

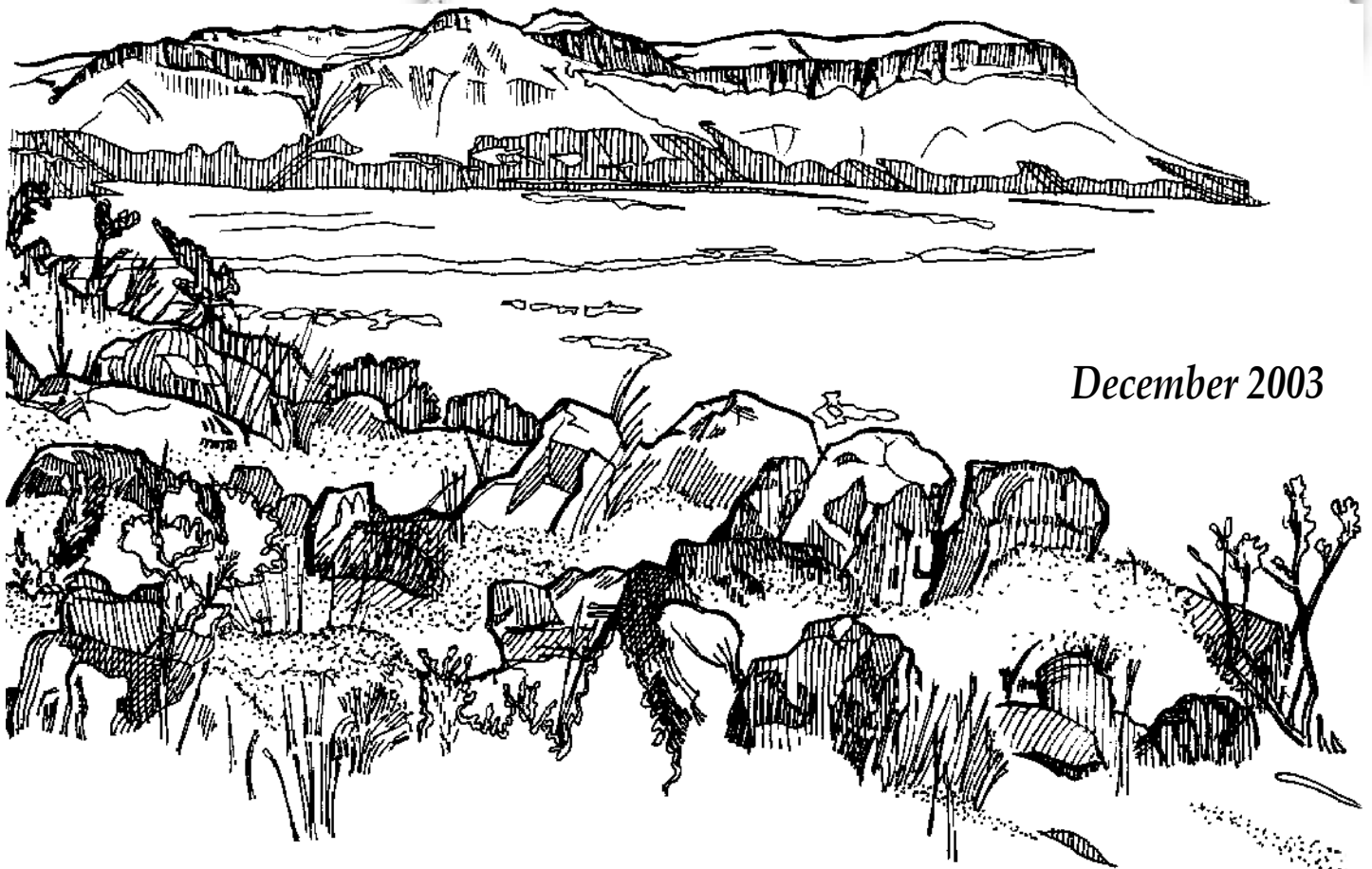


Proposed Resource Management Plan Amendment and Final Environmental Impact Statement for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties

Volume I

*United States Department of the Interior
Bureau of Land Management*

LAS CRUCES FIELD OFFICE



December 2003

BUREAU OF LAND MANAGEMENT

The Bureau of Land Management is responsible for the balanced management of the public lands and resources and their various values so that they are considered in a combination that will best serve the needs of the American people. Management is based upon the principles of multiple use and sustained yield, a combination of uses that take into account the long-term needs of future generations for renewable and nonrenewable resources. These resources include recreation, range, timber, minerals, watershed, fish and wildlife, wilderness and natural, scenic, scientific, and cultural values.

BLM/NM/PL-FES 03-53



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Las Cruces Field Office
1800 Marquess
Las Cruces, New Mexico 88005
www.nm.blm.gov

IN REPLY REFER TO:
1610 (03000)

Dear Reader:

Enclosed is the Proposed Resource Management Plan Amendment (PRMPA) and Final Environmental Impact Statement (FEIS) for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties. The PRMPA/FEIS describes the Proposed Plan that identifies which lands under the jurisdiction of the Bureau of Land Management (BLM) in Sierra and Otero Counties would be made available for leasing and development and how those lands would be managed.

The PRMPA/FEIS is presented in two volumes. Volume I is the main body of the document. Volume II contains the Public Comments and Agency Responses. Copies of both Volumes I and II have been mailed to individuals who submitted original letters, provided oral comments at the public hearing, received the Draft RMPA/EIS, or requested to be on the mailing list for the RMPA/EIS, as well as appropriate Federal, Tribal, State, and local agencies. The PRMPA/FEIS is available for review at the BLM Las Cruces Field Office, 1800 Marquess, Las Cruces, New Mexico, 88005. In addition, both Volumes I and II are posted on the BLM New Mexico State Office internet web page at www.nm.blm.gov.

BLM Planning Regulations (43 CFR 1610.5-2) state that any person who participated in the planning process and has an interest that may be affected may protest. A protest may raise only those issues that were submitted for the record during the planning process. The protest must be filed within 30 days of the date that the Environmental Protection Agency publishes the notice of receipt of the FEIS. All protests must be in writing and mailed to the following address:

Regular Mail:

Director (210)
Attention: Brenda Williams
P.O. Box 66538
Washington, D.C. 20035

Overnight Mail:

Director (210)
Attention: Brenda Williams
1620 L Street, N.W.
Suite 1075
Washington, D.C. 20036

E-mail and faxed protests will not be accepted as valid protests unless the protesting party also provides the original letter by either regular or overnight mail postmarked by the close of the protest period. Under these conditions, BLM will consider the e-mail or faxed protest as an advance copy and it will receive full consideration. If you wish to provide BLM with such advance notification, please direct faxed protests to the attention of the BLM protest coordinator at (202) 452-5112, and e-mails to Brenda_Hudgens-Williams@blm.gov. Please direct the follow-up letter to the appropriate address above.

The protest must contain the following:

- a. The name, mailing address, telephone number, and interest of the person filing the protest,
- b. A statement of the part or parts of the plan and the issue or issues being protested,

- c. A copy of all documents addressing the issue(s) that the protesting party submitted during the planning process or a statement of the date they were discussed for the record, and
- d. A concise statement explaining why the protestor believes that the State Director's decision is wrong.

Upon completion of the protest period and resolution of protests, BLM will issue a Record of Decision that will be made available to the public and mailed to all interested parties. Once the Record of Decision is issued and a 30-day waiting period ends, BLM will begin implementing the RMPA. The Las Cruces Field Office plans to use the PRMPA as the framework for pursuing collaborative management of natural resources on public land in Sierra and Otero Counties.

Questions regarding this document can be directed to Tom Phillips, Planning Team Leader at (505) 525-4377.

Sincerely,

A handwritten signature in black ink, appearing to read "Amy L. Lueders". The signature is fluid and cursive, with a large initial "A" and "L".

Amy L. Lueders
Field Manager

Enclosures

**RESOURCE MANAGEMENT PLAN AMENDMENT/
ENVIRONMENTAL IMPACT STATEMENT
FOR FEDERAL FLUID MINERALS LEASING AND DEVELOPMENT
IN SIERRA AND OTERO COUNTIES**

Draft ()

Final (X)

LEAD AGENCY: U.S. Department of the Interior, Bureau of Land Management (BLM)

TYPE OF ACTION: Administrative

JURISDICTION: Sierra and Otero Counties, New Mexico

ABSTRACT

This Proposed Resource Management Plan Amendment and Final Environmental Impact Statement (RMPA/EIS) describes and analyzes the expected impacts of implementing the Proposed Management Plan Amendment for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties, New Mexico. Of the nearly 7 million acres of Federal, State, Tribal, and private lands in the two counties, BLM administers approximately 1.8 million surface acres and 5 million acres with underlying Federal minerals. Public land in the two counties is managed by the Bureau of Land Management, Las Cruces Field Office. The Proposed Plan is a modified version (as a result of public input) of preferred Alternative A described and analyzed in the Draft RMPA/EIS dated October 2000.

For further information contact:

Tom Phillips, RMPA/EIS Team Leader
Bureau of Land Management
Las Cruces Field Office
1800 Marquess
Las Cruces, New Mexico 88005
Telephone: (505) 525-4377

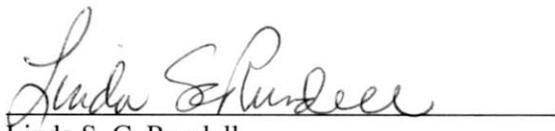
Protests must be postmarked within 30 days following the date the Environmental Protection Agency Notice of Availability is published in the *Federal Register*.

RECOMMENDED:

APPROVED:



Amy Lueders
Las Cruces Field Manager



Linda S. C. Rundell
State Director New Mexico

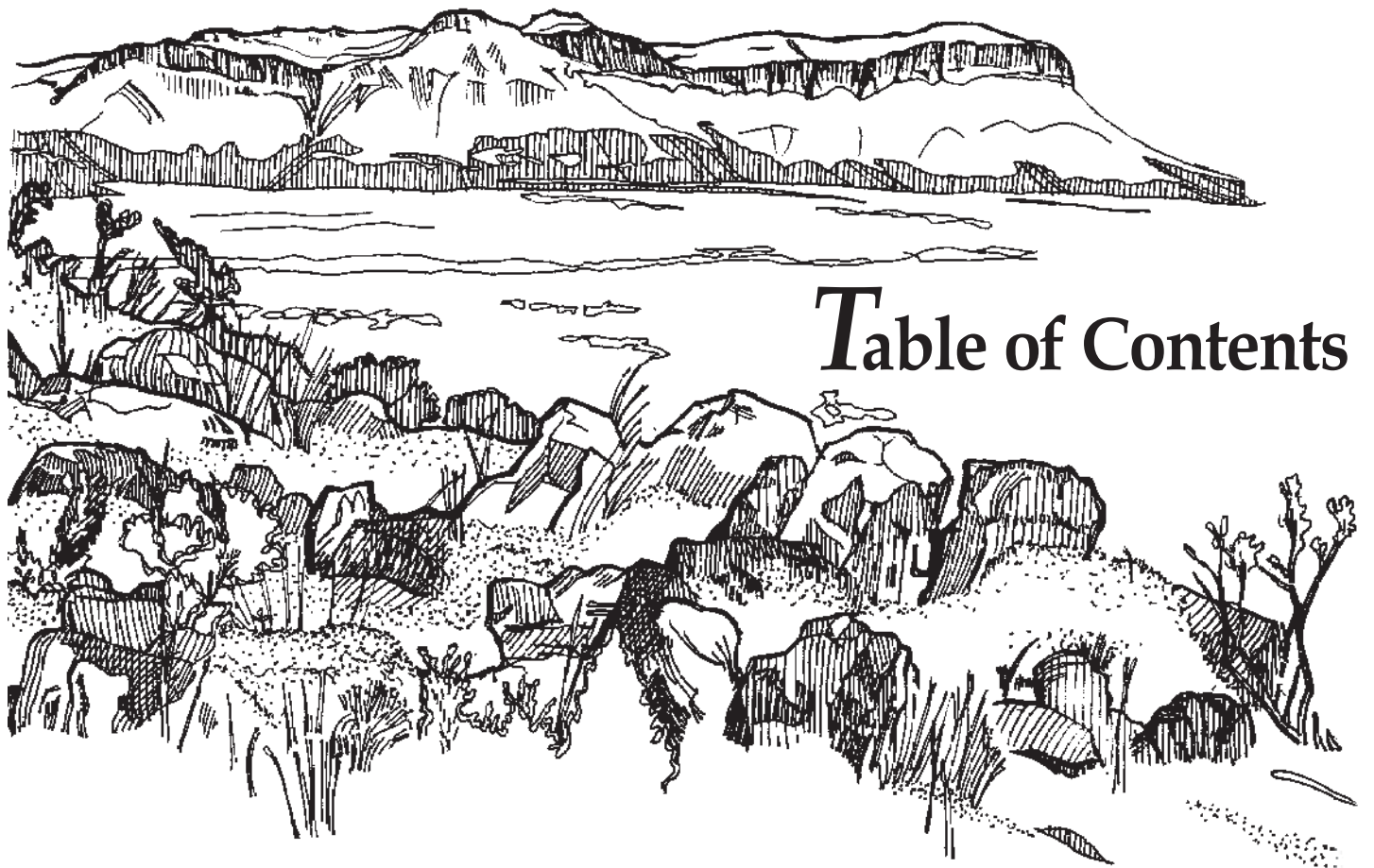


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The large-scale maps listed below accompany the text of the Management Situation Analysis and are on file at the Las Cruces Office of the Bureau of Land Management.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACEC	Area of Critical Environmental Concern
AD	anno Domini
ADT	average daily traffic
APD	Application for a Permit to Drill
AU	Animal Unit
Bbl	per barrel
BC	before Christ
bcf	billion cubic feet
BLM	Bureau of Land Management
BMP	best management practice
BOP	blowout preventer
C	Celsius
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO ₂	carbon dioxide
COA	conditions of approval
CRMP	Cultural Resource Management Plan
CSU	controlled surface use
CUA	common use area
dB	decibels
dBA	A-weighted sound level
DC	discretionary closure
DST	drill stem test
EIA	Energy Information Administration
EIS	environmental impact statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
°F	degrees Fahrenheit
FACA	Federal Advisory Committee Act
FEIS	Final EIS
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act
ft ² /day	square feet per day
FWS	U.S. Fish and Wildlife Service
GIS	geographic information systems
gpm	gallons per minute
HMP	Habitat Management Plan
hp	horsepower
H ₂ S	hydrogen sulfide

IHICS	Integrated Habitat Inventory and Classification System
IMP	Interim Management Policy
IPAA	Independent Petroleum Association of America
I-25	Interstate 25
KGRA	known geothermal resource area
Ldn	day-night noise level
Leq	equivalent sound level
Leq(h)	one-hour equivalent sound level
$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
mg/L	milligrams per liter
MCF	thousand cubic feet
MCFD	thousand cubic feet per day
MMCFD	million cubic feet per day
mph	miles per hour
MS	manual section
MSA	Management Situation Analysis
NAGPRA	Native American Graves Protection and Repatriation Act
NC	nondiscretionary closure
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act
NIA	Notice of Intent to Abandon
NMAC	New Mexico Administrative Code
NMBMMR	New Mexico Bureau of Mines and Minerals Resources
NMCRIS	New Mexico Cultural Resource Information System
NMDGF	New Mexico Department of Game and Fish
NMOCD	New Mexico Oil Conservation Division
NMED	New Mexico Environment Department
NMPM	New Mexico Prime Meridian
NMSU	New Mexico State University
NMTSD	New Mexico Traffic Safety Department
NMWQCC	New Mexico Water Quality Control Commission
NOI	Notice of Intent
NO ₂	nitrogen dioxide
NO _x	oxides of nitrogen
NOS	Notice of Staking
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NSO	no surface occupancy
NTL	Notice to Lessees
O ₃	ozone
OHV	off-highway vehicle
ORV	off-road vehicle
OSE	Office of State Engineer

PAC	primary activity centers
PILT	payment in-lieu of taxes
PL	Public Law
PLO	Public Land Order
PM ₁₀	particulate matter of 10 microns or less
ppm	parts per million
PRMPA	Proposed RMPA
PSD	Prevention of Significant Deterioration
PVC	polyvinyl chloride
RAC	Resource Advisory Council
R&PP	Recreation and Public Purposes
RCRA	Resource Conservation and Recovery Act
RFD	reasonable foreseeable development
RMP	Resource Management Plan
RMPA	Resource Management Plan Amendment
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
SHS	standard habitat site
SHPO	State Historic Preservation Office
SLTC	standard lease terms and conditions
SO _x	oxides of sulfur
SO ₂	sulfur dioxide
SPCC	spill prevention, control, and countermeasure
SR	State Route
SS	special status
SSS	special status species
STATSGO	State Soil Geographic (Database)
SUPO	Surface Use Plan of Operation
T&E	threatened and endangered
TL	timing limitation
TSCA	Toxic Substances Control Act
TSP	total suspended particulate matter
UIC	underground injection control
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VMT	vehicle miles traveled
VOC	volatile organic compound
VRM	Visual Resource Management
WQA	New Mexico Water Quality Act
WSA	Wilderness Study Area



*P*reface

PREFACE

INTRODUCTION

This Proposed Resource Management Plan Amendment (PRMPA) and Final Environmental Impact Statement (FEIS) for Federal Fluid Minerals Leasing and Development was developed by the Bureau of Land Management (BLM) Las Cruces Field Office and responds to public and agency comments on the Draft RMPA/EIS.

The Draft RMPA/EIS was published and distributed for review and comment in October 2000. The Draft RMPA/FEIS described and evaluated a range of three reasonable alternative plans for managing public land that overlies Federal fluid minerals (oil, gas, and geothermal) in Sierra and Otero Counties. It also described the environmental consequences of those alternatives. A number of written and oral comments were received during an extended public review and comment period (195 days). Based on the comments received, BLM re-evaluated elements of the Draft RMPA/EIS alternatives and modified the Preferred Alternative (Alternative A modified).

This PRMPA/FEIS responds to those comments, and identifies and describes the Proposed Plan. This document consists of two volumes: Volume I includes the body of the document, Appendices A through F, and other supporting information; and Volume II, Appendix G, presents all of the written and oral public comments received on the Draft RMPA/EIS and agency responses to those comments.

This PRMPA/FEIS was prepared in accordance with the Federal Land Policy and Management Act and National Environmental Policy Act, as amended, and contains the following:

- A statement of the purpose and need for the action (Chapter 1); also provides the background for the RMPA and describes the project area, decisions to be made, the planning process, and the planning issues

- A description of the Proposed Plan including continuing management guidance and actions, and a summary of the alternatives evaluated in the Draft RMPA/EIS (Chapter 2)
- A description of the existing condition of the environment in the two-county Planning Area (Chapter 3)
- An analysis of potential environmental, social, and economic consequences of implementing the Proposed Plan (Chapter 4)
- A description of the consultation and coordination that has taken place during the process and a summary of the public comments on the Draft RMPA/EIS and BLM's responses (Chapter 5)
- Other information required including the Glossary, References, and Index
- Appendices

PROTEST PERIOD

Any person who participated in the planning process and has an interest that is or may be adversely affected by the approval of the Proposed Plan may protest the approval. A protest may be raised on only those issues that were submitted for the record during the planning process.

Reviewers who do not request administrative review of the Proposed Plan may not preserve their standing to litigate the final decision.

DIFFERENCES BETWEEN THE DRAFT RMPA/EIS AND THE PRMPA/FEIS

Modifications and corrections have been made in response to public comments on the Draft RMPA/EIS. Most of the changes were made to improve the clarity and intent of the management direction. The changes reflected in the PRMPA/FEIS are within the scope and analysis of the Draft RMPA/EIS and do not significantly alter the alternatives or analysis of the environmental consequences.

The Preferred Alternative (Alternative A in the Draft RMPA/EIS) has been modified in response to public and internal (BLM) review comments. It is presented in its entirety in this PRMPA/FEIS.

Insertions or modifications are shown in the text of the PRMPA/FEIS in bold print. Listed below is a summary of the modifications made in preparing the PRMPA/FEIS.

Chapter 1 – Introduction

- Made minor edits to a few sections.
- Added a brief explanation of the status of leasing in the Planning Area.
- Added a brief statement regarding the requirements before consent can be given for leases.
- Added a summary of the events that occurred between the issuance of the Draft RMPA/EIS and the present.
- Included a list of the applicable acts of authority and mandates, and a table of the major Federal, State, and county authorizing actions (previously in Appendix A-I of the Draft RMPA/EIS).

Chapter 2 – Proposed Plan

- Made minor edits for clarification to Section 2.2.
- Added descriptions of existing fluid minerals decisions in Table 2-1, Section 2.2.2.
- Two Wilderness Study Areas, the Sacramento Escarpment and Guadalupe Escarpment, which had been inadvertently left out, are incorporated into the PRMPA/FEIS.
- Incorporated updated water resources and air quality information in Sections 2.2.4 and 2.2.5.
- Section 2.3.2 was revised to clarify the availability of land for leasing and subsequent development; that is, lands that are closed or open to leasing.
- Re-evaluated and modified Alternative A (Preferred Alternative in the Draft RMPA/FEIS) based on public comment; therefore, Section 2.3.2.2 has been revised to

reflect the modifications and Section 2.4 presents the Proposed Plan.

- In Table 2-10, a number of the constraints of the Proposed Plan were re-evaluated and modified or corrected.

BLM corrected the restriction on public water reserves from nondiscretionary closure to standard lease terms and conditions.

BLM modified the following:

- watershed areas – from a stipulation to control surface use to standard lease terms and conditions
- big game habitat areas – from a stipulation to control surface use to standard lease terms and conditions
- Nutt and Otero Mesa desert grassland habitat areas – from no surface occupancy to a stipulation to control surface use (as described in the text of Chapter 2)
- habitat suitable for bighorn sheep – from a stipulation to control surface use and timing limitation to standard lease terms and conditions
- Rattlesnake Hill Archaeological District – from a discretionary closure to a stipulation of no surface occupancy
- Jarilla Mountains protected cultural resource area – from a stipulation to control surface use to no surface occupancy
- Red Sands ORV Area - from a stipulation to require a timing limitation to standard lease terms and conditions
- Cuchillo Mountains Piñon Nut Collection Area from a stipulation to control surface use to standard lease terms and conditions, and a Lease Notice would notify operators that they would be required to implement necessary mitigation to reduce damage to piñon pine trees.
- Lake Valley Backcountry Byway – from a stipulation to control surface use to no surface occupancy

Also, BLM re-evaluated the stipulation to control surface use in concert with the resource concerns associated with the nominated ACECs and determined that adequate interim protection would not be afforded to the resources. Therefore, BLM increased the interim protection by changing the stipulation from controlled surface use to discretionary closure, which is deemed necessary based on BLM guidance that calls for the need to provide protection of the significant resource values until the areas are fully evaluated and a determination has been made on whether to designate them as ACECs.

Chapter 3 – Affected Environment

- Made minor edits in a few sections to clarify information.

Chapter 4 – Environmental Consequences

- Made minor edits to text.
- Revised the text to reflect the modifications to the Preferred Alternative.
- Revised the text to clarify or correct information.

Chapter 5 – Consultation and Coordination

- Updated section describing the public review of the Draft RMPA/EIS including a summary of public comments and agency responses.
- Reformatted Tables 5-4 and 5-5.
- Incorporated a description of the protest process (Section 5.6).
- Incorporated a description of the Record of Decision.

Appendices

- Inserted portions of Appendix A-I: Acts of Authority and Mandates into Chapter 1
- Deleted Appendix A-II, Lease Issuing Process.
- Appendix A-III, Surface Use and Best Management Practices, was edited to clarify and is Appendix B in PRMPA/FEIS.
- Appendix A-IV, Reasonable Foreseeable Development, is Appendix A in the PRMPA/FEIS.
- Appendix A-V, Plan Alternatives Considered, was modified to reflect only Proposed Plan and is Appendix C, Summary of Proposed Plan.
- Appendix A-VI, Stipulation Forms, was edited to reflect the Proposed Plan and is Appendix D in the PRMPA/FEIS.
- Appendix D in the Draft RMPA/EIS, Special Status Species, has been updated and is Appendix E in the PRMPA/FEIS.
- Appendix F, Adaptive Management Implementation Strategy, has been added.
- Appendix G (Volume II) in the PRMPA/FEIS has been added and contains all of the written and oral public comments and agency responses.

Glossary, References, and Index

- Made minor edits to the Glossary.
- Made minor edits and corrected references in the References section.
- Updated page numbers for the Index.



Summary

SUMMARY

INTRODUCTION

The Las Cruces Field Office of the Bureau of Land Management (BLM) has prepared this **Proposed** Resource Management Plan Amendment (PRMPA) and **Final** Environmental Impact Statement (FEIS) to address Federal fluid minerals (oil, gas, and geothermal) leasing in Sierra and Otero Counties (referred to as the Planning Area). The RMPA amends the 1986 RMP for the **(former) BLM** White Sands Resource Area.

In 1998, a gas find in Otero Mesa resulted in increased interest on the part of the oil and gas industry. Large increases in the number of lease nominations prompted BLM to review the 1986 RMP with regard to subsequent guidelines for fluid minerals leasing and development. Given the lack of direction in the existing 1986 RMP and the increasing level of interest, it was determined that an amendment to the 1986 RMP would be required to guide leasing decisions on public land in order to comply with the 1992 supplemental guidelines described above (BLM Handbook H-1624-1).

The objective of the RMPA is to determine (1) which lands overlying Federal fluid minerals are suitable and available for leasing and subsequent development and (2) how those leased lands will be managed. The FEIS identifies the impacts that the Proposed Plan for fluid minerals leasing and subsequent activities could have on the environment and identifies appropriate measures to mitigate those impacts.

This PRMPA/FEIS is being prepared to meet the current requirements of the Federal fluid minerals program **and grants no rights to other parties to proceed with fluid mineral activities, nor does it initiate ground-disturbing activities.** Decisions on all subsequent site-specific actions **would undergo a determination of adequacy under the National Environmental Policy Act (NEPA) and interdisciplinary review process.**

Sierra and Otero Counties are located in south-central New Mexico. Of the approximately 7 million acres of Federal, State, Tribal, and private lands in Sierra and Otero Counties, BLM administers approximately 1.8 million surface acres and 5 million acres of Federal fluid mineral (subsurface) estate. The latter is the area within which BLM has the authority to approve leases (including privately or State-owned surface acreage overlying Federally owned fluid minerals). Although BLM is responsible for considering potential impacts on all resources in the Planning Area regardless of ownership or management, BLM can make decisions regarding surface management for actions only on public land and subsurface Federal mineral estate (administered by BLM). Public land and private split-estate lands are referred to in this document as BLM's Decision Area.

The planning and environmental process began in October 1998 with scoping, a set of activities to identify issues early in the analysis. The results of scoping were documented in a Scoping Summary Report in January 1999. Data collection and preparation of the Management Situation Analysis continued from Fall 1998 through Spring 1999. A characterization of the existing environment is summarized in Chapter 3. This information contributed to the formulation of the alternatives, which are based on the management guidance to be applied to a set of resource concerns that were identified (Chapter 2). The impact assessment was conducted based on the reasonably foreseeable development of Federal fluid minerals over a period of the next 20 years (Appendix A) and an understanding of the standard operating procedures for fluid minerals exploration, development, production, and abandonment.

ALTERNATIVES INCLUDING THE PROPOSED PLAN

In the Draft RMPA/EIS, a total of five alternatives were addressed. Two alternatives were considered but eliminated from further analysis and three alternatives were developed

and evaluated in detail: No-action Alternative, Alternative A, and Alternative B. The alternatives were developed to respond to issues identified through the scoping process, explore alternatives to existing management direction, comply with BLM's planning guidelines for Federal fluid mineral resources, and comply with the Federal Land Policy and Management Act requirement of managing public land for sustained yield and multiple use. The reasonable foreseeable fluid minerals development and associated surface disturbance predicted for the Planning Area over the 20-year planning period remains the same for each alternative. Therefore, the alternatives were formulated based on the extent of modification to the existing management situation as it applies to certain resources that were identified as concerns.

For fluid minerals, objectives for managing public lands and associated resources are defined in terms of the availability of land for leasing (closed or open to leasing) and management of lands that are open (with standard lease terms and conditions or stipulations).

Public land may be closed nondiscretionarily or discretionarily. Public land may be open with no specific management decisions defined, but is subject to standard lease terms and conditions. Or, lands open to leasing may be managed with constraints in the form of stipulations, which are conditions included in a lease when planning and environmental analyses have demonstrated that additional and more stringent protection is needed. There are two types of lease stipulations referred to in this PRMPA/FEIS: a stipulation of no surface occupancy and stipulations to control surface use.

The alternatives were distinguished by the type and degree of constraints. The No-action Alternative represents the continuation of existing management. Compliance with laws and regulations would continue on a case-by-case basis. The objective of Alternative A was to modify the existing management direction to respond to legislative or regulatory requirements and/or management objectives that otherwise would be achieved on a case-by-case basis under

the No-action Alternative (Existing Management). Alternative B also responded to legislative or regulatory requirements and/or management objectives, but provided a relatively greater emphasis on resource protection by imposing more constraints on fluid minerals leasing and development. A summary of leasing constraints is provided in Table 2-9 in Chapter 2.

At the Draft RMPA/EIS step of the environmental review process, BLM's preferred alternative was **Alternative A, which has been modified to become the Proposed Plan.**

The Draft RMPA/EIS was completed and distributed to the public for a 90-day review and comment period in October 2000. Two requests for extension to the review period were granted, which extended the period to a total of 195 days. During the review period, written and oral comments were received. Based on these comments, BLM re-evaluated the alternatives and developed a modification of Alternative A, which is the Proposed Plan in this PRMPA/FEIS. The main difference is that the stipulation for no surface occupancy placed on remnant patches of Chihuahuan Desert grassland habitat was changed to a stipulation to control surface use, allowing the grassland areas to remain open to leasing, but limit industry's disturbance to no more than 5 percent of the leasehold at any one time, and require the new lessees to form exploratory units prior to commencing drilling activity. The purpose is to protect the remnant grassland habitat and associated special status species of wildlife through greater planning of fluid minerals development activities.

Following publication of a Notice of Availability in the *Federal Register*, distribution of the PRMPA/FEIS, a 60-day Governor's Consistency Review, and a 30-day public protest period, the BLM will issue a Record of Decision summarizing the findings and decisions regarding the Proposed Plan and its determination regarding compliance with NEPA and other regulations. Also, the RMPA will be prepared to document the

resource management decisions and complete the BLM's resource management planning process for Federal fluid minerals in Sierra and Otero Counties.

AFFECTED ENVIRONMENT

Chapter 3 addresses the existing condition of the human and natural environment that potentially could be affected by the alternatives. The majority of data and information was extracted and used from existing data on file at the BLM Las Cruces Field Office. Data included published and unpublished reports, maps, and digital format (geographic information system) data. The affected environment is characterized for the following general resource concerns:

- lands and access
- rangeland
- soils
- paleontological resources
- air quality
- noise
- vegetation
- wildlife
- special status species
- geology and minerals
- water resources
- cultural resources
- recreation
- visual resources
- special management areas
- social and economic condition

While data for these resources were being compiled, relevant geological data were compiled and reviewed to estimate the potential for oil and gas and geothermal resources in the Planning Area. These and other historical data served as a basis for estimating the fluid minerals development that is reasonably foreseeable over the planning period of the next 20 years.

ENVIRONMENTAL CONSEQUENCES

Using the information regarding the affected environment (Chapter 3), a description of the standard operating procedures for fluid mineral

activities, and the reasonable foreseeable development (RFD) projected for the Planning Area (Appendix A), the types of impacts that each alternative could have on the resources were identified and quantified only to the extent practical for this document. No ground-disturbing activities would be authorized and result directly from the alternatives addressed in this document; however, leases issued subsequent to and associated with this document could result in surface-disturbing activities. Therefore, further site- and project-specific environmental evaluation is required prior to final approval of the activities.

As part of estimating the RFD, the potential for fluid mineral resources to exist in the Planning Area was derived from available geologic data. For geothermal resources, several areas of high potential were identified. Although locations of future development are not assured, there are some historical data available and recent interest in fluid minerals that suggest locations likely to experience development. Areas of high potential for geothermal resources within BLM's Decision Area occur in the vicinity of Truth or Consequences, Arrey, and Derry in Sierra County. A recent gas discovery on Otero Mesa in southern Otero County suggests that **this area shows potential for oil and gas field development. However, the field has not been delineated clearly and it is not feasible to depict the area as high potential.** For oil and gas, the results indicate that in the majority of the Planning Area there is medium and low potential.

The RFD is a projection of the Federal fluid mineral actions that are likely to occur in the Planning Area over the next 20 years. For oil and gas resources, it is possible that three fields could be developed. The approximate number of acres that are projected to be disturbed directly from activities is **1,590** in the short term (one to three years from implementation of ground-disturbing actions) and 862 over the long term (up to 20 to 30 years). Based on historical information, it is likely that future wells drilled for Federal oil and gas resources would be on lands under the surface jurisdiction of the BLM. For geothermal

resources, the approximate number of acres that are projected to be disturbed from geothermal activities are 27.

Impacts identified are described in Chapter 4. The **Proposed Plan** incorporates many of the stipulations that are likely to accompany the current leasing process. Overall, significant adverse impacts are not anticipated for environmental resources under any of the alternatives. This is primarily the result of the comparatively small amount of surface disturbance projected for the RFD and assumes the inclusion of best management practices and other mitigating measures (Appendix B).

However, under certain circumstances, cumulative effects may result in significant impacts. Cumulative impacts, as defined by Title 40 of the Code of Federal Regulations, Part 1508.7, are those impacts that result from the incremental impact of an action “when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.”

At this level of analysis and the uncertainty of the location(s) of the potential fluid mineral activities, it is difficult to define the functional, temporal, and spatial relationships between potential fluid mineral activities and other past, present, and reasonably foreseeable future actions. Therefore, past, present, and potential reasonably foreseeable future actions are addressed generally, and subsequent action such as lease nominations and applications for permit to drill will be reviewed and evaluated to ensure compliance with NEPA.

Overall, the cumulative impacts resulting from leasing and subsequent development activities are anticipated to be minimal for most resources over the 20-year planning time frame, due to the limited nature of expected surface disturbance, unless a substantial amount of development were to occur in one area that has sensitive resource

concerns. Potential cumulative impacts may be anticipated to occur on visual resources, wildlife habitat, groundwater levels, surface water quality, and socioeconomic resources, as described below.

Because of the open and undeveloped landscape within BLM’s Decision Area, the potential exists for cumulative visual impacts if development occurs in visual proximity to other past, present, or reasonably foreseeable future actions. The greatest concern is if the combination of visual effects of the proposed action and other development were to result in a moderate to strong visual contrast to the setting. These types of cumulative impacts may be mitigated through siting and other proposed mitigation measures.

Another cumulative impact may result in the form of habitat fragmentation due to clearing for facilities and/or road development. Although the volume of anticipated road development is not large relative to the existing road network, the density or location of new access may have a cumulative effect on a previously undisturbed area. Although the associated road networks would not be particularly dense, especially given the existing access in the Planning Area and possibilities for collocation, the cumulative effect may be notable in terms of habitat fragmentation for larger wildlife. However, trips are expected to decrease once wells are in production since only maintenance visits are required.

With regard to groundwater resources, water demands such as irrigation and domestic needs due to population growth could make even the small water requirements for fluid minerals development a burden to the water system. Declining water levels are of concern to residents of Otero County; however, fluid minerals development on non-Federal land is not expected to greatly increase the groundwater supply demands in the Planning Area. None of the other potential projects in the area are believed to impact the supply of groundwater resources.

Indirect impacts on surface water quality also may be cumulative due to incremental impacts of the actions taken within the Planning Area when

added to other past, present, and future actions that could adversely affect downstream receiving waters.

Positive primary and secondary effects on local economies would be small in magnitude; thus, the total positive benefits are not anticipated to produce a significant cumulative impact. As a result, the adverse impacts associated with stress on communities due to rapid growth are not anticipated as a long-term significant impact.

CONSULTATION AND COORDINATION

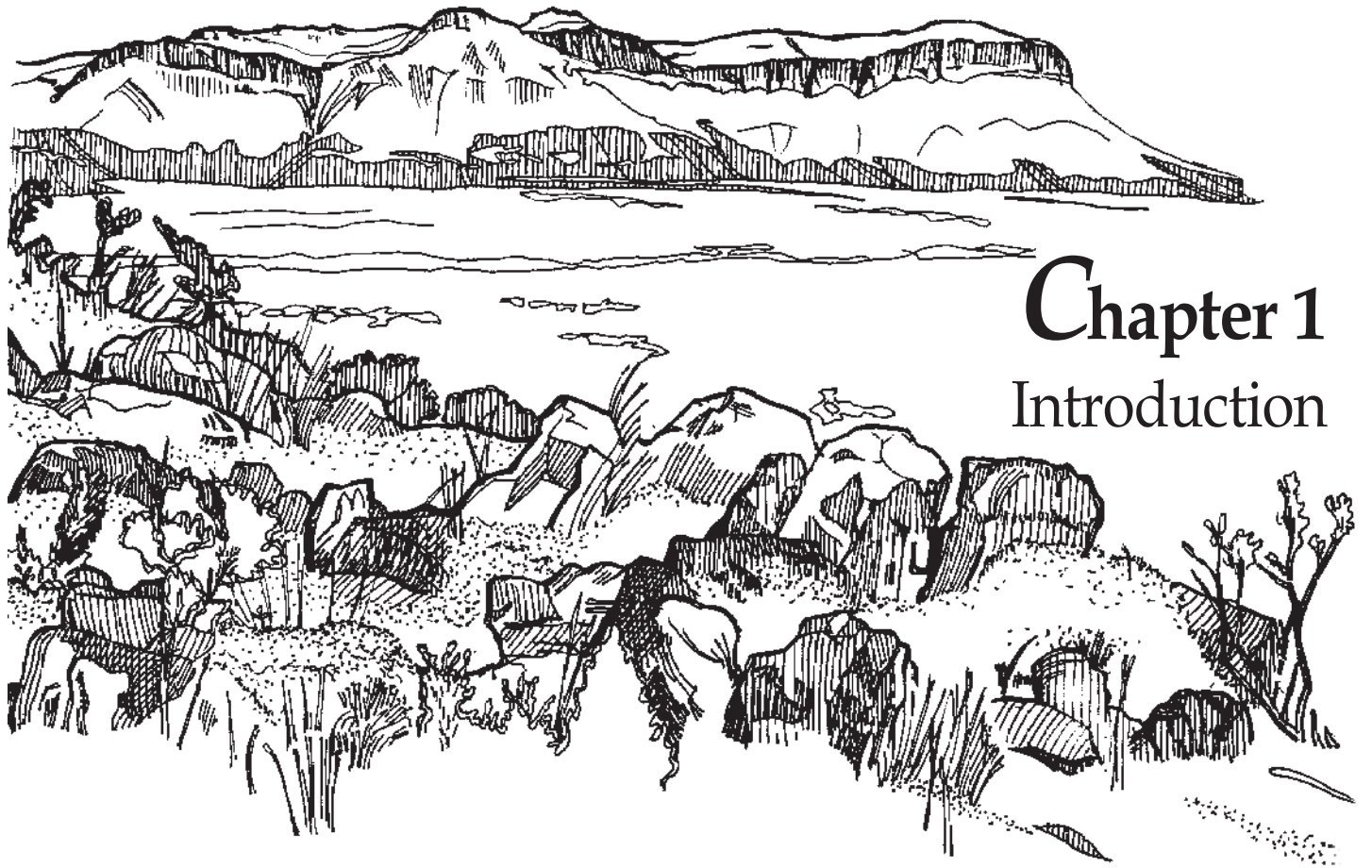
The analysis for this RMPA/EIS was completed in consultation with other agencies and the public. Agencies consulted include the U.S. Fish and Wildlife Service, New Mexico Department of Game and Fish, New Mexico Natural Resources Department, State Historic Preservation Officer, and other Federal and State agencies and local governments as appropriate. Public scoping meetings were held in November 1998, and written comments were received from members of the public and representatives from the oil and gas industry.

