish further data on such areas, which now include but are not limited to:

(Legal land description to lot and/or quarter, quarter section.)

Reasons for Restriction:

Duration of Restriction: (year-round, month[s])

Prior to acceptance of this stipulation the prospective lessee is encouraged to contact the Federal surface management agency for further information regarding the restrictive nature of this stipulation.

Note: Stipulation No. 14 is not exclusionary but it notifies the lessee/operator that the described lands contain special values and that these values must be considered in the proposed operating plan. This stipulation is an alternative to many of the above stipulations.

ENDANGERED SPECIES, CULTURAL, AND PALEONTOLOGICAL RESOURCES 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 operation 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 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 the Bureau of Land Management (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 either until the BLM wilderness inventory process has resulted in a final wilderness inventory decision that an area lacks wilderness characteristics, or in the case of a wilderness study area 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 recommenda-

tions 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 conservative assumptions with regard to growing conditions, so as to ensure that the reclamation will be complete, and the impacts will be substantially unnoticeable in the area as a whole, by the time the Secretary is scheduled to send his recommendations to the President. ("Substantially unnoticeable" is defined in Appendix F of the *Interim Management Policy and Guidelines for Lands Under Wilderness Review*.)

3. When the activity is terminated, and after any needed reclamation is 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.

APPENDIX 2

GENERAL AND SPECIAL STIPULATIONS

FOR GORDON CORRAL AND FLINT FLAT TRACTS

GENERAL STIPULATIONS

- A. Notwithstanding any provisions of this lease to the contrary, any mining, drilling, 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 authorized officer of the Bureau of Land Management in consultation with National Park Service and to such reasonable conditions, not inconsistent with the purposes for which this lease is issued, as the authorized officer may require to protect the surface of the lease lands and the environment.
- B. Prior to entry on the surface thereof for drilling lessee shall submit for approval three (3) copies of a plan of operations which shall meet the requirements of 30 CFR 231.4 and 231.10(1), (b), and (c) to the authorized officer and the National Park Service.

The submitted plan of operations must contain, in addition to all the requirements stated above, the methods and actions proposed for the following:

1. Stripping and saving of topsoil;
2. Reclamation of the disturbed areas including, but not limited to, recontouring and revegetation;
3. Erosion control measures on all disturbed areas, roads, and waterway crossings;
4. Road design, construction, and maintenance standards;
5. Resource protection and clearances for cultural, threatened and endangered species, and paleontological resources;
6. Livestock protection;
7. Fugitive dust and emission controls;
8. Wildlife protection and mitigation;
9. Protection of streams, springs, water wells, and other water sources;
10. Methods for retaining all mine drainage and runoff on-site;
11. Protection of recreationists (security, lighting, signs, etc.).

Environmental analysis will be made by the authorized officer in consultation with the National Park Service 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.

- C. Upon completing of said environmental analysis, the authorized officer shall notify lessee of the conditions, if any, to which the proposed surface-disturbing operations will be subject.

Said conditions may relate to any of the following:

1. Location of mining, drilling, or other exploratory developmental operations or the manner in which they are to be conducted;
2. Types of vehicles that may be used and areas in which they may be used; and
3. Manner or locations in which improvements such as roads, buildings, pipelines, mills, processing plants, or other improvements are to be constructed.

SPECIAL STIPULATIONS

- A. The drilling rig would be situated so as to direct cuttings and dust from the blooie line away from the public road and/or away from the eastern cliff edge.
- B. Archaeological surveys and clearances would be conducted for the location to the satisfaction of the National Park Service. Operating personnel would be required to refrain from disturbing any cultural/archaeologic/paleontological resources encountered. Also, if during site construction any new archaeological/paleontological remains are unearthed, construction would cease immediately and the Glen Canyon National Recreation Area Superintendent contacted. No further work would continue until the extent, nature, and significance of the remains were decided by a qualified archaeologist/paleontologist and further mitigating measures implemented, according to procedures established by the NPS and by the Advisory Council on Historic Preservation.
- C. A threatened and endangered species survey and clearance would be conducted to the satisfaction of the National Park Service.

- D. A survey and clearance for paleontological resources would be conducted to the satisfaction of the National Park Service.
- E. All available topsoil would be removed, stockpiled, and reseeded or otherwise protected in a designated area of the drill pad, and protected from wind and water erosion.
- F. The drill pad configurations may be adjusted for aesthetic or resource protection purposes.
- G. Access road construction and upgrading would be restricted to the maximum width necessary to accommodate the operation as specified in a road plan approved by the National Park Service.
- H. The contractors would notify the Superintendent of Glen Canyon National Recreation Area, or his designee (602-645-2471) 48 hours prior to entering on the National Recreation Area.
- I. During construction and operations, "caution" signs would be maintained 200 feet either side of the access location along the public road. Flagmen would be utilized when heavy equipment is being operated on the public road.
- J. No off-pad disturbance or vehicular travel would be authorized.
- K. Trash bins with fine wire mesh covers would be provided by the permittee and used for all solid waste and garbage. The trash would be hauled and disposed of at the approved disposal site outside the National Recreation Area.
- L. Portable toilets would be provided by the leasee and used for all human waste. The wastes would be hauled out and properly disposed of outside the National Recreation Area.
- M. This lease is for land located near an area classified "Class I" under Federal "Prevention of Significant Deterioration" air quality regulations. Any development of the tract must be in conformance with all applicable air quality standards and regulations.
- N. Control of fugitive dust would be required by non-toxic water sprinkling of roads or other disturbed areas and water spraying of emissions from the blooie line (an air release hose).
- O. In the event of a blowout, BLM and the National Park Service would be notified within 24 hours. Reclamation of damage to the surface resources is the responsibility of the applicant.
- P. Upon abandonment, all wells not retained for water would be plugged, all surface facilities removed, and the area reclaimed.
- Q. Proper operating methods will be used to protect aquifers.
- R. Use of the Gordon Flat's air strip and helicopter use would be subject to the approval of the Superintendent of Glen Canyon National Recreation Area. That approval may include setting times and approaches that may be necessary to protect wildlife from noise disturbances.
- S. No burning would be permitted.
- T. No surface mining would be permitted on the lease.
- U. All operations on the lease would be subject to the regulations in 43 CFR 3140.7.