The Draft RMPA/EIS was distributed to relevant agencies and the interested public for review and comment in October 2000. Subsequently, two requests for extensions were granted and the review period was extended to a total of 195 days.

During the review period, BLM conducted two sets of three public hearings in January and April 2001. A total of 132 people attended the meetings and 50 people presented comments orally. Also, BLM received 236 letters and postcards with comments on the Draft RMPA/EIS. Responses have been made to all substantive comments; that is, those that addressed either the adequacy of the Draft RMPA/EIS or the merits of the alternatives or both. The results of the content analysis were important to the development of this PRMPA/FEIS.

Generally, the majority of comments focused on interests regarding the Otero Mesa area. Considering the gas discovery in the Bennett Ranch Unit, representatives of the oil and gas industry indicated that an alternative plan that favors leasing and development on public land is preferred and the alternatives in the Draft RMPA/EIS were too restrictive. On the other hand, considering the remnant patches of unfragmented Chihuahuan Desert grassland habitat, interests in support of protecting and preserving the area indicated a preference for more protective restrictions.

A summary of the most common substantive public comments received and BLM responses are provided in Chapter 5 and all of the written and oral public comments and BLM responses are provided in Appendix G (Volume II).



Chapter 1

Introduction

CHAPTER 1 – INTRODUCTION

1.1 PURPOSE AND NEED

The Bureau of Land Management (BLM) has prepared this Resource Management Plan Amendment (RMPA) and Environmental Impact Statement (EIS) to address Federal fluid minerals (oil, gas, and geothermal) leasing and development in Sierra and Otero Counties (Map 1-1), formerly the White Sands Resource Area. The RMPA will amend the 1986 RMP for the White Sands Resource Area.

The Minerals Leasing Act of 1920, as amended, provides the Secretary of the Interior with authority to issue leases on lands where the mineral rights are held by the Federal government. This authority has been delegated to the BLM State Director. As of 1992, BLM is required to determine (1) which lands overlying Federal fluid minerals are suitable and available for leasing and subsequent development and (2) how those leased lands will be managed. Such determinations are required in every RMP prepared by BLM.

Although fluid minerals exploration has occurred in Sierra and Otero Counties, extensive development has not resulted. Oil and gas exploration has occurred within the Sierra and Otero Counties since at least 1925, when the first well was drilled in Otero County. To date, **101** wells have been drilled in the Planning Area, of which **77** are on Federal leases. Shows of oil or gas were reported for 21 of the wells on Federal leases. However, extensive field development has not resulted. Geothermal exploration also has occurred within Sierra and Otero Counties, often in conjunction with military efforts to locate geothermal resources. Geothermal resources have been used in localized areas for space and swimming pool heating, particularly in the vicinity of Truth or Consequences.

In 1998, a gas find in Otero Mesa resulted in increased interest on the part of the oil and gas industry. Large increases in the number of lease

nominations on public land prompted BLM to review the 1986 RMP with regard to guidelines for fluid minerals leasing and development. Given the lack of direction in the existing 1986 RMP and the increasing level of interest in exploration, it was determined that an amendment to the 1986 RMP would be required to guide leasing decisions on public land in order to comply with the 1992 supplemental guidelines described above (BLM Handbook H-1624-1).

Between 1988 and 1998, BLM issued mineral leases on approximately 143,600 acres in Otero County under existing management guidance, and RMP decisions (prior to issuance of this document). Also during this time period, no interest in leasing has been expressed and, therefore, no leases have been issued in Sierra County. Although the decisions resulting from this RMPA have no effect on existing leases, lessees were given the option to voluntarily suspend existing leases for the duration of the RMPA/EIS process. Consequently, only limited exploratory drilling has taken place on existing leases in Otero County. Also, BLM deferred any new leasing pending completion of the RMPA/EIS.

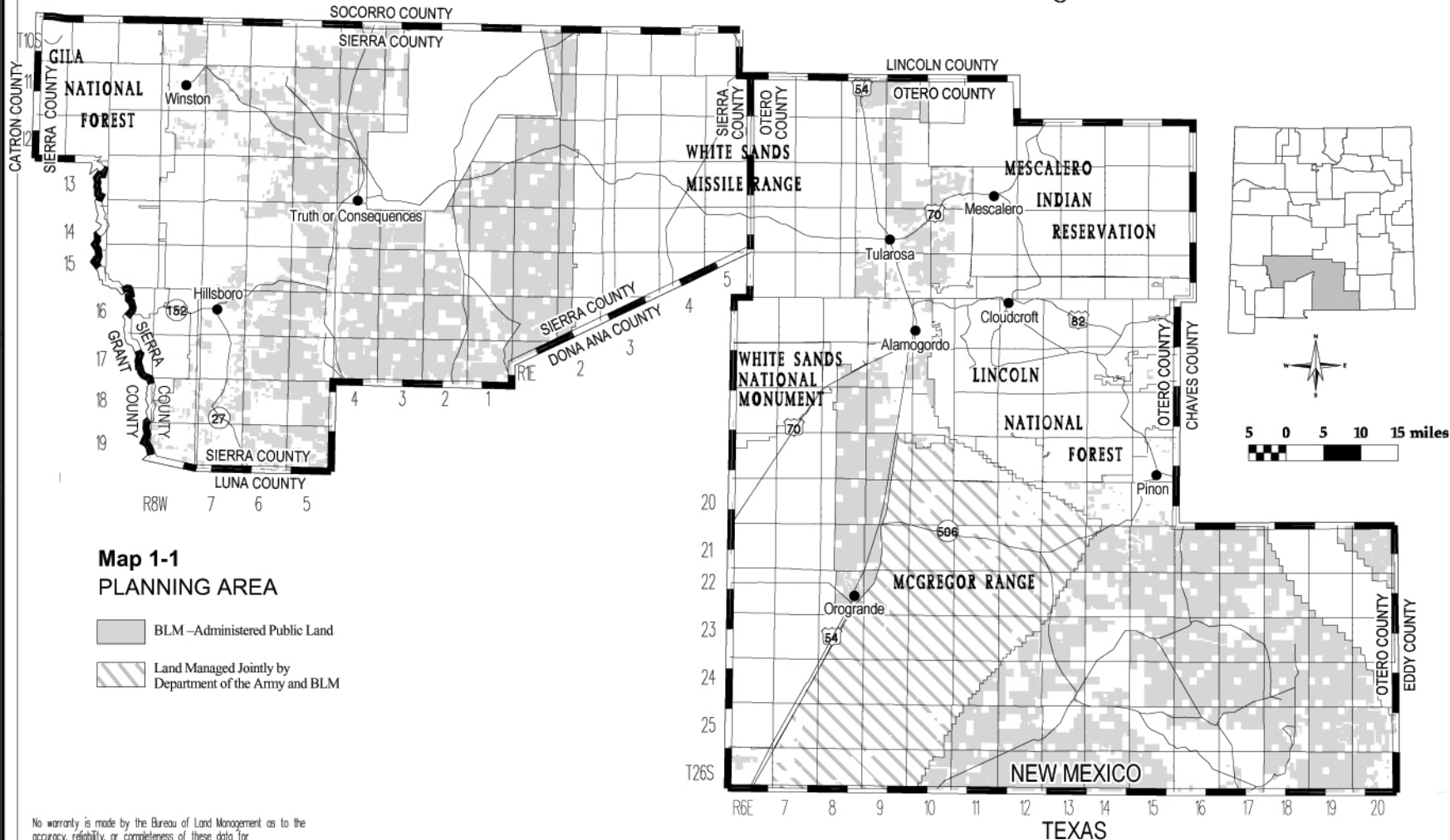
The result of the BLM planning process will be an RMPA that identifies which lands under BLM jurisdiction in Sierra and Otero Counties **will** be made available for development through leasing and what requirements, or stipulations, are needed to manage those lands and protect other resource values. **Before consent can be given for leases to be issued by BLM, regulations require (1) verifying that leasing on specific lands is consistent with the land use plan; (2) ensuring that conditions of surface occupancy are properly included (as stipulations) in resulting leases; and (3) determining that operations and development could be allowed somewhere on each proposed lease except where a stipulation would prohibit all surface occupancy.**





U.S. DEPARTMENT OF THE INTERIOR



BUREAU OF LAND MANAGEMENT
LAS CRUCES FIELD OFFICE



Map 1-1
PLANNING AREA

-  BLM - Administered Public Land
-  Land Managed Jointly by Department of the Army and BLM

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

Proposed RMPA/Final EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties

In the case of this RMPA, stipulations that **may** be attached to **new** Federal fluid mineral leases could include **no surface occupancy or a form of controlled surface use**. The document also will identify the circumstances necessary for granting waivers, exceptions, or modifications to stipulations. Preparation of the RMPA is guided by BLM planning regulations (Title 43, Code of Federal Regulations [CFR] Parts 1600-1610) issued under the authority of the Federal Land Policy and Management Act of 1976 (FLPMA) and by BLM Handbook H-1624-1 (Planning for Fluid Mineral Resources), and associated regulations.

The EIS **identifies** the potential impacts that **the Proposed Plan** for fluid minerals leasing and subsequent activities could have on the environment and identifies appropriate measures to mitigate those impacts. The primary purpose is to analyze and document the direct, indirect, and cumulative impacts of reasonably foreseeable future actions resulting from Federally authorized fluid mineral activities. By law, these impacts must be analyzed before an agency makes an irreversible commitment of resources. In the fluid minerals program, this commitment occurs at the point of lease issuance (BLM Handbook H-1624-1 I.B.2). The EIS prepared with the RMPA is intended to satisfy the requirements of the National Environmental Policy Act of 1969 (NEPA), Council on Environmental Quality regulations implementing NEPA (40 CFR Parts 1500-1508), and other associated regulations.

This RMPA/EIS **is being** prepared to meet current requirements of the Federal fluid minerals program **and grants no rights to other parties to proceed with fluid mineral activities, nor does it initiate ground-disturbing activities**. Decisions on all subsequent site-specific, **ground-disturbing** actions will be tiered from this RMPA/EIS. That is, further environmental analyses and additional NEPA compliance will be required **prior to ground-disturbing activities**; however, the scope of the site-specific approval process will be streamlined and facilitated by the planning

and evaluation of impacts accomplished in the RMPA/EIS.

1.2 LOCATION

Sierra and Otero Counties are located in south-central New Mexico. The two counties are addressed in their entirety throughout this document, regardless of jurisdiction or ownership. This two-county area is referred to in this document as the Planning Area. Of the approximately 7 million acres of Federal, State, Tribal, and private lands in Sierra and Otero Counties, BLM administers approximately 1.8 million surface acres and 5 million acres of Federal fluid mineral (subsurface) estate. The latter is the area within which BLM is mandated and has the authority to approve leases (including private- or State-owned surface acreage overlying Federally owned minerals [referred to as split estate]). BLM considers potential impacts on all resources in the Planning Area regardless of surface ownership or management, and makes decisions on Federal fluid mineral leases in consultation with those other surface owners and managers. Public land and private split-estate lands are referred to in this document as BLM's Decision Area and includes approximately 2,053,029 acres.

1.3 PLANNING PROCESS FOR THE RMPA/EIS

The RMPA process employs the nine basic steps of the BLM planning process, which are listed below:

- identification of issues
- development of planning criteria
- data and information collection
- management situation analysis
- formulation of alternatives
- estimation of effects of the alternatives
- selection of the preferred alternative (s)
- selection of the plan amendment
- monitoring and evaluation

The process requires the use of an interdisciplinary team of resource specialists to complete each step.

1.3.1 Step 1 – Identification of Issues

Issues were identified through the scoping process at the beginning of the project. Scoping and the RMPA/EIS process began with the publication in the *Federal Register* of the Notice of Intent (NOI) to amend the RMP, prepare an EIS, and conduct public scoping meetings. The NOI was published on October 15, 1998. In addition to the NOI, BLM prepared a scoping notice to send to approximately 700 agencies, interested organizations, and individuals in early October 1998. Also, BLM prepared and issued a media release introducing the project and announcing the scoping meetings on October 21, 1998 by the BLM to local and regional newspapers, television, and radio.

BLM conducted three public scoping meetings in early November 1998 (see Chapter 5, Section 5.4). A total of 102 people attended the three meetings and 35 people provided oral comments. In addition to the comments received during the meetings, a total of 36 comment forms and letters were submitted to the BLM. Scoping ended on November 16, 1998; however, additional comments were accepted after that date.

All of the comments and questions received were compiled, reviewed, and analyzed to identify the issues to be addressed in the RMPA/EIS. Comments primarily addressed the RMPA/EIS process; leasing; exploration, development, and production lands and access resources other than fluid minerals socioeconomics; mitigation and reclamation and operations and maintenance. The scoping process, including a summary of comments and issues, was documented in a Scoping Summary Report in January 1999 and sent to the interested parties on the mailing list. A complete record of scoping is on file at the BLM Las Cruces Field Office. The comments and issues, and where they are addressed in this document, are summarized in Table 1-1.

1.3.2 Step 2 – Development of Planning Criteria

The planning criteria to guide the development of the RMPA/EIS include the following:

- comply with laws, executive orders, and regulations
- provide orderly leasing and development of fluid minerals while holding environmental damage to as minimum as practical
- provide for conservation of mineral resources
- provide for the rehabilitation of affected land
- minimize soil erosion
- provide for the protection of water resources
- provide for the protection and management of plant and animal special-status species
- provide for the protection and management of wildlife and wildlife habitat
- provide for the protection of cultural and paleontological resources
- provide for the availability of recreation opportunities
- identify, protect, and enhance visual quality
- maintain public health and safety
- consider social and economic effects

1.3.3 Step 3 – Data and Information Collection

The majority of data and information was extracted and used from existing data on file at the BLM Las Cruces Field Office. Other data were obtained from relevant sources to update and/or supplement the BLM's data (see References). Data included published and unpublished reports, maps, and digital information (geographic information system). Resource concerns addressed include the following:

- lands and access
- rangeland
- soils
- paleontological resources
- air quality

**TABLE 1-1
ISSUES IDENTIFIED THROUGH THE SCOPING PROCESS**

Issue	Section(s) in RMPA/EIS Where Issue is Addressed
Justify the need for this process and leasing deferment.	Chapter 1, Section 1.1
Provide adequate time for public review and response.	Chapter 1, Section 1.3.7
Consider mitigative effects of leasing, management options, and new technology.	Chapter 4; Appendices B and C
Provide an objective set of rules and criteria for decision making.	Chapter 1, Section 1.3
Consider a range of alternatives including least restrictive, balanced, and no leasing.	Chapter 2, Sections 2.3 and 2.4
Specify how existing lease rights would be impacted by the RMPA.	Chapter 1, Section 1.1
What will be the potential damage to lands due to construction and maintenance of roads during development and production?	Chapter 4
What will be the impacts on the existing transportation system?	Chapter 3, Section 3.4.5; Chapter 4, Section 4.2.1
Review existing RMPs to ensure consistency.	References
Clarify split estate rules.	Chapter 2, Section 2.2.1
What is the potential for land subsidence due to extraction of fluid mineral resources?	Chapter 4, Section 4.2.1 (Minerals)
Concern about impacts on resources (soil, vegetation wildlife and habitats, desert grassland habitat fragmentation rangeland, cultural sites, recreation and visual setting).	Chapter 4
What will be done to protect the aquifers and water quality in general?	Chapter 3, Section 3.7; Chapter 4, Section 4.2.1 (Water Resources)
Exclude Wilderness Study Areas (WSAs) and other proposed wilderness from leasing.	Chapter 2, Section 2.3.2; Chapter 4, Section 4.2.1 (Special Management Areas)
Prohibit activities in areas of critical environmental concern (ACECs).	Chapter 2, Section 2.3.2; Chapter 4, Section 4.2.1 (Special Management Areas)
Examine the importance of fluid mineral production to local economies.	Chapter 3, Section 3.19; Chapter 4, Section 4.2.1 (Social and Economic Conditions)
What are potential impacts on the growth of the area and property values?	Chapter 3, Section 3.19; Chapter 4, Section 4.2.1 (Social and Economic Conditions)
How will affected land be rehabilitated and will funds be assured for reclamation measures?	Chapter 4; Appendix B

- noise
- vegetation
- wildlife
- special status species
- geology and minerals
- water resources
- cultural resources
- recreation
- visual resources
- special management areas
- social and economic condition

As a part of this step, relevant geological data were compiled and reviewed to estimate the potential for oil and gas and geothermal resources in the Planning Area. This and other historical data served as the basis for estimating the fluid minerals development that is reasonably foreseeable over the planning period of the next 15 to 20 years (Appendix A).

1.3.4 Step 4 – Management Situation Analysis

The purpose of the Management Situation Analysis (MSA) was to conduct a deliberate

assessment of the current situation as it relates to Federal fluid minerals. The resulting documentation is a compilation of information appropriate and commensurate with the planning issues. The MSA provides a profile of the resource concerns in the Planning Area, description of the existing management situation as it pertains to Federal fluid minerals, and analysis of opportunities to modify the existing management situation. The MSA and accompanying resource maps are on file at the BLM Las Cruces Field Office.

1.3.5 Step 5 – Formulation of Alternatives

Three alternatives were examined. The alternatives were developed to respond to issues identified through scoping, explore alternatives to the existing management situation, comply with BLM's planning guidelines for fluid mineral resources (Handbook H-1624-1), and comply with the FLPMA requirement of managing for sustained yield and multiple use on public land.

The No-action Alternative would continue the existing management situation, that is, compliance with laws and regulations, and existing management plans, policies, and decisions would continue on a case-by-case basis. Two alternatives were developed as modifications to existing management. Alternative A would incorporate legislative or regulatory requirements and/or management objectives that otherwise would be achieved on a case-by-case basis under existing management. Alternative B would accomplish the same objective as Alternative A, but would provide a relatively greater emphasis on resource protection by imposing more constraints on fluid minerals leasing and development. The selection of Alternatives A or B would allow **site-specific** decisions and analyses, **subsequent to leasing**, to be tiered **to** the RMPA/EIS, thereby **facilitating** future **site-specific** compliance with NEPA and other legal and regulatory requirements. The existing management situation and alternatives are described further in Chapter 2.

1.3.6 Step 6 – Estimation of Effects of Alternatives

A scenario of the reasonable foreseeable development of fluid minerals within the Planning Area was developed in order to estimate the extent of potential impacts for each alternative. The beneficial and adverse impacts that would result from each of the alternatives were identified and evaluated. Mitigation measures also were considered in evaluating impacts. The baseline information that describes the existing environment in the Planning Area is included in Chapter 3, and environmental consequences **for each alternative** are discussed in Chapter 4 **of the Draft RMPA/EIS**. The reasonable foreseeable development used in the impact assessment is described in Chapter 2 and Appendix A.

1.3.7 Step 7 – Selection of the Preferred Alternative

Based on the information generated in Step 6, the BLM Las Cruces Field Manager identified and recommended Alternative A as the preferred alternative to the BLM State Director. The Draft RMPA/EIS then was completed and distributed to the public for review and comment in **October 2000**.

In late December 2000, during the 90-day public review and comment period, the BLM Las Cruces Field Office received a letter written on behalf of oil and gas industry representatives requesting an extension of 60 days to the comment period. The extension was granted. Subsequently, based on a request by an Otero County Commissioner, the comment period was extended by an additional 45 days. In addition, following a set of three public hearings in January 2001, a second set of three public hearings was conducted in April 2001. The extensions and added set of public hearings were intended to provide ample opportunity for public comment on the Draft RMPA/EIS. BLM carefully reviewed the numerous written and oral comments. Based on the comments, BLM developed a modification of Alternative A

that was reviewed by and received input from BLM management as well as the Resource Advisory Council (RAC), a statewide body of citizens representing a diversity of interests advising the BLM about public land issues and solutions. Following a presentation to the RAC, BLM agreed to fund the services of a professional mediator to allow for further discussions regarding the Otero Mesa area. The mediator, selected by the RAC, was tasked with convening a RAC subcommittee to develop a consensus for an alternative plan regarding how leasing would take place on Otero Mesa. Following an assessment period, the mediator determined that mediation, as identified by the RAC and BLM, would not be successful. Even though mediation did not proceed, the BLM has been a part of a number of discussions with the RAC, which have aided in the development of portions of the Proposed RMPA (PRMPA).

In addition to comments received during the 195-day public comment period, the Las Cruces Field Office received an additional 364 letters and postcards and approximately 3,200 electronic mail messages regarding the RMPA/EIS and future publication of the Proposed RMPA/Final EIS (PRMPA/FEIS).

1.3.8 Step 8 – Selection of the Plan Amendment

Based on the results and thorough consideration of the public comments, the BLM Las Cruces Field Manager **has recommended and the BLM State Director has selected Alternative A with modifications to be the PRMPA and is publishing it along with the FEIS.** A final decision will be made after a 60-day Governor's Consistency Review and a 30-day protest period. A Record of Decision and approved RMPA then will be published.

1.3.9 Step 9 – Monitoring and Evaluation

Once the RMPA has been approved, it will serve as management guidance for Federal fluid mineral actions for BLM's Decision Area. The applicable stipulations will be attached to **future**

leases, and **conditions of approval** will be applied to **authorizations for site-specific actions (i.e., approved Applications for Permits to Drill [APDs]).**

Over time, BLM will monitor and evaluate actions, resource conditions, and trends to determine the effectiveness of the decisions and to ensure that implementation is achieving the desired results. The RMPA will be kept current through minor maintenance as demands on resources change, as the resources change, or as new information is acquired.

1.4 RELATIONSHIP TO BLM POLICIES, PLANS, AND PROGRAMS

This document has been prepared to reflect and be consistent with current laws, regulations, and supplemental program guidance (BLM Manual Section 1624.2) for fluid minerals leasing and to provide the public the opportunity to review leasing decision making.

The 1986 *White Sands Resource Management Plan* set forth decisions that are considered and will be incorporated appropriately into the RMPA. Since 1986, two RMPAs have addressed specific areas within the Planning Area. The RMPA (Otero County Areas of Critical Environmental Concern RMPA, BLM 1997b) that resulted in the creation of five new ACECs in the Planning Area and expansion of an existing ACEC, closed those areas to leasing; the decisions within that RMPA also will be carried forward unchanged. **Fluid minerals leasing and development on McGregor Range were addressed in the McGregor Range RMPA/EIS (BLM 1990a) and are being readdressed in a current RMPA/EIS required by the Military Lands Withdrawal Act (Public Law 106-65); therefore, fluid minerals leasing and development on McGregor Range is not addressed in this RMPA/EIS.**

WSAs are designated by the Federal government and managed in accordance with the Wilderness Management Policy (BLM 1981c). Four WSAs are included in BLM's Decision Area that have not received formal Congressional designation;

these areas are managed under the Interim Management Policy Guidelines for Land Under Wilderness Review (BLM 1995).

1.5 ACTS OF AUTHORITY AND MANDATES

A series of statutes establish and define the authority of the Secretary of the Interior to make decisions regarding fluid minerals leasing and development. The major relevant statutes are listed below and described in more detail in Appendix A-I of the Draft RMPA/EIS. Table 1-2 summarizes permit and approval requirements.

1.5.1 Background Acts

- General Mining Law of 1972 (later amended by the Mineral Leasing Act of 1920)
- Mineral Resources on Weeks Law Lands

1.5.2 Acts of Authority

- Mineral Leasing Act of February 25, 1920
- Mineral Leasing Act for Acquired Lands of August 7, 1947
- Federal Onshore Oil and Gas Leasing Reform Act of December 22, 1987
- Onshore Oil and Gas Leasing and Operations: Proposed Rule (43 CFR Part 3100, et al.)
- Geothermal Steam Act of 1970

- Geothermal Resources Leasing and Operations: Final Rule (43 CFR Part 3200, et al.)

1.5.3 Mandates and Guidance for Planning and Environmental Resources Management

- Federal Land Policy and Management Act of 1976
- National Environmental Policy Act of 1969
- Clean Air Act, as amended
- Endangered Species Act of 1973
- Clean Water Act
- National Historic Preservation Act of 1966
- Energy Policy Act of 1992
- BLM Manual Section 1624-2
- Onshore Oil and Gas Orders No. 1 and No. 2
- Executive Orders 11988 and 11990
- Instruction Memoranda
- Continuing Management Direction in BLM's Decision Area

1.5.4 New Mexico State Statutes

- New Mexico Oil and Gas Act
- New Mexico Geothermal Resources Act
- New Mexico Geothermal Resources Conservation Act
- State Cultural Properties Act of 1977
- New Mexico Water Quality Act

**TABLE 1-2
MAJOR FEDERAL, STATE, AND COUNTY AUTHORIZING ACTIONS¹**

Agency and Permit/Approval	Nature of Action	Authority	Application
Federal Permits, Approvals, and Authorizing Actions			
<i>Bureau of Land Management</i>			
Decision Record for proposed action	Evaluate environmental impacts of proposed action	NEPA	Proposed Federal action
Permit to Drill	Provide for compliance with regulations and requirements during drilling and completion phases of the well	Mineral Leasing Act of 1920; Federal Oil and Gas Royalty Management Act of 1982; Secretarial Order No. 3087; Amendment No. 1, February 7, 1983	Proposed injection wells and gas production wells
Rights-of-way	Grant right-of-way and potentially evaluate the environmental impacts of proposed action	NEPA FLPMA Mineral Leasing Action of 1920	Pipeline, electrical lines, access roads
NOI to conduct geophysical exploration	Protect resource values during geophysical exploration activities	FLPMA Mineral Leasing Act of 1920	Proposed action
Approval to dispose of produced water	Controls disposal of produced water from Federal leases	Mineral Leasing Act of 1920	Well
Permit to use earthen pit (part of APD)	Regulates reserve pits on drilling locations	Mineral Leasing Act of 1920	Well
Authorization for flaring and venting of gas	Regulates flaring and venting of gas	Mineral Leasing Act of 1920	Well testing and evaluation
Temporary abandonment of a well	Regulates temporary abandonment of wells	Mineral Leasing Act of 1920	Successful well
Plugging and abandonment of a well	Establishes procedures for permanent abandonment	Mineral Leasing Act of 1920	Dry hole
<i>U.S. Army Corps of Engineers</i>			
Section 404 permit	Issue a permit for placement of fill or dredge materials in waters of the United States or adjacent wetlands	Section 404, Clean Water Act	Pipeline; proposed actions in waters of the United States
<i>U.S. Fish and Wildlife Service</i>			
Consultation process, threatened or endangered species	Review potential impactson Federally listed and candidate threatened and endangered species	Section 7 of the Endangered Species Act	Federal action
<i>Environmental Protection Agency</i>			
(Administered by New Mexico Water Quality Control Commission) Stormwater discharge permits (National Pollutant Discharge Elimination System permits)	Regulate discharge to surface waters from point sources	Federal Water Pollution Control Act Amendments and Section 404(p) of Clean Water Act	Construction activities disturbing five or more acres (as of 01/26/02, the acreage will be reduced from 5 or more to 1 acre)

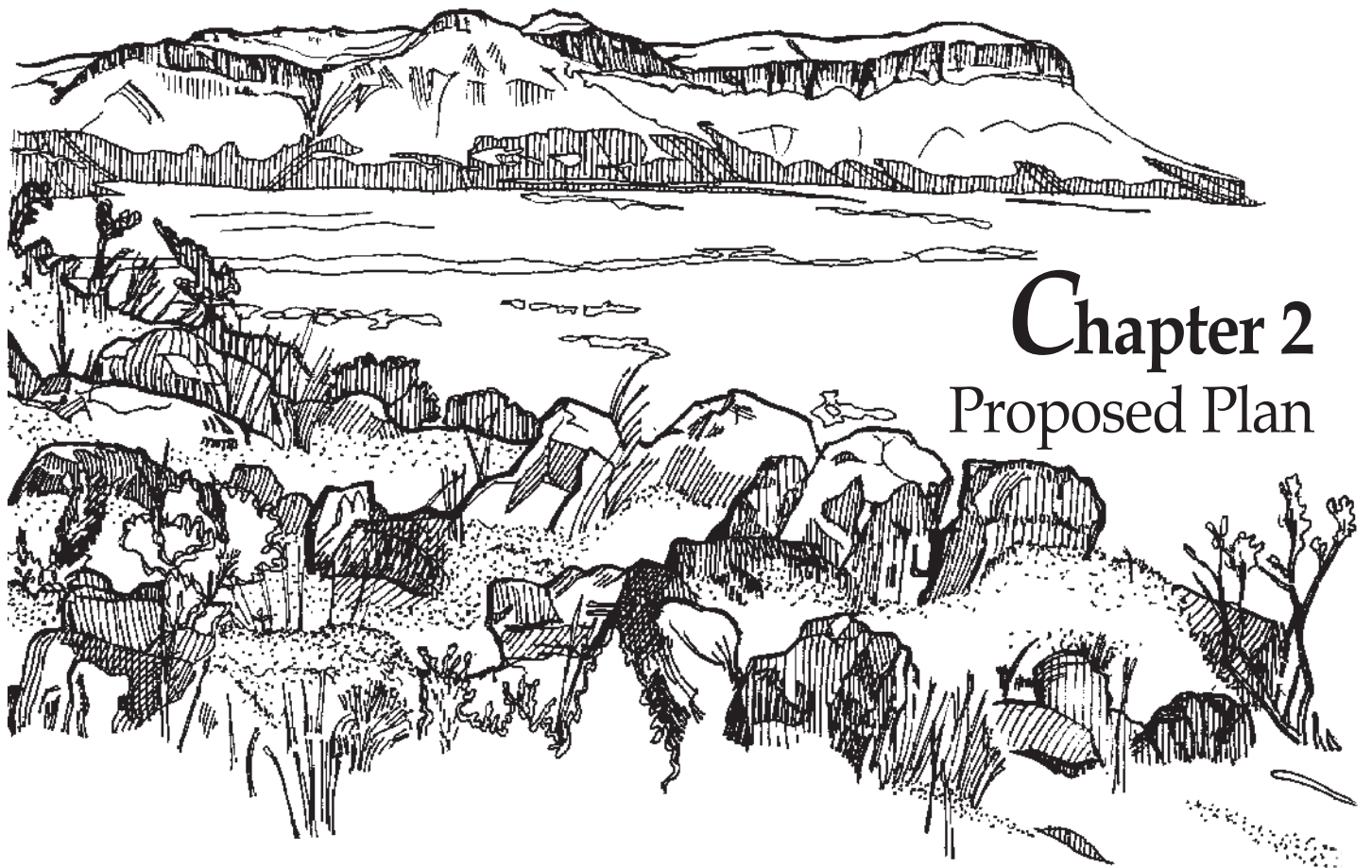
**TABLE 1-2
MAJOR FEDERAL, STATE, AND COUNTY AUTHORIZING ACTIONS¹**

Agency and Permit/Approval	Nature of Action	Authority	Application
Permit for approval to dispose produced water (also must be approved by the surface management agency)	Issue permit to allow underground injection of produced water	Federal Safe Drinking Water Act, 40 CFR Parts 144 and 147	Underground injection control
(Administered by the Oil Conservation Division of the New Mexico Energy and Minerals Department) Underground Injection Control permit	Ensure potable aquifers are not adversely affected by injection of produced water	Federal Safe Drinking Water Act Underground Injection Control program (40 CFR Parts 144 and 146.22 and 40 CFR Parts 100 to 149, July 1, 1991 revision) Onshore Order No. 7	New injection well
Spill prevention, control, and countermeasure plan	Pollution control	40 CFR Part 112	Drilling operations
State or Local Permits, Approvals, and Authorizing Actions			
<i>New Mexico State Historic Preservation Officer</i>			
Cultural resource clearance	Review and consultation	Historic Preservation Act of 1966, State Cultural Properties Act of 1977	All proposed action components
<i>New Mexico State Engineer's Office</i>			
Permit to appropriate groundwater within declared groundwater basins	Regulate groundwater use, permit for water wells	New Mexico Oil and Gas Act; New Mexico Geothermal Resources Act; Water Quality Act	All well development
<i>New Mexico Energy, Minerals and Natural Resources Department - Oil Conservation Division</i>			
Permit to drill, re-enter, deepen, plugback, or add a zone (Form C-101)	Permit new wells	New Mexico Oil and Gas Act; New Mexico Geothermal Resources Act	New well development
Request for allowable and authorization to transport oil and natural gas (Form C-104)	Permit new wells	New Mexico Oil and Gas Act; New Mexico Geothermal Resources Act	New well development
Spill report	Notification of fire, breaks, leaks, spills, and blowouts	OCD Rule 116	In the event of fire, breaks, leaks, spills, and blowouts at drilling operations
<i>New Mexico Environmental Department - Air Quality Division</i>			
Air pollutant emission permits	Regulate emissions of air pollutants to the atmosphere	Clean air Act (PL 84-159, as amended) State Statutes (including 20.2.1 New Mexico Administrative Code [NMAC] through 20.29 NMAC)	Combustion sources, compressors, volatile chemical handling, storage piles, and storage tanks

**TABLE 1-2
MAJOR FEDERAL, STATE, AND COUNTY AUTHORIZING ACTIONS¹**

Agency and Permit/Approval	Nature of Action	Authority	Application
Sierra and Otero Counties			
May require road use permits	Permits for the use of overweight or overlength trucks on county roads		
Some sites may be associated with zoning codes or building code standards			

NOTE: ¹This list is not necessarily all-inclusive. It is the responsibility of the operator to ensure that all permits and approvals are secured before a project may proceed.



Chapter 2

Proposed Plan

CHAPTER 2 – PROPOSED PLAN

2.1 INTRODUCTION

This chapter describes continuing management guidance and the alternatives examined for the Resource Management Plan Amendment/ Environmental Impact Statement (RMPA/EIS). Continuing management guidance refers to the direction provided by legislation, the RMP, and other relevant authority on public land within the Planning Area that applies to all alternatives. The section on alternatives describes the range of alternatives developed to address resource concerns identified through scoping and describes the Proposed Plan.

The Plan selected and documented in the RMPA will update existing management decisions that pertain to fluid minerals leasing and development in the previous RMP. Those public land resources and programs not addressed in this document will continue to be managed under the existing RMP and RMPAs, and as outlined in **Section 2.2** on continuing management guidance.

2.2 CONTINUING MANAGEMENT GUIDANCE AND ACTIONS

This section describes the existing resource management guidance and actions in Bureau of Land Management (BLM)'s Decision Area. It is based on the more detailed discussions in Section 3.0 of the Management Situation Analysis on file at the Las Cruces Field Office BLM.

Overall guidance is provided through regulations and other mandates, which are **listed in Chapter 1, Section 1.5**. The information that follows pertains to public land in the Planning Area.

2.2.1 Lands and Access

Within the Planning Area, approximately 2,042,311 acres of public land have been withdrawn in order to protect special uses or resources, or to ensure public safety (this acreage was calculated by adding the acreage managed

by the Department of Defense [both withdrawn and acquired], National Park Service, Bureau of Reclamation, and public water reserves). These areas include the White Sands Missile Range, Holloman Air Force Base, McGregor Range, **old Air Force bombing and gunnery range**, Bureau of Reclamation projects, Federal Aviation Administration land, and others. Decisions regarding fluid minerals leasing are addressed in the legal documents enabling the withdrawals and will be carried forward unchanged.

The BLM is responsible for approving mineral development on split estates (privately or State-owned surface area overlying Federal minerals), and for ensuring that such development occurs in accordance with existing statutes and regulatory requirements, and that National Environmental Policy Act (NEPA) documentation considers impacts on surface area in the event of mineral development.

Where the surface is privately owned (split estate), the operator (i.e., the person who has taken formal responsibility for the operations conducted on the leased land) is responsible for reaching agreement with the private surface owner. The agreement should establish the requirements for the protection of surface resources and/or damages. In areas where actions on private surface may affect the surface of adjacent Federal or Indian lands, BLM may request submission of the private agreement. If the agreement is not adequate to protect adjacent Federal or Indian lands, the area may require additional protective measures. However, construction standards or mitigation measures more stringent than those otherwise provided by applicable agency standards or plans would not be required. Each Application for Permit to Drill (APD) or other application to conduct other surface-disturbing activities needs to include the name and contact information of the private surface owner. As applicable, BLM would invite the surface owner to participate in any on-site inspection conducted. In the absence of an agreement, BLM may permit the operations

provided the operator has complied with the provisions of the law and Federal regulations. Regardless, BLM will require a surface use plan for all operations, including those on private surface. Surface protection and restoration requirements will be included in the surface use plan even if the agreement between the surface owner and the operator is silent in this regard.

The operator is responsible for making access arrangements with the private surface owner prior to entry for purposes of surveying and staking a well site location and/or access road. The operator may be required to obtain any cultural resource or threatened and endangered species clearances that may be necessary. However, if the private surface owner objects to either an inventory or mitigation, a written statement to that effect should be obtained from the surface owner. Documentation regarding the lack of survey and mitigation would be submitted by the operator to the BLM or the appropriate surface-management agency. The operator should be aware that the inability to obtain permission to conduct a survey or mitigation does not relieve BLM or other surface-management agency from its responsibilities as required by NEPA, the National Historic Preservation Act, Endangered Species Act, or other applicable regulations. BLM still must be responsible for preparing environmental documentation and initiation of any consultation with appropriate State or Federal agencies, as necessary. Operators should be aware of the potential for delays in approval of projects if extended consultation is required.

A number of areas within BLM's Decision Area have been designated for specific public uses, and the management to sustain those uses will continue. Designated areas are as follows:

- The Cuchillo Mountains Piñon Nut Collection Area is located in the northwestern portion of the Planning Area. The trees in this area are maintained in order to provide personal and commercial piñon nut collection (Decision R-2 in the 1986 RMP).