APPENDIX 3

IN REPLY REFER TO



United States Department of the Interior

BUREAU OF LAND MANAGEMENT
UTAH STATE OFFICE
136 E. SOUTH TEMPLE
SALT LAKE CITY, UTAH 84111

Report

Combined Hydrocarbon Potential Lease
Tract Ranking and Leasing Alternatives

May, 1983

by

Earl Hindley

On April 25 and 26, 1983, a meeting was held in the Utah State Office for the purpose of ranking the 18 potential combined hydrocarbon lease tracts. Representatives of the Bureau of Land Management (BLM), National Park Service (NPS), and the State of Utah were present (see attached attendance sheet). Personnel from the State of Utah were observers at this particular meeting. They formulated a state position at a subsequent session (April 27, 1983).

Each participant in the ranking process had previously reviewed the site specific analysis for each of the 18 tracts. They were asked to rank each tract in four general categories (tar sand resources, environmental considerations, socio-economics, and a composite ranking). Each of the categories was ranked either low, medium low, medium, medium high, or high. The ranking was done with the understanding that the higher the tract was ranked the more favorable the tract would be for leasing.

At the meeting, each participant's ranking was listed for each individual tract. A discussion then followed with the coordinating committee arriving at a single overall rank for individual tracts.

As a result of the ranking, alternatives for the new leasing portion of the combined hydrocarbon EIS were determined by the group.

The ranking and leasing alternatives were given to representatives of the State of Utah at the meeting for their subsequent deliberations.

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On May 6, 1983, Governor Matheson signed a letter to the BLM State Director (copy attached) which endorsed the rankings and alternatives as formulated.

Summary of Tract Rankings

Tract	Rank	Dev. Method
Pariette 1	High	O & G only
Pariette 2	High	O & G only
Pariette 3	High	O & G only
Sunnyside 1	Med.	Surface
Sunnyside 2	Med.	In-situ
Sunnyside 3	Med.	Surface
Sunnyside 4	Med.	Surface
Sunnyside 6	Med. -	In-situ
Sunnyside 7	Med. -	In-situ
Sunnyside 7	Med. -	Surface
Sunnyside 8	Med. -	In-situ
Sunnyside 8	Med. -	Surface
Sunnyside 2	Med. -	Surface
Sunnyside 3	Med. low	In-situ
Sunnyside 5	Med. low	Surface
Sunnyside 9	Med. low	In-situ
Gordon Flat	Med. low	In-situ
Flint Flat	Med. low	In-situ
Black Dragon	Med. low	Surface
Sunnyside 10	Low	O & G only
Sunnyside 11	Low	O & G only
Sunnyside 12	Low	O & G only

Combined Hydrocarbon Leasing Alternatives

- A. No Action - This alternative would be the no lease alternative
- B. Lease the following tracts:
 - Pariette 1, 2, & 3
 - Sunnyside 1, 2, 3, & 4

This alternative would make 604.1 million barrels of in-place oil reserves available for lease. This would be approximately 60.6 percent of the in-place reserves of 995.5 million barrels on the 18 tracts. The alternative would concentrate leasing where more reliable tar sand resource data are available. Little tar sand data are available on the Pariette tracts but they are potentially valuable for oil and gas production.

- C. Lease all 18 tracts

This alternative would be the maximum leasing alternative.

APPENDIX 3

Tar Sands Tract Ranking Meeting 4/25/83

<u>Name</u>	<u>Office</u>	<u>Tel. No.</u>
Al Logosz	BLM UT State Office	524-4257
Chuck Horsburgh	Richfield BLM	896-8221
Brad Palmer	Vernal BLM	789-1362
Earl Sparks	U.S. Wildlife Resource SLC	533-9333
Dennis G Dalley	Utah Div. of Env. Health	533-6121
Paul Carter	Cedar City BLM	586-2401
Ray Kerns	SLC - UGMS	581-6831
Keith Clem	SLC - UGMS	581-6831
Alan Partridge	Richfield BLM	896-8221
Earl Hindley	BLM UT State Office	524-4257
Lynn Jackson	Moab District BLM	259-6111
Jim Piani	BLM - USO - Minerals	524-5326
Joel Pickelner	NPS - SLC	524-4112
Hal Hubbard	BLM - MMS	524-4570
Ron Daniels	Utah Oil & Gas - Mining	533-5771



STATE OF UTAH

SCOTT M. MATHESON
GOVERNOR

OFFICE OF THE GOVERNOR
SALT LAKE CITY

84114

May 6, 1983

Mr. Roland Robison
State Director
Bureau of Land Management
University Club Building
136 E. South Temple
Salt Lake City, Utah 84111

Dear Roland:

The Utah Minerals Leasing Policy Task Force has examined the tar sands site-specific analyses (SSA's) which were prepared by the Department of Interior coordinating group and forwarded to the State on April 14, 1983. Part of the task force's work included meeting with the coordinating group to become more familiar with the tracts.

Due to the short time frame in which the task force responded to the SSA's, its analysis is based on its interaction with the coordinating group, its brief review of the SSA's themselves and each member's knowledge of the environs of each lease. Consequently, the task force has drafted only a tentative state position on the tract rankings presented by the coordinating group.

I endorse the position of the task force as the tentative state position, that is, that the tract rankings and alternatives for D.E.I.S. analysis are acceptable in the form presented by the coordinating group on April 26th. However, Utah will reserve final further comment on the ranking and alternatives until presented in the D.E.I.S.

Further, it is noteworthy to point out that some concerns to the State remain at this time and that I expect additional analysis will be presented on these areas in the D.E.I.S. for the leasing of these tracts. Those concerns are:

1. Several tracts have not been analyzed for conventional oil and gas development, only tar sands.
2. There appears not to be a thorough analysis of the strains which could occur to human resources in the areas affected, should development proceed.

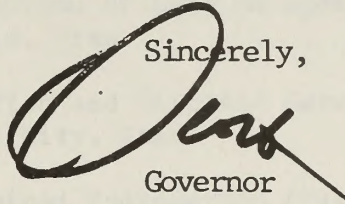
APPENDIX 3

Mr. Roland Robison
May 6, 1983
Page Two

3. Consumptive water use appears to need a more quantitative analysis.

I hope that you can address the above items in more detail. For more information on Utah's position please contact Mr. Lorin Nielsen, Associate Director of the Department of Natural Resources.

Sincerely,



Governor

SMM:tar

APPENDIX 4



United States Department of the Interior

FISH AND WILDLIFE SERVICE

ENDANGERED SPECIES OFFICE

1406 Federal Building

125 South State Street

Salt Lake City, Utah 84138

13 June 1983

IN REPLY REFER TO:

MEMORANDUM

TO: District Manager, U. S. Bureau of Land Management, Richfield
District Office, Richfield, Utah

FROM: Field Supervisor, U. S. Fish and Wildlife Service, Endangered
Species Office, Salt Lake City, Utah

SUBJECT: Species list for the Combined Hydrocarbon (Tar Sand) leasing.

We have reviewed your memo of 18 May 1983 and attached information concerning the combined hydrocarbon leasing in eastern and southern Utah. It appears that listed endangered and threatened species, or species proposed for listing, may occur in the area of influence of this action.

To comply with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies or their designees are required to obtain from the Fish and Wildlife Service (FWS) information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed construction project. Therefore, we are furnishing you the following list of species which may be present in the concerned area:

1. Asphalt Ridge - White rocks

Listed Species

Colorado squawfish
black-footed ferret
bald eagle
Uinta Basin hookless cactus

Ptychocheilus lucius
Mustela nigripes
Haliaeetus leucocephalus
Sclerocactus glaucus

Candidate Species

razorback sucker
western yellow-billed cuckoo
mountain plover
white-faced ibis
Swainson's hawk
ferruginous hawk
long-billed curlew
Hamilton milk-vetch
Dinosaur milk-vetch
Horseshoe Bend milk-vetch

Xyrauchen texanus
Coccyzus americanus occidentalis
Charadrius montanus
Plegadis chihi
Buteo swainsoni
Buteo regalis
Numenius americanus
Astragalus hamiltonii
Astragalus saurinus
Astragalus equisolensis

Vernal beardtongue

Penstemon angustifolius var.
vernalensis

No Common Name (N.C.N.)
N.C.N.

Hedysarum boreale var. gremiale
Gutierrezia sarothrae var. pomariense

2. Raven Ridge-Rimrock
Listed Species

Colorado squawfish
black-footed ferret

Candidate Species

razorback sucker
western yellow-billed cuckoo
mountain plover
white-faced ibis
Swainson's hawk
ferruginous hawk
long-billed curlew
Hamilton milk-vetch
Dinosaur milk-vetch Vernal beard tongue
Vernal beardtongue

3. Pariette
Listed Species

Colorado squawfish
bald eagle
black-footed ferret
Uinta Basin hookless cactus

Candidate Species

razorback sucker
western yellow-billed cuckoo
mountain plover
white-faced ibis
Swainson's hawk
ferruginous hawk
long-billed curlew

4. Argyle Canyon-Willow Creek
Listed Species

Colorado squawfish
black-footed ferret
Uintah Basin hookless cactus

Candidate Species

razorback sucker
long-billed curlew
ferruginous hawk

- spotted bat
Garrett's beard tongue
Sedge fescue
- Euderma maculatum
Penstemon garrettii
Festuca dasyclada
5. Sunnyside
Listed Species
Colorado squawfish
black-footed ferret
bald eagle
Uintah Basin hookless cactus
- Candidate Species
razorback sucker
long-billed curlew
ferruginous hawk
spotted bat
Canyon sweetvetch
Sedge fescue
- Hedysarum occidentale var. canone
6. Hill Creek
Listed Species
Coloradosquawfish
black-footed ferret
- Candidate Species
razorback sucker
southern spotted owl
ferruginous hawk
long-billed curlew
Sedge festuca
Barneby catseye
toad flox cress
Barneby Columbine
Graham beardtongue
- Strix occidentalis lucida
Cryptantha barnebyi
Glaucocarpum suffrutescens
Aquilegia barneby
Penstemon grahami
7. PR Springs
Listed Species
Colorado squawfish
black-footed ferret
- Candidate Species
razorback sucker
Southern spotted owl
ferruginous hawk
long-billed curlew
Dragon milkvetch
Barneby catseye
Aquilegia barnebyi
White River beardtongue
Graham beard tongue
Sedge fescue
- Astragalus lutosus
Penstemon albifluvis
8. San Rafael Swell
Listed Species
Colorado squawfish
black-footed ferret

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Candidate Species

razorback sucker
ferruginous hawk
long-billed curlew
spotted bat
N.C.N.
N.C.N.
Ruth milkweed
San Rafael milk-vetch
Johnston catseye
Jones catseye
Jones cycladenia
Maguire daisy
Drab phacelia

Pediocactus despainii
Hymenozys depressa
Asclepias ruthiae
Astragalus rafaelensis
Cryptantha johnstonii
Cryptantha jonesiana
Cycladenia humilis var. jonesii
Erigeron maguirei
Phacelia indecora

9. Tar Sand Triangle
Listed Species

Colorado squawfish
black-footed ferret
peregrine falcon
Wright fishhook cactus

Falco peregrinus

Candidate Species

razorback sucker
ferruginous hawk
spotted bat
Smith wild buckwheat
monument milkvetch
Jones cycladenia
San Rafael milk-vetch
Drab phacelia