- Community Pit 7, a mineral material area for public use, is located on 80 acres in Otero County approximately 14 miles north of Orogrande. Sand may be extracted from the pit during the week; however, extraction activities are suspended on weekends because it is used as a staging area for motorcycle use in the nearby Red Sands Off-road Vehicle (ORV) Area.
- Personal sales of red building stone occur in the Green Canyon Common Use Area, on approximately 5 acres in Sierra County.
- Sand and gravel may be extracted from Apache Canyon in Sierra County, as long as the arroyo banks are not disturbed.
- **Executive Order (PWR 107, 1926)** places surface use restrictions in areas of public water reserves permitting certain public land withdrawals. Specifically, the smallest legal subdivision surrounding a spring or water hole, or land within 0.25 mile of a spring or water hole on unsurveyed land, is withdrawn from settlement, location, sale, or entry in order to reserve public use of the water reserve.
- **Subsurface use of lands used as impact areas of the old Air Force bombing and gunnery range is prohibited (PLO 2569); approximately 8,264 acres. Leasing is precluded in these areas. Surface use only is allowed until such time as the restriction is removed (RMP Decision L-2).**
- Under the Recreation and Public Purposes (R&PP) Act, BLM has the authority to lease or patent land to governmental and nonprofit entities for public parks, building sites, or other public purposes. The proposed rule for oil and gas leasing notes that R&PP lands may be subject to leasing under stipulations, if appropriate. However, existing management generally prohibits surface occupancy to any use other than the intended R&PP use to protect recreation and public purpose facilities.

In order to accommodate BLM's multiple-use responsibilities, access and roads would be provided to most of those public lands that currently have none. Generally, maintenance and

easement acquisition are conducted in support of resource management objectives. Easements are acquired on a case-by-case basis. Public demand, administrative needs, resource values or conflicts, and availability of existing access are criteria that guide prioritization of areas for access development. Roads are constructed only when existing roads cannot be used or where off-road travel is not possible because of terrain.

All roads are constructed or maintained in accordance with the BLM New Mexico Road Policy. Specific road construction and maintenance standards are determined on a case-by-case basis dependent on resource management needs, user safety, impacts on environmental values, and construction and maintenance costs. The process is coordinated with adjacent landowners and permittees as appropriate.

Specific management direction associated with access is intended to protect unique resources or values where BLM determines it necessary. This pertains to controlling surface use by limiting ORV¹ use to existing roads and trails or closing areas to ORV use completely. ORV use restrictions are described further in the discussion of recreation resources.

2.2.2 Minerals

Mineral activities in the Planning Area include geophysical exploration for hydrocarbons and geothermal resources, exploration for oil and gas via wells, exploration and development of locatable materials, and extraction of mineral materials. The BLM is responsible for ensuring that mineral development occurs in such a way as to minimize environmental damage and provide for the rehabilitation of affected land.

The prime management concern that may involve the other mineral resources is the need for saleable minerals such as sand and gravel, caliche, and fill material. Sand, gravel, **and**

¹ The BLM now uses the term off-highway vehicles (OHV) in lieu of ORV. See Section 2.2.13 for explanation.

caliche probably would be needed for access road and drill pad development. Should production be established, additional gravel and/or sand would be required at the supporting ancillary facilities. When possible, sales of mineral materials are made from designated community pits, which help to keep surface disturbance on public lands to a minimum (BLM 1984). **Although community pits are not available in all locations, negotiated sales of mineral materials from private owners is often available.**

Existing management decisions for minerals (i.e., fluid minerals) are summarized in Table 2-1.

2.2.3 Soils

Federal legislative acts that BLM generally must consider in addressing the management and protection of soils and prime farmland include the Federal Land Policy and Management Act of 1976 (FLPMA), Clean Water Act, Farmland Protection Policy Act of 1984, Executive Order 11752 (December 1973), Executive Order 11988 (May 1977), and Soil and Water Resources Conservation Act of 1977.

The general management objectives stated in the 1986 RMP for soil resources are to maintain productivity, minimize erosion, and stabilize the resources. Management activities in areas of high erosion potential are designed to minimize surface disturbance to the extent possible. In addition, areas of soil disturbance would be reclaimed. Management of soils within Sierra and Otero Counties include coordination with the related programs of State, local, and other Federal agencies.

Existing management decisions in the RMP specific to soils include the watershed areas that are listed in Table 2-2. The primary management objectives of the watershed areas are to improve watershed values by reducing peak runoff rates, reduce sediment yields, improve water quality, and receive better on-site, long-term use of runoff. In each case, ORV use is limited to existing roads and trails.

**TABLE 2-1
EXISTING MANAGEMENT DECISIONS FOR MINERALS**

RMP Decision	Area/Concern	Acres	Description
OGG-1	White Sands Missile Range Safety Evacuation Zone	311,410	These lands shall be evacuated on those days that missiles are to be fired. Memorandum of Understanding between the Department of the Army and Department of the Interior, January 1960.
OGG-2	Wilderness Protection Stipulations	45,311	Standard BLM wilderness leasing protection for the four Wilderness Study Areas (WSAs) in the Planning Area: Brokeoff Mountains, Jornada del Muerto, Guadalupe Escarpment, Sacramento Escarpment.
OGG-3	Caballo Mountain Communication Site	161	No occupancy or other activity on the surface is allowed in order to protect the existing sites on Caballo Mountain.
OGG-4	Ecological Study Plots	3,160	No occupancy or other activity on the surface is allowed in order to protect their value as ecological study plots and demonstration areas.
OGG-5	Rattlesnake Hill ORV Designation	2,932	Vehicular use on all or portions of lands contained in this area is limited to existing roads and trails in order to prevent damage to cultural resources (in accordance with <i>Federal Register</i> notice of July 31, 1980).
OGG-6	National Register of Historic Places - Rattlesnake Hill	889	No occupancy or other activity on the surface is allowed in order to protect sites listed on the State Register of Historic Places and sites nominated to the National Register of Historic Places.
OGG-7	National Register of Historic Places - Alamo Mountain	2,525	No drilling or storage facilities are allowed within 500 feet of sites on leased lands in the Alamo Mountain area that are listed on the State Register of Historic Places and sites nominated to the National Register of Historic Places. This distance may be modified when specifically approved in writing by the BLM Authorized Officer, with the concurrence of the State Historic Preservation Officer.
OGG-8	Tularosa River	119	No occupancy or other activity on the surface is allowed in order to protect recreational opportunities along the Tularosa River.
OGG-9	Sacramento Escarpment	4,852	No occupancy or other activity on the surface is allowed in order to protect the scenic quality of the Sacramento Escarpment.
OGG-10	R&PP Leases and Patents	1,799	The lessee is given notice that all or part of the lease of patent areas 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 is strictly prohibited.

SOURCE: Bureau of Land Management 1986a, geographic information system database 1998

NOTE: Acres were calculated using current data in a geographic information system and may be different from acres published in the 1986 Resource Management Plan and subsequent *Federal Register* notice.

**TABLE 2-2
EXISTING MANAGEMENT DECISIONS FOR WATERSHED AREAS**

RMP Decision	Description	Acres
W-1	Wind and Chess Draw (Cornudas Mountain)	34,499
W-2	Moccasin and Otto Draw (southwest of Piñon)	13,662
W-3	East of Tularosa and south of Tularosa River	17,046
W-4	Three Rivers (north of Tularosa)	12,741
W-5	East of Crow Flats	14,890

SOURCE: Bureau of Land Management 1986a, geographic information system database 1998

NOTE: Acres were calculated using current data in a geographic information system and may be different from acres published in the 1986 Resource Management Plan and subsequent *Federal Register* notice.

BLM is continuing erosion control work in specific areas in Otero County near Alamogordo, on the Batte, Virden, and Walker **grazing** allotments. These projects involve creating frequent “gully-plugs” with heavy equipment along feeder drainages of major arroyos, beginning at the top of the watershed. This occurs in conjunction with chemical brush controls and grazing deferment. With this combination of management actions, large watershed areas are being improved.

2.2.4 Water Resources

Protection of water resources specific to fluid minerals development would be achieved through compliance with BLM regulatory requirements for onshore oil, gas, and geothermal operations. These regulations are discussed in Title 43 of the Code of Federal Regulations (CFR) Parts 3160 and 3162 and in the BLM Oil and Gas Adjudication Handbook 3203-1. Also, other regulations provide additional guidance as described below and **listed in Chapter 1, Section 1.5.**

Federal regulations regarding water resources are implemented and administered at the State level. The State of New Mexico establishes standards for State and interstate water bodies, assesses the quality of waters, adopts regulations, and develops programs and takes actions to protect and maintain water quality through the New Mexico Water Quality Control Commission (NMWQCC), New Mexico Office of the State Engineer (OSE), and New Mexico Oil Conservation Division (NMOCD) programs. Surface water flows are dictated primarily by

existing water rights and irrigation requirements as administered by the OSE and U.S. Bureau of Reclamation.

The NMWQCC develops groundwater protection regulations and establishes standards for groundwater, assesses the quality of groundwater, and takes actions to protect and maintain groundwater quality. The comprehensive set of regulations is designed to protect all groundwater with total dissolved solids concentrations of 10,000 milligrams per liter or less for present and potential future use as domestic and agricultural water supply. **The most current set of regulations is 20.6.2 New Mexico Administrative Code New Mexico Water Quality Control Commission Regulations (dated January 15, 2001).** The general surface water standards are applicable at all times to all surface waters of the State, unless otherwise specified, and include site-specific standards for stream segments, including their designated uses for which the water quality is to be maintained; numeric and narrative standards to sustain the uses; and specific numeric water quality standards for existing, attainable, and designated uses.

The principal mechanism regulating discharge to surface water, the Federal National Pollutant Discharge Elimination System (NPDES) permit, is administered by the NMWQCC on the delegated authority of the U.S. Environmental Protection Agency (EPA). Effluent regulations apply to specific discharges entering the public waters of a state, and in areas with only ephemeral streams or groundwater resources to protect water quality (40 CFR Part 133). In

addition, stormwater discharge permits **currently** are required for construction activities disturbing 5 or more acres of land as covered under Section 402 (p) of the Clean Water Act. **As of March 2003, stormwater discharge permits will be required for all construction activities disturbing 1 or more acres of land, as described in the *Federal Register* Volume 64, No. 135 (Wednesday, December 8, 1999). Also, further coverage under NPDES may be required under the multisector general permit for stormwater discharges with industrial activities. A Notice of Intent needs to be filed with EPA.**

Section 303(d) of the Clean Water Act requires states to identify waters that do not or are not expected to meet applicable water quality standards with technology-based controls alone. This identification of water-quality-limited waters is presented in a document called the 303(d) List, updated biennially. Once listed, the State is required to prioritize these waters, analyze the causes of the water quality problem, and allocate responsibility for controlling the pollution under a process known as the Total Maximum Daily Load process. This results in the determination of the amount of a specific pollutant that a water body or stream segment can receive without violating water quality standards and the apportionment to the different contributing sources of the pollutant loading. For a water-quality-limited stream segment that requires a total maximum daily load, the state must quantify the pollutant sources and allocate allowable loads to the contributing sources, both point and nonpoint, so that the water quality standards can be attained for that segment (New Mexico Environment Department [NMED] 1998).

A permit from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act may be required to excavate or fill waters of the United States. Areas that may be affected in the Planning Area may include stream channels, wetlands, springs, seeps, playas, mudflats, or sandflats. If a Section 404 permit is required, a Section 401 Water Quality Certification from NMED's Surface

Water Quality Bureau also would be required before a Section 404 permit could be issued.

As of 1996, 47 numeric groundwater quality standards for various compounds had been adopted. In addition to the numeric standards, it is required that approximately 87 listed toxic pollutants not be present in concentrations that would create a lifetime risk of more than one cancer per 100,000 exposed persons at a place of present or reasonably foreseeable future use (NMWQCC 1996).

Also, New Mexico has received delegated authority from the EPA to implement, at the State level, the wastewater revolving loan program of the Clean Water Act (33 USC 1288), hazardous waste underground injection control (UIC), public water supply programs of the Safe Drinking Water Act, and hazardous waste management and State underground storage tank programs of the Federal Resource Conservation and Recovery Act (RCRA). Other Federal programs such as Superfund, the uranium mill tailings programs, and the Waste Isolation Pilot Plant are programs in which the State plays a role (NMWQCC 1996).

Section 319 of the Clean Water Act is a nonpoint-source management program that allows states to establish projects for improving water quality with respect to nonpoint sources. No regulatory mechanism exists for implementation of this program.

Because so many activities may affect water quality, the New Mexico Water Quality Act (Chapter 74, Article 6 New Mexico Statutes Annotated 1978) is one of numerous State laws involved in water quality protection. Other relevant legislation includes the Utility Operators Certification Act, Wastewater Facility Construction Loan Act, Oil and Gas Act, Environmental Improvement Act, Solid Waste Act, Hazardous Waste Act, Mining Act, and several laws giving authority to local governments to regulate water quality (NMWQCC 1996).

Groundwater is the major water source for livestock within the Planning Area, and currently the trend is to conserve more groundwater for future needs than is currently necessary. Water rights for the use of underground water in the State are administered by the OSE. Rules and regulations governing drilling of wells and appropriation and use of groundwater in New Mexico were formulated for the purpose of carrying out the provisions of the statutes governing underground waters and describing the present extent of all declared underground water basins in New Mexico. An application to appropriate groundwater within declared basins must be filed with, and a permit obtained from, the OSE.

To ensure orderly development of groundwater resources within the Tularosa Declared Basin, the Water Rights Division of the New Mexico OSE developed administrative criteria for a basin sub-area, which were adopted by the OSE in May of 1997. At present, most pending well applications are located near Alamogordo and Tularosa. The criteria provide administrative guidelines for processing water rights applications within that sub-area. Because of the high level of total dissolved solids in the basin, groundwater applications would be evaluated for their impact on dissolved solids as well as for their impact on water supplies. Applications outside the sub-area would be considered on a case-by-case basis. Further information can be obtained from the OSE Water Rights Division (OSE 1999b).

Use of surface waters also requires water rights permitting, which is handled through the OSE under New Mexico Statutes 1978, Chapter 72, Water Law.

In oil, gas, and geothermal drilling programs, disposal UIC wells are designed for “well injection” of wastewater and are subject to the permitting and regulatory control provisions of the Federal Safe Drinking Water Act’s Underground Injection Control Program (40 CFR Parts 144 and 146.22) (40 CFR Parts 100 to 149, July 1, 1991 revision). A UIC permit from the NMOCD is required prior to drilling a new

injection well. Injection pressures and volumes are monitored to ensure that potable aquifers are not affected adversely by injection of produced water. UIC-described practices are used to protect against potential cross-contamination of groundwater supply aquifers from disposal wells. These described practices include well construction (e.g., entire well bore cased and cemented), restrictions on injection pressures, completion of mechanical integrity testing, and completion of detailed monitoring of produced and injected water volumes.

2.2.5 Air Quality and Meteorology

All BLM actions and use authorizations must comply with all applicable local, State, Tribal, and Federal air quality law, statutes, regulations, standards, and implementation plans. Prior to implementation, all BLM-initiated or authorized activities within nonattainment **and maintenance** areas must undergo a review and determination (when applicable) to determine conformity with the National Ambient Air Quality Standards, per 40 CFR part 93.150 et al. If the standards are being met, the area is designated as attainment, and if the status of attainment has not been verified through data collection, the area is unclassified. For permitting purposes, an unclassified area is treated as an attainment area. Sierra and Otero Counties are currently classified as in attainment with all State and Federal air quality regulations.

Air quality permitting limitations may be imposed on oil and gas development and production activities by the State of New Mexico, Environment Department, Air Quality Bureau. Additional air pollution emission restrictions may be required to further protect Prevention of Significant Deterioration Class I Areas located outside the Planning Area including Carlsbad Caverns and Guadalupe Mountains National Parks; and the Gila, Bosque del Apache, and White Mountain Wilderness Areas.

Additionally, there are regional haze regulations that require states to review how pollution emissions affect visibility in Class I

areas. These rules require states to make “reasonable progress” in reducing any effect this pollution has on visibility in Class I areas and to prevent future impairment in visibility. New Mexico is required by this rule to analyze a pathway that takes the Class I areas from current conditions to “natural conditions” within 60 years. “Natural conditions” is a term used in the Clean Air Act, and means that no human-caused pollution can impair visibility. This program is designed to improve regional visibility throughout the United States.

Hydrogen sulfide, carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter (including particulate matter of 10 microns or less and total suspended particulate matter), and sulfur dioxide are all air pollutants regulated by the State of New Mexico.

2.2.6 Noise

There currently is no specific Federal, State, or local legislation that provides quantitative requirements for land use compatibility with noise sources within the Planning Area; however, all BLM actions and use authorizations must comply with applicable Federal regulations and guidelines described as follows.

The Noise Control Act of 1972 (PL 92-574) established a National policy “to promote an environment for all Americans free from noise that jeopardizes their public health and welfare.” The Act provides for a division of powers between Federal, State, and local government, in which the primary Federal responsibility is for noise source emission control, with the states and other agencies retaining the rights to control noise sources and the level of noise within their communities and jurisdictions. Military aircraft are exempt from the requirements of this Act.

The EPA has published acoustical guidelines designed to protect public health and welfare with an adequate margin of safety. In the absence of State or local noise standards, EPA guidelines (Table 2-3; **EPA 1974**) serve as useful tools to assess the significance of an impact that may

result from a source. Table 2-3 classifies the various areas according to the primary activities that are most likely to occur in each. A review of the table shows that an indoor noise environment of 45 day-night sound level (Ldn) permits speech communication in homes, while an outdoor Ldn not exceeding 55 decibels (dB) permits normal speech communication. An equivalent sound level ($Leq_{(24)}$) of 70 dB is identified as protecting against damage to hearing.

In some cases, Federally threatened and endangered wildlife species may be affected by elevated noise levels. High noise levels potentially can mask communications by wildlife that are used to attract mates and defend territories. No specific noise control requirements are available for wildlife species within the Planning Area.

The State of New Mexico and Sierra and Otero Counties do not have quantitative requirements for assessing the compatibility of a noise source with a land use.

2.2.7 Vegetation

The BLM is responsible for management of vegetation that occurs on public land. A number of areas within BLM’s Decision Area has been recognized as important vegetation communities or as ecological study plots. The 1986 RMP imposes a stipulation of no surface occupancy for the study plots including Engle, Cuchillo, Nordstrom, Lee, Trujillo, and Danley.

The Cuchillo Mountains Piñon Nut Collection Area is located within the northwestern portion of the Planning Area. The trees in this area are **maintained in order to provide personal and commercial piñon nut collections (Decision R-2 in the 1986 RMP).**

The existing management measures that have been stipulated to improve vegetation and control noxious weeds include brush control, grazing deferment, erosion control, and prescribed burns.

TABLE 2-3
YEARLY AVERAGE* EQUIVALENT SOUND LEVELS IDENTIFIED AS
REQUISITE TO PROTECT THE PUBLIC HEALTH AND WELFARE WITH
AN ADEQUATE MARGIN OF SAFETY

	Measure	Indoor			Outdoor		
		Activity Interference	Hearing Loss Consideration	To Protect Against Both Effects ²	Activity Interference	Hearing Loss Consideration	To Protect Against Both Effects ²
Residential with outside space and farm residences	Ldn	45		45	55		55
	Leq ₍₂₄₎		70			70	
Residential with no outside space	Ldn	45		45			
	Leq ₍₂₄₎		70				
Commercial	Leq ₍₂₄₎	¹	70	70 ³	¹	70	70 ³
Inside transportation	Leq ₍₂₄₎	¹	70	¹			
Industrial	Leq ₍₂₄₎ ⁴	¹	70	70 ³	¹	70	70 ³
Hospitals	Ldn	45		45	55		55
	Leq ₍₂₄₎		70			70	
Educational	Leq ₍₂₄₎	45		45	55		55
	Leq ₍₂₄₎ ⁴		70			70	
Recreational areas	Leq ₍₂₄₎	¹	70	70 ³	¹	70	70 ³
Farm land and general unpopulated land	Leq ₍₂₄₎				¹	70	70 ³

SOURCE: U.S. Environmental Protection Agency, March 1974

NOTES: Explanation of identified level for hearing loss: the exposure period that results in hearing loss at the identified level is a period of 40 years.

* Refers to energy rather than arithmetic averages.

¹ Since different types of activities appear to have been associated with different levels, identification of a maximum level for activity interference may be difficult except in those circumstances where speech communication is a critical activity.

² Based on lowest level.

³ Based only on hearing loss.

⁴ An Leq₍₂₄₎ of 75 dB may be identified in these situations so long as the exposure over the remaining 16 hours per day is low enough to result in a negligible contribution to the 24-hour average; i.e., no greater than an equivalent sound level of 60 dB.

Management of noxious weeds is directed by the Carlson-Foley Act of 1968, which directs agencies to destroy noxious weeds, and the Federal Noxious Weed Act of 1974 as amended, which requires agencies to (1) have an office or person trained to coordinate an undesirable plant management program, (2) adequately fund the program, and (3) conduct Integrated Weed Management. Also, BLM has entered into cooperative agreements with both Sierra and Otero Counties for the control of noxious weeds.

Instruction Memorandum 99-178 (dated **August 13, 1999**) instructs BLM to **add** to the list of Critical Elements of the Human Environment in BLM's NEPA handbook and **that invasive, non-native species will be given thorough consideration in all BLM NEPA**

documents. Moreover, Executive Order 13112, Invasive Species, directs Federal agencies to restrict activities that facilitate the spread of such species. One of the new elements added to this list is invasive non-native species in order to require that these species, especially weeds, will be given thorough consideration in all NEPA documents.

2.2.8 Wildlife and Fisheries

BLM is responsible for the balanced management of public land and resources and their associated values. The objectives of BLM's wildlife management program are to ensure optimum populations and a natural abundance and diversity of fish and wildlife values by

restoring, maintaining, and enhancing habitat conditions (BLM 1987).

The 1986 RMP provides guidance in the form of land use allocations. Site-specific management of fish and wildlife habitat occurs through habitat management plans. According to FLPMA and Department of the Interior policy (43 CFR Part 24.4), BLM is primarily a habitat manager. Issues involving the management of resident fish and wildlife species (with the exception of migratory birds and endangered species) are managed by the state agencies with responsibilities for them. Existing wildlife management direction is shown in Table 2-4. The BLM works closely with the New Mexico Department of Game and Fish (NMDGF) to develop and implement habitat management plans, plan hunting strategies, and mitigate or avoid the impacts of BLM actions. Interagency coordination between BLM and NMDGF is accomplished through a Master Memorandum of Understanding that sets forth responsibilities for coordination, identifies issues of concern, and establishes methods of coordination.

BLM currently is implementing two Habitat Management Plans (HMPs). These are the Jornada del Muerto HMP and McGregor Range Co-Use Area HMP. Several plans have been identified for preparation. These include revision of the McGregor Range Co-Use Area HMP (in three pieces) to include the Otero Mesa grasslands east of McGregor Range, Percha Creek (riparian), Caballo Mountains (deer), Sacramento Escarpment (deer), and riparian in Sierra and Otero Counties.

Management issues for wildlife in general include maintenance and restoration of desert grassland, riparian, and arroyo habitats; improvement or maintenance of big game habitats and populations (particularly on the Jornada del Muerto, Otero Mesa desert grassland area, Sacramento Escarpment, foothills of the Sacramento Mountains, Brokeoff Mountains, San Andres Mountains, and Nutt desert

grassland area); and the long-term decline of grassland birds and migratory birds in general.

2.2.9 Special Status Species

The Endangered Species Act, as amended, requires special protection and management for Federally listed threatened and endangered species, or species proposed to be listed as threatened and endangered. BLM also manages a large number of sensitive, non-Endangered Species Act species (BLM Sensitive and U.S. Fish and Wildlife Service (FWS) species of concern) to avoid the need for listing as Federally endangered. The purpose of this management prior to Federal listing is to use the broader range of management options available to protect a species.

Other Federal laws and regulations, such as the Bald Eagle Protection Act and Fish and Wildlife Coordination Act, also may apply.

The Las Cruces Field Office of BLM currently is implementing reasonable and prudent measures, terms and conditions, and conservation recommendations from the 1997 Section 7 consultation on the 1986 RMP for the aplomado falcon, southwestern willow flycatcher, peregrine falcon, and Sacramento prickly poppy. Operating guidelines resulting from that consultation include the following:

- conduct a consultation on fluid minerals activities in Sierra and Otero Counties
- inventory and monitor riparian areas for the presence of southwestern willow flycatchers
- manage peregrine falcon nesting habitat according to *Peregrine Habitat Management in National Forests of New Mexico* (Johnson 1994)
- implement management of designated areas of critical environmental concern (ACECs)
- study the habitat requirements of aplomado falcons and apply the results to public land management

**TABLE 2-4
EXISTING MANAGEMENT DECISIONS FOR WILDLIFE**

RMP Decision	Area/Concern	Acres	Description	Decision
WL-2	Percha Creek Riparian Habitat Area	940	Protect riparian area for wildlife habitat, watershed values, recreation, and visual quality.	Limits ORV use to existing roads and trails
WL-4	Otero Mesa HMP (Otero Mesa Habitat Area)	427,275	Provide adequate habitat for pronghorn.	Directs the development of an HMP
WL-5	Caballo Mountain HMP (Caballo Mountain Deer Area)	93,179	Provide adequate habitat for mule deer.	Directs the development of an HMP
WL-6	Sacramento Escarpment HMP (Sacramento Mountains Deer Area)	170,275	Provide adequate habitat for mule deer.	Directs the development of an HMP
WL-8	Jornada del Muerto HMP and Nutt Area HMP (Nutt and White Sands Antelope Areas)	453,709 75,850	Improve habitat and population size for pronghorn on the Jornada del Muerto and in the grasslands near Nutt, New Mexico.	Directs the development of an HMP
ACEC	Sacramento Escarpment	5,365	RMP general management guidance; manage big game habitat and compliance with special status species law and policy.	Closed to leasing
ACEC	Alkali Lakes	6,903	RMP general management guidance.	Closed to leasing
ACEC	Alamo Mountains	2,525	Barbary sheep are managed to prevent habitat degradation while providing hunting opportunities for the public.	Closed to leasing
ACEC	Wind Mountain	2,472	Barbary sheep are managed to prevent habitat degradation while providing hunting opportunities for the public.	Closed to leasing

SOURCE: Bureau of Land Management 1986a, 1997b

NOTES: Acres were calculated using current data in a geographic information system and may be different from the 1986 Resources Management Plan and subsequent *Federal Register* notices..

The FWS opinion resulting from the 1997 consultation, and BLM policy, leads the Las Cruces Field Office to consider all riparian areas, desert grasslands, and areas with endemic species to be areas of management concern for special status species. Analysis and management of these areas, particularly grasslands, should include a broad ecosystem view as well as finer detailed analysis. ACECs have been designated to manage and protect some of the species; however, many areas **of concern** have no protective designations.

In addition, BLM manages several special status species areas, which are areas that have been nominated as ACECs (BLM 1999b; Dunmire 1992). BLM policy on such areas is to manage the resources for which the area was nominated

until these areas can be evaluated fully through the planning process (Manual 1613.21E).

2.2.10 Rangeland

Livestock grazing is authorized under the Taylor Grazing Act of 1934, FLPMA of 1976, and the Public Rangelands Improvement Act of 1978. BLM is directed to authorize and manage livestock grazing on public land under the principles of multiple use and sustained yield and to prevent the degradation of the rangeland resources by providing for their orderly use, improvement, and development.

BLM's Final Grazing Management Policy was established in 1982 and is now incorporated in BLM handbook's identified goals and objectives.

This policy is consistent with BLM's responsibility to improve rangelands and manage grazing use on public land in compliance with laws and policies affecting the grazing management program. The intent of the policy is to make the grazing management program more efficient and cost effective through the use of a selective management approach. This is accomplished by assigning management priorities among allotments on public land based on similar resource characteristics, management needs, and both resource and economic potential for improvement.

Additional BLM policy for the management of livestock grazing is considered in the Proposed Statewide RMPA/Final EIS (FEIS) for New Mexico Standards for Public Land Health and Guidelines for Livestock Grazing Management (BLM 2000). **The Record of Decision was signed on January 12, 2001.** The standards describe conditions needed for healthy sustainable public rangelands and relate to all uses of public lands. The standards provide the measure of resource quality and functioning condition upon which the public land health will be assessed. In order to measure the effectiveness of each standard in specific areas, a set of measurable indicators and associated criteria were identified for each site-specific situation. Livestock grazing guidelines include management tools, methods, strategies, and techniques designed to maintain or achieve standards. In order to bring authorized grazing into compliance with NEPA, the BLM Las Cruces Field Office is preparing environmental assessments for grazing permit renewals for each allotment in Sierra and Otero Counties. Changes to existing grazing practices may result in attainment of the new standards for public land health, based on the need to retain the integrity of the soil and the continued sustainability of ecological processes.

There are 33 allotments in BLM's Decision Area for which Allotment Management Plans have been implemented. These allotments are on grazing systems established in cooperation with individual permittees. The schedules allow for deferment on one or more pastures for a growing

season or full year. Many ranchers are now practicing some type of grazing management through these or other grazing systems.

2.2.11 Cultural Resources

BLM implements numerous Federal laws, regulations, and executive orders by managing cultural resources in conjunction with the FLPMA mandate to promote multiple, sustainable uses of resources on public lands. In particular, cultural resources are considered in compliance with NEPA, which directs agencies to assess the impacts of projects to conserve the historic and cultural, as well as the natural, aspects of our national heritage. BLM also complies with Section 106 of the National Historic Preservation Act by considering ways to protect resources eligible for the National Register of Historic Places. Because the majority of the cultural resources in the decision area are archaeological sites, compliance with the Archaeological Resources Protection Act also is an important element of the cultural resource program. Human remains, funerary objects, sacred objects, and objects of cultural patrimony affiliated with traditional American Indian cultures are sometimes associated with archaeological sites, and these are addressed in accordance with the Native American Graves Protection and Repatriation Act. Any proponent of future exploration and development activities would be expected to provide cultural resource inventories and other types of studies as needed to support BLM compliance with Federal historic preservation laws. The existing management decisions made in the 1986 RMP to protect particularly significant cultural resources are listed in Table 2-5.

The 1986 RMP also indicated Cultural Resource Management Plans would be prepared for Rattlesnake Hill, Alamo Mountain, Lone Butte, Butterfield Trail, Jornada del Muerto Trail, and archaeological sites on the McGregor Range. In addition, the 1986 RMP indicated that BLM would initiate a 10 percent sample survey of public land in Sierra and Otero Counties.

**TABLE 2-5
EXISTING MANAGEMENT DECISIONS FOR CULTURAL RESOURCES**

RMP Decision	Area/Concern	Acres	Description
C-1	Three Rivers Petroglyph Site and Picnic Area	1,130	ORV use is limited to existing roads and trails to protect the site and 340 acres are fenced to eliminate livestock grazing.
C-2	Rattlesnake Hill Archaeological District	889	Closed to ORV use and future rangeland improvements to protect the archaeological district.
C-3	Alamo Mountain petroglyphs	2,525	Designated no surface occupancy and closed to ORV use to protect the petroglyph site.
C-4	Lone Butte	352	ORV use was limited to existing roads and trails within a 100-acre parcel to protect cultural resources.
C-5	Jarilla Mountains	803	Closed to ORV use to protect cultural resources in a portion of the Jarilla Mountains (area increased August 3, 1989, Federal Register).
C-6	Butterfield Trail	1,178	Areas within 0.25 mile of well-preserved segments of the Butterfield Trail were closed to surface-disturbing activities.
C-7	Jornada del Muerto Trail	4,448	Areas within 0.25 mile of well-preserved segments of the Jornada del Muerto Trail were closed to surface-disturbing activities.

SOURCE: Bureau of Land Management 1986a, geographic information system database 1998.

NOTE: Acres were calculated using current data in a geographic information system and may be different from the 1986 Resource Management Plan and subsequent *Federal Register* notices.

A portion of the Jarilla Mountains is designated closed to ORV use to protect cultural resources (RMP Decision C-5, 120 acres; *Federal Register* August 3, 1989, 683 acres).

Sections of the Butterfield and Jornada del Muerto Trails are protected by the 1986 RMP “no-surface-disturbance” decisions (C-6 and C-7); however, additional segments of these trails have been identified and are not specifically protected. The Cooke’s Trail, also known as the Mormon Battalion Trail, was not identified when the RMP was prepared, and has no protection through the RMP. Similarly, the historic townsite of Lake Valley was not considered nor afforded any protection under the 1986 RMP.

2.2.12 Paleontological Resources

In addition to FLPMA and NEPA, management of paleontological resources is directed by the National Historic Preservation Act of 1966 (as amended), National Natural Landmarks Program under the Historic Sites Act of 1935, and

Executive Order 11593 (Protection and Enhancement of the Cultural Environment). Actions relating to the management and protection of paleontological and other resources are subject to the provisions in the NEPA Handbook H-1790-1, Section 516 DM6, Appendix 5. The BLM’s objectives for paleontological resources are to manage them for their scientific, educational, and recreational values, and to mitigate adverse impacts on them (BLM Manual H-8270-1, General Procedural Guidance for Paleontological Resource Management). For future projects that may require surface disturbance, adherence to the guidelines and requirements in the General Procedural Guidance for Paleontological Resource Management document will be important to provide protection of those resources.

2.2.13 Recreation

The objective of the recreation program is to ensure the continued availability of quality outdoor recreation opportunities and experiences

that are not readily available from other sources. Recreation programs are managed according to multiple-use principles, to protect the health and safety of the users, protect natural and cultural resource values, and promote public use and enjoyment of the public land. Management priority is given to undeveloped areas experiencing resource damage or user conflicts, or that are threatening visitor safety.

The BLM office in Washington, D.C. **developed** a strategy to address the management of off-highway vehicle (OHV) use on public lands. This strategy **was** developed through the summer of 2000 and **culminated** in guidance provided by the Washington Office to the BLM State and Field Offices in **December** of 2000. This guidance **went** into effect immediately; however, local implementation would vary depending on individual circumstances.

There was a change in the terminology that is used regarding off-highway travel due to the differences in the definitions. ORVs, according to 43 CFR 8340.0-05, are vehicles capable of or designed to be driven off of roads, while the term OHV is meant to describe motor vehicles that are used off of artificially surfaced roads or trails. The use of the term OHV will help to clarify that vehicle designations apply to all vehicles traveling off of artificially surfaced roads and trails, regardless of whether those vehicles were designed to be driven off of roads.

For the purposes of this document, the use of the term ORV will be interchangeable with OHV. This will help the RMPA to remain consistent with the 1986 RMP and yet recognize the new policy that has been developed and will apply to future vehicle use designations.

Public land is open for ORV use unless specifically designated for limited use or as closed. BLM policy is to manage the ORV program to protect resources, promote safety, and minimize conflicts among the various uses of the land. Table 2-6 summarizes the limited or closed ORV areas.

In response to obvious increasing use of the unofficial ORV area known as Red Sands, the BLM intends to begin managing the area proactively for year-round ORV use. The trails have been inventoried for cultural resources. Mitigation is planned and an environmental assessment is being prepared for signing the trails, encouraging use of the trail system versus creation of new trails and “cross-country” use, and installing some basic visitor amenities such as a shade shelter and an informational kiosk.

2.2.14 Visual Resources

The BLM Visual Resource Management (VRM) System is the basic tool for the inventory, planning, and management of visual resources in BLM’s Decision Area. The primary character of each landscape should be retained, and each class within the VRM System prescribes the allowable level of modifications to remain within that guidance. Within the Planning Area, ACECs, WSAs, and areas along some roadways are among the areas included within the visual classes that are more restrictive with regard to modifications in scenic quality.

Three areas are designated as “limited-ORV” areas for protection of visual resources—the Brokeoff Mountains, Cornudas Mountains area, and Cuchillo Mountains (refer to Table 2-6). The Jornada del Muerto and Butterfield Trails also are resources of visual concern. The two historic trails are protected partially by decisions in the 1986 RMP, which stipulate that no surface-disturbing activities can occur within 0.25 mile of either side of specific segments of the trail.

The Lake Valley Backcountry Byway is a scenic and historic route in Sierra County, consisting of State Highway 152 from Interstate 25 to Hillsboro, and Highway 27 from Hillsboro to Nutt. Continuing management guidance is to protect the scenic value of the byway by minimizing visual intrusions.

**TABLE 2-6
EXISTING MANAGEMENT DECISIONS FOR ORV LIMITED AND CLOSED AREAS**

RMP Decision	Description	Acres
Areas in which ORV use is limited to existing roads and trails		
W-1	Wind and Chess Draw watershed area	34,499
W-2	Moccasin and Otto Draw watershed area	13,662
W-3	Watershed area east of Tularosa and south of Tularosa River	17,046
W-4	Three Rivers watershed area	12,741
W-5	Watershed area east of Crow Flats	14,890
WL-2	Percha Creek riparian area	276
C-1	Three Rivers Petroglyph Site and Picnic Area	1,130
VR-1	Sacramento Escarpment ACEC	5,365
C-4	Lone Butte Area	352
VR-2	Brokeoff Mountains VRM and ORV limited area	11,647
VR-3	Cornudas Mountains VRM and limited ORV area	2,533
VR-4	Cuchillo Mountains VRM and limited ORV area	5,947
Area designated as closed to ORV use		
V-1	Vegetation study plot enclosures	3,159
C-2	Rattlesnake Hill Archaeological District	889
C-3	Alamo Mountains petroglyphs area	2,525
C-5	Jarilla Mountains (area increased August 3, 1989, <i>Federal Register</i>).	803

SOURCE: Bureau of Land Management 1986a, geographic information system database 1998

NOTE: Acres were calculated using current data in a geographic information system and may be different from acres published in the 1986 Resource Management Plan or subsequent *Federal Register* notices.

2.2.15 Special Management Areas

There are four WSAs in the Planning Area. All four were designated in the November 1980 Wilderness Study Areas Decisions, but two of those were inadvertently left out of the Draft RMPA. Those two WSAs are the Sacramento Escarpment (3,197 acres) and Guadalupe Escarpment (6,956 acres). The other two WSAs are the Brokeoff Mountains (30,838 acres) and Jornada Del Muerto (4,320 acres). All four will be managed according to the Interim Management Policy and Guidelines for Land Under Wilderness Review (BLM 1995) until the areas are either designated as Wilderness or released for wilderness study by Congress.

The BLM manages six ACECs in the Decision Area—Three Rivers Petroglyph Site (1,130 acres), Sacramento Escarpment (5,365 acres), Cornudas Mountain (861 acres), Alamo Mountain (2,525 acres), Wind Mountain

(2,472 acres), and Alkali Lakes (6,903 acres).² The ACECs are managed by direction provided in the Otero County ACEC RMPA (BLM 1997b). Some of the 1986 RMP decisions are superseded by the 1997 ACEC RMPA decisions including OGG-9 (changed from no surface occupancy of Sacramento Mountains ACEC to “closed”), visual designations for the ACECs, and ORV designations for the ACECs. The ACECs are closed to fluid minerals leasing.

Eight areas in BLM’s Decision Area have been nominated to become ACECs (BLM 1999b; Dunmire 1992). The nominations are based primarily on the presence of special status species. Current management of the nominated ACECs includes those reasonable measures necessary to protect significant resource values until the areas are fully evaluated through the resource management planning process. The

² Acres were calculated using current data in a geographic information system and may be different from acres published in the 1997 Otero County ACEC RMPA (BLM 1997b).

nominated ACECs are listed in Table 2-7 and described in Section 3.19.3. **The nominated ACECs have undergone a BLM “relevance and importance” review. That is, the areas have been evaluated to determine that the identified resources warrant special attention and that they meet the criteria for relevance and importance.**

2.2.16 Fire Management

At present, the fire management within the Planning Area administered by the BLM Las Cruces Field Office is in accordance with a number of existing fire management plans, as follows:

- Fort Bliss/McGregor 1st Combined Arms Support Battalion Fire Management Plan, 1997
- Interim Management Policy for Lands Under Wilderness Review, H-8550-1, 1995
- Las Cruces District Fire Management Plan, 1995
- White Sands Missile Range Catastrophic Fire Management Plan, 2003 (proposed)
- Gila and Lincoln National Forests Fire Management Plans, 2002 and 2003 (respectively)

- White Sands National Monument Fire Management Plan, 2003
- **New Mexico Smoke Management Plan and Memorandum of Understanding, 2003**

2.2.17 Hazardous Materials

The use, transport, and disposal of hazardous materials is regulated by the RCRA, Emergency Planning and Community Right-to-Know Act, and Toxic Substances Control Act. Most wastes generated at oil and gas production facilities are exempt from RCRA under the exploration and production exemption. To ensure compliance, documentation for projects must include information on hazardous substances that would be used in quantities that meet or exceed the threshold planning quantities (generally 10,000 pounds or more), the quantity of each hazardous substance that would be used, and the methods of storage, transport, and disposal. Hazardous substances that must be declared are listed in the EPA’s *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendment and Reauthorization Act (SARA) of 1986*. The BLM must be notified if a significant change occurs in the chemicals to be used in a proposed project.

**TABLE 2-7
NOMINATED ACECs**

Nominated ACEC	Acres
Brokeoff Mountains	3,834
Caballo Mountains	2,213
Jarilla Mountains	7,032
Mud Mountain	2,580
Percha Creek	940
Sacramento Mountains	2,381
Six Shooter Canyon	1,060
Pup Canyon	3,677

SOURCE: Bureau of Land Management 1986a, geographic information system database 1998.

NOTE: Acres were calculated using current data in a geographic information system and may be different from acres in Dunmire 1992.

Hazardous materials used and hazardous wastes generated at well sites may include fuel, drilling fluids, pit sludges, and soils contaminated by exploration and production wastes. Solvents may be used on equipment, acids could be used in well stimulation, and fertilizers and herbicides

could be used in reclamation. Due to the potential for spills, vehicles and equipment should be located away from streams. Any firewalls or containment dikes must be constructed and maintained around all storage

facilities, and be designed to contain the full volume of the largest tank.

Any hazardous materials used and hazardous wastes generated during exploration and production must be contained prior to disposal, and disposed of at approved landfills. There **currently** are no landfills in New Mexico that accept hazardous waste, and the operator would be required to arrange for an out-of-state transfer if hazardous materials are to be generated.

2.3 ALTERNATIVES

NEPA, the BLM's land use planning regulations (43 CFR 1600), and BLM Handbook 1624-H require BLM to "rigorously explore and objectively evaluate all reasonable alternatives."

BLM complied with these requirements including comments from the public, analyzing an adequate range of reasonable alternatives, and meeting planning criteria.

Five alternatives were addressed. Two alternatives were considered but eliminated from further analysis and three alternatives were developed and evaluated in detail.

2.3.1 Alternatives Considered but Eliminated from Further Analysis

In developing the alternatives, two were considered initially **as possible methods of resolving issues**, but eliminated prior to **detailed analysis because they were unreasonable or not practical as a result of technical, legal, or policy factors**. These **two** alternatives and the reasons for their elimination are described briefly below.

2.3.1.1 No New Leasing for Fluid Minerals Development

Closing the Planning Area to new leasing of Federal minerals was considered as a possible method of resolving conflicts with other resource uses. The alternative was eliminated from further analysis because resource conflicts tend to be located in specific areas that are dispersed over a larger area or region. Closing the entire Planning Area to

new mineral leasing would eliminate mineral development and production in areas where conflict does not exist thereby placing unreasonable restrictions on such activities.

Also, based on the reasonable foreseeable development (RFD) scenario, BLM does not anticipate a large amount of new development that would lead to unacceptable levels of adverse affects in all areas. The analysis of impacts indicates that effects would not be anticipated on every acre and that not all acres where development would occur would be so sensitive as to preclude all new development. Therefore, closure to new leasing of Federal fluid minerals in the entire Planning Area is unreasonable.

Because development most likely would be limited in scope and effect, it was concluded that it would not be reasonable to analyze this alternative in detail. Rather, consideration of no leasing was analyzed in association with specific resource concerns as part of the alternatives analyzed. **The alternatives analyzed in detail include various considerations for maximizing individual resource values and uses in specific areas where conflicts exist.** Where it was determined that even the most restrictive stipulation available (i.e., no surface occupancy) would not adequately mitigate conflicts or environmental consequences, so that leasing is not in the public's interest, then a decision was considered to close these areas to mineral leasing and subsequent development.

2.3.1.2 Comprehensive No Surface Occupancy

A requirement for no surface occupancy in BLM's Decision Area would preclude all surface use and surface-disturbing and disruptive activities. Not all of the Decision Area contains the sensitive or significant resources that warrant this most restrictive stipulation. However, applying the stipulation of no surface occupancy as mitigation to preclude surface disturbance and disruptive activities to protect resources where

warranted is addressed as part of the plan alternatives (Section 2.3.2).

2.3.2 Plan Alternatives Considered

The three alternatives that were examined in the **Draft RMPA/EIS** are (1) No-action (Existing Management), (2) Alternative A, and (3) Alternative B. The alternatives were developed to respond to issues identified through scoping, explore alternatives to the existing management situation, comply with BLM's planning guidelines for fluid mineral resources (Handbook H-1624-1), and comply with the FLPMA requirement of managing for sustained yield and multiple use on public land. The reasonable foreseeable fluid minerals development and associated amount of surface disturbance predicted for the Planning Area over the next 20 years (refer to Chapter 4 and Appendix A) remains the same for each alternative. Therefore, the alternatives were formulated based on the extent of modification to the existing management situation as it applies to certain resources that were identified as concerns. It should be noted that development of existing leases would continue according to the terms of the lease.

Federal fluid mineral leasing and development may occur on lands where the surface is managed by Federal, State, or **Tribal** agencies, or by private individuals. BLM's environmental objectives and constraints apply equally to these areas; however, such constraints are developed at the permit stage in consultation with the other surface-managing agency or the surface owner.

BLM's existing guidance prescribes objectives for managing public land and associated resources. For fluid minerals, the objectives are defined in terms of the availability of land for leasing (closed or open to leasing) and management of lands that are open to leasing (with standard terms and conditions or stipulations). A brief explanation follows.

2.3.2.1 Availability of Lands

Prior to offering lands for lease, the New Mexico State Office Adjudication Staff reviews the records to identify what lands are available for leasing and whether stipulations need to be attached to the lease form.

Determining the availability of land and the need for either continuing existing management or imposing constraints on fluid mineral activities is accomplished through a broad level of resource planning and NEPA analysis; in this case, the RMPA and EIS. The results of the analysis are used to clarify BLM's intent, in advance, of the need to protect certain resources and resource values. The primary benefit is that NEPA analysis and legal compliance are streamlined for future undertakings (e.g., leasing, APD, etc.).

Closed to Leasing

The availability of public land for lease and subsequent development may be affected by nondiscretionary and discretionary closures. These areas are determined to be unsuitable for leasing and development because of unique, highly valued, complex, or legally protected resources; conflicting land uses; or because they pose substantial hazards to exploration, development, and production.

Nondiscretionary closures include those lands that must be closed to leasing for reasons beyond the discretion of the BLM. These are lands specially precluded from fluid minerals leasing by law, regulations, Secretarial or Executive Order, or that have been otherwise formally closed by decisions reached beyond the scope of the BLM. Nondiscretionary closures in the Planning Area include the White Sands Missile Range and other military installations; White Sands National Monument and other National Park Service land; towns, villages, and incorporated cities. Within BLM's Decision Area, nondiscretionary closures include four WSAs, an air navigation site, and an old Air Force Bombing and Gunnery Range.

Discretionary closures include those lands where the BLM has determined that fluid minerals leasing, even with the most restrictive stipulations, would not adequately protect other resources, values, or land uses. Discretionary closures in BLM's Decision Area are the ACECs, and nominated ACECs.

Open to Leasing

As mentioned, lands that are open to leasing are open with standard lease terms and conditions or open with stipulations as described below.

Open to Leasing with Standard Terms and Conditions

Areas may be open to leasing with no specific management decisions defined in a RMP. However, these areas are subject to the lease terms and conditions as defined on the appropriate lease form (Form 3100-11, Offer to Lease and Lease for Oil and Gas; and Form 3200-24, Offer to Lease and Lease for Geothermal Resources). The forms include lease terms and conditions, which cover subjects such as bonding, rentals, royalties, inspections, and safety. Of particular interest is Section 6, Conduct of Operations, of the lease form, which establishes the general and reasonable requirements for the protection of surface resources and is referred to as "standard lease terms and conditions." The Authorized Officer has the right to relocate proposed facilities, control timing of operations, and impose other mitigation in accordance with Sections 2 and 6 of the standard oil and gas lease terms.

In addition, the standard lease terms and conditions specifically require that the lessee contact the lessor prior to disturbing the surface. They also specify that the lessee may be required to complete inventories or special studies in accordance with NEPA and compliance with the Endangered Species Act of 1973, National Historic Preservation Act of 1966, and other applicable laws.

Open to Leasing with Stipulations

Constraints in the form of stipulations are conditions attached to a lease when environmental and planning analyses have demonstrated that additional environmental protection is needed, more stringent than provided by other existing regulations. Stipulations are provisions that modify the standard lease rights and are attached and made part of the lease.

It is BLM policy that the use of stipulations should be considered appropriate only when they are both necessary and justifiable. A stipulation is justifiable if there are resources, values, or users present that (1) cannot coexist with fluid minerals operations, or (2) cannot be adequately managed or accommodated on other lands for the duration of the operation, and (3) would provide greater benefits to the public than those of fluid minerals operations.

Waivers, exceptions, and modifications to existing lease stipulations can be granted if circumstances or relative resource values change or if the lessee demonstrates that operations can be conducted without causing unacceptable impacts. A waiver is a one-time, permanent exemption to a lease stipulation (i.e., the stipulation no longer applies anywhere in the leasehold). An exception is a one-time exemption to a lease stipulation, which is determined on a case-by-case basis (the stipulation would continue to apply to all other sites within the leasehold to which restrictive criteria apply). A modification is a change to the provisions of a lease stipulation, either temporary or for the term of the lease. If the Authorized Officer determines, prior to lease issuance, that a stipulation involves an issue of major concern, modification or waiver of the stipulation is subject to public review (43 CFR 3101.1-4).

Lands currently under lease would not be affected by the stipulations identified in this RMPA. New leases would be required to adhere to the stipulations as identified in the RMPA upon completion of the RMPA.

The two types of lease stipulations employed in this planning effort are no surface occupancy and controlled surface use as described below.

No Surface Occupancy

A stipulation of no surface occupancy is intended for use only when other restrictions are determined to be insufficient to adequately protect the public interest. As implied, the surface of a given area cannot be occupied. The surface areas are determined to be unsuitable because of unique, highly valued, complex, or legally protected resources; significant potential conflict with current or planned land use; and/or areas posing hazards to fluid minerals activities. Generally, a stipulation of no surface occupancy is considered feasible only for areas that could be directionally drilled. In BLM's Decision Area, the stipulation for no surface occupancy would apply to protected cultural resource areas, Recreation and Public Purpose Leases and Patents, a community materials pit, riparian/other wetlands/playas, ecological study plots, Tularosa River Recreation Area, Lake Valley Historic Townsite, and Lake Valley Backcountry Byway.

Controlled Surface Use

A stipulation to control surface use is intended to be used when lease occupancy and use generally are allowed on all portions of the lease year-round, but because of special values, or resource concerns, specific lease activities require strict control. A stipulation to control surface use is used to identify constraints on surface use or operations that may otherwise exceed the mitigation provided by Section 6 of the standard lease terms and conditions and the regulations and operating orders. Each stipulation is defined specifically for the resource concern for which the requirements to manage the resource may modify the lease rights. A stipulation to

control surface use is less restrictive than a stipulation of no surface use, which prohibit all occupancy and use on portions of a lease. The use of controlled surface use should be limited to areas where restrictions are necessary for specific types of activities rather than all activity. In BLM's Decision Area, stipulations to control surface use would be applied to limit certain activities in the vicinity of a sensitive resource, including highly erosive and fragile soils, Nutt and Otero Mesa desert grassland habitat areas, designated historic trails, VRM Class II areas, special status species habitats, and Berrendo Administrative Camp Site. More specific descriptions of each stipulation are provided in Appendix D.

2.3.2.2 Summary and Comparison of Alternatives

The three alternatives are distinguished by the type and degree of constraints. The No-action Alternative represents continued implementation of existing management plans, policies, and decisions, **some of which are outdated and not in compliance with current program direction**. The other two alternatives represent modifications to existing management. Alternatives A and B address **and would comply with current** legislative and regulatory requirements, and/or place constraints if resource values are determined to be sufficiently high or protections are justified in the public interest.

It should be noted that a number of the resource concerns occur, or cluster, in certain geographic areas as listed in Table 2-8. The areas of some of these resource concerns overlap. In those cases, a more restrictive constraint is dominant and would serve as the management direction. For example, in the Sacramento Mountains, under Alternative A, the area of the Sacramento Escarpment ACEC, which is discretionarily closed to leasing, overlaps with the Sacramento Mountains Deer Area, which **is open to leasing with standard lease terms and conditions**.

**TABLE 2-8
GEOGRAPHIC AREAS WITH MULTIPLE RESOURCE CONCERNS**

Geographic Area	Resource Concerns
Cuchillo Mountains	<ul style="list-style-type: none"> • Cuchillo Mountains limited ORV area • Cuchillo Mountains Piñon Nut Collection Area
Caballo Mountains	<ul style="list-style-type: none"> • Caballo Mountains Communication Site • Caballo Mountains Deer Area • Caballo Mountains Nominated ACEC • Potential bighorn sheep habitat
Sacramento Mountains	<ul style="list-style-type: none"> • Sacramento Mountains Deer Area • Sacramento Escarpment ACEC • Sacramento Escarpment WSA • Sacramento Mountains Nominated ACEC • Potential bighorn sheep habitat • Tularosa River Recreation Area
Percha Creek	<ul style="list-style-type: none"> • Southwestern willow flycatcher • Riparian habitat • Percha Creek Riparian Habitat Area • Percha Creek Nominated ACEC
Jarilla Mountains	<ul style="list-style-type: none"> • Jarilla Mountains ORV closed area • Jarilla Mountains Nominated ACEC
Cornudas Mountains	<ul style="list-style-type: none"> • Wind and Chess Draw Watershed Area • Cornudas, Alamo, and Wind Mountains ACECs • Cornudas Mountains limited ORV area • Potential bighorn sheep habitat
Otero Mesa	<ul style="list-style-type: none"> • Alamo Mountains ACEC • Otero Mesa Habitat Area • Potential aplomado falcon range
Brokeoff Mountains	<ul style="list-style-type: none"> • Brokeoff Mountains WSA • Brokeoff Mountains VRM and ORV area • Brokeoff Mountains Nominated ACEC • Potential bighorn sheep habitat

Where the area of discretionary closure overlaps with the area of **standard lease terms and conditions**, the area would be discretionarily closed to leasing.

Each alternative is generally described below. Table 2-9 is a summary of leasing constraints by alternative. Table 2-10 is a summary of the plan alternatives considered. **It is a list of** the resource categories and concerns and the constraints applied **under** each alternative. Those public land resources not addressed in the text, tables, or maps would continue to be managed as outlined in Section 2.2, which addresses continuing management guidance.

Since the three alternatives are distinguished primarily by type and degree of constraints, areas

associated with the various constraints of each alternative are compared in Table 2-11. Also, Figure 2-1 illustrates the percentages of areas closed or open to leasing within BLM's Decision Area.

Under all alternatives, certain lands are closed to leasing. The number of acres of public land non-discretionarily closed to leasing remain constant under all three alternatives. These closures total approximately **55,823** acres (about **3** percent of **land in the Decision Area**). The amount of land discretionarily closed to leasing increases from **about 1** percent under the No-action Alternative and Alternative A to about 14 percent under Alternative B.

**TABLE 2-9
SUMMARY OF LEASING CONSTRAINTS IN DECISION AREA BY ALTERNATIVE**

Constraint	Alternatives		
	No-Action Alternative (Existing Management)	Proposed Plan (Alternative A Modified)	Alternative B
Closed to Leasing			
Nondiscretionary Closure	<ul style="list-style-type: none"> • Old Air Force bombing and gunnery range • Air navigation site • WSAs 	<ul style="list-style-type: none"> • Old Air Force bombing and gunnery range • Air navigation site • WSAs 	<ul style="list-style-type: none"> • Old Air Force bombing and gunnery range • Air navigation site • WSAs
Discretionary Closure	<ul style="list-style-type: none"> • VRM Class I • ACECs (6) 	<ul style="list-style-type: none"> • VRM Class I • ACECs (6) (and coinciding VRM Class II areas) • Nominated ACECs (8) 	<ul style="list-style-type: none"> • Berrendo Administrative Camp Site • Watershed areas (5) • Special status species habitats • Lake Valley Historic Townsite • Protected Cultural Resource Areas <ul style="list-style-type: none"> – Rattlesnake Hill Archaeological District – Jarilla Mountains • Tularosa River Recreation Area • Red Sands ORV Area • VRM Class II • VRM and ORV limited areas • Cuchillo Mountains Piñon Nut Collection Area • Lake Valley Backcountry Byway • ACECs (6) and VRM Class I • Nominated ACECs

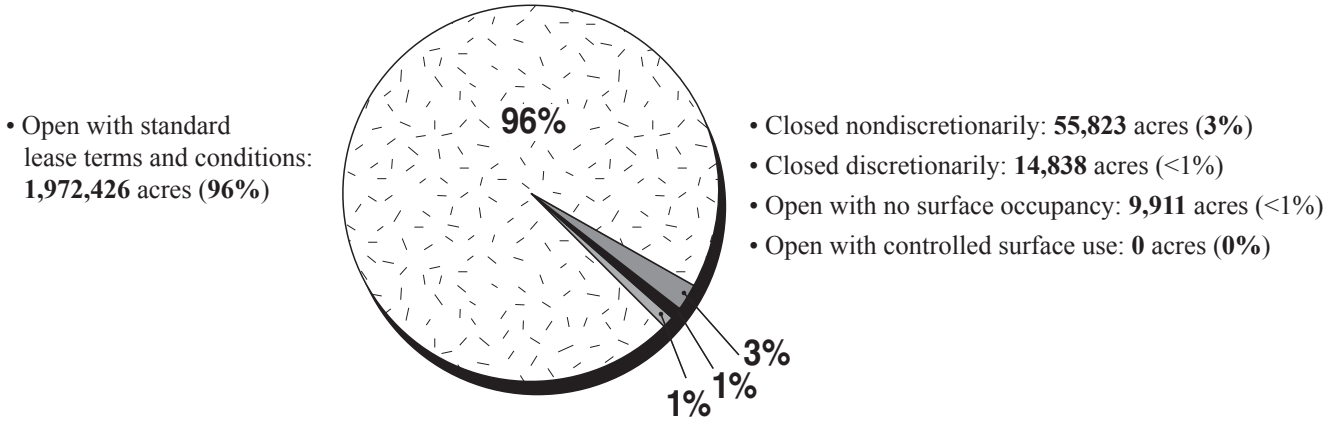
**TABLE 2-9
SUMMARY OF LEASING CONSTRAINTS IN DECISION AREA BY ALTERNATIVE**

Constraint	Alternatives		
	No-Action Alternative (Existing Management)	Proposed Plan (Alternative A Modified)	Alternative B
Open for Leasing			
No Surface Occupancy	<ul style="list-style-type: none"> • Caballo Mountain Communication Site • R&PPs patents and leases • Ecological study plots (6) • Rattlesnake Hill Archaeological District • Tularosa River Recreation Area • Designated historic trails <ul style="list-style-type: none"> – Butterfield Trail – Jornada del Muerto 	<ul style="list-style-type: none"> • R&PPs • Community Pit 7 • Riparian/Other Wetlands/Playas • Ecological study plots (6) • Lake Valley Historic Townsite • Protected Cultural Resource Areas <ul style="list-style-type: none"> – Rattlesnake Hill Archaeological District – Lone Butte – Jarilla Mountains • Tularosa River Recreation Area • Lake Valley Backcountry Byway 	<ul style="list-style-type: none"> • Berrendo Administrative Camp Site • R&PPs • Community Pit 7 • Ecological study plots (6) • Riparian/Other Wetlands/Playas • Nutt and Otero Mesa desert grassland habitat areas • Designated cultural resource area <ul style="list-style-type: none"> – Lone Butte • Designated historic trail <ul style="list-style-type: none"> – Mormon Battalion Trail
Controlled Surface Use	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Berrendo Administrative Camp Site • Highly erosive and fragile soils • Nutt and Otero Mesa desert grassland habitat areas • Special status species habitats • Designated historic trails <ul style="list-style-type: none"> – Mormon Battalion Trail – Butterfield Trail – Jornada del Muerto Trail • VRM Class II 	<ul style="list-style-type: none"> • Highly erosive and fragile soils • Big game habitat areas • Bighorn sheep habitat • Designated historic trails <ul style="list-style-type: none"> – Butterfield Trail – Jornada del Muerto Trail • VRM Class III
Timing Limitation	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • None

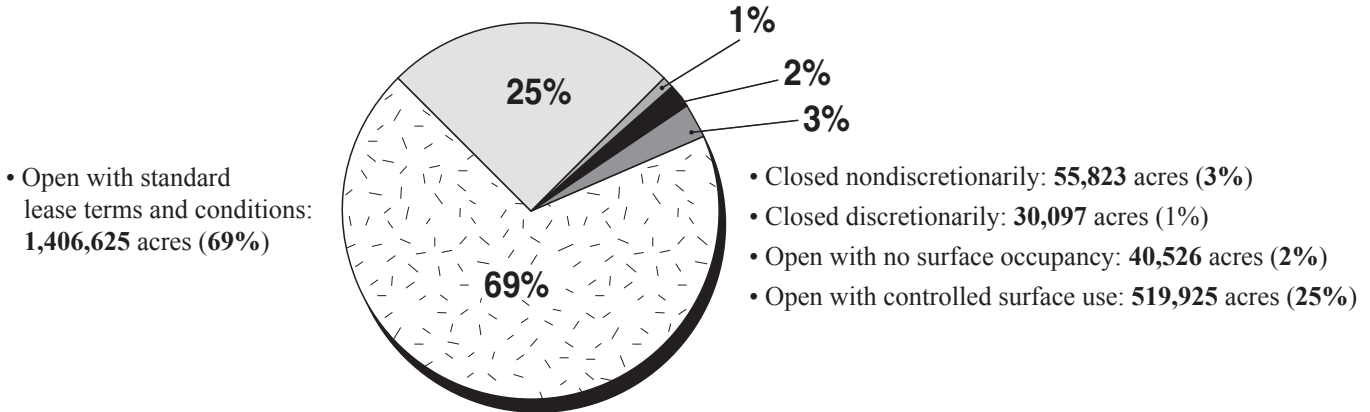
NOTE: The areas of some of these resource concerns overlap. In those cases, the more restrictive stipulation is dominant and will serve as the management direction.

FIGURE 2-1 MANAGEMENT GUIDANCE IN DECISION AREA BY ALTERNATIVE

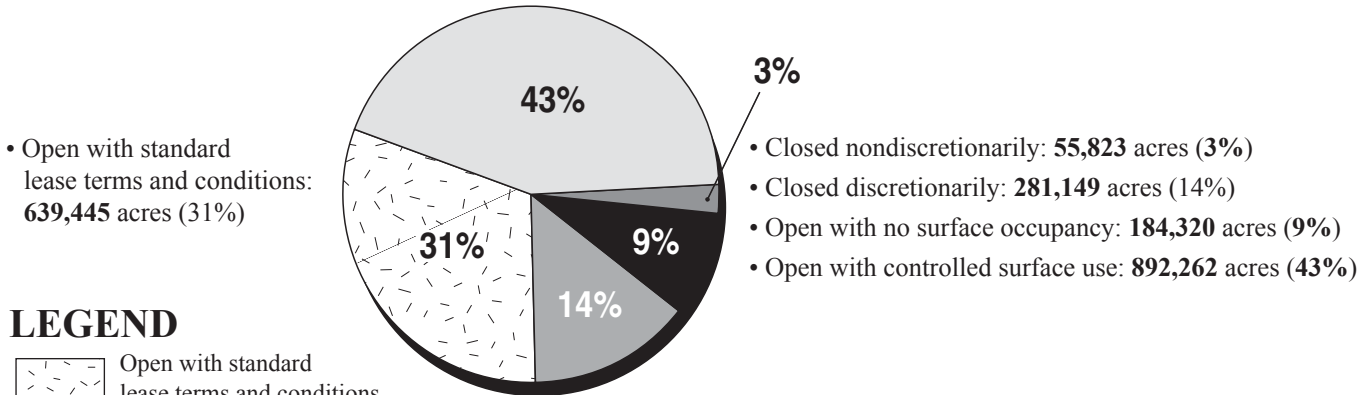
No-action Alternative



Proposed Plan (Alternative A Modified)



Alternative B



LEGEND

- Open with standard lease terms and conditions
- Closed nondiscretionarily
- Closed discretionarily
- Open with no surface occupancy
- Open with controlled surface use

**TABLE 2-10
PLAN ALTERNATIVES CONSIDERED**

Resource Concern	No Action	Proposed Plan (Alternative A Modified)	Alternative B
Lands and Access			
White Sands Missile Range Safety Evacuation Zone (Map 3-2)	SLTC	SLTC*	SLTC
Old Air Force bombing and gunnery range (Map 3-2)	NC	NC	NC
Caballo Mountain Communication Site (Map 3-2)	NSO	SLTC	SLTC
Recreation and Public Purposes Leases and Patents	NSO	NSO	NSO
Public water reserves	SLTC	SLTC	SLTC
Community Pit 7	SLTC	NSO	NSO
Air navigation site	NC	NC	NC
Berrendo Administrative Camp Site	SLTC	CSU	DC
Watersheds and Water Resources			
Highly erosive and fragile soils (Map 3-5)	SLTC	CSU	CSU
Riparian/other wetlands/playas (Map 3-7)	SLTC	NSO	NSO
Watershed areas (Map 3-5)	SLTC	SLTC	DC
Ecological study plots (Map 3-7)	NSO	NSO	NSO
Wildlife and Special Status Species			
Big game habitat areas (Map 3-7)	SLTC	SLTC	CSU
Nutt and Otero Mesa desert grassland habitat areas (Map 3-7)	SLTC	CSU	NSO
Special status species habitats (Map 3-8)	SLTC	CSU	DC
Habitat suitable for bighorn sheep (Map 3-7)	SLTC	SLTC	CSU
Cultural Resources			
Lake Valley Historic Townsite (Map 3-10)	SLTC	NSO	DC
Protected cultural resource areas (Map 3-10)			
Rattlesnake Hill District	NSO	NSO	DC
Lone Butte	SLTC	NSO	NSO
Jarilla Mountains	SLTC	NSO	DC
Designated historic trails (Maps 3-9 and 3-10)			
Mormon Battalion Trail	SLTC	CSU	NSO
Butterfield Trail	NSO	CSU	CSU
Jornada del Muerto Trail	NSO	CSU	CSU
Recreation and Visual Resources			
Tularosa River Recreation area (coincides with riparian area) (Map 3-10)	NSO	NSO	DC
Red Sands ORV Area (Map 3-10)	SLTC	SLTC*	DC
VRM Class I (Map 3-9) (six areas that coincide with the ACECs)	DC	DC	DC
VRM Class II (Map 3-9)	SLTC	CSU	DC
VRM Class III (Map 3-9)	SLTC	SLTC	CSU
VRM Class IV (Map 3-9)	SLTC	SLTC	SLTC
VRM and ORV limited areas (Map 3-10)	SLTC	SLTC	DC
Cuchillo Mountains Piñon Nut Collection Area (Map 3-10)	SLTC	SLTC*	DC
Lake Valley Backcountry Byway (Map 3-10)	SLTC	NSO	DC
Special Management Areas			
Wilderness Study Areas (3-10)	NC	NC	NC
Areas of Critical Environmental Concern (Map 3-10)	DC	DC	DC
Nominated ACECs (Map 3-10)	SLTC	DC	DC

NOTES: NC = Nondiscretionary closure
DC = Discretionary closure
SLTC = Standard lease terms and conditions

CSU = Controlled surface use
NSO = No surface occupancy
*Lease Notice would be issued

**TABLE 2-11
MANAGEMENT GUIDANCE IN DECISION AREA BY ALTERNATIVE
(approximate acres)**

Constraints	No-Action Alternative	Proposed Plan (Alternative A Modified)	Alternative B
Closed to Leasing			
Nondiscretionary closure	55,823	55,823	55,823
Discretionary closure	14,838	30,097	281,149
<i>Total closed to leasing</i>	70,661	85,920	336,972
Open to Leasing			
No surface occupancy	9,911	40,526	184,320
Controlled surface use	0	519,925	892,262
Standard lease terms and conditions	1,972,426	1,406,625	639,445
<i>Total open to leasing</i>	1,982,337	1,967,076	1,716,027

SOURCE: Bureau of Land Management database 1999

No-Action Alternative

Under the No-action Alternative, fluid minerals leasing and development would continue under existing management **plans, policies, and decisions, some of which are outdated and not in compliance with current program direction. Lease issuance would continue to be considered on a case-by-case basis; that is, each lease application would have to be reviewed and evaluated comprehensively for compliance with NEPA. Once a lease is issued, BLM would continue to implement primarily standard lease terms and conditions to conduct operations in a manner that would minimize impacts on resources, land uses, and users.** A substantial amount of land open to leasing could be leased with standard lease terms and conditions—about **96** percent. Approximately 14,838 acres (less than 1 percent) are discretionarily closed to leasing. Less than 1 percent could be leased with a stipulation of no surface occupancy. Stipulations to control surface use would not be implemented. **At the time when each APD is reviewed, mitigating measures that provide environmental protection (but do not impact the ability to develop the lease) would be applied in the form of conditions of approval (as described in Section 1.3.9, Section 1.5 [Table 1-2], and Appendix B). The operator would be required to conform to the prescribed conditions of approval attached to the approved APD. Under this alternative, industry would have the**

ability to achieve the RFD. **For the majority of resource concerns, potential impacts would be expected to be minimal—protection of the resources would be through existing regulations and policies. However, if a substantial amount of development (the entire RFD) were to occur in an area of sensitive resources (e.g., Nutt and Otero Mesa desert grassland habitat areas, VRM Class II areas), surface-disturbing and disruptive activity could result in significant impacts on that environment.**

Alternative A Modified (BLM’s Proposed Plan)

Alternative A Modified (Proposed Plan) **would comply with current management direction by (1) clearly identifying which lands under BLM jurisdiction in the Planning Area would be available for development through leasing and (2) how those available lands would be managed, including constraints in the form of stipulations attached to new leases, where warranted, to protect resource concerns that cannot otherwise be protected by existing regulations and policies. This provides the lease applicant with information, in advance of leasing, regarding the availability of land for leasing and constraints, if any, which would be attached to the lease. Under the Proposed Plan (Map 2-1), the amount of land discretionarily closed to leasing would be 30,097 acres (1 percent). The amount of land open to leasing with a stipulation for no**

surface occupancy would be **40,526** acres, or about **2** percent. The amount of land open to leasing with stipulations to control surface use would be approximately **519,925** acres (**25** percent). The amount of land that could be leased with standard lease terms and conditions would be **1,406,625** acres (**69** percent).

While this alternative represents an increase in constraints beyond the existing management situation (No-action Alternative), Alternative A **modified** allows for implementing the least restrictive constraints **needed** to provide protection **to resources** while allowing fluid minerals leasing and development to occur. Given the levels of potential for fluid minerals development, the constraints under this alternative are not anticipated to affect the ability to explore for and develop fluid mineral resources and achieve the RFD **in the overall Decision Area. However, in the Nutt and Otero Mesa desert grassland habitat areas (Map 2-1A), the stipulation to control surface use by limiting industry's disturbance to no more than 5 percent of the leasehold at any one time and requiring new lessees to form exploratory units prior to commencing drilling activity (refer to stipulation description in Appendix D), would restrict development activities, but should not preclude the ability to explore for and develop fluid mineral resources and achieve the RFD.** Alternative A **Modified** consolidates the requirements and objectives, which would clarify the leasing process for both industry and BLM, and would streamline the overall NEPA process; **that is, site-specific actions would be tiered to this RMPA/EIS thereby reducing the amount of time required for site-specific NEPA review.**

Alternative B

Alternative B, **which also complies with most of the current management direction**, provides for greater protection of resource concerns. The increase in protection is most evident in the amount of land discretionarily closed, which would increase to approximately **281,149** acres (14 percent) of the Decision Area land. The

amount of land open to leasing with a stipulation of no surface occupancy would increase to approximately **184,320** acres (**9** percent). The amount of land open to leasing with stipulations to control surface use would be approximately **892,262** acres (**43** percent). The amount of land that could be leased with standard lease terms and conditions would decrease to approximately **639,445** acres (about 31 percent).

While providing more protection for resource concerns than the No-action Alternative and Alternative A **Modified**, the increased amount of land closed to leasing in Alternative B would limit the spatial area in which to explore for and develop fluid minerals in certain locales. This potentially could reduce the opportunity and/or increase the cost to achieve the RFD estimated for oil and gas.

Also, public lands would be closed in areas of high potential for geothermal resources; however, since most geothermal resources are developed in proximity to population areas (not on public land), it is not anticipated that these discretionary closures would have an effect on the ability to achieve the RFD for geothermal resources.

2.4 PROPOSED PLAN

The Proposed Plan is Alternative A from the Draft RMPA/EIS modified as a result of public input and further analysis. Under the Proposed Plan (Map 2-1), the majority of public land in Sierra and Otero Counties would remain open to leasing. However, in accordance with H-1624-1, BLM has modified the existing management situation as follows: (1) to identify which public lands would be available for leasing and subsequent development, (2) to determine how those available lands would be managed, and (3) to respond to legislative or regulatory requirements and/or management objectives. The Proposed Plan allows for the protection of resource values while sustaining the ability for the fluid minerals industry to achieve the RFD and fulfilling the policy of multiple use and

sustained yield of public lands as directed under FLPMA.

2.4.1 Lands and Access

The majority of existing management direction for lands and access allows leasing with standard lease terms and conditions. Resource concerns that warrant closure to leasing, a stipulation for more protection, or further clarification are described below.

White Sands Missile Range Safety Evacuation Zone, an area adjacent to the western edge of the White Sands Missile Range, may be evacuated on days that missiles are fired. The land is administered by BLM; however, the Department of the Army is responsible for evacuation notification. Therefore, BLM will continue to manage the land as open to leasing with standard lease terms and conditions, but would issue a Lease Notice to lessees informing them of the potential for evacuation (Appendix D, page D-13).

The old Air Force bombing and gunnery range is an area that was used previously as an impact area and subsurface use is prohibited. BLM would manage the land as a nondiscretionary closure to ensure public safety (Appendix D, page D-2).

The area of the Caballo Mountain Communication Site would be managed as open to leasing with standard lease terms and conditions.

R&PP leases and patents would remain open to leasing with a stipulation of no surface occupancy (Appendix D, page D-5).

Public water reserves would be managed as open to leasing with standard lease terms and conditions.

Community Pit 7, a mineral material area managed by BLM for public use, would remain open to leasing with no surface occupancy (Appendix D, page D-6).

The Berrendo Administrative Camp Site would remain open to leasing with a stipulation to control surface use to avoid effects on existing structures and the helipad to protect capital investment (Appendix D, page D-9).

2.4.2 Watersheds and Water Resources

Highly erosive and fragile soils (mapped by Natural Resource Conservation Service as Nickel-Bluepoint, Alamogordo-Gypsum Land-Aztec, Holloman-Gypsum Land-Yessum, and Prelo-Tome-Largo) would remain open to leasing, but with a stipulation to control surface use to maintain productivity and minimize erosion (Appendix D, page D-9).

Riparian/other wetlands/playas would remain open to leasing, but with a stipulation of no surface occupancy within 0.25 mile to minimize impacts on these sensitive areas (Appendix D, page D-6).

The five watershed areas identified and mapped by BLM would remain open to leasing with standard lease terms and conditions.

The six ecological study plots would remain open to leasing with a stipulation of no surface occupancy to protect existing ecological resources in these areas for research and scientific purposes (Appendix D, page D-7).

2.4.3 Wildlife and Special Status Species

The four big game habitat areas identified and mapped by BLM would remain open to leasing with standard lease terms and conditions.

The Nutt and Otero Mesa desert grassland habitat areas would remain open to leasing, but with a stipulation to control surface use by limiting industry's disturbance to no more than 5 percent of the leasehold at any one time and requiring the new lessees to form

exploratory units prior to commencing drilling activity. The purpose is to protect remnant Chihuahuan Desert grassland habitat and associated special status species of wildlife through greater planning of the future oil and gas development (Appendix D, page D-10).

As part of discussions during the Section 7 Consultation effort with the U.S. Fish and Wildlife Service, and because of the uncertainties regarding the future of oil and gas activities and their impact in the Nutt and Otero Mesa grassland areas, BLM decided to withhold leasing in three of the more pristine portions of the grassland habitat. Although the Proposed Plan identifies these areas as being open to leasing with stipulations, the three core habitat areas would be withheld from leasing until the effects are understood better. The three areas are comprised of the Nutt grassland complex (8,094 acres) and two Otero Mesa grassland complexes (11,483 acres and 16,213 acres). A map showing these areas is found in Appendix F on page F-2. As part of BLM's adaptive management, these areas and adjacent grasslands would be re-evaluated at 5-year intervals. During the intervening 5 years, BLM would seek public input into the development of an adaptive management strategy. The strategy would include: the desired outcomes, the resource indicators to be monitored, and how information will be evaluated. A draft of that Adaptive Management Implementation Strategy is found in Appendix F.