Eriogonum smithii
Astragalus monumentalis

Phacelia indecora

10. White Canyon
Listed Species

Colorado squawfish
black-footed ferret
peregrine falcon

Candidate Species

razorback sucker
Southern spotted owl
white-faced ibis
yellow-billed cuckoo
spotted bat
San Rafael milk-vetch
monument milkvetch
Cottam milk-vetch
Kachina daisy
Sheathed deathcamus

Astragalus cottamii
Erigeron Kachinensis
Zigadensu vaginatus

11. Circle Cliffs

Candidate Species

southern spotted owl
 white-faced ibis
 Swainson's hawk
 ferruginous hawk
 long-billed curlew
 spotted bat
 Kaiparowits milk-vetch
 Barneby milk-vetch

Astragalus malacoides

Section 7(c) also requires the Federal agency proposing a major Federal action significantly affecting the quality of the human environment to conduct and submit to the FWS a biological assessment to determine the effects of the proposal on listed and proposed species. The biological assessment shall be completed within 180 days after the date on which initiated or a time mutually agreed upon between the agency and the FWS. Before physical modification/alteration of a major Federal action is begun the assessment must be completed. If the biological assessment is not begun within 90 days, you should verify this list with us prior to initiation of your assessment. We do not feel that we can adequately assess the effects of the proposed action on listed and proposed species or critical habitat and proposed critical habitat without a complete assessment. When conducting a biological assessment, you shall, at a minimum:

1. conduct a scientifically sound on-site inspection of the area affected by the action, which must, unless otherwise directed by the FWS, include a detailed survey of the area to determine if listed or proposed species are present or occur seasonally and whether suitable habitat exists within the area for either expanding the existing population or potential reintroduction of populations;
2. interview recognized experts on the species at issue, including those within the Fish and Wildlife Service, state conservation agencies, universities, and others who may have data not yet found in scientific literature;
3. review literature and other scientific data to determine the species' distribution, habitat needs, and other biological requirements;
4. review and analyze the effects of the action on the species, in terms of individuals and populations, including consideration of the cumulative effects of the action on the species and habitat;
5. Listed fishes may be impacted as a result of water withdrawals from the Green and Colorado River systems. To evaluate possible impacts to listed fishes the following information is needed: net depletion figures (acre-feet), intake volumes and reservoir storage, evaporative losses from reservoirs and reservoir volumes, location, timing, and water quality characteristics of any return flows. Also, certain

APPENDIX 4

instantaneous flows during various times of the year for sections of the Green and Colorado Rivers need to be met to insure survival of the listed fishes. Potential impacts to these flows need to be analyzed.

6. analyze alternative actions that may provide conservation measures;
7. conduct any studies necessary to fulfill the requirements of (1) through (5) above;
8. review any other relevant information.

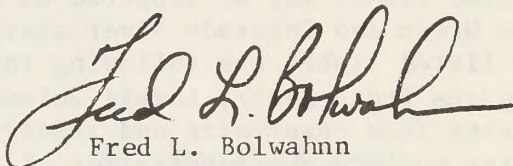
The FWS can enter into formal Section 7 consultation only with another Federal agency or its designee. State, county, or any other governmental or private organizations can participate in the consultation process, help prepare information such as the biological assessment, participate in meetings, etc.

After your agency has completed and reviewed the assessment, it is your responsibility to determine if the proposed action "may affect" any of the listed species or critical habitats. You should also determine if the action is likely to jeopardize the continued existence of proposed species or result in the destruction or an adverse modification of any critical habitat proposed for such species. If the determination is "may affect" for listed species you must request in writing formal consultation from the Field Supervisor, Endangered Species Office, U.S. Fish and Wildlife Service at the address given above. In addition, if you determine that the proposed action is likely to jeopardize the continued existence of proposed species or result in the destruction or adverse modification of proposed critical habitat, you must confer with the FWS. At this time you should provide this office a copy of the biological assessment and any other relevant information that assisted you in reaching your conclusion.

Your attention is also directed to Section 7(d) of the Endangered Species Act, as amended, which underscores the requirement that the Federal agency or the applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which, in effect, would deny the formulation or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species.

We are prepared to assist you whenever you have questions which we may be able to answer. If we can be of further assistance, please advise us.

The FWS representative who will provide you with technical assistance is Terry J. Hickman of our Salt Lake City Office ([801] 524-4430; FTS 588-4430).


Fred L. Bolwahn

APPENDIX 5

CULTURAL RESOURCES
MEMORANDUM OF UNDERSTANDING
UTAH COMBINED HYDROCARBON REGIONAL EIS
BETWEEN
THE BUREAU OF LAND MANAGEMENT
AND
THE UTAH STATE
HISTORIC PRESERVATION OFFICER

I. PURPOSE

The Bureau of Land Management, hereinafter referred to as the Bureau, is preparing the Utah Combined Hydrocarbon Regional Environmental Impact Statement (CHL Regional EIS) under the provisions of the National Environmental Policy Act of 1969. The Bureau has determined that cultural values could be damaged or lost as a result of actions proposed in the CHL Regional EIS. The following kinds of actions are proposed on public lands administered by the Bureau:

- a. Mineral exploration
- b. Mining activities
- c. Construction of drill pads and support facilities
- d. Rights-of-way for access, pipelines, powerlines, etc.
- e. Waste disposal

The Bureau has the responsibility to protect the cultural values on land administered by the Bureau. The Utah State Historic Preservation Officer, hereinafter referred to as the State, is designated as the state representative by the National Historic Preservation Act of 1966, as amended, within the State of Utah. The Bureau has entered into this Memorandum of Understanding with the State in order to outline the responsibilities and procedures that will be used to protect cultural resources affected by the above-mentioned actions. In this agreement, "cultural resources" means data and sites which have archaeological, historical, architectural, or cultural importance and interest.

Investigators will be qualified to evaluate these "cultural resources." Qualifications of investigators will be submitted to the State Historic Preservation Officer.

II. AUTHORITY

This agreement is authorized under the Federal Land Policy and Management Act of 1976 and the National Historic Preservation Act of 1966. It is in accord with Bureau policies and programs. It does not abrogate nor amend any other agreement between the Bureau and the State.

III. RESPONSIBILITIES AND PROCEDURES

The Bureau will comply with 36 CFR 800 in identifying sites which are listed in or eligible for inclusion in the National Register of Historic Places.

APPENDIX 5

A. As part of the planning and environmental analysis required prior to any decision to authorize rights-of-way for the proposed project, the Bureau will search for archaeological and historical literature concerning the affected areas.

B. After completing the planning and environmental analysis process, should the proposed management be implemented, the Bureau will inform project participants of, monitor compliance with, and enforce the following stipulations:

1. Prior to initiation of ground-disturbing activities, literature searches and intensive surveys will be undertaken on all areas which would be disturbed.
2. Wherever possible and feasible, cultural resources will be avoided by construction and related activities. This will be accomplished mainly by rerouting linear facilities such as pipelines and access roads, and adjusting the location of other facilities.
3. A professional archaeologist may be required to be present when ground-disturbing operations are underway.
4. Subsurface cultural resources that are encountered during any construction will be salvaged if there is no other recourse in such a situation.

C. Wherever it is not possible and feasible to avoid sites that contain cultural values, the Bureau will consult with the State Historic Preservation Officer to determine the most satisfactory means of mitigating damage, as required by 36 CFR 800.

D. The Bureau will provide cultural resource reports, technical reports, and other pertinent material to the State.

IV. IMPLEMENTATION

A. This agreement will become effective on the date of the last signature on this agreement.

B. Either party may request revision or cancellation of this agreement by written notice, not less than 30 days prior to the time when such action is proposed.

C. Any problems resulting from this agreement which cannot be resolved by the Bureau and the State will be referred to the Secretary of the Interior and the Advisory Council on Historic Preservation.

8-16-83
Date

Earl C. Hurd
ACTING Utah State Director
Bureau of Land Management
Department of the Interior

8-22-83
Date

Melvin I. Smith
Utah State Historic Preservation Officer

LIST OF ABBREVIATIONS

<u>Abbreviation</u>	<u>Term</u>
ACEC:	Area of Critical Environmental Concern
ADT:	Average Daily Traffic
APD:	Application for Permit to Drill
API:	American Petroleum Institute
AUM:	animal unit month
bbf:	barrels
BIA:	Bureau of Indian Affairs
BLM:	Bureau of Land Management
Btu:	British thermal unit
CCD:	Census County Division
CFR:	Code of Federal Regulations
CHL:	Combined Hydrocarbon Lease
CMA:	Cooperative Management Area
dBA:	A-weighted sound level
DOE:	Department of Energy
EA:	environmental assessment
EIS:	environmental impact statement
EPA:	Environmental Protection Agency
ERT:	Environmental Research and Technology, Inc.
F:	Fahrenheit
FIRE:	Finance, Insurance, and Real Estate
FLPMA:	Federal Land Policy and Management Act
FR:	Federal Register
FS:	Forest Service
FWS:	Fish and Wildlife Service
g/cc:	grams per cubic centimeter
g/m ² /yr:	Grams per square meter per year
gpm:	gallons per minute
H ₂ :	hydrogen
HMP:	Habitat Management Plan
HUD:	Department of Housing and Urban Development
IBLA:	Interior Board of Land Appeals
IMP:	Interim Management Policy
IPP:	Intermountain Power Project
ISA:	Instant Study Area
KGS:	known geologic structure
KRCRA:	known recoverable coal resource area
lbs.:	pounds
MFP:	Management Framework Plan
mg/m ³ :	micrograms per cubic meter
mg/l:	milligrams per liter
mg/m ³ :	milligrams per cubic meter
mm:	millimeter
MMS:	Minerals Management Service
mpg:	miles per gallon
mph:	miles per hour
NO _x :	nitrogen oxide
NO ₂ :	nitrogen dioxide
NPS:	National Park Service
NRA:	National Recreation Area
NWPS:	National Wilderness Preservation System
O ₂ :	Ozone
OSPC:	Office of the State Planning Coordinator
ORV:	off-road vehicle
PCPI:	per capita personal income
PSD:	Prevention of Significant Deterioration
PRLA:	Preference Right Lease Application
R&PP:	Recreation and Public Purposes
RMA:	Recreation Management Area
RMP:	Resource Management Plan
ROS:	Recreation Opportunity Spectrum
RVD:	Recreation Visitor Day
S:	sulfur
Sec:	section
SERI:	Solar Energy Research Institute
SLM:	Salt Lake Meridian
SMASA:	standard metropolitan statistical area
SO ₂ :	sulfur dioxide
SSA:	site-specific analysis
SSF:	soil surface factor
STSA:	Special Tar Sand Area
SVIM:	soil-vegetation inventory method
TDS:	total dissolved solids
TSP:	total suspended particulates
UDES:	Utah Department of Employment Security
UDOT:	Utah Department of Transportation
UDWR:	Utah Division of Wildlife Resources
UGMS:	Utah Geological and Mineralogical Survey
U ₃ O ₈ :	uranium oxide
USDA:	United States Department of Agriculture
USDC:	United States Department of Commerce
USDI:	United States Department of Interior
USGS:	United States Geological Survey
V ₂ O ₅ :	vanadium oxide
VOC:	volatile organic compounds
VRM:	visual resource management
WA:	Wilderness Area
WDAFS:	Western Division of American Fisheries Society
WSA:	Wilderness Study Area