Special status species habitats identified by BLM would remain open to leasing, but with a stipulation to control surface use to avoid adverse impacts on individual species and their associated habitats (Appendix D, page D-12).

Habitat suitable for bighorn sheep, identified by BLM, would remain open to leasing with standard lease terms and conditions.

2.4.4 Cultural Resources

Lake Valley Historic Townsite would remain open to leasing, but with a stipulation of no surface occupancy to protect the townsite and schoolhouse, which are subject to existing cultural resource regulations since both are on the State Register of Historic Properties and are eligible for inclusion on the National Register of Historic Places (Appendix D, page D-8).

The protected cultural resource areas of Rattlesnake Hill District, Lone Butte, and Jarilla Mountains would be open to leasing, but with a stipulation of no surface occupancy to protect those cultural resources since they are listed on the State Register of Cultural Properties and/or eligible for inclusion on the National Register of Historic Places (Appendix D, page D-5).

Designated historic trails (i.e., Mormon Battalion, Butterfield, and Jornada del Muerto trails) would remain open to leasing, but with a stipulation to control surface use. No surface-disturbing activities would be allowed within 0.25 mile from each side of the trails for their entire lengths; however, areas along the trail where there is existing disturbance could be used to cross the trails (Appendix D, page D-11).

2.4.5 Recreation and Visual Resources

Tularosa River Recreation Area would remain open to leasing with a stipulation of no surface occupancy (Appendix D, page D-7).

Red Sands ORV area would remain open to leasing with standard lease terms and conditions; however, a Lease Notice would be issued advising the lessee about the intermittent use of this recreation area (Appendix D, page D-13).

VRM Class I areas, which coincide with the six ACECs, would remain discretionarily closed to

leasing to protect the high-quality visual resource values that have been identified in these areas.

VRM Class II areas would remain open, but with a stipulation to control surface use to protect visual resources in these areas (Appendix D, page D-11).

VRM Classes III and IV would remain open to leasing with standard lease terms and conditions.

Cuchillo Mountains Piñon Nut Collection Area would remain open to leasing with standard lease terms and conditions; however, a Lease Notice would be issued advising the lessee that the current use of the stands of piñon pine trees as a public and commercial nut collection area must be maintained (Appendix D, page D-13).

Lake Valley Backcountry Byway would remain open to leasing, but with a stipulation of no surface occupancy in order to protect the scenic resources along the Byway (Appendix D, page D-8). No surface disturbance will be authorized within 0.5 mile of either side of the road. For proposed

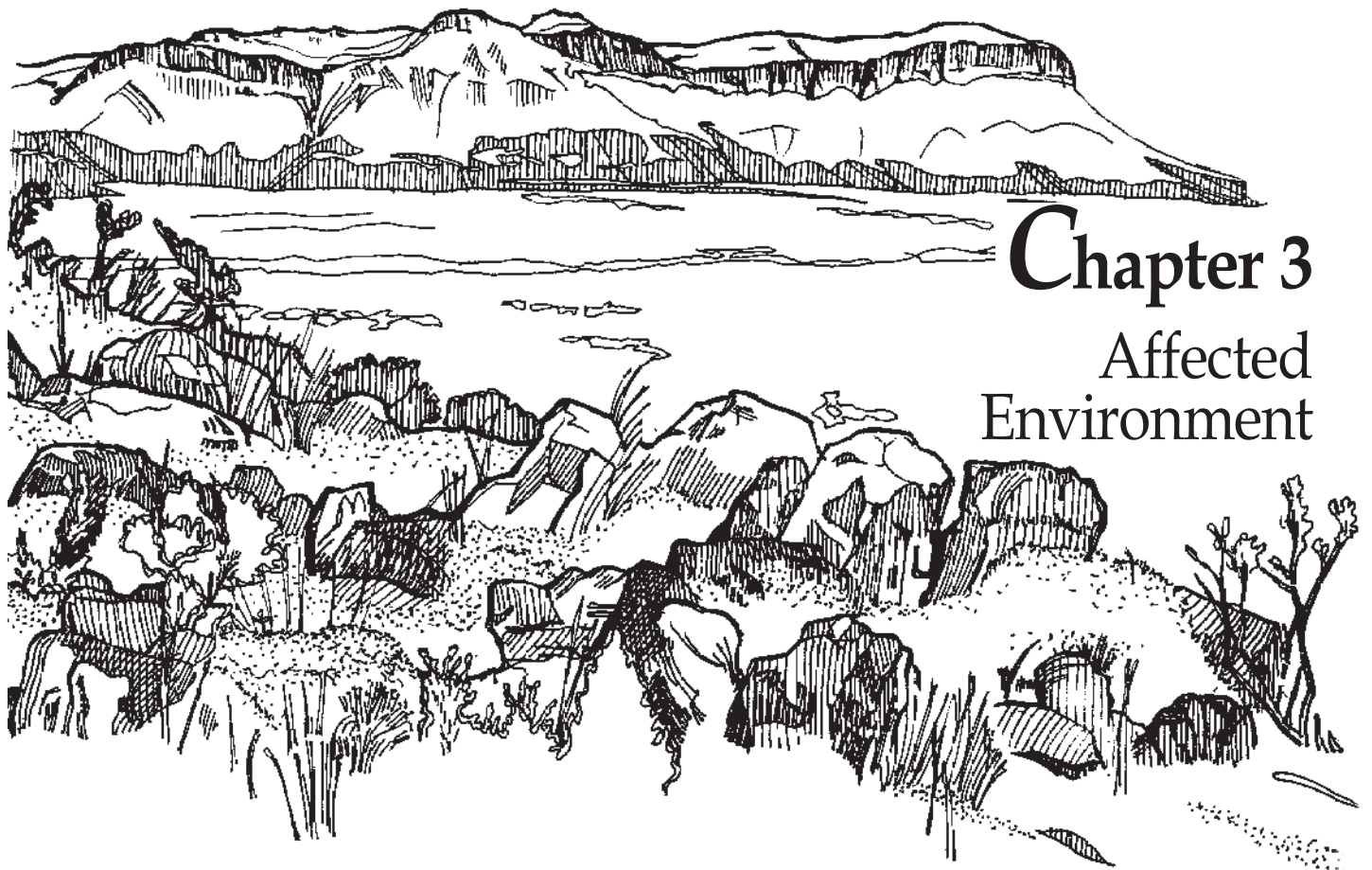
disturbances between 0.5 and 1 mile from either side of the road, operators also may be required to provide and implement mitigation plans for proposed development activities.

2.4.6 Special Management Areas

The Jornada del Muerto, Brokeoff Mountains, Guadalupe Escarpment, and Sacramento Escarpment WSAs would remain nondiscretionarily closed to leasing to protect the wilderness values of these areas (Appendix D, page D-2).

The six ACECs would remain discretionarily closed to leasing to protect the high-quality resource values of these areas (Appendix D, page D-3).

The eight nominated ACECs would be discretionarily closed to leasing. They have been determined to meet BLM's "relevance and importance" criteria and they will be managed to protect the known and/or potential biological communities in each of these areas until such time as they are evaluated further for designation (Appendix D, page D-4).



Chapter 3

Affected
Environment

CHAPTER 3 – AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter provides a summary of the existing environment within the Planning Area. Generally, the discussion is limited to the resource concerns that could be affected by fluid minerals leasing and subsequent activities. These resource concerns have been identified as part of the issues listed in Chapter 1, and/or need to be described for an overall understanding of the affected environment and identified issues.

Much of the information in this chapter is summarized from material contained in the Management Situation Analysis (MSA). In preparing the MSA, environmental resource data were collected and compiled using existing data from several sources. The majority of the data were provided by the Las Cruces Field Office of the Bureau of Land Management (BLM) from Federal, State, county, and local agencies including but not limited to the U.S. Geological Survey, U.S. Fish and Wildlife Service, New Mexico Department of Game and Fish (NMDGF), other State agencies, counties, and other public and private sources. Data included published and unpublished reports, maps, and digital format (geographic information system [GIS]). The data compiled represent a level of detail appropriate for and commensurate with the nature of this Resource Management Plan Amendment/Environmental Impact Statement (RMPA/EIS). Where data were lacking, the data were interpreted from the best available sources. Field verification of the data was not conducted. Sources used in the preparation of this RMPA/EIS are listed in the reference section.

GIS has been used extensively to capture, manage, analyze, and display the geographic data for this RMPA/EIS. In particular, GIS was used effectively to execute certain complex spatial analyses. It is important to note that there are differences between the areal data estimated for the 1986 RMP and the more recent GIS data. For the purposes of this RMPA/EIS, the more up-to-date GIS data have been used.

Maps summarizing environmental resource information relevant to the RMPA/EIS planning and analysis are provided in the map section of this document. More comprehensive resource maps were prepared in conjunction with the MSA (refer to List of Maps). The MSA and accompanying maps are available for review at the Las Cruces Field Office of BLM.

In accordance with the National Environmental Policy Act regulations codified in 40 CFR 1502.15, the affected environment section discusses the existing condition of the human and natural environment that potentially could be affected, beneficially and adversely, by the alternative **plans as described in the Draft RMPA/EIS and by the Proposed Plan in this Proposed RMPA/Final EIS**. The affected environment is characterized for the following resource concerns:

- Physiography and Topography
- Climate and Meteorology
- Lands and Access
- Geology and Minerals
- Soils
- Groundwater
- Surface Water
- Air Quality
- Noise
- Vegetation
- Wildlife
- Special Status Species
- Rangeland
- Cultural Resources
- Paleontological Resources
- Recreation
- Visual Resources
- Special Management Areas
- Social and Economic Conditions

3.2 PHYSIOGRAPHY AND TOPOGRAPHY

The Planning Area is located in south-central New Mexico, encompassing Sierra and Otero Counties. The area lies within the Basin and Range physiographic province with the exception of the northeasternmost corner of Otero County, which is in the Great Plains province. Typical features of the Basin and Range physiographic province include rugged and steep fault-block mountain ranges, broad basins, and more gentle volcanic landforms. From the northwest to the southeast boundaries of the Planning Area, important features include the Cuchillo Mountains (covered by the Mogollon-Datil volcanic field), Palomas and Engle Basins, Rio Grande Valley, Caballo and Turtleback Mountains, Jornada del Muerto Basin, San Andres Mountains, Tularosa Basin, Sacramento Mountains, Otero Mesa, and Brokeoff and Guadalupe Mountains. Other prominent topographic features of the Planning Area include Crow Flats, Hueco Basin, Jarilla Mountains, Godfrey Hills, Chupadera Mesa, and the foothills of the Black Range and Mimbres Mountains.

The average elevation in the Planning Area is approximately 4,500 to 5,000 feet, ranging from approximately 3,650 feet in southeastern Otero County (valley areas of Crow Flats) to approximately 11,808 feet in the Sacramento Mountains (Sierra Blanca Peak) (BLM 1981a, 1985b).

3.3 CLIMATE AND METEOROLOGY

Southern New Mexico has an arid to semi-arid continental climate with mild winters and hot summers. The climate is determined primarily by a subtropical high pressure system. As the summer Bermuda High intensifies and moves westward, the predominant wind flow is from the southeast. This wind pattern brings in moist air from the Gulf of Mexico and provides a summer maximum precipitation pattern through localized thunderstorms. July, August, and September are the wettest months of the year. As winter approaches and the Bermuda High weakens,

polar masses intrude into the area and the general wind pattern is from the northwest and west. Average precipitation below 6,000 feet is between 8 and 10 inches annually and between 14 and 16 inches at higher elevations.

The average annual temperature in the Planning Area is approximately 60 degrees Fahrenheit (°F). The average maximum temperature in July is approximately 96°F with maximum readings generally over 100°F. The average minimum temperature in January is approximately 39°F with minimum readings in the low 20s.

Wind speeds average approximately 6 to 10 miles per hour on an annual basis in the Planning Area and typically are highest in the spring (March to May). These spring winds are most often from the west and may exceed 30 miles per hour. Locally strong winds associated with summer thunderstorms may come from any direction and frequently exceed 30 miles per hour, but are usually brief in nature (BLM 1984, 1986a).

3.4 LANDS AND ACCESS

This section summarizes the lands and access components within the Planning Area including jurisdiction/surface ownership, existing, and future land uses, utilities and rights-of-way, and access and transportation.

3.4.1 Jurisdiction/Surface Ownership

Jurisdictions shown on Map 3-1 depict the lands administered by Federal, State, and local agencies, and lands privately owned. Maps 3-1 through Map 3-10 are located in the map section. The Planning Area contains about 7 million acres, of which the BLM manages more than 1.8 million (exclusive of the 606,198 acres of McGregor Range managed cooperatively with the **Department of Defense, U.S. Army**). In addition to the surface ownership, BLM also administers approximately 5 million acres of Federal mineral estate. Other jurisdictions within the two counties include the following:

- Federal
 - Department of Agriculture
 - Gila National Forest
 - Cibola National Forest
 - Lincoln National Forest
 - Department of Defense
 - White Sands Missile Range
 - Holloman Air Force Base
 - Fort Bliss Military Reservation
 - Department of the Interior
 - National Park Service**
 - White Sands National Monument
 - Bureau of Reclamation
- Mescalero Apache Indian Reservation

- State
 - New Mexico State Trust Land
- Private Land

The land ownership in the Planning Area resembles a checkerboard pattern. Acres associated with jurisdictions in the Planning Area are shown in Table 3-1. Private (or patented) land and State Trust Land include split estate; that is, privately owned or State-administered surface land overlying Federal fluid mineral estate.

Although inholdings, lease agreements, joint ownership, cooperative agreements, and other land ownership situations may be present in the Planning Area, they are not depicted on Map 3-1.

**TABLE 3-1
LAND STATUS IN ACRES¹**

Landowners/Managers	Sierra County	Otero County	Total
Federal			
Department of Agriculture			
Forest Service	375,158	558,948	934,106
Department of Defense			
Military Withdrawn	523,423	713,304	1,236,727
Military Acquired	0	69,449	69,449
McGregor Range ²	0	606,198	606,198
Department of the Interior			
Bureau of Land Management	781,825	924,828	1,706,653
National Park Service	0	92,394	92,394
Bureau of Reclamation	36,851	0	36,851
Other			
Public Water Reserves	200	492	692
Total Federal	1,717,457	2,965,613	4,683,070
Tribal			
Mescalero Apache Indian Reservation	0	459,887	459,887
State of New Mexico			
State Trust Land	283,979	339,484	623,463
Split estate ³ (State Trust Land surface/Federal fluid minerals)	(5,667)	(9,404)	(15,071)
Private			
Private Land	709,323	473,815	1,183,138
Split estate ³ (Private surface/Federal fluid minerals)	(217,503)	(133,943)	(351,446)
Total acreage (split estate not counted)	2,710,758	4,238,799	6,949,557

SOURCE: Bureau of Land Management, Las Cruces Field Office and New Mexico State Office database 1998

NOTES:

¹ Inland water areas included in ownership

² McGregor Range is cooperatively managed by the BLM and U.S. Army

³ Surface acreage only is included in total

3.4.2 Existing Land Uses

The Planning Area comprises two counties characterized by their rural qualities, vast open spaces, and generally sparse population (Map 3-2). Otero County maintains a comprehensive plan for management direction, the Otero County Comprehensive Plan (May 1998). Sierra County does not have a general plan; the County uses the South Central New Mexico Overall Economic Development Program as management framework (July 1998).

Residential, commercial, and public uses in Otero County are concentrated in the communities of Alamogordo, Tularosa, Orogrande, and around Holloman Air Force Base. In Sierra County, these uses are located primarily within the communities of Truth or Consequences, Williamsburg, Hillsboro, Cuchillo, and Kingston. Rural residential and commercial properties are sparsely located throughout the Planning Area.

Agricultural uses are associated primarily with livestock production, including cattle and sheep. There is limited crop production of hay, barley, and wheat. Pecan orchards are grown in the Alamogordo area.

The primary use of public land is livestock grazing. Mining, mineral material excavation, rights-of-way, leasing, and dispersed recreation constitute other uses occurring on public lands. The BLM currently administers mineral material leases on approximately 114 acres within BLM's Decision Area. Current uses of particular concern include Community Pit 7, a public source of sand and gravel, and the Caballo Mountain Communication Site. Military and space exploration research activities occur on some Federal land within the Planning Area, including McGregor Range, Holloman Air Force Base, and White Sands Missile Range. Some of the land associated with military activities has been withdrawn from public use or its use is regulated to protect public safety, such as the former Air Force bombing and gunnery range in southern Otero County.

In accordance with the Recreation and Public Purposes (R&PP) Act, BLM has the authority to lease or patent public land to governmental or nonprofit entities for public parks, building sites, or other public purposes. Currently, there are a total of 32 R&PP patents or leases—12 in Sierra County and 20 in Otero County. At present, the total number of acres involved in the 32 sites is about 1,799 with 218 acres in Sierra County and 1,581 in Otero County. Land uses occurring on land leased or patented under the R&PP within the Planning Area include landfills, recreation (parks, shooting ranges), and other public purposes (e.g., a fire station and sewage treatment plant). Lessees or owners are generally a city or county, but may include State agencies, school districts, or nonprofit associations.

Public water reserves are another protected use on public land. The reserves, about 40 acres each, are withdrawn land for the purpose of protecting water resources. Public water reserves are defined as the legal subdivision or area within 0.25 mile of a spring or water hole.

There are no commercial timber resources located on public land. Noncommercial timber resources include piñon-juniper forests at higher elevations and broadleaf species such as cottonwoods and Gambel's oak along Tularosa River and Three Rivers Creek.

3.4.3 Future Land Uses

According to information from county and BLM management plans, general trends of future land use within the Planning Area include residential, commercial, and industrial growth that is anticipated to develop in areas surrounding the current population centers.

The primary objective of the Otero County Comprehensive Plan is to protect and enhance the scenic beauty and diversity of the land while accommodating growth. The primary objective of the Sierra County Council of Governments' overall economic development program is to promote sufficient economic opportunity within the County for residents to find suitable and adequately compensated employment. This is to

be accomplished with an increase in outside economic investment and an increase in the values of goods and services produced within the County.

Future land uses anticipated on public land generally include granting additional rights-of-way, grazing and minerals leases, and recreation.

3.4.4 Utilities and Rights-of-Way

This category includes electric transmission and distribution lines, pipelines, fiber optic corridors, transportation corridors, and the corresponding rights-of-way. Within the Planning Area, there are numerous electrical transmission and distribution lines, as well as telephone lines and various natural gas, water, sewer pipelines, and two long-distance petroleum product pipelines. Petroleum product lines include the Navajo Pipeline and Diamond Shamrock Pipeline, both in Otero County (the lines parallel each other and both cross Otero Mesa) (refer to Map 3-2). Currently, there are approximately 3,810 acres of rights-of-way granted by BLM.

3.4.5 Access and Transportation

The main component of the transportation system within the Planning Area is the roadway network. Two rail lines are present, one each in Sierra and Otero Counties. Map 3-2 depicts access and transportation in the Planning Area.

3.4.5.1 Transportation System

Access in the Planning Area is based entirely on the use of county and State roads and U.S. highways. Primary transportation routes in the Planning Area include County Roads 59, 52, 27, 26, 142, and 24; State Routes (SR) 82, 70, and 506; and Interstate 25 (I-25). The only access road in the Planning Area for which BLM is responsible for maintenance and control is the road to the Caballo Mountain radio communications site in Sierra County.

Several roads in the Planning Area are closed periodically to ensure public safety during military exercises. Closures affect US 54 and 70,

and SR 506 within the Planning Area; these roads are major arterials in Otero County.

There are several thousand acres of public land that do not have direct access. These generally are located where large amounts of private and State Trust Lands are interspersed with public land in a checkerboard pattern. Some areas of concern include the Cuchillo Mountains, Animas Hills, and Piñon area.

Lake Valley Backcountry Byway is the only National Backcountry Byway in BLM's Decision Area. This route includes State Highways 152 and 27. The Byway begins at the junction of I-25 and State Highway 152 and proceeds west to the historic town of Hillsboro. The Byway route then turns south onto State Highway 27 towards the historic mining town of Lake Valley and ends at Nutt where State Highway 27 intersects State Highway 26. The route features scenic views of the Black Range Mountains, Caballo Mountains, Cooke's Peak, and Las Uvas Mountains.

The total mileage of major roadways in the Planning Area (Table 3-2) is approximately 716 miles. Many light-duty and four-wheel drive roads also traverse the area.

3.4.5.2 Traffic Volumes and Roadway Capacities

The New Mexico State Highway Department reports average daily traffic (ADT) counts by roadway within individual counties. The ADT counts are reported in milepost increments with similar ADTs within each county. ADT counts may vary by as much as 5,000 vehicles on the same stretch of roadway depending upon the surrounding land use (i.e., rural versus urban areas). This factor makes documenting ADT counts by roadway and county difficult. Table 3-2 shows ADT volumes for roads in Sierra and Otero Counties and New Mexico State highways. Only those roads that are at least 10 miles long with an ADT count greater than that of State Highway 506, or an ADT volume of 30, are shown.

**TABLE 3-2
AVERAGE DAILY TRAFFIC VOLUMES
(STATE AND INTERSTATE ROADS LONGER THAN 10 MILES
WITH AN ADT VOLUME OF 30 OR GREATER)**

Road	Length (miles)	ADT 1997	Road	Length (miles)	ADT 1997
NM 24	26.5	589.0	US 70	259.3	1754.0
NM 130	21.9	650.0	US 82	43.7	2215.0
NM 244	29.4	287.0	I-25	104.1	2649.5
NM 506	31.9	30.0	NM 59	23.1	217.0
NM 26	37.2	40.0	NM 142	10.1	138.0
NM 27	30.2	73.0	NM 152	66.1	311.4
NM 52	38.8	290.0	NM 187	36.2	1266.0
NM 181	11.8	782.4	NM 51	17.9	2075.0
NM 1	10.9	40.1	NM 6563	15.5	657.0
US 54	101.6	5960.0	—	—	—

SOURCE: New Mexico State Highway and Transportation Department 1999

3.4.5.3 Traffic Accidents

Total accident counts by year and county are available from the New Mexico Traffic Safety Department (NMTSD). NMTSD had Otero County data for the years 1995, 1996, and 1997, and Sierra County data available for 1996 and 1997. Data from both counties are reported in Table 3-3.

Accidents in Otero County **increased between 1995 to 1997, based on** available data to a high of 524 in 1997. Sierra County saw a slight drop in accidents from 1996 to 1997. Accident counts by segment for Federal and State highways in

both counties were available for the period 1995 to 1997 and is reported in Table 3-4. Accident counts for individual county roads were not available.

All of the Federal and State roadways within the two counties showed an increase in traffic accidents from the year 1995 to 1997. The exception was US 82 in Otero County, which experienced a decrease in traffic accidents, and US 54 in Otero County, which had the same number of accidents in both 1996 and 1997.

**TABLE 3-3
ACCIDENT TOTALS BY YEAR**

Year	Sierra County Number of Accidents	Otero County Number of Accidents
1997	158	524
1996	171	497
1995	Not Available	410

SOURCE: New Mexico Traffic Safety Department 1999

**TABLE 3-4
FEDERAL AND STATE HIGHWAY ACCIDENT TOTALS
BY ROADWAY SEGMENT AND YEAR**

	1995	1996	1997
Sierra County			
Federal Highways			
I-25 (Milepost 52.03 to 104.2)	65	79	83
Otero County			
State Roads			
US 82 (Milepost 0.0 to 43.75)	173	206	202
US 54 (Milepost 0.0 to 107.6)	812	165	165
US 70 (Milepost 177.8 to 259.5)	82	94	109

SOURCE: New Mexico Traffic Safety Department 1999

3.5 GEOLOGY AND MINERALS

3.5.1 Tectonics and Structural Regime

The Basin and Range physiographic province of New Mexico is highly influenced by the Rio Grande Rift with the exception of the westernmost quarter of Sierra County, which is covered by the Mogollon-Datil volcanic field. The Rio Grande Rift is a series of north-south trending basins, which in southern New Mexico widens into a series of parallel basins separated by intrarift horsts. From west to east these Tertiary age tectonic features are Palomas and Engle Basins, Caballo Uplift, Jornada del Muerto Basin, San Andres Mountains, Tularosa Basin, Otero Platform and Sacramento Uplift, Salt Basin, and Guadalupe Uplift. Map 3-3 shows tectonic feature boundaries.

3.5.2 Stratigraphy

Only minor stratigraphic differences are present in Otero and Sierra Counties indicating that the areas have similar geologic histories. Variation in thickness, lithologic character, and/or presence of a formation within the local stratigraphic columns are related to depositional environments during tectonically active periods of geologic time. Tectonically active geologic time periods for the Planning Area include mountain building in the Pennsylvanian, Tertiary basin and range faulting, and late Tertiary rifting.

The pre-Pennsylvanian deposition generally was similar throughout the Planning Area. Cambrian through Mississippian time is represented by clastic and carbonate rocks of shallow marine origin. The Pennsylvanian rocks indicate a period of increased tectonic activity with areas like the Pedernal Uplift providing sediments for the basins. The basins collect thick sequences of clastic continental-dominated sediments near the uplifts with marine and near-marine clastic and carbonate facies within the basins.

Mesozoic rocks appear to be thin to nonexistent in most of the Planning Area. An exception is a potentially thick section of Cretaceous formations on both sides of the Caballo Uplift in the Palomas-Engle and Jornada del Muerto Basins (Foster 1978). Tertiary basin-fill sediments are found in great thicknesses in the basins, and Tertiary intrusions also are present. The basin sediments are typically continental in origin.

3.5.3 Leasable Minerals

In keeping with the RMPA focus on fluid minerals leasing and development, the following description includes the potential ranking of fluid minerals and a brief discussion of the reasoning behind the ranking. A more detailed description of the fluid mineral potential is provided in Appendix A.

3.5.3.1 Oil and Gas Resources

While oil and gas production currently does not exist in the Planning Area, the presence of source rock and reservoir strata is fairly well documented throughout the Planning Area. Occurrences of oil and gas shows are noted in both the dominant Paleozoic section as well as the limited Cretaceous section. No area has been ranked as having “no potential” or “high potential” for oil and gas.

To distinguish the medium and low potential areas, the tectonic areas were evaluated for evidence of whether the trapping mechanism for the oil and gas resource likely would be present. In the Basin and Range province it was determined that while the source rock, thermal maturity, and reservoir rock likely would be present, the trap in the horst may be either nonexistent (breached) or likely to have been flushed by fresh waters. Therefore, the horst blocks or uplifted areas (Caballo Uplift, San Andres Mountains, Sacramento Uplift, and Guadalupe Uplift) with the exception of the Otero Platform have been given a low potential ranking. The Otero Platform is only partly uplifted and a large portion of its stratigraphic section is still beneath the subsurface. Map 3-3 presents the potential for oil and gas resources.

Thick, abundant, Pennsylvanian brown-to-black carbonaceous shales are potential source rocks, the dark basinal Devonian shales as secondary source rocks (Bulter 1988). Other favorable hydrocarbon source rocks are found in the Mississippian and Permian shales and carbonates (Bulter 1988; Grant and Foster 1989).

The evidence of thermal maturation for the source rocks indicates the presence of oil and gas shows throughout the Planning Area. At the time of this analysis, a total of 98 wells had been drilled in Sierra and Otero Counties (35 and 63,

respectively³); at least 28 percent of these wells (27 wells) reported shows of oil and gas. Four of these wells potentially had significant gas production (refer to Appendix A, Table A-1) and had they been near infrastructure, they may have been gas production wells. One of these wells is the recent Harvey Yates #1Y Bennett Ranch (Section 14, T. 26 S., R. 12 E., New Mexico Prime Meridian [NMPM]) which, depending upon success in the offsets, may warrant development of the infrastructure needed for production.

Reservoir rocks are almost ubiquitous in the Paleozoic stratigraphic section—of note are the Permian and Pennsylvanian bioherms and siliciclastic strata, Mississippian bioherms, and carbonates of the Silurian and Ordovician (Bulter 1988). Numerous opportunities appear to be available for trapping of hydrocarbons including wedge on wedge (unconformity pinchouts), stratigraphic pinchouts, biohermal, fault, and anticlines (Bulter 1988; Grant and Foster 1989). Pennsylvanian and Permian bioherms are likely to be more abundant near the temporal highs (Pederal Uplift). Oil and gas accumulations in the Silurian and Ordovician may depend on structural trapping rather than stratigraphic facies changes (Bulter 1988).

Mesozoic rocks appear to be thin to nonexistent in most of the Planning Area and therefore potential is limited. An exception is a potentially thick section of Cretaceous sediment with oil and gas shows on both sides of the Caballo Uplift in the Palomas-Engle and Jornada del Muerto Basins (Foster 1978). Tertiary basin-fill sediments are found in great thicknesses in the basins and Tertiary intrusions also are present. The basin sediments typically are continental in origin and are not oil and gas prone; shows seen in these sediments are believed to be due to older

³ Since the completion of the Draft RMPA/EIS, the Harvey E. Yates Company drilled another well on Otero Mesa, and is shut in. Also, in the summer of 2003, two exploratory wells were drilled by Threshold Development, Inc., in Crow Flats (east of Otero Mesa), and these have been plugged. Available data from these three wells do not suggest a change in the RFD; therefore, the RFD was not recalculated.

sources. The igneous intrusions near hydrocarbon accumulations are believed to destroy the hydrocarbons.

3.5.3.2 Geothermal Resources

Sierra and Otero Counties are located within the Rio Grande Rift, which is one of the three principal geothermal areas in New Mexico (Hatton 1978). While no known geothermal resource areas have been identified in the Counties, anomalously warm springs (surface temperatures at least 50EF above mean annual air temperature) and wells (thermal gradients exceeding 86EF) have been recorded in the counties indicating geothermal potential (Callender et al. 1983; Sammel 1979; Summers 1976; Trainer 1975; Witcher 1988). Both convection (hot-water-dominated) and conduction-dominated geothermal resources have been documented in Sierra and Otero Counties (Brookins et al. 1981; Muffler 1979; Sammel 1979; Witcher 1988).

Conduction-dominated geothermal systems are associated with the flanks of deep sedimentary basins and originate from deeply circulating groundwater along basin-bounding faults. These geothermal systems are believed to be very abundant in New Mexico, especially associated with the Basin and Range province; however, due to typical depth of the resource, the risk associated with exploration and development of the resource is believed to be high (Brookins et al. 1981; Sammel 1979; Witcher 1988).

Convection systems, less abundant in New Mexico, are associated with Quaternary igneous rocks and may be in part heated by magmatic activity (Brookins et al. 1981). While the exact origin of the heat source may not always be known, the anomalous temperature in spring or well discharges is a reliable criteria of the existence of convective systems (Witcher 1988). These convective geothermal resources typically are characterized as having structurally high and usually exposed faulted and fractured bedrock. The convective geothermal resource usually is found at shallower depths than conductive-dominated systems and its presence has been

confirmed with a well or spring; therefore, the exploration and development risks are lower.

Geothermal resources identified in the Planning Area are low temperature (less than 194EF) resources. While these resources are not suitable for electrical power generation, their uses include, but are not limited to, space and domestic water heating, crop drying, greenhouse heating, animal husbandry, fish hatching and farming, biodegradation and fermentation processes, de-icing, soil warming, low temperature refrigeration cycles, drying and curing of concrete, distillation and evaporation cycles, and hot water spas and baths. The drawback to the production of geothermal resources is that since the energy from these resources is transported as hot water, the user must be located near the production site (Sammel 1979; Starkey and Icerman 1983). Therefore, while an area may have a high-to-moderate potential for geothermal resources, exploration and/or development may not occur if a potential end user is not near or identified. Map 3-4 presents the potential for geothermal resources.

Areas of the Planning Area that have had geothermal development or have been noted by authors as having potential for geothermal development were given the ranking of high potential. These areas include Truth or Consequences (Sierra County), Derry Warm Springs (Sierra County), and McGregor Range Camp (Otero County) (Hatton 1978; Muffler 1979; Starkey and Icerman 1983; Summers 1976). Recent geothermal exploration indicates that an area near Hillsboro also appears to have high potential (Witcher, personnel communications, 1998).

3.5.3.3 Coal Resources

Minor amounts of sub-bituminous coal have been extracted from the Engle coalfield east of the Caballo Mountains. A larger and more promising coal deposit, the Sierra Blanca coalfield, extends southward from Carrizozo in Lincoln County to the Three Rivers area of Otero County (Tabet and Frost 1978). Although coal production from this deposit has occurred in

Lincoln County, none is known to have taken place in Otero County (BLM 1985b).

3.5.4 Locatable Minerals

The locatable mineral resources of the area are diverse and include gold, silver, copper, lead, zinc, iron, molybdenum, cement-quality limestone, gypsite, turquoise, beryllium and other rare earth minerals, tin, uranium, alunite, zeolites, fluorite, and manganese. **There are three known mining districts active in the last century—Hillsboro and Lake Valley areas and Caballo Mountains in Sierra County, and Jarilla Mountains in Otero County.**

Production of locatable minerals from public land within the Planning Area is sporadic. The potential is moderate to high in many areas throughout the Planning Area, typically located in the uplifts or horst blocks. In recent years, a nepheline syenite mine was established at Wind Mountain in Otero County prior to the mountain becoming an Area of Critical Environmental Concern (ACEC).

3.5.5 Saleable Minerals

Sand, gravel, and stone are the most common saleable mineral materials in the Planning Area and generally are found along mountain pediments, particularly the eastern edge of the Sacramento Escarpment, and in arroyos adjacent to mountain uplifts. Eolian sand is found within the Tularosa and Jornada del Muerto Basins. Cinders, fill material, building stone, and clay occur in minor amounts throughout the Planning Area.

Sales of mineral materials are made, when possible, from designated community pits. Existing community pits are Community Pit No. 4 northeast of Tularosa (Section 6, T. 14 S., R. 10 E., NMPM) and Community Pit No. 7 about 25 miles south of Alamogordo (Sections 9 and 10, T. 20 S., R. 9 E., NMPM).

Access to Community Pit No. 4 (Coyote Canyon) is problematic, decreasing its viability as a source of sand and gravel. Community Pit No. 7

(Escondida) is an important source of blow sand; however, the eastern portion of the community pit area has been largely depleted. Weekend use of Community Pit No. 7 is not authorized due to heavy use of the area by motorcycle recreationists (Red Sands off-road vehicle [ORV] area). Community Pit No. 7 is the staging area for an annual motorcycle race held in mid-February. Extraction operations are suspended for one week to accommodate the race.

In addition to the community pits, there are two established common use areas (CUAs), both in Sierra County. The 5-acre Green Canyon CUA, also known as the Garfield CUA due to its proximity to the town, is a source of red building stone located in Section 29, T. 17 S., R. 4 W., NMPM. Sales are for personal use only, not to exceed 110 tons per family per year. No mechanized equipment is allowed. The Apache Canyon CUA is a source of arroyo sand and building stone. The area is less than 1 acre within the Apache Canyon arroyo in Section 20, T. 16 S., R. 4 W., NMPM. Material is extracted only from the arroyo bottom and gravel bars, without disturbing vegetation. No disturbance is allowed within 5 feet of the arroyo bank and vehicles are restricted to the road.

Materials can be obtained from various locations throughout the Planning Area. In 1988, one pit in Sierra County and 11 pits in Otero County were producing sand and gravel (Barker et al. 1988). An expanding population coupled with major road work has increased the demand for sand and gravel resources. Except for site-specific construction projects, it is not probable that these resources will be needed from public land.

3.6 SOILS

Soils within the Planning Area typically consist of loam; silty clay loams; and sandy, gravelly, gypsiferous, or cobbly loams. Rock outcrop is common. The soils are developed on a range of parent materials including underlying igneous and metamorphic rocks, limestone, shale, sandstone, gypsum beds, and alluvial and eolian deposits.

Several soil types are represented in the Planning Area. The soils typically are well drained to excessively drained. The profiles range from deep, nearly level to gently sloping silt and silty clay loam soils developed on low lying areas, to shallow, moderately steep to steep calcareous gravels and gravelly loam soils developed on upland features.

Erosion caused by water and wind processes is a primary consideration in the Planning Area. Susceptibility to erosion varies depending on soil type, slope, and vegetation cover. Some of the soils may be classified as prime farmland.

3.6.1 Soil Erosion

The potential for soil erosion is the result of several factors including slope, parent material, vegetation cover, climate, and the physical/chemical characteristics of the soil. The Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service) has mapped general and high detail soil units in portions of Sierra and Otero Counties. The NRCS soil survey publications were referenced for this study of the Planning Area. Erosion potential designations of slight, moderate, high, and severe, assigned by the NRCS, are used to indicate how susceptible soils are to increased erosion due to disturbances such as removal of vegetation, construction activities, and vehicular activity.

The most active wind erosion occurs during the spring in dune areas of sandy gypsiferous loam soils typical of the Alamogordo-Gypsum Land-Aztec soils located to the west of Alamogordo and in the Crow Flats area in Otero County, Pintura-Dona Ana sandy soils located in the Orogrande area, Simona-Delnorte-Nickel soils to the east of Engle in Sierra County, and Nickel-Bluepoint and Glendale-Gila-Brazito soils in the Rio Grande Valley of Sierra County.

Soils susceptible to water erosion have the potential to produce high sediment loads in nearby streams. Two independent studies and BLM rangeland inventories conducted within the Planning Area have identified areas of high

sediment yield. Soil types susceptible to water erosion in Sierra County include sparsely vegetated Nickel-Bluepoint soils of the Rio Grande Valley and Simona-Delnorte-Nickel soils east of the Caballo Mountains. In Otero County, valley slopes dissected by erosion gullies have been mapped in Holloman-Gypsum Land-Yesum soils in the Crow Flats area and west of Alamogordo. Other generalized soil types exhibiting severe erosive characteristics are Prelo-Tome-Largo soils of the Tularosa River Valley, and Badland soils (mapped as Alamogordo-Gypsum Land-Aztec soils) to the east of Tularosa and Three Rivers in north-central Otero County. Predominant soil types exhibiting highly erosive and fragile characteristics are presented on Map 3-5.

Other areas with soils susceptible to water erosion in the Planning Area include gravelly soils at the base of mountain ranges and steep hillslopes, pediments, alluvial fans; and gravelly sand along river breaks in Sierra County.

3.6.2 Prime Farmland

As defined by the U.S. Department of Agriculture, prime farmland soils have characteristics that are best suited for the economic production of sustained high crop (food, seed, forage, fiber, and oilseed) yields. These soils have a sufficiently long growing season and need only to be treated and managed using acceptable farming methods, which generally result in the least damage to the environment. Prime farmland soils typically are made up of loam, silt, silt loam, and clay loam developed on floodplains. With the availability of a dependable and adequate water supply (e.g., irrigation), some soils in the Planning Area may be suitable as prime farmland. Within the Planning Area, Caballo and Elephant Buttes Reservoirs in the Rio Grande Valley have created a dependable irrigation water source for agricultural development on Glendale-Gila-Brazito type soils of Sierra County. Other diversions from a finite number of smaller rivers and creeks also support prime farmland in Sierra County. Potential prime farmland in Otero County is generally limited to irrigated Prelo-

Tome-Largo soils along the Tularosa River and on irrigated lands within the Crow Flats area. Map 3-5 shows areas within the Planning Area capable of prime farmland development including nonirrigated areas. The NRCS publications further delineate high detail soil types capable of supporting prime farmland development.

3.7 GROUNDWATER

The Planning Area is characterized by north-trending, sub-parallel mountain ranges separated by basins filled with alluvial material. Some of the basins may contain up to 9,000 feet of basin-fill, but the most permeable layers and most of the recoverable groundwater is in the upper 1,000 feet of the basin units. The basin-fill material is important in the consideration of regional groundwater supplies (BLM 1984).

There is an increasing need for groundwater in the Planning Area for rangeland and municipal uses. In order to protect existing groundwater from impairment, 12 underground water basins (for which all or part are within the Planning Area) have been “declared” by the State Engineer (New Mexico Water Quality Control Commission [NMWQCC] 1996). The declared basins include the Rio Grande, Lower Rio Grande, Hot Springs, Las Animas Creek, Tularosa, Nutt-Hockett, Mimbres Valley, Hondo, Hueco, Penasco, and Gila-San Francisco Declared Basins (BLM 1984). The area located in southeastern Otero County was declared as of September 13, 2000 (Special Order 156). Map 3-6, Water Resources, illustrates the declared underground water basins in the Planning Area.

Groundwater in the Planning Area occurs in valley-fill deposits, basin-fill deposits, and in consolidated rock. Valley-fill aquifers consists of floodplain and channel deposits of the major rivers such as the Rio Grande and its tributaries. Groundwater can be found as shallow as 10 feet below surface in the valley-fill aquifers in the Rio Grande Valley. Recharge occurs by precipitation and movement of water from rivers toward the aquifers. Discharge occurs by

evapotranspiration and groundwater withdrawals (Anderholm et al. 1995).

The basin-fill aquifers consist mainly of unconsolidated to semi-indurated sedimentary deposits. The material is generally of Quaternary and Tertiary ages and ranges from poorly sorted to moderately sorted mixtures of gravel, sand, silt, and clay from consolidated rock in the nearby mountain ranges. Evaporite deposits, limestone, conglomerate, and volcanic rocks are present in places. Most of the groundwater occurs under water-table (unconfined) conditions; however, due to the wide range in permeability of the basin deposits, some groundwater occurs under artesian conditions. Groundwater in the basins is primarily recharged by ephemeral streams draining the surrounding mountains and discharging either across the permeable alluvial fans at the mouths of the steep canyons or by underflow in these canyons, which enters the alluvial fan directly. Discharge can occur by evapotranspiration, movement to rivers and streams, groundwater withdrawals, or through springs emerging at the surface (BLM 1984).

As part of a comprehensive geographic approach to protect all the State’s water resources, the NMWQCC recognizes 11 distinct water quality basins in the State, which are identified mainly by surface hydrology. Several of these basins are considered “closed” basins, meaning that each basin completely contains all the surface flows within its boundaries (NMWQCC 1996). One of the closed basins, the Central Closed Basin, occupies the majority of the Planning Area, with the exception of the extreme western end of Sierra County and the northeastern section of Otero County. The Central Closed Basin impacts groundwater quality in the Planning Area because saline groundwater results from the concentration of salts by evaporation in the topographically lower parts of the closed basin (Garza and McLean 1971).

Consolidated rock in the Planning Area consists mostly of sedimentary and volcanic rock, with lesser amounts of metamorphic and igneous rock. This rock makes up the mountain ranges that

border the basins and is the principal source of sedimentary material in the basin-fill deposits. Consolidated rock typically exhibits very low permeability and very low rates of groundwater flow. Well yields in consolidated rock are generally low and occur by interception of water in fracture zones (Brady et al. 1984).

Hydraulic conductivity is relatively large in the coarse-grained alluvial fan deposits near the mountain fronts of the basins. Fine-grained fan deposits and lacustrine deposits basin-wide are characterized by relatively small hydraulic conductivity. Large ratios of horizontal to vertical hydraulic conductivity are due to discontinuous, thinly bedded clay units throughout much of the basin-fill deposits (Garza and McLean 1971).

Depth to groundwater in most of the Planning Area is less than 500 feet. Two areas of Sierra County contain groundwater at depths greater than 500 feet, located at the extreme western and eastern edges of the County. Three areas in Otero County also contain groundwater at depths greater than 500 feet—two areas located at the northern end of the County and one larger area located to the south (Brady et al. 1984). More comprehensive information can be found in individual basin reports available for review at the Las Cruces Field Office of BLM.

Approximately 90 percent of the population of the State depends on groundwater for its drinking water. Nearly one half of the total water used for all purposes in New Mexico is groundwater. In many locations groundwater is the only available water supply and the Planning Area is no exception (NMWQCC 1996).

The NMWQCC has regulations in place controlling discharges onto or below the surface of the ground to protect all groundwater that has an existing concentration of 10,000 milligrams per liter or less of total dissolved solids. The NMWQCC has established a set of numeric groundwater standards based on the regulations governing groundwater. Groundwater quality in the Planning Area is highly variable depending upon the types of soluble minerals found in the

water-bearing strata of the individual basins (BLM 1984).

The New Mexico Environment Department maintains an inventory of known groundwater contamination cases in the State. Records indicate that both public and private water supply wells have been impacted by contamination. The NMWQCC has identified both point source and nonpoint source contamination in groundwater of the Planning Area. Factors affecting aquifer vulnerability include preferential flow pathways, clay and organic matter content of soils, and oxidation-reduction potential. Portions of aquifers located in the Planning Area are considered highly vulnerable to contamination from surface water discharges in areas of a shallow water table where the vadose zone is highly fractured. Further information on aquifer vulnerability can be located at the NMWQCC office in Santa Fe (NMWQCC 1996).

Most of the groundwater in the Planning Area is used for municipal, industrial, military, agricultural, rural domestic, and livestock purposes. The primary use of water on the public rangeland is by livestock and wildlife. Most of the water provided for this purpose is depleted either as (1) water consumed by animals, or (2) evaporation from facilities constructed to furnish water supplies. These facilities include storage tanks and troughs that hold water from windmills and springs, and earthen stock tanks that generally receive water from surface sources (BLM 1984).

The Office of the State Engineer (OSE) has summarized water use in Sierra and Otero Counties for 1995. In both counties, nine major uses of water include public water supply, domestic, irrigated agriculture, livestock, commercial, industrial, mining, power, and reservoir evaporation (OSE 1999a).

In Otero County, the lowest groundwater withdrawal rate was for mining (20 acre-feet/year), and the highest rate was for irrigated agriculture (29,219 acre-feet/year). There were no withdrawals for power and reservoir depletion uses. The lowest groundwater depletion rate in

Otero County was for mining (4 acre-feet/year), and the highest rate was for irrigated agriculture (23,767 acre-feet/year) (OSE 1999a).

In Sierra County, the lowest groundwater withdrawal rate was for mining (18 acre-feet/year), and the highest rate was for irrigated agriculture (15,013 acre-feet/year). There were no withdrawals for commercial, power, and reservoir evaporation uses. The lowest groundwater depletion rate in Sierra County was for mining (4 acre-feet/year), and the highest rate was for irrigated agriculture (9,796 acre-feet/year) (OSE 1999a).

Appendix C of the Draft RMPA/EIS summarized various information for the undeclared basin and the declared basins including aquifers, water quality, and problems. Information on water quality and quantity within the basins has been gathered from various sources and is more extensive for some basins than others. Additionally, not all basins have had basin-wide studies conducted but rather smaller studies on local groundwater occurrence.

3.8 SURFACE WATER

The Planning Area consists of major portions of three closed hydrologic basins—Jornada del Muerto, Tularosa Basin, and Salt Basin—and minor parts of the Mimbres and Pecos River closed basins. Closed basins completely contain all surface water flow within their boundaries (NMWQCC 1975). The remainder of the Planning Area is located within an approximately 50-mile segment of the Rio Grande hydrologic basin. These hydrologic basins are shown on Map 3-6.

Occurrence and quality of surface water varies greatly and is unevenly distributed across the Planning Area (Weir 1965). Perennial streamflow is limited to the Rio Grande and streams that drain the mountains along the eastern boundary of the Tularosa Basin. In addition, water occurs as seeps and springs across the Planning Area, sometimes at the headwaters of perennial flows or more often

appearing as minor contributing flows to the streams (Garza and McLean 1971).

Only the large drainage areas have appreciable baseflow, which is derived largely from groundwater. Part of the total annual snowmelt and storm runoff recharges the alluvium aquifers throughout the basins (Garza and McLean 1971). Overall, tributaries flow mainly during storm events but quickly cease to flow due to loss by infiltration to the alluvium and by evaporation (Ellis 1991). The closed basins contain playas that form ephemeral lakes during rainy periods and alkali flats upon drying (BLM 1981a).

Surface water storage reservoirs also occur in the area. These include the Elephant Butte Reservoir, used for irrigation storage and hydroelectric power generation, and Caballo Reservoir used for irrigation storage. Both reservoirs are located on the Rio Grande in Sierra County. There are no rivers or segments of rivers in the Planning Area that are designated as wild and scenic.

Floodplains are land areas susceptible to being inundated from any source and include small and often dry water courses and areas along rivers, streams, and lakes. Floodplains are delineated on Flood Insurance Rate Maps and Flood Hazard Boundary Maps issued by the Federal Emergency Management Agency on a county-wide basis. Floodplain management is covered by Executive Order 11988 (42 CFR 26951, 1977) and BLM Manual 7221.

3.9 AIR QUALITY

Generally, the air quality in the Planning Area is good. The air quality does not exceed State or Federal ambient air quality standards. There are several Prevention of Significant Deterioration Class I areas adjacent to or near the Planning Area as found in Table 3-5. In Otero County, the Guadalupe Mountains National Park in Texas is adjacent to the Planning Area to the south, the Carlsbad Caverns National Park is approximately 10 miles east of the Planning Area, and the White Mountain Wilderness Area is approximately 3 miles north of the Planning Area. In

Sierra County, Bosque del Apache Wildlife Refuge (Wilderness Area) is approximately 13 miles north of the Planning Area, and the Gila Wilderness Area is approximately 10 miles west of the Planning Area. These Class I areas have more restrictive air quality permitting requirements. The remainder of the Planning Area is designated as Prevention of Significant Deterioration (PSD) Class II.

Currently, the State of New Mexico has **no** monitoring station located in Sierra and Otero Counties. To characterize the Planning Area, 2002 monitoring data from sites in surrounding Dona Ana, Grant, Luna, and Grant Counties were reviewed and listed in Table 3-6 to

Table 3-9. In general, the monitoring data revealed that the air quality in the area is good. The ozone (O₃) levels listed in Table 3-6 show no exceedences of the 1-hour standard and only three minor exceedences of the 8-hour standard for the entire year. Sulfur dioxide (SO₂) levels (Table 3-7) and nitrogen dioxide (NO₂) levels (Table 3-8) were well below the ambient air quality standard with no exceedences reported. Particulate with diameter less than 10 micrometers (PM₁₀) emission concentrations (Table 3-9) were below the standard for both 24-hour and annual values.

**TABLE 3-5
FEDERAL AND NEW MEXICO AMBIENT AIR QUALITY STANDARDS
AND PSD INCREMENTS**

Pollutant	Averaging Period	NAAQS		NMAAQS	PSD Class I Increment (mg/m ³)	PSD Class II Increment (mg/m ³)
		Primary	Secondary			
Sulfur dioxide	Annual	0.03 ppm	–	0.02 ppm	2	20
	24-hour	0.14 ppm	–	0.10 ppm	5	91
	3-hour	–	0.50 ppm	–	25	512
Total suspended particulate	Annual	–	–	60 µg/m ³	–	–
	24-hour	–	–	150 µg/m ³	–	–
PM ₁₀	Annual	50 µg/m ³	50 µg/m ³	–	4	17
	24-hour	150 µg/m ³	150 µg/m ³	–	8	30
PM _{2.5}	Annual	15 µg/m ³	15 µg/m ³	–	–	–
	24-hour	65 µg/m ³	65 µg/m ³	–	–	–
Carbon monoxide	8-hour	9.0 ppm	9.0 ppm	8.7 ppm	–	–
	1-hour	35.0 ppm	35.0 ppm	13.1 ppm	–	–
Nitrogen dioxide	Annual	0.053 ppm	0.053 ppm	0.050 ppm	2.5	25
	24-hour	–	–	0.10 ppm	–	–
Lead	Quarterly	1.5 µg/m ³	1.5 µg/m ³	–	–	–
Ozone	1-hour	0.12 ppm	0.12 ppm	0.12 ppm*	–	–
	8-hour	0.08 ppm	–	–	–	–
Hydrogen sulfide	1-hour	–	–	0.01 ppm*	–	–

SOURCE: New Mexico Air Pollution Control Board 1998

NOTE: *For the State except for the Pecos-Permian Basin Intrastate Air Quality Control Region where the standard is more lenient.

ug/m = micrograms per cubic meter

PM₁₀ = particulate matter of 10 microns or less

PM_{2.5} = particulate matter of 2.5 microns or less

ppm = parts per million

NAAQS = National Ambient Air Quality Standards

NMAAQS = New Mexico Ambient Air Quality Standards

**TABLE 3-6
O₃ EMISSION CONCENTRATIONS
REPORTED BY PLANNING AREA MONITORS FOR 2002**

Monitor Site	O ₃ (ppm)							
	1-Hour Values				8-Hour Values			
	Standard	1 st Max	2 nd Max	# Exceed	Standard	1 st Max	2 nd Max	# Exceed
St. Lukes, La Union (Dona Ana County)	0.12	0.100	0.096	0	0.08	0.080	0.080	0
Sunland Park City (Dona Ana County)	0.12	0.107	0.098	0	0.08	0.087	0.081	1
Las Cruces Well (Dona Ana County)	0.12	0.086	0.085	0	0.08	0.072	0.072	0
Mcombs, Chaparral (Dona Ana County)	0.12	0.108	0.102	0	0.08	0.080	0.078	0
Valle Vista, Sunland Park (Dona Ana County)	0.12	0.103	0.100	0	0.08	0.085	0.083	1
Santa Teresa International (Dona Ana County)	0.12	0.100	0.093	0	0.08	0.090	0.083	1
Holiday Inn, Las Cruces (Dona Ana County)	0.12	0.074	0.072	0	0.08	0.068	0.064	0
Holland Street Carlsbad (Eddy County)	0.12	0.088	0.087	0	0.08	0.082	0.082	0

SOURCE: U.S. Environmental Protection Agency Air Data – Monitor Values Report, <http://oaspub.epa.gov/airdata> 2003.

**TABLE 3-7
SO₂ EMISSION CONCENTRATIONS
REPORTED BY PLANNING AREA MONITORS FOR 2002**

Monitor Site	SO ₂ (ppm)							
	3-Hour Values			24-Hour Values			Annual	
	Standard	1 st Max	2 nd Max	Standard	1 st Max	2 nd Max	Mean	# Exceed
St. Lukes, La Union (Dona Ana County)	0.5	0.006	0.006	0.14	0.003	0.002	0.001	0
Sunland Park City (Dona Ana County)	0.5	0.008	0.007	0.14	0.003	0.003	0.001	0
North 13 th Street, Artesia (Eddy County)	0.5	0.058	0.026	0.14	0.012	0.009	0.001	0
Cobre Schools, Bayard (Grant County)	0.5	0.093	0.040	0.14	0.017	0.006	0.001	0
Chino Blvd. Hurley Park (Grant County)	0.5	0.014	0.013	0.14	0.005	0.003	0.001	0

SOURCE: U.S. Environmental Protection Agency Air Data – Monitor Values Report, <http://oaspub.epa.gov/airdata> 2003.

**TABLE 3-8
NO₂ EMISSION CONCENTRATIONS
REPORTED BY PLANNING AREA MONITORS FOR 2002**

Monitor Site	NO ₂ (ppm)		
	Annual		
	Standard	Mean	# Exceed
Las Cruces Well Station (Dona Ana County)	0.053	0.004	0
Mccombs, Chaparral (Dona Ana County)	0.053	0.005	0
Valle Vista, Sunland Park (Dona Ana County)	0.053	0.010	0
Santa Teresa International (Dona Ana County)	0.053	0.006	0
N. 13 th Street, Artesia (Eddy County)	0.053	0.007	0
Holland Street Carlsbad (Eddy County)	0.053	0.004	0

SOURCE: U.S. Environmental Protection Agency Air Data – Monitor Values Report, <http://oaspub.epa.gov/airdata>, 2003.

**TABLE 3-9
PM₁₀ EMISSION CONCENTRATIONS
REPORTED BY PLANNING AREA MONITORS FOR 2002**

Monitor Site	PM ₁₀ (µg/m ³)						
	24-Hour Values				Annual		
	Standard	1 st Max	2 nd Max	# Exceed	Standard	Mean	# Exceed
Anthony Elementary School (Dona Ana County)	150	95	74	0	50	33	0
Sunland Park City (Dona Ana County)	150	152	128	0	50	40	0
N. Solano Drive, Las Cruces (Dona Ana County)	150	100	62	0	50	23	0
Cobre Schools, Bayard (Grant County)	150	62	46	0	50	22	0
Hurley Elementary School (Grant County)	150	139	61	0	50	19	0
E. 18 th Street, Silver City (Grant County)	150	62	51	0	50	20	0
Post Office Pine Street Deming (Luna County)	150	67	46	0	50	19	0

SOURCE: U.S. Environmental Protection Agency Air Data – Monitor Values Report, <http://oaspub.epa.gov/airdata> 2003.

The lower Rio Grande Valley near the urban areas of Las Cruces, New Mexico; El Paso, Texas; and Juarez, Mexico have generally poor air quality. Portions of the urban area of El Paso are classified as nonattainment for several pollutants. These include PM₁₀ (moderate), ozone (serious), and carbon monoxide (moderate). These events of poor air quality are more likely to occur in the winter when temperature inversions prevent the transport and dispersion of pollutants. Polluted air has the potential to travel up the Rio Grande Valley and north via the Tularosa Basin into portions of the

Planning Area. Blowing dust also contributes to air pollution events especially during the windy spring months. Dry, sparsely vegetated soils and unpaved roads are the main sources of particulate matter.

3.10 NOISE

Noise is generally defined as unwanted or annoying sound that is typically associated with human activity and interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to

environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, perceived importance of the noise and its appropriateness in the setting, time of day and type of activity during which the noise occurs, and sensitivity of the individual. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are usually measured and expressed in decibels (dB). Most of the sounds one hears in the environment do not consist of a single frequency, but rather a broad band of frequencies differing in sound level. The intensities of each frequency add to generate sound. The method commonly used to quantify environmental sounds involves evaluating all of the frequencies of a sound according to a weighting system which reflects that human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This is called “A” weighting, and the decibel level measured is called the A-weighted sound level (dBA). A sound level range of 0 to 10 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

Although the A-weighted sound level may provide an adequate indication of the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of noise from distant sources that create a relatively steady background noise in which no particular source is identifiable. A single descriptor called the Leq (equivalent sound level) is used. Leq is the energy-mean A-weighted sound level during a measured time interval. It is the “equivalent” constant sound level that would have to be produced by a given source to equal the fluctuating level measured. Leq(h) is the one-hour equivalent sound level.

Day-night noise level (Ldn) is the weighted 24-hour average sound level. It is calculated by adding 10 decibels to the sound level at night (10:00 p.m. to 7:00 a.m.). The penalty is added to account for the increased sensitivity to noise during the quiet nighttime hours. Sound levels of typical noise sources and noise environments are presented in Table 3-10.

The Planning Area is primarily undeveloped with vast open spaces. Land uses vary from sparsely populated rural regions to residential, commercial, and public uses in various small communities within Sierra and Otero Counties. Portions of the Planning Area consist of recreational (hiking, camping, rockhounding, birdwatching, hunting, and off-road vehicles) and agricultural (livestock and crop production) uses. The primary uses on public land are livestock grazing and mining, mineral material excavation, and dispersed recreation.

Baseline ambient hourly sound levels typically range from 35 to 70 dBA depending on the population density, distance to county and State roads, U.S. highways, and commercial and industrial noise sources (Dames & Moore, from numerous project sound level measurements, refer to Table 3-10). In some areas, noise from military aircraft overflights from various bases and other activities contribute to the noise environment.

3.11 VEGETATION

Information on the existing vegetation within Sierra and Otero Counties was obtained from BLM sources, including the *White Sands Resource Area Management Situation Analysis* (BLM 1984) and *White Sands Resource Area Draft Resource Management Plan/Environmental Impact Statement* (BLM 1985b), and from Dick-Peddie (1993).

TABLE 3-10
SOUND LEVELS OF TYPICAL NOISE SOURCES AND NOISE ENVIRONMENTS
(A-WEIGHTED SOUND LEVELS)

Noise Source (at a Given Distance)	Scale of A-Weighted Sound Level in Decibels	Noise Environment	Human Judgment of Noise Loudness (Relative to a Reference Loudness of 70 Decibels ^a)
Military jet take-off with after-burner (50 feet) Civil Defense siren (100 feet)	140 130	Carrier flight deck	
Commercial jet take-off (200 feet)	120		<i>Threshold of pain</i> 32 times as loud ^a
Pile driver (50 feet)	110	Rock music concert	16 times as loud ^a
Ambulance siren (100 feet) Newspaper press (5 feet) Power lawn mower (3 feet)	100		<i>Very loud</i> 8 times as loud ^a
Motorcycle (25 feet) Propeller plane flyover (1,000 feet) Diesel truck, 40 mph (50 feet)	90	Boiler room Printing press plant	4 times as loud ^a
Garbage disposal (3 feet)	80	High urban ambient sound	2 times as loud ^a
Passenger car, 65 mph (25 feet) Living room stereo (15 feet) Vacuum cleaner (3 feet) Electronic typewriter (10 feet)	70		<i>Moderately loud</i> 70 decibels ^a (Reference loudness)
Normal conversation (5 feet) Air conditioning unit (100 feet)	60	Data processing center Department store	one-half as loud ^a
Light traffic (100 feet)	50	Private business office	one-quarter as loud ^a
Bird calls (distant)	40	Lower limit of urban ambient sound	<i>Quiet</i> one-eighth as loud ^a
Soft whisper (5 feet)	30 20 10 0	Quiet bedroom Recording studio	<i>Just audible</i> <i>threshold of hearing</i>

SOURCE: Compiled by Dames & Moore from numerous sources including but not limited to Federal Transit Administration 1995; General Radio 1972; Harris 1991; U.S. Department of Housing and Urban Development 1977; U.S. Environmental Protection Agency 1980.

Eight major physiognomic vegetation types were identified for Sierra and Otero Counties including grasslands, desert scrub, montane scrub, woodland/forest, arroyos, malpais, riparian/other wetlands, and other (cropland). These major vegetation types are shown on Map 3-7. Grasslands and desert scrub occupy the greatest area. Factors such as soils, topography, elevation, temperature, and precipitation have a direct influence on the distribution of vegetation occurring on the various sites. Six ecological study plots have been established in BLM's Decision Area. These areas are subject to more

stringent surface use management in the current RMP in order to protect resource values (native species, especially grasses).

Three vegetation types have been identified as particular concerns due to their habitat value for special status species: grasslands, woodland/forest, and **wetland**/riparian types.

3.11.1 Grasslands

Grasslands occur throughout the Planning Area at all elevations, and generally these habitats

consist of grass flats (low swales that receive flood overflow), grass hills, grass rolling uplands (nonswale, isolated pocket settings), and grass mountains (slopes of mountain ranges above the surrounding uplands). Grasslands cover approximately 1,849,277 acres in the Planning Area and 585,831 acres in BLM's Decision Area. Droughts are common in these regions and must be anticipated in management practices.

The predominant **grass** species in lower elevations include black grama, blue grama, tobosa, alkalai sacaton, burrograss, sand dropseed, mesa dropseed, ring muhly, and fluffgrass. In higher elevations, curl-leaf muhly, black grama, three-awns, sideoats grama, mountain muhly, spike muhly, and needle and thread dominate. Grasslands on sandy soils contain dropseed, alkali sacaton, and Indian rice grass, **which** are designated as mid-grass vegetation. **Additional grassland species include sand muhly, hairy grama, and warnock's grama. Forbs also are a major component of desert grasslands and include careless weed, louisiana wormwood, field bahia, locoweed, spectacle pod, filaree, desert marigold, twinleaf, plains hiddenflower, desertnut, buckwheats, pale trumpets, peppergrass, Gordon bladderpod, limoncillo, desert holly, common purselane, Russian thistle, globemallows, mouse ear, and zinnia.**

Encroachment of desert scrub into grasslands has been occurring over the past 80 to 90 years. This **encroachment** may be attributed to a combination of climatic change, introduction of roads, livestock grazing, and concurrent interruption of naturally occurring fire (Dick-Peddie 1975; Neilsen 1986). Grass species that are highly palatable, such as black grama, provide a highly desirable livestock forage. Of particular concern are two remnant **patches** of desert grassland within BLM's Decision Area, which provide habitat for pronghorn (and coincide with the Otero Mesa Habitat Management Area and Nutt Antelope Area).

3.11.2 Woodland/Forest

Woodland/forest vegetation types are found at the higher elevational limits of the Planning Area, which receive the greatest amounts of precipitation. These species occupy shallow soils and are predominantly on the north-facing slopes of the mountains and hills. Woodland/forest **vegetation** types are associated primarily with the Caballo, Sacramento, San Andres Mountains, and the Black Range, and **include** piñon-juniper woodlands (generally on mountain ranges at about 6,000 feet), montane coniferous forest (on mountain ranges between 8,000 to 10,000 feet), and subalpine coniferous forest (on mountain ranges between 9,500 and 12,000 feet). Woodlands/forests occur on approximately 1,849,304 acres in the Planning Area and 118,626 acres in BLM's Decision Area.

While juniper usually is not considered a desirable species, the trees in this area do not form a continuous canopy, but are in scattered clumps that provide wildlife cover. The piñon provides food for wildlife, and several species of browse plants also provide excellent deer **food source**. Understory vegetation consists primarily of blue grama, black grama, sideoats grama, and galleta. This **vegetation type** also represents higher average elevations and should be considered a transition zone as reflected by the presence of ponderosa pine, Gambel oak (oakbrush), serviceberry, and some of the ash species.

Besides providing forage **and habitat for wildlife**, these areas **can be managed for** the use of trees for posts and firewood, and the **collection of piñon nuts**.

3.11.3 Riparian/Other Wetlands/Playas

The riparian vegetation type currently identified within BLM's Decision Area accounts for approximately 14.5 miles along creeks and surrounding seeps and springs. It is very important as a habitat type. In addition, arroyos, playas, and salt flats are likely to be classified as Waters of the United States and therefore subject to Section 404 of the Clean Water Act. Within

BLM's Decision Area, there are approximately 3,351 acres of playas identified. Intermittent streams, mud flats, and sand flats also **are found throughout the area**. Salt flats, or playas, occur within the Planning Area and have been identified by the BLM as resources of concern because these areas are sensitive to surface disturbance (e.g., wind erosion on salt flats, playas as spring habitat for shore and wading birds). Some of the larger, more important riparian areas in the Planning Area include the Elephant Butte and Caballo Reservoirs and along the Rio Grande, the south fork or Palomas Creek, Berrenda Creek, Tularosa River, and Percha Creek.

Riparian vegetation along the Rio Grande consists of dense stands of trees and shrubs that form "bosques" (Dick-Peddie 1986). The composition ranges from pure stands of salt cedar, bank willow, and willows mixed with mesquite and four-wing saltbrush. Open areas usually are dominated by saltgrass with seep willow on the perimeters. Cottonwood trees are scattered along the Rio Grande and dominate the bosques in some areas, but usually contain tree willow.

These areas can provide excellent food and cover for wildlife and smaller game animals. Generally water is plentiful in these areas and more reliable for wildlife as well as livestock.

3.11.4 Noxious Weeds

The major noxious plants that occur in the Planning Area are locoweed, mustard, and milkweed. Primary plants that are undesirable for livestock include oak, mustards, cocklebur, and snakeweed.

Noxious weeds that are listed for the BLM Las Cruces Field Office (1996a, 1997a) include Russian knapweed (*Centaurea repens*), hoary cress (*Cardaria draba*), Canada thistle (*Cirsium arvense*), Malta starthistle (*Centaurea melitensis*), leafy spurge (*Euphorbia escula*), musk thistle (*Carduus nutans*), yellow starthistle (*Centaurea solstitialis*), and African rue (*Peganum harmala*). Because of the invasive

nature of these plant species, and an increasing dominance at the expense of economically important native species, land management policy makers should be cognizant of activities that facilitate the spread of weeds, and conversely, of measures that help prevent infestations and spread of these noxious species.

Noxious weed distribution was mapped for Otero County by the NRCS. Infestations of African rue occur east and southeast of Alamogordo along U.S. Highway 54 and also east of this highway between Alamogordo and Tularosa. Russian knapweed also occurs in this area, but mostly between Alamogordo and Tularosa. Other noxious weed species are less pronounced, having more scattered distributions. The exception is a concentration of common burdock east of Alamogordo.

3.12 WILDLIFE

Information regarding wildlife species that are present within the Planning Area was gathered from the BLM and NMDGF. The BLM maintains an inventory of wildlife in the Integrated Habitat Inventory and Classification System (IHICS). The IHICS is designed to assist in accumulating, storing, retrieving, and analyzing data on wildlife, as well as on vegetation, soils, landforms, climate, and other ecosystem determinants as they relate to wildlife resources. Inventories were conducted for the *White Sands Resource Area Management Situation Analysis* (1984). Selected habitat sites were sampled for vertebrate species for the *Draft Grazing Environmental Impact Statement for the Southern Rio Grande Planning Area* (BLM 1981b). The Southern Rio Grande Planning Area includes parts of Sierra, Luna, and Dona Ana Counties.

3.12.1 Standard Habitat Sites

Wildlife in the Planning Area is associated with specific habitat types, **or Standard Habitat Sites** (SHS), as identified by the BLM. These SHSs are delineated according to the vegetation type present, landforms, and soil types. For the purposes of this document, the SHSs have been

combined into seven groups under broader habitat type definitions. These groupings are based on similarities in vegetation between SHSs. Table 3-11 provides a list of which SHSs are within each group. Several SHSs are found in both Sierra and Otero Counties, while others are limited to only one area, as indicated on Table 3-11. Map 3-7 depicts the broader vegetation types. Several key habitat types are discussed in Section 3.10.

There have been changes in the distribution and amount of each habitat type over time resulting from **natural fluctuations and** human activities such as livestock grazing, road construction, and the introduction of exotic (non-native) species. It is estimated that overall there has been a 37 percent increase in creosote-dominated habitat types, a 2 percent increase in half-shrub types, a 7 percent increase in mesquite-dominated types, and a 17 percent increase in mixed shrub habitat type (Howard 1999). These types generally have resulted in an overall loss (62 percent) of grasslands, which are preferred by many wildlife species.

The SHSs system is an important wildlife management tool for the BLM. The BLM maintains lists of vertebrate species associated with each of the SHSs. These lists differ slightly between counties depending on specific habitat features within each SHS.

3.12.2 Wildlife

3.12.2.1 **Big Game**

Pronghorn and mule deer occur throughout the Planning Area and utilize several of the SHSs listed above. Two elk herds are present in the Planning Area. The NMDGF tracks these animals and maintains information about total animal populations, habitat and population trends, areas of critical habitat, winter range, and areas of population concentrations. The wildlife habitat map (refer to Map 3-7) delineates the boundaries of five habitat areas.

Pronghorn inhabit the Otero Mesa Management Area on Otero Mesa in Otero County and the

Nutt Antelope Area east of SR 85 in Sierra County. Pronghorn are associated most commonly with grass flats, grass hills, and grass rolling uplands, **primarily foraging on forbs and, to a lesser extent, on grass and shrub species**. The two habitat areas are desert grassland patches, which are remnants of a habitat type that was more dominant historically. However, degradation and conversion to desert scrub has been occurring over the past 80 to 90 years as a combined result of climatic change, introduction of roads, extensive livestock grazing, and concurrent interruption of naturally occurring fire.

The Caballo Mountains Deer Habitat Area, Sacramento Escarpment Deer Habitat Area, and Jornada del Muerto Habitat Area support deer populations and have been identified by the BLM as resources of concern. There are few habitat sites within the Planning Area that provide the biological requirements for significant numbers of big game species other than those mentioned above; however, infrequent occurrences of elk, bear, turkey, and mountain lion have been recorded. Elk move onto McGregor Range, although most elk in the area are year-round residents. No defined winter or calving areas are present (Massey 1999). Elk and bear occasionally are seen in the Brokeoff Mountains and along the lower elevations of the Sacramento Mountains, Guadalupe Mountains, and Black Range; however, these areas are not essential to either elk or bear population viability because of more suitable habitat located outside of the Planning Area. Turkey have been seen in the areas mentioned above with the exception of the Brokeoff Mountains. Habitat for turkey is not essential in any of these areas for the same reasons as for those of elk and bear. Mountain lions occur predominantly in the more rugged mountainous areas of the Brokeoff, Sacramento, Guadalupe, San Andres, and Caballo Mountains and Black Range. Locations and numbers of mountain lion at any one time are dependent on the presence of prey species, which in turn is related to the suitability of the habitat for prey.

**TABLE 3-11
HABITAT TYPES IN SIERRA AND OTERO COUNTIES**

Type	Standard Habitat Sites	Acres	
		Planning Area	Decision Area
Grasslands	Grass Flat (S, O) Grass Hill (O) Grass Mountain (S, O) Grass Rolling Upland (S, O) Half-Shrub Hill Half Shrub Rolling Upland (S) Salt Flat (O)	1,849,277	585,831
Desert Scrub	Creosote Breaks (S) Creosote Hills (O) Creosote Rolling Upland (S, O) Mesquite Rolling Upland (S, O) Mesquite Sand Dune (S, O) Mixed Shrub Rolling Upland (S)	2,774,236	1,183,512
Montane Scrub	Mixed Shrub Montane (S)	56,424	25,000
Woodland/Forest	Piñon-Juniper Grass Mountain (S,O)	1,849,304	118,626
Arroyo	Arroyo (S, O)	38,295	21,335
Malpais	Malpais Rock (S)	32,969	54
Riparian/Wetlands/Playas	Riparian (S, O)	14,390	5,762
Unclassified and Miscellaneous Vegetation Types	(Alpine Tundra [O] Sand Dunes [S])	334,064	112,959
Total Acres		6,949,557	2,053,029

SOURCE: Bureau of Land Management 1999a, b
NOTE: S = Sierra County; O = Otero County

The NMDGF has developed goals for increasing the existing populations of desert bighorn sheep. These goals are documented in *New Mexico's Long Range Plan for Desert Bighorn Sheep Management 1995-2002* (NMDGF 1995). Potential reintroduction sites for the bighorn are located within the Planning Area. Sites with suitable habitat parameters for bighorn sheep are located in the Caballo, Sacramento, and Guadalupe Mountains. Secondary reintroduction sites include the Brokeoff and Cornudas Mountains (Massey 1999). The Caballo Mountains provide a potential movement corridor for bighorn sheep from the Fra Cristobal Mountains (Snyder 1999).

3.12.2.2 Small Game

Major species of upland game birds include Gambel's quail, scaled quail, and mourning dove. Gambel's quail occur in the more mesic habitat sites, whereas scaled quail utilize those that are more xeric. Population numbers of quail, both Gambel's and scaled, fluctuate depending in part on precipitation and quality of habitat. Mourning dove occur throughout the Planning

Area with concentrations favoring those areas where water is present. Jackrabbits and cottontail rabbits also are common in the area, utilizing most habitat sites (BLM 1985b).

3.12.2.3 Nongame

Avian species account for 67 percent (319) of the total nongame species that occur throughout the Planning Area. This high number can be attributed to the varied topography, climate, and diverse vegetation types occurring within the Planning Area.

There are 63 species of nongame mammals, 77 species of reptiles and amphibians, and 19 species of nongame fish that occur throughout the Planning Area.

3.12.2.4 Raptors

Raptors (eagles, hawks, and owls) are common throughout the Planning Area. Wintering raptors often are associated with habitats that are associated with water and open grassland areas where prey species are abundant. Raptors that are

associated with several SHSs within the Planning Area include sharp-shinned hawk, prairie falcon, Cooper's hawk, red-tailed hawk, Swainson's hawk, ferruginous hawk, and golden eagle. Bald eagles winter in the area, roosting in the mountains near water and foraging into the surrounding lower elevations. **Elephant Butte and Caballo Reservoirs and Elephant Butte Marsh are major bald eagle wintering areas.** Owls in the area include great-horned owl, western screech owl, long-eared owl, and northern pygmy owl.

3.12.2.5 Waterfowl

Waterfowl occurrences in the Planning Area are limited to those habitat sites where freestanding water is available. Earthen stock tanks are utilized seasonally; however, habitat along the Rio Grande, and in Caballo and Elephant Butte Reservoirs and Lake Holloman, is more abundant and desirable. **Elephant Butte and Caballo Reservoirs and Elephant Butte Marsh are major waterfowl wintering areas.** The Rio Grande corridor is a major migration route for waterfowl, raptors, and passerines.

3.12.2.6 Fisheries

Fisheries in the Planning Area include Caballo Reservoir, Elephant Butte Reservoir, portions of the Rio Grande, Three Rivers, and Tularosa Creek. Records indicate that Three Rivers contains some concentrations of brook trout, which is the sole species known to occupy this aquatic habitat. The Tularosa Creek contains both rainbow and brown trout.

3.13 SPECIAL STATUS SPECIES

An estimated 10 Federally listed threatened and endangered species and 45 other special status species (Federal candidate, Federal proposed, BLM sensitive, and State-listed) are known or potentially could occur on public land within the Planning Area. Other species have an extremely restricted distributional range and are known as endemic species; a variety of endemic species are present within Sierra and Otero Counties. Many of the more mobile species (birds, large

mammals) can use several different habitat types. Appendix E provides a list of the special status species that are most likely to occur in BLM's Decision Area.

The following sections describe the (1) special status species that potentially could occupy the general habitat types in the Planning Area, (2) endemic species, and (3) six special status species areas on public land.

3.13.1 Special Status Species Habitats

The variety of habitats in Sierra and Otero Counties (refer to Map 3-7) provide important environments (for growth, foraging, cover, and reproduction and rearing) for a number of special status species. Of these habitat types, grasslands, woodland/forest, and riparian are the most important to special status species. The species associated with each of the important habitat types are summarized briefly below.

3.13.1.1 Grasslands

A number of special status species are dependent on grassland habitats including Guadalupe rabbitbrush, grama grass cactus, aplomado falcon, black-footed ferret, mountain plover, Arizona black-tailed prairie dog, Baird's sparrow, ferruginous hawk, and western burrowing owl.