GLOSSARY

- A-WEIGHTED SOUND LEVEL (dBA).** The measurement of sound approximating the auditory sensitivity of the human ear.
- ACCIPITERS.** A genus of small- or medium-sized hawks having short, rounded wings and long tails.
- AIR POLLUTION.** Accumulation of aerial wastes beyond the concentrations that the atmosphere can absorb and, in turn, which may damage the environment.
- ALLOTMENT (RANGE ALLOTMENT).** A management area designated for the use of a prescribed number and kind of livestock under one management plan. An area where one or more livestock permittees graze their livestock, consisting of public lands and any enclosed State and private lands.
- ALLUVIAL FANS.** Unconsolidated sedimentary material deposited by streams in fan- or cone-shaped deposits at the base of mountains.
- ALTERNATIVE.** One of at least two proposed means of accomplishing planning objectives.
- AMBIENT AIR QUALITY.** Prevailing condition of the atmosphere at a given time; the outside air. All lands are categorized in one of the Prevention of Significant Deterioration (PSD) classes. Class I is the most restrictive and generally applies to specific national parks and monuments. No decrease in air quality is allowed under this class. Class II areas allow some decrease in air quality. Class III areas allow for a substantial decrease in air quality such as is found in urban areas.
- ANALYSIS.** The examination of existing and/or recommended management needs and their relationships to discover and determine the outputs, benefits, effects, and consequences of initiating a proposed action.
- ANIMAL UNIT MONTH (AUM).** 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 useable air-dried forage).
- ANTICLINE.** An upfold or arch of stratified rock in which the beds or layers bend downward in opposite directions from the crest or axis of the fold.
- 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.
- AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC).** An area of public lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values; fish and wildlife resources; or other natural systems or processes, or to protect life/provide safety from natural hazards.
- AVERAGE DAILY TRAFFIC (ADT).** The total number of vehicles traveling both directions on a section of road during a time period divided by the number of days in that time period.
- AVULSION.** A sudden change in the course of a river.
- BASIC VISUAL ELEMENTS.** See Visual Elements.
- BITUMEN.** A naturally occurring viscous mixture of hydrocarbons that may contain sulphur compounds and that, in its naturally occurring state, is not recoverable at a commercial rate through a well.
- BRITISH THERMAL UNIT (Btu).** The quantity of heat required to raise the temperature of one avoirdupois pound of water 1 degree Fahrenheit at or near 39.2 F.
- CARBON MONOXIDE.** A colorless, odorless, toxic gas that competes with oxygen for bonding sites on the hemoglobin molecule in the blood.
- CARRYING CAPACITY.** The maximum stocking rate of livestock and/or big game possible without damaging vegetation or related resources. It may vary from year to year on some areas because of fluctuating forage production.
- CATEGORIES (LEASING).** The four categories used to determine leasing activities for oil and gas and tar sand were based on potential for development, other resource uses, and protection of sensitive resource values. *Category 1* opens all public lands to leasing with standard stipulations. *Category 2* allows leasing with standard and special stipulations to protect sensitive resource values. *Category 3* allows leasing with no right of surface occupancy; recovery methods must not disturb the surface; and *Category 4* closes lands to leasing.
- CENSUS COUNTY DIVISION (CCD).** A division designated to represent community areas focused on trading centers or to represent major land use areas. (CCDs have visible, permanent, and easily described boundaries.)
- CENTIPOISE.** A unit of viscosity equal to 1/100 poise. (A poise is a centimeter-gram-second absolute unit of viscosity that is equal to one dyne-second per square centimeter.)
- CHANGE AGENT.** Any factor (person, physical force, living entity, chemical, etc.) which affects the primary characteristics of an ecological element, either positively or negatively.
- CLEAN AIR ACT (42 USC 1857 et seq.).** An act for air pollution prevention and control: (1) to protect and enhance public health and welfare and the productive capacity of its population; (2) to initiate and accelerate a national research and development program to achieve the prevention and control of air pollution; (3) to provide technical and financial assistance to state and local governments in connection with the development and execution of their air pollution prevention and control programs; (4) to encourage and assist the development and operation of regional air pollution control programs.
- COMBINED HYDROCARBON LEASE (CHL).** 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.
- CONVERSION LEASE TRACT.** As used in this EIS, changing an oil and gas lease existing before November 16, 1981 to a Combined Hydrocarbon Lease (CHL). A CHL allows production of all hydrocarbons except coal, oil shale, and gilsonite.
- CRUCIAL WILDLIFE HABITAT.** That portion of wildlife habitat essential to the survival and perpetuation of a certain species in an area.
- CRUDE OIL.** Oil as it comes from a well.
- CULTURAL RESOURCES.** Those resources of historical or archaeological significance.
- DECANT SYSTEM.** A system for separating water from solid waste material.
- DEPOSIT.** An accumulation of a mineral.
- DIRECTIONAL DRILLING.** Slant drilling or drilling on an angle. Directional drilling is utilized when the operator is not allowed to occupy the surface of a given tract of land, but still wishes to drill a structure or target beneath that tract.
- EDGE EFFECT.** The effect that occurs when two or more habitat types come together and create more favorable wildlife habitat than either type could provide alone.