3.13.1.2 Woodland/Forest

A number of species are dependent on woodland/forest habitats and include Glass Mountain coral root, Kuenzler hedgehog cactus, Todsens' pennyroyal, gray-footed chipmunk, Mexican spotted owl, northern goshawk, Sacramento Mountain salamander, and numerous bat species (foraging and roosting).

3.13.1.3 Riparian

Species dependent on riparian habitat types include Sacramento prickly poppy, Sacramento Mountains thistle, Wright's marsh thistle, brown pelican, interior least tern, whooping crane, southwestern willow flycatcher, bald eagle, Chiricahua leopard frog, Arizona southwestern

toad, black tern, New Mexico jumping mouse, northern goshawk, white-faced ibis, yellow-billed cuckoo, and numerous bat species (foraging for insects).

3.13.2 Endemic Species

A variety of endemic species, or species whose occurrence is restricted to a small area, are present within Sierra and Otero Counties. These endemic species and their area of occurrence (listed in parentheses) are as follows:

- Sacramento prickly poppy (Sacramento Escarpment)
- Sacramento Mountain thistle (Sacramento Mountains)
- Villard's pincushion cactus (Sacramento Escarpment)
- Guadalupe Mountain mescal bean (Brokeoff Mountains)
- Duncan's cory cactus (Mud Mountains in New Mexico, but also present in Big Bend National Park in Texas)
- gypsum scalebroom (Alkali Lakes in New Mexico and Texas)
- Todsen's pennyroyal (San Andres Mountains on west side of Tularosa Basin and Sacramento Mountains on east side of Tularosa Basin)
- gypsum ringstem (Pup Canyon)
- gypsum blazingstar (Pup Canyon)
- Sierra Blanca cliffdaisy (Sacramento Mountains)
- Mineral Creek mountainsnail (Mineral Creek)
- Cornudas Mountain land snail (Cornudas Mountains)
- Organ Mountain Colorado chipmunk (Organ Mountains)
- White Sands pupfish (White Sands Missile Range)

Appendix E provides lists of the special status species that are most likely to occur in BLM's Decision Area within standard habitat types.

3.13.3 Nominated ACECs

Eight areas in BLM's Decision Area have been nominated to become ACECs (BLM 1999b; Dunmire 1992). The nominations are based primarily on the presence of special status species. The nominated ACECs are shown on Map 3-8 and listed in Section 3.19.3. **All of these areas have been evaluated against the BLM's relevance and importance criteria and have been found to meet that assessment review.**

3.14 RANGELAND

Rangeland within the Planning Area occurs on private land and lands administered by State, Forest Service, Mescalero Apache Indian Tribe, and BLM. Grazing use is primarily by cattle, sheep, and horses. BLM authorizes grazing on approximately 805,640 acres of public land in Sierra County and approximately 933,269 acres of public land in Otero County (BLM 1998a).

Range production for livestock, described as *Acres Per Animal Unit – Yearlong*, has been described and categorized for the Planning Area. *Acres Per Animal Unit – Yearlong* is defined as the number of acres required to support one cow-calf unit for one year. Range production categories vary from a relatively high level of production as in Class B (37 to 43 acres per animal unit – yearlong) to relatively low areas of production as in Class G and H (265 or greater acres per animal unit – yearlong). Table 3-12 lists the range production classes and the number of acres within each of the classes in the Planning Area. Class E (75 to 119 acres per animal unit – yearlong) contains the largest number of acres (3,168,000 acres) while Class B (37 to 43 acres per animal unit) has the smallest number of acres (7,000 acres).

More productive areas, such as Class C, occur along the southern end of the Sacramento and Brokeoff Mountains, and the foothills to the east of the Black Range and Mimbres Mountains. Least productive areas, such as Class G and H, occur in the Black Range, Malpais, and portions of the White Sands Missile Range.

**TABLE 3-12
RANGELAND PRODUCTION CLASSES AND ACREAGES**

Range Production Classes	Acres/Animal Unit Yearlong	Head/Section Yearlong	Approximate Acres
Class B	37 to 43	17.30 to 14.80 head	7,000
Class C	44 to 54	14.55 to 12.08 head	572,000
Class D	55 to 74	11.64 to 8.65 head	1,799,000
Class E	75 to 119	8.30 to 5.98 head	3,168,000
Class F	120 to 264	5.33 to 2.42 head	1,061,000
Class G	265 and more (high elevations)	8 head or less (high elevations)	112,000
Class H	265 and more	3 head or less	227,000

SOURCE: Department of Agricultural Economics and Agricultural Business, Agricultural Experiment Station, and New Mexico State University, n.d.

On public land, there are 248 grazing allotments in Sierra and Otero Counties. Acreage and forage allocation by allotment for Sierra and Otero Counties are on file at the Las Cruces Field Office of BLM.

3.15 CULTURAL RESOURCES

BLM defines a *cultural resource* or *cultural property* as:

a definite location of human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence. The term includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses, and may include definite locations (sites or places) of traditional cultural or religious importance to specified social and/or cultural groups (BLM Manual 8100, *Cultural Resource Management*)

No systematic, complete inventory of cultural resources has been undertaken in either Sierra or Otero County, but thousands of archaeological and historical sites have been recorded.

3.15.1 Cultural History

More than seven decades of intermittent research has demonstrated that human societies have occupied the Planning Area for approximately 12,000 years, and perhaps substantially longer.

The earliest occupants, whom archaeologists call Paleoindians, occupied the region from approximately 10,000 to 6000 or 7000 B.C. Remnants of the Paleoindian era are rare, because these earliest occupants lived in small groups, left little durable evidence of their presence, and the archaeological evidence that was left has been subject to millennia of erosion.

Archaeologists call the long period from about 6000 or 7000 B.C. to approximately A.D. 200 the Archaic era. Archaic sites are much more common than Paleoindian sites. Sizeable villages of pit houses, probably representing winter settlements of populations that dispersed during other seasons of the year, date from as early as the Keystone phase (4300-2500 B.C.). Sites with small numbers of pit houses become much more common during the late Archaic era. Corn was being grown as early as about 1000 B.C., as evidenced in sites such as Fresnal Shelter in Otero County.

The subsequent period from about A.D. 200 to approximately 1400 or 1500 is called the Formative or Ceramic era. Sherds of broken ceramic vessels are extremely durable and are key pieces of archaeological evidence of the Formative era. Ceramic era sites dominate the archaeological record of the region.

Archaeologists classify the Ceramic era sites in the Planning Area as reflecting the Mogollon culture. These sites in Otero County and eastern Sierra County are considered to be part of the

Jornada branch of the Mogollon. Sites in western Sierra County are part of the Mimbres branch.

A Jornada Mogollon village site and numerous images pecked onto boulders (petroglyphs) at Three Rivers in northern Otero County constitute one of the most spectacular archaeological sites on public land in the Planning Area. Other petroglyphs at Alamo Mountain, and clusters of Mogollon archaeological sites at the Jarilla Mountains, Rattlesnake Hill, and Lone Mountain, are other major archaeological resources on public land in the Planning Area. The Mogollon cultural system appears to have collapsed in the mid-1400s, or at least changed so drastically that it left an essentially invisible archaeological record.

Very little is known about the peoples occupying the Planning Area when the first Spanish expeditions passed through south-central New Mexico in the 1580s. By the late 1600s, various groups of Apaches moved into southern New Mexico and came to dominate this territory.

Spanish era settlement in New Mexico focused on the Rio Grande Valley well to the north of Sierra and Otero Counties. A major route of travel between Mexico and the New Mexican colony was developed along the Rio Grande at the end of the sixteenth century. The trail, known as the Camino Real or Chihuahua Trail, generally ran adjacent to the river, except for a 90-mile segment known as the Jornada del Muerto. Portions of this trail are on public land in Sierra County.

The Spanish waged campaigns against the Apaches throughout southern New Mexico, but did not settle in the region. The only Spanish settlement in southwestern New Mexico, dating from early in the 1800s, was at the Santa Rita Mine in what is now Grant County.

Mexico gained independence from Spain in 1821. Mexican agricultural settlement began expanding north from the El Paso area in the 1840s with the settlement of Dona Ana and Las Cruces in the Rio Grande Valley. At this time Mexico lost New Mexico to the United States as

a result of the Mexican War of 1846-1848, and the Gadsden Purchase was ratified in 1854. Remnants of the Cooke's Wagon Road, also known as the Mormon Battalion Trail, created during the Mexican War, are on public land in Sierra County.

The United States invested considerable military efforts to control the Apaches. Fort Thorn and Fort Craig were established in the Rio Grande Valley to the south and north of Sierra County in 1853 and 1854, respectively. In the late 1850s, native New Mexicans cautiously began to expand into the river valley between these forts in what is now Sierra County. Fort McRae, built in 1863 near where Elephant Butte Reservoir is now, provided additional protection, but the Civil War diverted military efforts against the Apaches. Southern New Mexico was part of the Confederacy for about a year from mid-1861 through mid-1862.

By the beginning of the 1870s, relations with the Apaches shifted from hostilities to reciprocal trade and many Apaches were relocated to reservations. The Mescalero Reservation, which is partly in northeastern Otero County, was established in 1873.

Remnants of the "upper route" of the Butterfield Trail, a U.S. Army-protected travel route used prior to August 1859, are on public land in southern Otero County.

Although some discoveries of gold and silver ore were made somewhat earlier than the 1870s, mining in the Planning Area was not seriously pursued until the Apaches were controlled. Discovery of gold and silver in the 1870s and 1880s led to the establishment of numerous mining communities in this area, including Winston, Chloride, Kingston, Hillsboro, and Lake Valley. Lake Valley suffered boom and bust cycles and is essentially a ghost town today, as are virtually all of the mining communities founded in the Planning Area during the nineteenth century. Lake Valley is partially on public land and BLM manages the site for heritage tourism.

Ranching is another major theme of historic Euro-American settlement in the Planning Area, although large-scale cattle ranching dates only from the 1880s, when railroads arrived in the territory.

During World War II the Federal government purchased many large ranches in Otero County and converted them to military ranges. Some of the ranch headquarters abandoned at that time have been recognized as important properties representing the history of ranching. Military training and research remains a primary activity in much of Otero County.

The completion of Elephant Butte Dam on the Rio Grande in 1916 provided more stable agricultural water supplies. Agriculture, particularly the farming of cotton, alfalfa, vegetables, and pecans, along with military training and research, growing trade across the international border, and “Sun Belt” retirement dominate much of the local economy today.

3.15.2 Archaeological and Historical Sites

When the White Sands RMP (BLM 1986a) was prepared, it was estimated that fewer than 250 archaeological and historical sites had been recorded in Sierra and Otero Counties during survey of approximately 50 square miles. The extent of inventory represented only about two percent of the approximately 2,741 square miles of public land within those counties. These data suggested there is an average of almost five sites per square mile, and a total of more than 13,000 archaeological and historical sites on the public land within the Planning Area.

Fifty-one sites within the two counties are listed in the National Register of Historic Places; none occur on public land managed by the BLM. The BLM has been involved in cooperative efforts to list the Three Rivers Petroglyphs and the historic mining town of Lake Valley, but these nominations are not completed. In addition, the BLM has closed several areas to ORV use to protect cultural resources. These areas include the Rattlesnake Hills Archaeological District, Lone Butte, and Jarilla Mountains.

More than 550 archaeological and historical sites have been recorded during surveys conducted for BLM projects over the last 13 years. This is an average of more than 19 sites per square mile, which is almost four times higher than estimated in 1985. These numbers suggest that there could be more than 50,000 archaeological and historical sites on public land within Sierra and Otero Counties.

The New Mexico Cultural Resource Information System (NMCRIS) has information about approximately 2,200 cultural resource surveys conducted since 1930 within Sierra and Otero Counties. More than 1,560 of these surveys have been completed since 1985, with approximately 100 to 150 projects being completed annually since then for an average of about 130 projects per year. These data indicate that BLM projects constitute about 25 percent of the surveys that have been conducted annually within the Planning Area since the White Sands RMP was completed.

Information about the extent of field survey is available for about 2,190 of these projects (92 percent), and it is estimated that they encompassed about 1,130 square miles or approximately 10 percent of the Planning Area. More than 64 percent of the surveys recorded no archaeological or historical sites, but the others discovered an aggregate of 16,059 sites.

The largest surveys were conducted on military facilities in Otero County, including the McGregor Range, White Sands Missile Range, and Holloman Air Force Base. Lesser levels, but above average, of survey seem to be associated primarily with timber sales in the Sacramento Mountains. Few of the large surveys have been conducted on public land managed by the BLM. Although BLM projects account for about 25 percent of the projects conducted since 1985, they encompass only about 5 percent of the surveyed areas within the Planning Area. However, the BLM projects account for approximately 10 percent of the sites entered into the NMCRIS inventory since 1985. Accordingly, the average of about 19 sites per square mile on post-1985 BLM projects is somewhat higher

than the average of about 12 sites per square mile for all NMCRIS surveys. This average suggests there could be a total of approximately 130,000 archaeological and historical sites in the Planning Area. At the rate of survey since 1985, it would take about two centuries to complete the inventory of Sierra and Otero Counties.

In general, the number of recorded archaeological and historical sites correlates with the extent of survey. Therefore the lack of recorded archaeological and historical sites in many parts of the Planning Area does not necessarily mean there are no cultural resources present. Instead, it is much more likely to mean that little survey has been conducted in those areas, and when surveys are undertaken, archaeological and historical sites are likely to be found.

The cultural resource studies conducted in Sierra and Otero Counties, since the White Sands RMP was completed, have recorded more of the types of archaeological and historical sites identified in that RMP. The additional data have refined but not significantly modified the general outline of the cultural history of the region. The White Sands RMP included a map modeling the general variation in the distribution of archaeological and historical sites within the Decision Area. That model still reflects the current understanding of the general distribution of archaeological and historical sites, but is likely to be refined as survey data accumulate.

3.15.3 Traditional Cultural Places and Lifeway Values

No American Indian religious sites or traditional cultural places have been identified within the Planning Area. The Mescalero Apache Reservation is in northeastern Otero County and members of this Tribe visit the Three Rivers Petroglyphs and apparently regard it as a sacred place. The hot springs near Truth or Consequences may have been regarded as sacred by the Apache, but these springs do not appear to be part of contemporary sacred or religious practices for any American Indian group.

Other than the Mescalero Apache, the only other Federally recognized American Indian group residing in the immediate vicinity of the Planning Area is Ysleta del Sur Pueblo (Tigua Reservation) southeast of El Paso. The Tortugas and Piro-Manso-Tiwas are Indian/Hispanic communities in the Las Cruces area, but have not been Federally recognized as Indian Tribes. Other more distant groups may very well have traditional cultural interests in Sierra and Otero Counties.

In 1996, the BLM, in cooperation with the U.S. Forest Service, completed a cultural affiliation study for New Mexico and Arizona cultures in compliance with the Native American Graves Protection and Repatriation Act (U.S. Department of Agriculture, Forest Service, Southwestern Region 1996). The purpose of this study was to determine which American Indian groups might claim affiliation to human remains, funerary objects, sacred objects, and objects of cultural patrimony associated with archaeologically defined cultures. The three archaeological cultures relevant for Sierra and Otero Counties include the Jornada Mogollon (A.D. 200-1400), Upland Jornada Mogollon (A.D. 500-1450), and Upland Mogollon. No modern American Indian groups were definitely identified as culturally affiliated with either the Jornada or Upland Jornada Mogollon archaeological cultures. The Jornada Mogollon was identified as possibly associated with historic groups in northern Chihuahua that lost their cultural identity or possibly the Piro. The Piro were puebloan villagers who suffered from Apache raiding during the Spanish colonial era. Remnants of this group moved south with the Spanish when they were expelled by the Pueblo Revolt in 1680, and founded Ysleta del Sur Pueblo. The Hopi Tribe, Pueblo of Zuni, and Pueblo of Acoma were determined probably to be affiliated culturally with the Upland Mogollon culture.

3.16 PALEONTOLOGICAL RESOURCES

Sierra and Otero Counties include a broad diversity of geologic formations and structures.

The geology map prepared in conjunction with the MSA (Map MSA 5) shows the outcrops or exposures of 90 geologic units in the Planning Area (Anderson et al. 1997). These units are evidence of a long and varied geologic history. Section 3.5 of this document describes the general geology and stratigraphy of the Planning Area.

The geologic units in Sierra and Otero Counties range from almost two billion years old to the present (Table 3-13). Almost all fossils are found in sedimentary deposits. Sedimentary rocks form in marine and nonmarine environments and include sandstone, siltstone, shale, and limestone. The rocks of the Precambrian include a complex of gneiss, with metasedimentary and metavolcanic rocks intruded by granites. The formations of the Early Paleozoic include interbedded limestones, sandstones, and shales as well as conglomerates, quartzite, and dolomites. The formations represent approximately 320 million years and are characterized in New Mexico by widespread deposition of primarily marine sediments with invertebrate fossils. Early Paleozoic rocks (pre-Mississippian) crop out in southern New Mexico and are generally sparsely fossiliferous. Rocks of the Early Paleozoic crop

out along escarpments of the Sacramento, San Andres, Oscura, Organ, Caballo, and other mountains in southern Arizona. There have not been any confirmed reports of Cambrian vertebrates in New Mexico. A few heterostracan tesseræ were found in a glauconitic sandstone at the Virginia Mine in the northern part of the Sacramento Mountains in Otero County. The sandstone is believed to be part of the Cambro-Ordovician Bliss Formation. No Silurian vertebrates are known in New Mexico. There are several reports of Devonian vertebrates (bone beds with abundant ichthyoliths and conodonts) in the Sacramento Mountains. Fossil fish of the Pennsylvanian occur in the Sacramento Mountains. Vertebrate remains have been found in the Bursum Formation but also found in outcrops in Socorro County (Zidek and Kietzke 1993).

The Mesozoic Era is known as the Age of Reptiles, which included dinosaurs. Outcroppings of Triassic-aged rocks are very limited in the area. Although the Triassic Chinle and Moenkopi formations have yielded many fossils of all types, the localities have been in the northern part of the State (Hunt and Lucas 1993a).

**TABLE 3-13
GEOLOGIC TIME LINE**

Era	Period	Epoch	Millions of Years Ago
Cenozoic	Quaternary	Holocene	.01
		Pleistocene	2
	Tertiary	Pliocene	5
		Miocene	24
		Oligocene	38
		Eocene	55
		Paleocene	63
Mesozoic	Cretaceous		140
	Jurassic		205
	Triassic		240
Paleozoic	Permian		290
	Pennsylvanian		330
	Mississippian		360
	Devonian		410
	Silurian		435
	Ordovician		500
	Cambrian		570
Precambrian			4500+

SOURCE: American Geological Institute 1999

There are no Jurassic-aged rocks in southern New Mexico. Outcroppings are limited to the northern part of the State (Hunt and Lucas 1993b).

During the Cretaceous, New Mexico was at the western margin of an epicontinental seaway. A series of transgressive and regressive sequences moved the western shoreline of the seaway between western Arizona and northeastern New Mexico. The most extensive Cretaceous outcrops occur in northern New Mexico but there are exposures in portions of the Planning Area. In Sierra County, the McRae Formation has yielded skeletal remains of *Tyrannosaurus Rex*, *Alamosaurus*, *Ankylosauria*, and *Ceratopsidae* (Hunt and Lucas 1993c).

Cenozoic vertebrates have been found at several localities in Sierra and Otero Counties. Fossil vertebrates have been documented from the Palm Park Formation (Late Eocene) in the Caballo Mountains of Sierra County. The Miocene-Pliocene Santa Fe Group is exposed along both sides of the Rio Grande from Albuquerque to Las Cruces, and has produced diverse fossil fauna of mammals such as camels, gomphotheres (stegomastodons, mastodons), horses, antelope, and many more. There are several sites in the Palomas Formation near Cuchillo Negro Creek in Sierra County. Fossil mammals have been found in the Rubio Peak Formation in the northern Black Range near Winston in Sierra County.

The above is only a partial indication of the types of fossils that have been found in geologic units that crop out in Sierra or Otero Counties. Many areas have been unexplored and unsurveyed for paleontological resources.

3.17 RECREATION

There is a wide variety of recreation opportunities in the Planning Area including several State parks, White Sands National Monument, and National Forest system lands. State parks in the Planning Area include Elephant Butte, Percha Dam, Caballo Lake, and Oliver Lee. The BLM also manages portions of

the Tularosa River in Otero County for recreation. Four scenic byways are located within the Planning Area—Geronimo Trail, El Camino Real, Lake Valley Byway in Sierra County, and Sunspot Highway in Otero County. (Recreation resources are depicted on Map 3-10.)

There are many diverse opportunities for recreation, both dispersed and developed. Dispersed uses include hiking, camping, rockhounding, birdwatching, hunting, and ORV use over large areas encompassing most of the land in the Planning Area, independent of developed facilities. Typically these uses occur near the major population centers of Truth or Consequences and Alamogordo or in the various mountain ranges located in the Planning Area.

3.17.1 Recreation Sites

The only developed BLM recreation site in the Planning Area is the Three Rivers Petroglyph Site and Picnic Area in Otero County. The site contains more than 21,000 petroglyphs as well as a partially excavated and restored prehistoric village. Facilities include two self-guided interpretive trails, handicap-accessible bathrooms, picnic shelters, and a group shelter. The petroglyph trail is partially handicap accessible and includes a spotting scope for individuals unable to go farther along the trail to view the petroglyphs up close. Visitation varies between 25,000 to 28,000 visitors annually. Volunteer camp hosts reside on site. The entire area is now within the Three Rivers ACEC.

Although not a developed recreation site, the historic townsite of Lake Valley in Sierra County is becoming a tourist destination. It is located along the Highway 27 portion of the Lake Valley Backcountry Byway. Volunteer caretakers have resided on site since November 1, 1994. Facilities include a public restroom, water, and a self-guided interpretive trail. The Schoolhouse, which contains much of the original artifacts and furniture, has been restored and is open for visitation daily. Numbers of entries in the Schoolhouse visitor registry were 1,430 between November 1, 1994 and December 16, 1995; 1,936 in 1996; and 1,816 in 1997.

3.17.2 Off-road Vehicle Use

ORV use occurs throughout the area and can be characterized as either a method of transportation or as a direct recreation use. As a transportation category, ORVs are used to transport recreationists, such as hunters, to recreation sites. A small amount of this use occurs in the Planning Area. The second category, as a recreation use, includes motorcycle races and hill climbing. This type of use occurs near the population centers of Truth or Consequences and Alamogordo. Considerable ORV use occurs in the area known as Red Sands. This is approximately a 10-mile by 10-mile area on the west side of Highway 54, midway between Alamogordo and Orogrande. An annual enduro race, the Tarantula 100, normally draws between 150 and 200 contestants from several states. The staging area is the blow-sand-depleted section of Community Pit No. 7. The area receives an increasing amount of weekend use.

ORV use is subject to three levels of designations on public land—areas open to ORV use, areas limited to existing roads and trails, and areas closed to all ORV use. The majority of the Decision Area is open to ORV use. Areas classified as closed or limited to using existing or designated roads are described in Continuing Management Guidance in Chapter 2.

3.18 VISUAL RESOURCES

The Planning Area is located within the Colorado Plateau physiographic province (Fenneman 1931) generally in the south-central portion of New Mexico, in Otero County to the east and Sierra County to the west. This province is subdivided further into province sections including the Datil (Sierra County), Mexican Highland (Sierra and Otero Counties), and Sacramento (Otero County) sections (U.S. Forest Service 1989). The Planning Area is generally bounded on the southeast by the Guadalupe Mountains, on the west by the Black Range Mountains, and on the north by the Jornada del Muerto Wilderness Study Area (WSA). The Sacramento and San Andres Mountains occur within the central portion of the Planning Area.

A more detailed description of the province sections that are within the Planning Area is provided in the MSA.

3.18.1 Landscape Character

Within the Planning Area seven landscape character types were identified—volcanic formations, escarpments, foothills, mesas, riparian areas, alkali flats, and developed areas. These landscape character types were identified through analysis of major landform characteristics, and all occur within the sections mentioned above, Datil, Mexican Highland, and Sacramento. Landscape characteristics within the Planning Area are described in the MSA.

3.18.2 Scenic Quality

Scenic Quality Class A areas are associated with escarpments, volcanic formations, and riparian areas. Areas considered to be of Class A scenic quality within the Planning Area include the Sacramento Escarpment, intrusive formations of the Cornudas Mountains, and riparian areas identified in the Tularosa watershed, Three Rivers, and along the Rio Grande.

Scenic Quality Class B areas are associated with foothills and open mesas. Within the Planning Area foothill areas along major travel routes and Otero Mesa were rated Class B.

Scenic Quality Class C areas are associated with alkali flats and developed areas. Within the Planning Area major population centers were rated Class C.

3.18.3 Sensitive Viewpoints

Highly sensitive viewpoints within the Planning Area were inventoried as a component of either residential communities; parks, recreation areas, ACECs, and WSAs; travel routes; and significant cultural sites.

3.18.4 Distance Zones

Distance zones are established based on perception thresholds. Perception of form, line, color, and texture changes as distance from a

viewpoint becomes greater. Landscape elements tend to become less obvious and detailed at greater viewing distances. The elements of form and line become more dominant than color or texture at longer viewing distances. The BLM's Visual Resource Management (VRM) system utilized the following distance zones to evaluate the potential visibility when matrixed with contrast:

- Foreground – the limit of a viewed area in which details are perceived and obvious. Textural and other aesthetic qualities are normally perceived within this zone (0-0.25 mile to 0.5 mile).
- Middleground – the zone in which details of foliage and fine textures cease to be perceptible. Vegetative patterns begin to appear as outlines or patterns (0.25-0.5 mile to 3-5 miles).
- Background – those portions of the landscape where texture and color are weak and the landforms become the most dominant elements (3-5 to 15 miles).

3.18.5 VRM Classes in Context of BLM's Decision Area

The inventory of visual resources in BLM's Decision Area and the development of VRM classes were completed for Sierra County in 1977 and for Otero County in 1980. Each VRM class was determined through a matrix, which combines scenic quality, visual sensitivity, and distance zones. BLM VRM Classes in the Planning Area are shown on Map 3-9.

There are five ACECs that have visual and scenic value. The Sacramento Escarpment ACEC was established for the purposes of protecting and enhancing visual resources. The Sacramento Escarpment offers outstanding opportunities for visitor solitude, opportunities for a primitive type of recreation, and the presence of historical and biological amenities add supplemental values. The other ACECs with visual values are Three Rivers Petroglyph Site,

Cornudas Mountain, Wind Mountain, and Alamo Mountain.

Within BLM's Decision Area all scenic ACECs are within a VRM Class I designation and include portions of the Sacramento Escarpment ACEC, Cornudas Mountain ACEC, Wind Mountain ACEC, and Alamo Mountain ACEC (BLM 1997b). These ACECs are closed to leasing.

Within the Decision Area the two WSAs are within a VRM Class II designation and include the Jornada del Muerto and Brokeoff Mountains WSAs. Additionally, areas along I-25 and the Rio Grande (T. 13 S. to T. 18 S.), areas within the Tularosa watershed, Nutt Mountain (Sierra County), along the Sacramento Escarpment, in the area of Bent, and along SR 70 are within a VRM Class II designation.

Within the Decision Area the majority of land that occurs along interstates and State highways is within a VRM Class III designation. The Three Rivers ACEC is a VRM Class III designation.

Within the Decision Area the majority of seldom seen areas along travel routes is within a VRM Class IV designation. Also, Alkali Lakes ACEC is within a VRM Class IV designation.

3.19 SPECIAL MANAGEMENT AREAS

The Decision Area contains several BLM special management areas including WSAs, ACECs, and McGregor Range. Since all of these areas have been closed to fluid minerals leasing and development previously (refer to continuing Management Guidance in Chapter 2 for the authority under which each is closed), only brief descriptions are provided below. Also, there are eight areas that have been nominated to become ACECs. All of the special management areas are shown on Map 3-10.

3.19.1 Wilderness Study Areas

The **four** WSAs located in BLM's Decision Area are the Brokeoff Mountains, **Guadalupe**

Escarpment, Jornada del Muerto, and **Sacramento Escarpment**. BLM manages a **fifth** WSA in the Planning Area, Culp Canyon, located within the boundaries of McGregor Range, which is not included in the analysis for this RMPA/EIS. The WSAs are characterized by a high degree of apparent naturalness and landscape diversity. **WSAs are managed as VRM Class II except those portions designated as scenic ACECs, which are managed as VRM Class I.**

WSAs are managed according to the Interim Management Policy and Guidelines for Lands Under Wilderness Review, BLM Handbook 8550-1, which is referred to as the Interim Management Policy or IMP (BLM 1995). These lands are open to multiple uses within the constraints of the IMP. These areas will be managed according to the IMP until they are either designated as Wilderness or released from wilderness study by the United States Congress.

3.19.2 Areas of Critical Environmental Concern

ACECs are designated by the BLM to recognize, protect, and manage unique or sensitive resources. There are six ACECs in BLM's Decision Area (and one within the boundaries of McGregor Range—McGregor Black Grama Grassland ACEC). These are all located within Otero County, and include Three Rivers Petroglyph Site, Sacramento Escarpment, Cornudas Mountain, Alamo Mountain, Wind Mountain, and Alkali Lakes ACECs. These areas tend to be characterized by the presence of cultural resource sites and/or opportunities for primitive recreation and wildlife observation.

3.19.3 Nominated ACECs

Eight areas in BLM's Decision Area have been nominated to become ACECs (BLM 1999b; Dunmire 1992). These nominations are based primarily on the presence of special status species. The nominated ACECs are listed below and shown on Map 3-8.

- Brokeoff Mountains Nominated ACEC has a full range of habitats occurring. Species include Guadalupe needlegrass (*Stipa curvifolia*), gray sibara (*Sibara grisea*), cliff nama (*Nama xylopodum*), and five-flower rockdaisy (*Perityle quiniqueflora*).
- Caballo Mountains Nominated ACEC **has the potential for several rare and/or sensitive plants occurring on public lands and the potential for unusual biotic communities.**
- Jarilla Mountains Nominated ACEC has a high-diversity cactus community (possibly the highest known diversity of cactus species in New Mexico). Also, there is a unique hybrid swarm of *Echinocereus X roetteri* var. *Roetteri*, a past (delisted) Federally listed endangered species.
- Mud Mountain Nominated ACEC has plants and habitat of Duncan's pincushion cactus (*Coryphantha duncanii*), a BLM-sensitive and U.S. Fish and Wildlife Service species of concern; the high plant diversity; and the specialized limestone plant communities in late seral status.
- Percha Creek Nominated ACEC has riparian habitat and a small igneous outcrop containing *Agastache cana* (a rare plant).
- Sacramento Mountains Nominated ACEC is to protect habitat and plants of *Hedeoma todsenii*, a Federally listed endangered plant, and associated plants spoonleaf rabbitbush (*Chrysothamnus spathulatus*) and threadleaf horsebush (*Tetradymia filifolia*), and also common button cactus (*Epithelantha micromeris*) and desert rose (*Rosa stellata*).
- Six Shooter Canyon Nominated ACEC is to protect habitat for Guadalupe mesquite (*Sophora gypsophila* var. *guadalupensis*). In addition, five flower rock-daisy (*Perityle quiniqueflora*) and Guadalupe needlegrass (*Stipa curviflora*) occur within the area.

- Pup Canyon Nominated ACEC includes two endemic species—the gypsum ringstem (*Anulocaulis leisolensis* var. *howardii*) and gypsum blazing star (*Mentzelia humilis* var. *Guadalupensis*)—as well as habitat for several endangered/sensitive species and a diverse cactus community.

3.19.4 McGregor Range

McGregor Range encompasses approximately 606,198 acres within Otero County that are owned by the Federal government and jointly managed by the U.S. Army and BLM. The majority of the acreage is public land that has been withdrawn from public use, and the remainder is Army acquired (fee-owned) lands or U.S. Forest Service land. McGregor Range is part of the Fort Bliss Training Complex and provides for military use, grazing, wildlife and habitat management, and recreation. McGregor Range is not included as part of this RMPA/EIS analysis. It is addressed in the McGregor Range RMPA (BLM 1990a) and the decisions documented in that RMPA will be carried forward.

3.20 SOCIAL AND ECONOMIC CONDITIONS

Otero and Sierra Counties are rural counties with per capita and household incomes that generally are lower than the State average. Public infrastructure and services are clustered in population centers such as Truth or Consequences and Alamogordo. The military is very significant to Otero County's economy, and retail and other services are important in both counties. Agriculture is not as important a job- or earnings-provider in either county. Tourism also is a factor in Sierra County, which contains several State parks.

3.20.1 Demographics

Selected demographic information is illustrated in Table 3-14. The population of Sierra County is

older than that of Otero County and the State as a whole. Table 3-15 indicates that population projections suggest positive but slowing growth over the next 30 years.

Both counties contain a majority of White residents, although the Hispanic population totals approximately a quarter of total residents. In comparison with New Mexico as a whole, Sierra and Otero Counties have disproportionately large White populations and smaller proportions of Hispanic populations. Sierra County has a small percentage of Black and American Indian, Eskimo, or Aleut residents compared to the State, whereas Otero County has a much larger percentage of Black residents than the average throughout the State.

Per capita income in both counties is lower than State median; Sierra County has a substantially lower household income than either Otero County or the State. When compared to the entire State, a greater percentage of Sierra County residents live in poverty while a smaller percentage of the more populous Otero County live in poverty.

The 1990 Census indicated that the population of rural portions of Otero County totaled 15,826 or 30.5 percent. In Sierra County, the rural population was 3,731 or 37.6 percent. The majority of each county's population is clustered within Alamogordo or Truth or Consequences.

The Mescalero Apache Indian Reservation is located within Otero County. The Tribal population is 3,619. There are 868 households on the reservation and an average household size of 4.17. The median family income is \$16,536 and unemployment has reached 43 percent, much higher than the county or State unemployment rate (Mescalero Apache Indian Tribal Office 1993).

**TABLE 3-14
SELECTED DEMOGRAPHIC INFORMATION**

	Sierra County	Otero County	New Mexico
Population	11,052	56,945	1,729,751
Race			
White	72.8%	60.4%	48.6%
Black	0.6%	5.8%	1.9%
American Indian, Eskimo, or Aleut	0.8%	6.0%	8.5%
Asian and Pacific Islander	0.2%	2.6%	1.1%
Hispanic	25.1%	23.1%	38.3%
Income			
Per capita income	\$16,956	\$15,479	\$18,814
Median household income	\$17,020	\$26,258	\$26,802
Percent of people of all ages in poverty	23.3%	17.4%	20.2%

SOURCES:

For demographic information: Regional Economic Information System 1997

For per capita income: Regional Economic Information System 1996

For median household income: U.S. Bureau of the Census 1993

For poverty information: U.S. Bureau of the Census 1995

NOTE: There may be some double counting of the Hispanic population within the percentages of races other than White.

**TABLE 3-15
POPULATION PROJECTIONS**

Year	Sierra County		Otero County		New Mexico	
	Population	Percent Change	Population	Percent Change	Population	Percent Change
1990	9,994	-	52,028	-	1,519,889	10.9
1995	10,685	7.5	55,027	5.8	1,686,299	8.0
2000	11,338	6.1	57,537	4.6	1,821,078	7.4
2005	11,926	5.2	59,472	3.4	1,956,725	6.8
2010	12,502	4.8	61,057	2.7	2,090,678	6.8
2015	12,972	3.8	62,700	2.7	2,232,424	6.8
2020	13,380	3.1	64,277	2.5	2,380,802	6.6
2025	13,729	2.6	65,481	1.9	2,534,964	6.5
2030	14,046	2.3	66,238	1.2	2,691,578	6.2

SOURCE: Bureau of Business and Economic Research 1997

With regard to environmental justice concerns, demographic information for population centers in each county suggests that many of the larger communities reflect racial and income characteristics of the counties as a whole. A notable exception, however, is the Mescalero Apache Indian Reservation including the towns of Mescalero and Tularosa. These areas constitute disproportionate percentages of minorities (American Indian and Hispanic), lower median incomes, and a higher percentage of the population with incomes below the poverty level.

3.20.2 Housing

Table 3-16 illustrates housing characteristics for both counties. Both counties have experienced an increase in housing units since 1980, although Otero's stock is growing at a rate faster than both Sierra County and the State as a whole. Home ownership rates within the counties are similar to the State rate. However, rental vacancy rates are notably higher than the State average and homeowner vacancy rates are slightly higher in Sierra County. The median value of both owner-occupied and rental units is notably lower in the counties compared to the State average.

**TABLE 3-16
HOUSING CHARACTERISTICS**

	Sierra County	Otero County	New Mexico
Housing Units			
1980	5,392	17,961	507,513
1990	6,457	23,177	632,058
Percent change 1980-1990	19.8%	29.0%	24.5%
Urban and Rural			
Urban			
Inside urbanized area	0	0	268,612
Outside urbanized area	3,618	14,546	185,952
Rural			
Farm	129	156	5,328
Nonfarm	2,710	8,475	172,166
Age of housing			
Median year structure built	1972	1971	1972
Occupancy/Vacancy			
Home ownership rate	73.3%	62.3%	67.4%
Percent occupied units with over 1 person per room	4.3%	5.5%	7.9%
Homeowner vacancy rate	5.6%	3.0%	2.3%
Rental vacancy rate	21.8%	16.1%	11.4%
Financial Characteristics			
Median value of owner-occupied units	\$49,500	\$58,000	\$70,100
Median value of renter-occupied units	\$186	\$291	\$312

SOURCE: U.S. Bureau of the Census 1990

3.20.3 Economic Activity

3.20.3.1 Sierra County

Mining activities were important in Sierra County at the turn of the century, after which government, tourism, and agriculture increased in relative importance to the economy.

Table 3-17 indicates that retail, health services, construction, and agriculture continue to be important job providers. The largest employers in Sierra County are local, State, and Federal governments.

Nearby tourist destinations include Elephant Butte Lake, Caballo Lake, and Percha Dam State parks. In addition, the historic El Camino Real crosses Sierra County, a trade and travel route first used by Coronado in 1581. The White Sands Missile Range covers the eastern half of Sierra County.

3.20.3.2 Otero County

Historically, Otero County served as a source of timber resources. The railroad system and Alamogordo Lumber Company were established in Alamogordo, and were important to the establishment of a timber-based industry at the turn of the century (BLM 1986a). Since the late 1940s, the military has played a large role in Otero County's economy. Holloman Air Force Base develops research and testing programs, and is by far the largest employer within the County. The presence of military personnel and civilian employees also has permitted the development of healthy retail and service sectors within Otero County's economy. Table 3-17 indicates the importance of the military and retail as job providers within the County.