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- ERODIBILITY.** Susceptibility of a soil to erosion by water or wind. Relative terms are none, slight, moderate, and high.
- 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.
- EXPLORATION PERMIT.** A prospecting permit; a short-term agreement granting the holder the right to explore for minerals, oil and gas, or tar sand.
- EXPRESSIONS OF INTEREST.** As used in this EIS, industry nominations to lease tracts within Special Tar Sand Areas (STSAs) which are not currently under lease.
- EXTRACTION.** As used in this EIS, the process by which bitumen is separated from sand, water, and other impurities.
- FLOODPLAIN.** Nearly level land bordering a stream; this land consists of stream sediments and is subject to flooding.
- FORAGE.** Vegetation of all forms available and of a type used for animal consumption.
- FORB.** A broad-leafed herb.
- HABITAT.** A specific set of physical conditions that surrounds a single species, a group of species, or a large community. In wildlife management, the major components of habitat are food, water, cover, and living space.
- HERD UNIT.** An area designated by the Utah Division of Wildlife Resources (UDWR) as a big game (i.e., deer, elk, moose, etc.) herd management area.
- HOMOGENEOUS.** In this EIS, of uniform structure or composition throughout.
- HYDROCARBONS.** Organic chemical compounds of hydrogen and carbon atoms which form the basis of all petroleum products.
- HYDROPHILIC.** Having an affinity for water.
- INFRASTRUCTURE.** The set of supporting systems and facilities (i.e., transportation, education, medical service, communication, fire, and police protection, etc.) that support a region's or community's social and economic structures.
- IN PLACE.** As used in this EIS, the gross volume of crude bitumen or oil calculated or interpreted to exist in a reservoir before any volume has been produced.
- IN SITU.** In place; in the original location.
- IN-SITU EXTRACTION.** As used in this EIS, extracting the oil from tar sand while it is still in place 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.
- INTERMITTENT STREAM.** A stream which flows part of the time, usually after a rainstorm or during a spring thaw.
- ISOPLETH.** A line connecting points at which a given variable has a constant value.
- KNOWN GEOLOGIC STRUCTURE (KGS).** A geologic structure known to be present containing a producing or producible oil or gas well.
- LAND USE PLAN.** A planning decision document which establishes resource allocations and coordinated objectives and constraints for all forms of public land and resource uses within a specified area.
- 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.
- LEASING CATEGORIES.** Refer to categories (leasing).
- LENTICULAR.** Having the shape of a double-convex lens.
- LEVEL OF SERVICE.** A maximum number of vehicles that can pass over a given section of roadway during a specified time period. This is a qualitative measure of the effect of a number of factors, which include speed and travel time, traffic interruptions, freedom to maneuver, safety, driving comfort, and convenience, and operating costs.
- LINEAR SOURCE.** A line or trajectory at which material or other matter is added to a system either instantaneously or continuously. An example of a linear source in the context of air pollution would be highway traffic.
- LIQUID HYDROCARBONS.** Oil substances other than gas and solid substances (i.e., coal, oil shale, and gilsonite) which occur naturally in the earth.
- LOGICAL PRODUCTION AREA.** An area of land in which the recoverable mineral reserve can be developed in an efficient, economical, and orderly manner as a unit with due regard to conservation of other resources.
- 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.
- MEAN VISUAL RANGE.** The average distance of how far any object can be seen by the human eye.
- MIGRATION ROUTES.** Historical wildlife routes used to travel from one type of seasonal range to another.
- 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.
- MONOCLINE.** A geologic structure in which the strata are all inclined in the same direction at a uniform angle of dip.
- 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 (NO_x).** 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

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- 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.
- NOTICE OF INTENT.** A notice submitted to BLM by an existing oil and gas lessee in a Special Tar Sand Area (STSA). This notice states that the lessee intends to submit a plan of operation to convert his existing lease to a Combined Hydrocarbon Lease (CHL).
- NO ACTION ALTERNATIVE.** An alternative which would continue the current management direction or level of management intensity.
- NODE.** As used in this EIS, the actual measuring point for the Colorado River simulation system which determines flow and salinity.
- OFF-ROAD VEHICLE (ORV).** Any motorized vehicle designed for or capable of cross-country travel over land, water, sand, snow, ice, marsh, swampland, or other terrain.
- OIL.** All nongaseous hydrocarbon substances other than those substances leasable as coal, oil shale, or gilsonite (including all vein-type solid hydrocarbons).
- OUTCROPS (TAR SAND).** Those parts of a tar sand deposit exposed at the surface.
- OVERBURDEN.** Material of any nature, consolidated or unconsolidated, that overlies a deposit of useful materials, ores, or coal, especially those deposits mined from the surface by open cuts.
- OZONE.** A colorless to bluish gas produced by photochemical reactions with hydrocarbons and oxides of nitrogen.
- PARTICULATE MATTER.** Any material, except water, in a chemically uncombined form that is or has been airborne and exists as a liquid or a solid at standard temperature and pressure conditions. Minute particles of coal dust, fly ash, and oxides temporarily suspended in the atmosphere.
- PATENTED MINING CLAIM.** A parcel of mineral land for which the Federal Government has conveyed title to an individual.
- PERCHED WATER TABLE.** An aquifer formed by beds of clay or silt, unfractured consolidated rock, or other material with a relatively lower permeability than the surrounding materials, present in some areas above the regional water table. It is of limited areal extent with an unsaturated zone between bottom of the perching bed and the regional water table.
- PERENNIAL STREAM.** A stream with a yearlong flow.
- PERMEABILITY (SOIL).** The ease with which gasses, liquids, or plant roots penetrate or pass through a layer of soil.
- PETROGLYPH.** Prehistoric rock art pecked or carved into rock.
- PICTOGRAPH.** Prehistoric rock art drawn or painted onto rock.
- PILOT PLANT.** A small plant for testing chemical processes under actual production conditions.
- PLAN OF OPERATION.** As used in this EIS, a plan submitted by a lessee which outlines in detail exploration and mining proposals.
- PLANNING AREA.** One or more planning units for which Management Framework Plans (MFPs) or Resource Management Plans (RMPs) are revised/prepared.
- 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.
- POTENTIAL LEASE TRACT.** Areas within Special Tar Sand Areas (STSAs) not already leased for oil and gas, and which may be considered for new competitive leasing.
- PRECURSOR.** In this EIS, a substance from which another substance is formed, especially by natural processes.
- PRIMITIVE RECREATION.** Nonmotorized and undeveloped types of outdoor recreational activities.
- PRIMITIVE RECREATION VALUES.** Environmental features that enhance the quality of unconfined, undeveloped, and unmotorized recreation (i.e., hiking, backpacking, horseback riding, cross-country skiing, etc.). A general description would be scenic, undeveloped lands essentially removed from the effects of civilization with opportunities for solitude.
- PRIOR STABLE LEVEL.** This number is derived from consideration of deer population dynamics data averaging 10 or more years when deer populations were stable. This level is at the range's carrying capacity for a given deer herd unit.
- PUBLIC LANDS.** Any lands or interest in lands outside of Alaska owned by the United States and administered by the Secretary of Interior through the BLM, except lands located on the Outer Continental Shelf and lands held for the benefit of Indians.
- PUBLIC PARTICIPATION.** The process of attaining citizen input into each stage of the planning process. It is required as a major input into BLM's planning system.
- QUAD.** One quadrillion British thermal units (Btus) of energy.
- RAIN SHADOW.** A region of reduced rainfall to the lee of high mountains.
- RAPTORS.** Birds of prey such as eagles, hawks, and owls.
- RECLAMATION.** The process of converting mined land to its former or other productive uses.
- RECREATION AND RESOURCE UTILIZATION (RRU) ZONE.** A land use planning zone within lands administered by the National Park Service (NPS) which allows mineral development and livestock grazing to the extent these uses are compatible with recreation.
- RESOURCE.** A product of the earth or biosphere capable of serving, supplying, or supporting some human purpose or need.
- RESOURCE AREA.** A manageable geographic subdivision of a BLM district consisting of one or more planning units or areas.
- RESOURCE MANAGEMENT PLAN (RMP).** A written land use plan that outlines BLM's decisions and strategy for management of the resources in a particular area. The RMP is replacing Management Framework Plans (MFPs) in BLM's planning system.
- RIPARIAN HABITAT.** A native environment which supports plants adapted to moist growing conditions. Such habitat is found along waterways, ponds, and other wet areas.
- RIVER MORPHOLOGY.** The structure and form of the river.
- RURAL LIFESTYLE VALUES.** Those lifestyle values of significant worth as perceived by residents or local communities in a rural social environment.
- SAGE GROUSE STRUTTING GROUNDS.** A communal courtship display ground where both sexes of sage grouse congregate during the breeding season to mate.
- SATURATION.** As used in this EIS, a measure of the extent to which pore space in the sand or rock is occupied by bitumen or oil. Also, the extent to which pore space in soil is occupied by water.
- 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

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- 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).
- SEMI-PRIMITIVE MOTORIZED RECREATION.** A roaded area (primitive and secondary county maintained) of at least 2,500 acres, which is largely natural with surface disturbances limited. Only small, isolated structures and evidences of man are present, and encounters between users are moderate. Off-site administration of users is encouraged with small on-site controls evident.
- SENSITIVE SPECIES.** Species not yet officially listed but undergoing status review for listing on the official Fish and Wildlife Service (FWS) Threatened and Endangered list; species whose populations are small and widely dispersed or restricted to a few localities; and species whose numbers are declining so rapidly that official listing may be necessary.
- SERIAL COMMUNITIES.** Communities depicting various stages of plant development.
- SHRUB.** A plant that has a persistent woody stem, a relatively low growth habit, and generally produces several basal shoots instead of a single trunk.
- SPECIAL TAR SAND AREA (STSA).** An area designated by the Department of Interior's Orders of November 20, 1980 (45 Federal Register 76800) and January 21, 1981 (46 Federal Register 6077), and referred to in those orders as Designated Tar Sand Areas, as containing substantial deposits for tar and sand. Eleven STSAs are recognized in Utah by the Combined Hydrocarbon Leasing Act of 1981. The Act provided for the conversion of existing oil and gas leases in STSAs to Combined Hydrocarbon Leases (CHLs). This Act also requires competitive leasing for currently unleased lands within STSAs.
- SOIL-VEGETATION INVENTORY METHOD (SVIM).** A uniform, systematic method for inventory of soil and vegetation resources and data collection for use in planning and environmental assessments.
- STAGING GROUND.** A gathering and starting point for a recreational activity.
- STATE LANDS.** Lands owned by the State of Utah: school lands, sovereign lands, and lands acquired for special purposes.
- SULFUR OXIDES.** Compounds released during combustion of fossil fuels that may yield a pungent toxic gas.
- TAR SAND.** Any consolidated or unconsolidated rock (other than coal, oil shale, or gilsonite) that either: (1) contains a hydrocarbonaceous material with a gas-free viscosity at original reservoir temperature greater than 10,000 centipoise; or (2) contains a hydrocarbonaceous material and is produced by mining or quarrying. Tar sand constitutes one of the largest known nonfluid petroleum resources in the United States. Approximately 90 percent of the United States' tar sand (27 billion barrels) is located in Utah.
- TAR SAND DEPOSIT.** A natural bitumen (oil-impregnated) containing or appearing to contain an accumulation of tar sand, separated or appearing to be separated from any other such accumulation.
- THREATENED SPECIES.** Any plant or animal species likely to become endangered within the foreseeable future throughout all or a part of its range.
- 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 describes potentials and opportunities for development of resources within a planning unit or area.
- VISCOUS.** Having a thick consistency and lacking easy movement or fluidity.
- VISIBILITY.** The greatest distance in a given direction at which it is possible to see and identify with the unaided eye a prominent dark object against the sky at the horizon.
- VISUAL DISTANCE ZONE.** The expression of the normal distance of viewers from an area being viewed: foreground/middle ground--up to 5 miles; background--up to 15 miles; and seldom seen--greater than 15 miles or areas screened from normal view points.
- VISUAL ELEMENTS (BASIC).** The elements which determine how the character of a landscape is perceived. *Form:* the shape of objects such as landforms or patterns in the landscape. *Line:* Perceivable linear changes in contrast resulting from abrupt differences in form, color, and texture. *Color:* The reflected light of different wave lengths that enables the eye to differentiate otherwise identical objects. *Texture:* The visual result of variation in the surface of an object.
- VISUAL RESOURCE MANAGEMENT (VRM) SYSTEM.** Classification containing specific objectives for maintaining or enhancing visual resources, including the kinds of structures and modifications acceptable to meet established visual goals.
- 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.
- WATERFOWL.** Wildlife species such as ducks, geese, and swans.
- WATERSHED.** The total area above a given point on a stream that contributes water to the flow at that point.
- WETLANDS.** Lands including swamps, marshes, bogs, and similar areas such as wet meadows, river overflows, mud flats, and natural ponds.
- WILDERNESS.** An area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements.
- 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.
- 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).
- ZERO DISCHARGE.** The lack of any effluent from a given point or source.

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