**TABLE 3-17
EMPLOYMENT CHARACTERISTICS**

	Sierra County		Otero County		New Mexico	
	Number of Persons Employed	Percent of Total Labor Force	Number of Persons Employed	Percent of Total Labor Force	Number of Persons Employed	Percent of Total Labor Force
Agriculture, forestry, and fisheries	270	8.3	607	2.5	20,485	2.9
Mining	57	1.7	29	0.1	15,559	2.2
Construction	336	10.3	1,473	60.0	46,703	6.6
Manufacturing, nondurable goods	27	0.8	170	0.7	18,111	2.6
Manufacturing, durable goods	88	2.7	1,175	4.8	35,053	5.0
Transportation	108	3.3	821	3.4	23,019	3.3
Communications and other public utilities	70	2.1	613	2.5	18,018	2.5
Wholesale trade	51	1.6	385	1.6	20,902	3.0
Retail trade	640	19.6	3,419	14.0	116,210	16.4
Finance, insurance, and real estate	208	6.4	779	3.2	33,651	4.8
Business and repair services	97	3.0	681	2.8	29,445	4.2
Personal services	134	4.1	1,047	4.3	23,238	3.3
Entertainment and recreation services	54	1.7	276	1.1	9,155	1.3
Public administration	246	7.5	2,368	9.7	49,242	7.0
Professional and Related Services						
Health	337	10.3	1,008	4.1	47,039	6.6
Educational services	193	5.9	1,710	7.0	64,577	9.1
Other professional and related services	101	3.1	1,343	5.5	58,865	8.3
In Armed Forces	7	0.2	4,453	18.2	14,874	2.1
Unemployment	235	7.2	2,097	8.6	54,888	7.8

SOURCE: U.S. Bureau of the Census 1990

3.20.3.3 Economic Activity on Public Land

Table 3-18 provides a recent example of the primary economic activities and revenue generated on public land within Sierra and Otero Counties. Grazing provides the greatest amount of revenue. Some mining has occurred, and sand and gravel have been the most lucrative mining activities to date. The potential exists for copper mining concerns; however, due to low copper prices, mining projects have not been operational. The revenue generated from fluid

mineral leasing in Fiscal Year 1997 occurred entirely within Otero County, and represents a very small percentage (0.5 percent) of the total mineral revenue dispersed to the State of New Mexico.

Hunting and other recreational activities including ORV use, camping, and sightseeing also occur on public land. Expenditures on retail and services within the local community constitute the primary economic impact of these activities.

**TABLE 3-18
ECONOMIC ACTIVITY ON PUBLIC LAND**

Economic Activity	Revenue, FY 1997
Minerals	
Sand and Gravel	\$19,687.56
Fluid Minerals Leases	\$93,188.60 dispersed to State (half of royalty value) (MMS 1997)
Copper	None
Grazing Leases	\$794,176.19 (649,915 AUM) McGregor Contracts: \$244,014.10
Wildlife (hunting-related expenditures)	Guides and Outfitters: \$6,664.60
Recreation	\$14,561.63
Right-of-way Issuance	\$69,207.62
Land Disposal	0

SOURCES: U.S. Department of the Interior, Mineral Management Services 1997; T. Hanley, personal communication, 1999

3.20.4 Fiscal

3.20.4.1 Sierra County

Reflecting its smaller population and economy, the County's government has a much smaller budget than its neighbor Otero County, with \$3.91 million in revenues and \$4.16 million in expenditures. Local taxes are the primary source of revenues, while general government and public safety account for the majority of expenditures.

The County is permitted by the State Property Tax Code to levy taxes up to \$8.85 per \$1,000 of assessed valuation for general governmental services other than the payment of principal and interest on long-term debt and in unlimited amounts for the payment of principal and interest on long-term debt.

3.20.4.2 Otero County

In Fiscal Year 1997-1998, total revenues amounted to \$13.34 million while expenditures totaled \$16.95 million. For property taxes in Fiscal Year 1997, the County billed 7.772 per \$1,000 of net assessed valuation of residential property and 11.320 per \$1,000 of net assessed valuation for nonresidential property. Intergovernmental transfers provided the largest share of County government revenues (\$5.90 million, or 44 percent) followed by various local taxes (\$4.19 million, or 31 percent). The principal cost centers for the County are law

enforcement and general government, accounting for three-fifths of total expenses.

3.20.5 Values, Beliefs, and Attitudes

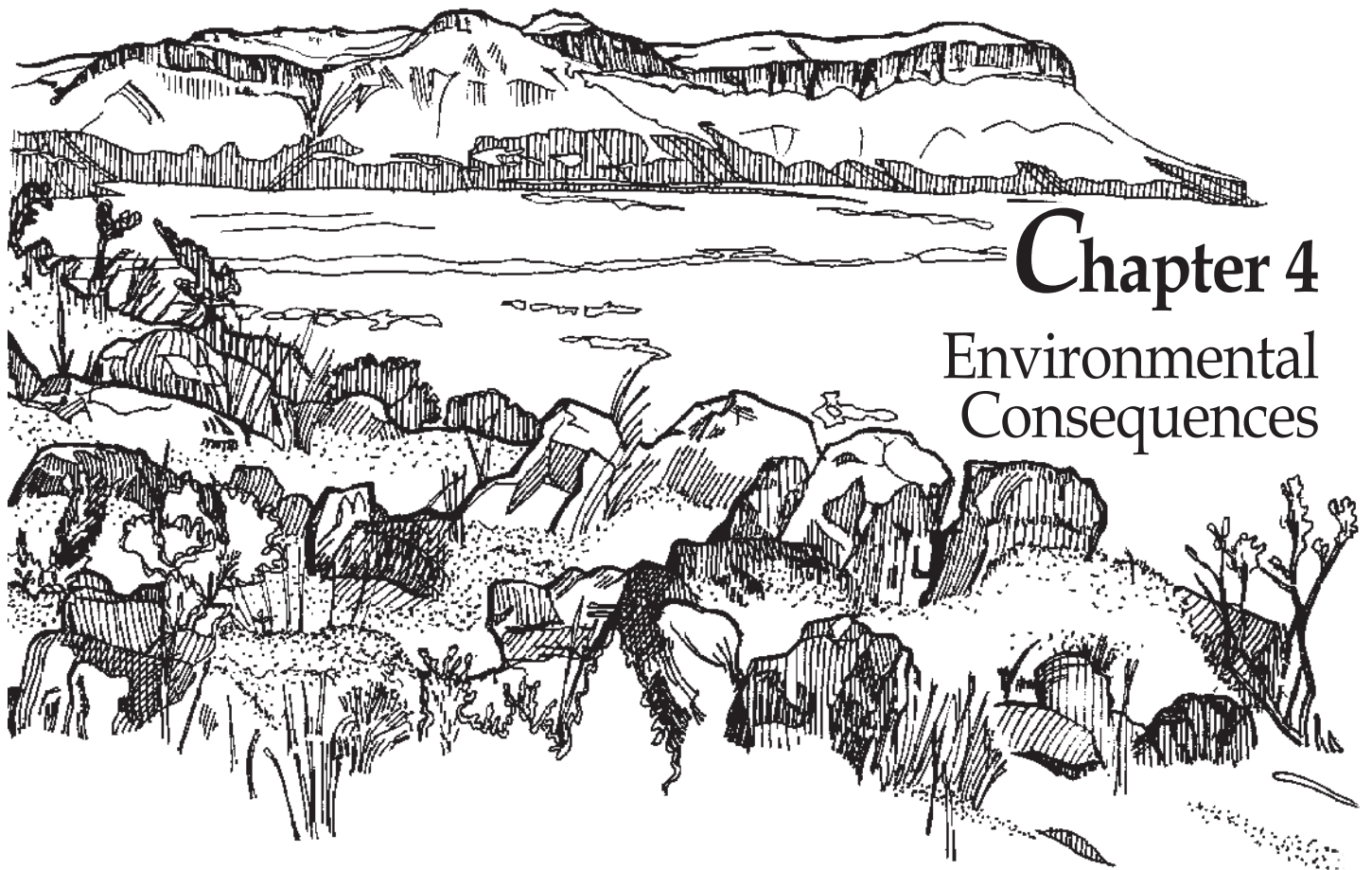
People's values, beliefs, and attitudes were expressed through the scoping process for the RMPA/EIS. The oil and gas industry emphasized the importance of the potential economic benefits to local communities. Some local residents agreed with this position and view fluid minerals leasing and subsequent activities as a potential job provider. Others questioned how close drilling would occur to homes, and expressed concern over potential noise and visual impacts that may lower property values. The Otero Comprehensive Plan also cites public opposition to growth as a possible constraint to economic development.

Ranchers who attended scoping meetings were concerned about potential impacts on grazing leases and groundwater. Environmental groups have raised the issues of potential adverse impacts on nonrenewable resources and habitat.

Previous documents have identified diverse groups within the two counties (BLM 1986a). Recreational users generally agree that public land should be available for a diverse set of uses including hunting, conservation, and ORV use that require access and sometimes solitude. Ranchers may feel that ranching and farming represent a significant sector (custom and

culture) of the human environment and also, as pre-existing uses, should have priority on public land.

Views expressed during public involvement activities subsequent to scoping are summarized in Chapter 5.



Chapter 4

Environmental Consequences

CHAPTER 4 – ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter describes the predicted consequences, or potential effects, on the environment of implementing **the Proposed Plan**, described in Chapter 2, in association with potential Federal fluid mineral activities (e.g., exploration, development, production, and abandonment). The chapter begins with a summary of the methods used for the impact assessment **and then** describes the **potential** impacts that could result from **the Proposed Plan**.

Using the information regarding the existing condition of the environment (Chapter 3), a description of fluid mineral activities, and the reasonable foreseeable development (RFD) projected for the Planning Area (Appendix A), the types of impacts that **the Proposed Plan** could have on the resources were identified and quantified only to the extent practical for this Resource Management Plan Amendment/ Environmental Impact Statement (RMPA/EIS). The inherent difficulty of a broad environmental impact statement is to describe potential impacts from a project action when exact locations of project sites are not known. In addition, frontier areas (new or incompletely investigated) or areas with low-to-medium potential for fluid mineral resources may lack more detailed analyses (e.g., probable locations, resource volumes) that are not feasible due to a lack of geologic data. It should be noted that no ground-disturbing activities would result directly from the **Proposed Plan** addressed in this document. Although the issuance of a lease grants rights that could result in surface-disturbing activities (unless the leasehold is 100 percent no surface occupancy), further site- and project-specific environmental evaluation is required prior to final approval of the activities (per 36 Code of Federal Regulations 228.107).

Impacts are defined as modifications to the environment, as it presently exists, that are brought about by an outside action. Impacts can be beneficial (positive) or adverse (negative), and

result from the action directly or indirectly. Impacts can be permanent, long-lasting (long term), or temporary (short term). In the case of this analysis, long-term impacts are defined as those that substantially would remain for the life of a project and beyond (approximately 20 to 30 years). Short-term impacts are defined as those changes to the environment during development or construction activities that generally would revert to preconstruction conditions (except for tree growth) at or within a few years of the end of construction. Short-term impacts may range from one to three years in duration. Impacts can vary in significance from no change, or only discernible change, to a full modification or elimination of the environmental condition. Throughout this analysis, emphasis was placed on lease stipulations that could be applied to areas that are sensitive to potential fluid mineral activities in order to mitigate or eliminate impacts.

4.1.1 Impact Types

The analysis includes three types of effects (see 40 CFR 1508.7 and 1508.8) as described below. *Direct effects* are caused by the action and occur at the same time and place. *Indirect effects* are caused by the proposed action and are later in time or farther in distance, but are still reasonably foreseeable. *Cumulative effects* result from incremental impacts of action when added to other past, present, and reasonably foreseeable future actions regardless of what person or agency (Federal or non-Federal) undertakes those actions. Reasonably foreseeable future actions consist of projects, actions, or developments that can be projected, with a reasonable degree of confidence, to occur within a defined time frame and that will impact the same, or portions of the same, resource. Because specific sites are not identified and addressed in this RMPA/EIS and the size of the Planning Area is large (nearly 7 million acres), it was not practical or economically feasible to describe all projects, actions, and developments within the Planning Area. Therefore, major past, present, and future

actions and their relation to potential fluid mineral activities are addressed generally.

The analysis of unavoidable adverse impacts, short-term versus long-term productivity, and irreversible and irretrievable impacts is incorporated into the discussions in Sections 4.2 and 4.3. If they are not discussed specifically, there are none.

In order to determine the vulnerability of resources to impacts, resources were evaluated in terms of the following general criteria:

- Resource significance—a measure of formal concern for a resource through legal protection or by designation of special status.
- Resource sensitivity—the probable response of a particular resource to project-related activities.
- Resource quality—a measure of rarity, intrinsic worth, or distinctiveness, including the local value and importance of a resource.
- Resource quantity—a measure of resource abundance and the amount of the resource potentially affected.

4.1.2 Reasonable Foreseeable Development

The RFD is a projection of the fluid mineral actions and activities, including development, that are likely to occur in the Planning Area over the life of the planning period, which in this case is 20 years. This projection includes the number, density, type of wells likely to be drilled, and the surface use requirements (to project the amount of surface disturbance). The RFD for oil and gas and geothermal resources is explained in Appendix A.

4.1.2.1 Oil and Gas Resources

A summary of the RFD for oil and gas resources is shown in Table 4-1.

Although location of future development is not assured, there is some information available. The recent gas discovery on Otero Mesa in southern Otero County suggests that location is likely to experience additional development. Map 3-3

indicates that medium and low potential for oil and gas are distributed throughout the Planning Area.

The timing of development is unlikely to occur evenly over time and multiple wells could be developed in a burst of activity in the same general area, with field development within a period of 2 to 5 years.

4.1.2.2 Geothermal Resources

Development over the next 20 years is expected to be on a small scale. In the RFD, it was assumed that over this period 2 temperature surveys of 30 wells each would be drilled. These drill sites would be located adjacent to existing roads and each site would disturb an area 25 feet by 25 feet. Five other various kinds of geophysical exploration permits would be approved. Most of these activities would be conducted along existing roads and trails and would involve minimal surface disturbance. Four test wells would be drilled and each would disturb an area of 1 acre and require an access road 1.5 miles long by 16 feet wide. Only one of the four test wells would be assumed to become a commercial greenhouse facility. The facility would require an area of 10 acres for development and 2 production wells (the original test well and another well). A total of approximately 27 acres would be disturbed from these activities.

Similar to oil and gas resource projections, the location of future geothermal development is uncertain. However, several areas of “high” potential for geothermal resources have been identified and are mapped (refer to Map 3-4). Within the Decision Area, these locations occur in the vicinity of Truth or Consequences, Hillsboro Arrey, and Derry in Sierra County.

**TABLE 4-1
TWENTY-YEAR PROJECTION FOR OIL AND GAS DEVELOPMENT¹**

Type of Action	Number of Actions on Federal Lands	Area Disturbed ²	Approximate Total Acres Disturbed	
			Short Term	Long Term
<i>Geophysical (miles)</i>	<i>5,000</i>	<i>On existing roads and trails and off-road (1 acre/mile)</i>	<i>5,000³</i>	<i>Minimal</i>
Frontier Wildcat Wells	39	Drill pads and access road	351 ⁴	101.4 ⁵
Appraisal gas wells (offsetting wildcat wells)	12	Drill pads, access road, pipelines, and power lines	108 ⁶	60 ⁷
Gas development wells	30	Drill pads, access road, pipelines, and power lines	228.6 ⁶	126.6 ⁷
Oil development wells	60	Drill pads, access road, and power lines	484.8 ⁸	268.8 ⁹
Gas production facilities	3	5 acres/site	15	15
Gas transmission pipeline (miles)	100	3.6 acres initial disturbance per mile, 2.6 acres stabilized per mile	360 ¹⁰	260 ¹⁰
Bulk oil storage facility	3	5 acres/site	15 ¹¹	15 ¹¹
Underground Injection Control (UIC) well	3	Drill pads, access road, and power lines	27 ¹²	15 ¹²
Total Acres Disturbed by Exploratory Drilling and Development			1,589.4	861.8

NOTES:

- 1 Not County-specific
- 2 Acreage estimates for each component from observed average disturbance in the Roswell/Carlsbad area as provided in Bureau of Land Management 1994 Appendix 18 unless otherwise noted.
- 3 **5,000 acres was the anticipated number of acres that could be disturbed during geophysical exploration (bold and italicized) and was used in assessing impacts as a potential associated action. However, geophysical exploration is not included in the RFD because (1) different from drilling and field development, surface-disturbing activities associated with geophysical exploration are very temporary and typically are minimally intrusive on the environment and (2) geophysical exploration requires a discretionary approval that is not associated with leasing and subsequent activities.**
- 4 Wildcat well - assume 6 acres (400 by 600 feet) for drill pad (including worker camp) and 3 acres per access road = 9 acres. The source of this assumption is recent drill pad requests from the Bennett Ranch Operators and assumptions based on historical data made in the Roswell/Carlsbad Resource Areas of the BLM (1994).
- 5 2.4 acres per well not reclaimed immediately for all but three of the rank wildcats. Three of the wildcats are assumed to develop into production wells, which result in 5 acres per well not reclaimed immediately.
- 6 Appraisal and development gas wells - assume 4.4 acres drill pad and access road for all wells, 4.6 acres for associated pipelines and power lines for all producing wells, which are assume to be economic (all appraisal wells and seven development wells per field). If a worker camp is needed, it is assumed that the one set up for the wildcat well can be used.
- 7 Production gas wells – 5 acres per producing well will not be reclaimed immediately. For the three wells per field that are assumed to be drilled but not economic, 2.4 acres per well are assumed not be reclaimed within a three-year period after initial disturbance.
- 8 Development oil wells – assume 4.4 acres drill pad and access road for all wells (20 wells per field), 4.6 acres for associated pipelines and power lines for only producing wells which are assume to be economic (16 producing wells per field). If a worker camp is needed, it is assumed that the one set up for the wildcat well can be used.
- 9 Production oil wells – 5 acres per well not reclaimed immediately. For the three wells per field that are assumed to be drilled but not economic, 2.4 acres per well are assumed not be reclaimed within a three year period after initial disturbance.
- 10 Gas transmission pipeline – 3.6 acres per mile (30 feet wide) and reclaim to approximately 2.6 acres (8 to 9 feet wide).
- 11 This facility could occupy the same acreage as the gas production facility or the UIC facility though the acreage for those facilities would increase. Therefore, for the purpose of estimating surface disturbance, all facilities are assumed to be separate.
- 12 UIC wells - assume a similar amount of acreage for drilling the well and constructing the facility as a production well (9 acres per well). Assume each well is reclaimed to 5 acres per well for long-term impacts.

4.1.3 Mitigation Planning

This assessment took into account the rules, regulations, guidelines, and best management practices or techniques that would apply generally to all proposed projects and stipulations that would be attached to leases (Chapter 2, **Appendices B and D**). In addition, as mentioned above, further site- or project-specific environmental evaluation is required at the time of an Application for Permit to Drill (APD). Any measures to mitigate impacts identified at that time would be attached to the APD as conditions of approval. The impacts remaining after considering and incorporating the above are considered residual, unavoidable impacts.

4.2 IMPACTS OF THE PROPOSED PLAN

The following sections provide descriptions of the issues associated with each resource, types of impacts from fluid minerals activities that have the potential to affect resources, **and** potential impacts that could result from **the Proposed Plan**.

Potential impacts on the various resources from oil and gas activities are addressed in Section **4.2.1**. To facilitate the discussion and narrow the focus geographically, the Planning Area was divided into four geographic areas. These areas generally correspond to the hydrologic basins shown on Map 3-6 including the Salt/Pecos

River Basins, Tularosa Basin, Jornada del Muerto Basin, and Rio Grande/Mimbres/Gila River Basins. It was assumed for the purpose of this analysis that the RFD could occur generally anywhere on Decision Area lands that are open to leasing within each basin. For other resources, it was not appropriate or necessary to discuss the resource by basin but, rather, a general discussion for the alternative was deemed sufficient.

Potential impacts on the various resources from geothermal activities are addressed in Sections 4.2.2. The discussion of geothermal resources focuses geographically on the area where the potential for developing geothermal resources is high and open for leasing; that is, the Rio Grande/Mimbres/Gila River Basins.

As explained in Chapter 2, the **Proposed Plan** represents a modification of existing management direction. **The Proposed Plan** incorporates legislative and regulatory requirements and/or management objectives that likely would be specified on a case-by-case basis under existing management.

Table 4-2 summarizes the approximate acres by basin of surface lands that are closed or open to leasing with stipulations or standard lease terms and conditions. Also, the table summarizes the total acres of Decision Area lands within each basin area and acres overlying Federal fluid minerals.

**TABLE 4-2
CONSTRAINTS IN THE DECISION AREA BY BASIN
(approximate acres)**

Constraint	Basins			
	Salt/Pecos River	Tularosa	Jornada del Muerto	Rio Grande/Mimbres/Gila River
Closed to Leasing				
Nondiscretionary closure	45,288	4,275	4,333	1,931
Discretionary closure	13,274	11,134	0	5,688
Open to Leasing				
No surface occupancy	12,373	8,992	1,928	17,234
Controlled surface use	162,314	127,358	2,280	227,973
Standard lease terms and conditions	513,328	158,368	269,374	465,553
Total acres	746,577	310,128	277,915	718,379
Total acres overlying Federal minerals	745,272	309,135	277,691	714,190

4.2.1 Oil and Gas

4.2.1.1 Lands and Access

Issues

In general, issues associated with lands that were identified during scoping focused on potential impacts on private property. Specific issues included the distance of potential fluid minerals development from existing residential and commercial uses, and potential impacts on cattle grazing operations and existing fence lines. In addition, private property in split estate situations was a concern. The development of Federal mineral rights in these situations may lead to land use conflicts if a private landowner is unaware of the severed mineral rights underlying **their** property. Split estate parcels in which the surface is managed by another Federal or State agency may require coordination in order to comply with existing land use plans and policies.

Access was identified as an issue regarding the siting and number of new roads that would be required by fluid minerals development. According to existing Bureau of Land Management (BLM) guidelines and public comments from scoping, it is desirable to use existing access roads to the greatest extent possible. Other access-related issues include road construction and traffic associated with fluid minerals development, the potential for an increase in accidents, and trespassing onto private property.

General Impacts

Types of potential impacts on lands and access were identified for the following situations:

- Those areas where direct impacts are related to physical restrictions and loss of land. Uses with the potential to be impacted directly include grazing and recreation activities that occur on public land. Grazing and recreation impacts are addressed in later sections of this chapter.
- Those areas where indirect impacts would include conflicts between fluid minerals development and residential or community areas related to the presence of truck traffic, dust, and noise.
- Those areas where cumulative impacts related to transportation and access could result from additional traffic volume and associated increase in traffic accidents.

The **Proposed Plan** potentially could have short-term and long-term effects on State Trust and private lands. However, the total number of acres disturbed in achieving the RFD is relatively small when compared to the total Federal mineral estate acreage (Table 4-3). The likelihood of leasing Federal minerals in a split estate situation is greatest within the Rio Grande/Mimbres/Gila River Basin (Map 3-6), where the majority of the Federal mineral estate acreage underlies primarily privately owned surface area.

TABLE 4-3
SPLIT ESTATE BY HYDROLOGIC BASIN
(approximate acres)

Split Estate Acres	Basin				Total
	Salt/Pecos River	Tularosa	Jornada del Muerto	Rio Grande/Mimbres/Gila River	
Private Land	91,910	42,033	5,189	212,314	351,446
State Land	6,342	3,062	568	5,098	15,070
Total	98,252	45,095	5,757	217,412	366,516

SOURCE: Bureau of Land Management database 1998c

NOTE: Refer to Map 3-6 and Section 4.2 for a description of hydrologic basins.

No physical displacement or significant indirect impacts (dust, noise) are expected to occur in larger residential or community areas. Incorporated cities, towns, and villages are nondiscretionarily closed to leasing under all of the alternatives.

Military lands and National Park Service lands (outside of BLM's Decision Area) are nondiscretionarily closed to leasing in all of the alternatives. Other concerns include the White Sands Missile Range Safety Evacuation Zone, old Air Force bombing and gunnery range, and Recreation and Public Purposes Act (R&PP) patents and leases.

Impacts on utilities or other right-of-way concerns are not expected as a result of the construction and operation of **fluid mineral** projects. Pipelines needed for fluid mineral production most likely would be located within existing utility rights-of-way or within road alignments associated with well development, in accordance with BLM guidelines.

Acres of surface disturbance that would result from access road development are estimated in the RFD. This is based on a conservative estimate of 3 acres per well, which may vary based on the ultimate locations of specific activities. The total activity in the RFD relates to an estimate of 432 acres disturbed by access development for oil and gas development over the short term. Over the long term, these impacts may be mitigated through the reclamation of the land and revegetation. However, once access roads are developed it may be desirable to maintain them, should ranchers and others who use public land want to use the new routes.

It is conceivable that existing access roads, which traverse a great deal of the Planning Area, would be used by the fluid mineral development industry, which would reduce the impacts of new surface disturbance. This is more likely in the case of wildcat well drilling. For appraisal and development wells, the need for more permanent access probably would result in the desire to establish more direct routes to well sites rather than collocating in existing corridors. Impacts associated with access development may include the increased fragmentation of habitat and removal of vegetation. The increase in traffic

along these routes may result in the introduction of noise and other human activity that may affect wildlife and/or nearby activities such as recreation. A more detailed discussion of these impacts is included in Section **4.2.1.9**.

Trips generated by each stage of fluid minerals activity (i.e., exploration, development, production, and abandonment) have been estimated based on previous oil and gas field development studies. Overall, impacts resulting from trips generated would be short term and largely associated with preproduction activities. For this RMPA/EIS, it is not possible to determine whether any variation would occur among the alternatives based on the specific well locations and roadways.

The closures of parts of US 54, US 70, and US 506 by the military may impact access to fluid minerals development locations for daily or emergency purposes, particularly in the Otero Mesa area. However, the schedule for closures is provided **by the military** in Otero County and is available to the public for use in alleviating potential delays. The impact of recurrent closures of these major arterials on access to specific project facilities should be considered during APD processing.

Tables 4-4 and 4-5 indicate that the greatest amounts of additional trips are generated by the project alternatives in the short term. The number of trips for well maintenance may be considered a maximum estimate since the number of maintenance trips may decline as a result of efforts to decrease operating costs. When distributed evenly over time (20-year planning time frame), the maximum short-term impact adds a total of 655 trips per year, or an average of less than two trips daily. Given the average daily traffic volumes described in Chapter 3 and even distribution of well sites within the Planning Area, it is anticipated that **fluid minerals development** would increase traffic volumes significantly. It is possible that the RFD **would** be realized as a cluster of development rather than an even distribution, which might result in the consolidation of trips in an area or shared use of roadways.

**TABLE 4-4
TRIPS GENERATED DURING WELL DEVELOPMENT**

Phase	Estimated Trips per Site
Well drilling	336
Well completion and testing	45
Wellsite facilities installation	31
Pipeline installation	181
Well maintenance	373 annual

SOURCE: BRW 1998

**TABLE 4-5
TOTAL TRIPS GENERATED BY RFD**

Activity	Number of Actions on Federal Lands	Total Estimated Trips
Frontier wildcat wells	39	13,104
Well completion and testing	39	1,755
Production wells (facilities installation)	16	496
Transmission pipeline	2 sites, 75 miles	150
Well maintenance (production wells)	16	5,968 annually (approximately 16 trips daily)*

SOURCE: BRW 1998

NOTE: * It was assumed that one truck would be used for maintenance on multiple sites, so the number of vehicles on the road is not necessarily reflected.

Impacts by Basin

Salt/Pecos River Basins

Under the **Proposed Plan** a total of approximately **58,562** acres (about **8** percent) of BLM's Decision Area within this basin area would remain closed to leasing. Approximately **12,373** acres (**2** percent) would **remain** open to leasing **but** with a stipulation for no surface occupancy. Approximately **162,314** acres (**22** percent) of BLM's Decision Area would be managed as open to leasing with stipulations **to** control surface use. Approximately **513,328** acres (**69** percent) would continue to be managed as open to leasing with standard lease terms and conditions.

Considering the small percentage of Decision Area land that is closed to leasing (**8** percent) and constrained with a stipulation for no surface occupancy (**2** percent) and the area surface disturbance projected for the RFD is less than 1 percent, overall impacts on the ability to

explore for or exploit fluid minerals are expected to be minimal.

Tularosa Basin

A total of approximately **15,409** acres (**5** percent) would be closed to leasing. Approximately **8,992** acres (**3** percent) would be open to leasing with a stipulation of no surface occupancy. **Approximately 127,358 acres (41 percent)** would be managed as open to leasing with stipulations **to** control surface use. The **majority of BLM's Decision Area, 158,368 acres (51 percent)**, would be open to leasing with standard lease terms and conditions.

Considering the small percentage of Decision Area land that is closed to leasing (**5** percent) and constrained with a stipulation of no surface occupancy (**3** percent) and the area of surface disturbance projected for the RFD is less than 1 percent, overall impacts on the ability to explore for or exploit fluid minerals are expected to be minimal.

Jornada del Muerto Basin

A total of approximately **4,333** acres (2 percent) would be nondiscretionarily closed to leasing. **Approximately 1,928 acres (less than 1 percent)** would remain open to leasing, but with a stipulation for no surface occupancy. Approximately **2,280** acres (less than 1 percent) would **remain** open to leasing with stipulations to control surface use. The remaining **269,374** acres (97 percent) would be open to leasing with standard lease terms and conditions.

Considering the small percentage of Decision Area land that is closed to leasing (2 percent) and constrained with a stipulation for no surface occupancy (less than 1 percent) and the area of surface disturbance projected for the RFD is less than 1 percent, overall impacts on Decision Area lands are not anticipated to be significant. However, the **potential for evacuation** associated with the White Sands Missile Range Safety Evacuation Zone, which is within an area estimated to have a medium potential for oil and gas resources, may have an effect on industry's decision regarding leasing and development.

Rio Grande/Mimbres/Gila River Basins

A total of approximately **7,619** acres (1 percent) within this basin area would be closed to leasing. Approximately **17,234** acres (2 percent) would **remain** open to leasing but with a stipulation for no surface occupancy. Approximately **227,973** acres (32 percent) would be managed as open to leasing with stipulations to control surface use. The remaining **465,553** acres (65 percent) would **remain** open to leasing with standard lease terms and conditions.

Considering the small percentage (1 percent) of Decision Area lands are closed to leasing in this basin area and 2 percent would be constrained with no surface occupancy and the area of surface disturbance projected for the RFD is less than 1 percent, overall impacts on Decision Area lands or on the ability to explore for or exploit fluid minerals are expected to be minimal.

4.2.1.2 Minerals

Issues

During scoping, the public expressed concern that the development of fluid minerals might increase the potential for land subsidence. As described below in **General Impacts**, removing the fluids from within the rock formations typically would not affect land subsidence like the removal of hard rock minerals. The oil and gas industry is concerned that other resource concerns would limit their ability to explore for and develop oil and/or natural gas. While the geothermal industry has not expressed a similar concern, the same issue of potential limitations is possible.

General Impacts

The potential for the RFD to affect natural seismic activity in the area during any phase of a project's activities is minimal, as is the potential for natural seismic activity to affect RFD activities. The New Mexico Bureau of Mines and Minerals has reported that some earthquakes in southeastern New Mexico may be related to oil and gas activities; however, normal petroleum activities typically would not affect land stability. Maps of seismic risk for the United States indicate the location of the Planning Area to be at the lowest seismic hazard risk although other areas of the Rio Grande Rift from Socorro to Albuquerque have the highest seismic hazard risk in New Mexico (U.S. Geological Survey [USGS] 1997).

A discussion of potential impacts common to all of the evaluated alternatives by project phase follows.

Preliminary Exploration Investigations

No exploration-related impacts on geological/mineral resources are expected within BLM's Decision Area.

Construction Phase

No specific construction-related impacts on geologic or mineral resources within the

Decision Area were identified. Potential impacts on health and safety such as high formation pressure and hydrogen sulfide can be predicted or evaluated based on knowledge of geological formations that are to be encountered during drilling.

Production Phase

Production of oil and natural gas from one geologic formation would not affect the recovery of oil and/or natural gas from other geologic formations. The production of natural gas and oil under **the Proposed Plan** is a beneficial irretrievable commitment of the resource as the produced natural gas or oil no longer would be available for future use. The amount of oil, gas, or heat produced would vary depending on the number of wells drilled in the field and the ability to recover the resource.

Geothermal resources are considered a renewable resource, as the heat source is not mined, but rather, groundwater is used to transfer the heat (the resource) to the surface. The removed groundwater can be reinjected or naturally recharged to be used again to retrieve the heat. The amount of geothermal production and the lifetime of the project would be dependent on the end use of the heat rather than the resource.

Oil and gas and geothermal activities could be located in parts of BLM's Decision Area where **other mineral resources** are mined or potentially could be mined. Geothermal activities also could be located in areas favorable for hard rock mining. However, the production of natural gas, oil, or geothermal resources is not expected to be a significant impact on the other minable mineral resources within the Decision Area. The long-term areal extent of the RFDs (e.g., the acreage affected) for petroleum and geothermal activities is small relative to the Decision Area. After abandonment of the facilities and wells, exploitation of the other minerals still can occur.

Although subsidence has occurred as a result of water production in some areas of the country, subsidence in the Decision Area from fluid mineral or groundwater withdrawal associated

with either petroleum or geothermal activities is unlikely because the production zone typically occurs at a significant depth and/or the geologic units are relatively incompressible.

Abandonment Phase

In general, plugging and abandonment of production wells is not predicted to result in any impacts on geological or mineral resources, but in fact would re-establish permanent vertical zonal isolation.

Impacts by Basin

Overall, the surface management constraints as well as required mitigation procedures and best management practices (refer to Appendix B) imposed by **the Proposed Plan** are not anticipated to significantly impact the ability to explore for or exploit oil and gas resources. Surface management requirements potentially may burden the project economics such that the project activities may be delayed (e.g., **compliance with visual resource management requirements, compliance with habitat management requirements**). Some surface management **requirements** are more financially burdensome to the operators, such as avoidance management that may require the use of directional drilling. The cost of the management requirements versus the anticipated revenue of the project may make the project infeasible. However, since BLM projects that the **constraints** imposed under **the Proposed Plan** most likely would be conditions of approval attached to APDs, the overall additional burden is not anticipated to be significant.

Many of the areas of **no surface occupancy** are small and the resource availability is not anticipated to be greatly affected. The feasibility and cost to reach the fluid minerals beneath these areas of **no surface occupancy** would be impacted. Depending on the depth to the resource and other stratigraphic and structural aspects influencing the drilling program of the well, directional drilling to reach the underlying fluid minerals may not be feasible due to technical issues or cost. The resulting impact of

the areas of **no surface occupancy** is project specific and cannot be fully evaluated in an EIS.

Salt/Pecos River Basins

No additional land would be closed to leasing under **the Proposed Plan**. Leasing stipulations would increase under **the Proposed Plan** by incorporating more controlled surface use, **but** approximately **69** percent of the public lands would be available for leasing under standard terms and conditions in **the Proposed Plan**). Overall, the constraints imposed under **the Proposed Plan** and most surface use requirements would not preclude the ability to explore for or exploit the oil and gas resources. Also, an area in T. 26 S., R. 18 E. does **have** the stipulation for no surface occupancy of the buffer zones around playa lakes and riparian area coalesce into an area where the ability to exploit potential oil and gas resources would be impacted, as the area is effectively closed. As not all playa or riparian areas were mapped for this assessment, other areas also potentially may be closed by coalescing areas with a stipulation for no surface occupancy after a site inspection. It is not anticipated that the overall ability of the industry to explore for or exploit oil and gas resources would be significantly impacted by the controlled surface use. **The stipulation to control surface use as it would be applied to the Otero Mesa desert grassland habitat area would not preclude the ability to explore for and develop oil and gas and achieve the RFD.**

Tularosa Basin

Under **the Proposed Plan**, approximately **5** percent of public land in this basin would be closed to leasing, which is not anticipated to impact the exploration and exploitation of oil and gas resources. Leasing stipulations would increase under **the Proposed Plan** by incorporating more controlled surface use **but** approximately **51** percent of the public lands would be available for leasing under standard terms and conditions in **the Proposed Plan**. The constraints imposed by **the Proposed Plan** as well as the surface use requirements are not anticipated to restrict the industries ability to

explore for or exploit oil and gas resources. Coalescing additional riparian/other wetlands/playa buffer zones with a stipulation for no surface occupancy is possible in this basin due to the incomplete inventory of the areas, but is not anticipated to impact the exploration or exploitation of oil and gas resources.

Jornada del Muerto Basin

No lands additional to those closed under existing management would be closed to leasing under **the Proposed Plan**. Leasing stipulations would increase under **the Proposed Plan** by incorporating more controlled surface use, **but 10** percent of the public lands would be available for leasing under standard terms and conditions in **the Proposed Plan**. The constraints imposed by **the Proposed Plan** as well as the surface use requirements are not anticipated to restrict the ability to explore for or exploit oil and gas resources. Coalescing additional riparian/other wetlands/playa buffer zones with a stipulation for no surface occupancy is probable in this basin due to the incomplete inventory of the areas, but is not anticipated to impact the exploration or exploitation of oil and gas resources. As stated above, the **potential for evacuation** associated with the White Sands Missile Range Safety Evacuation Zone, which is within the area estimated to have a medium potential for oil and gas resources, may have an effect on industry's decision regarding leasing and development.

Rio Grande/Mimbres/Gila River Basins

Approximately 1 percent of the public land in this basin would be closed to leasing under **the Proposed Plan**. Leasing stipulations would increase under **the Proposed Plan** by incorporating more controlled surface use (**32 percent**), but approximately **65** percent of the public lands would be available for leasing under standard terms and conditions. **Overall**, these additional surface use requirements are not anticipated to restrict the ability to explore for or exploit the oil and gas resources. **The stipulation to control surface use as it would be applied in the Nutt desert grassland habitat area would not preclude the ability to**

explore and develop oil and gas and achieve the RFD. These surface use requirements likely would have been specified as conditions of approval on APDs under existing management.

4.2.1.3 Soils

Issues

Issues associated with soils include concerns regarding damage to land and soil erosion resulting from fluid minerals exploration, development, and production. Another exists where fluid mineral activities affect soils on steeper slopes, typically greater than 30 percent.

General Impacts

Impacts on soils from fluid minerals activities include both short-term and long-term impacts. Short-term impacts typically occur during the preliminary investigations, construction, and abandonment (reclamation). Impacts continuing beyond construction and into production are long-term and potentially permanent. Potential short-term direct impacts on soil resources include localized compaction, temporary loss of prime farmland, increased soil erosion, mixing of soil horizons, and contamination of soils from various pollutants. Unless mitigated, short-term direct impacts may result in indirect or long-term impacts on soils.

Indirect impacts include accelerated soil erosion, loss of topsoil, and increased sedimentation in streams from runoff following rainfall or snowmelt. Increased sedimentation may affect aquatic habitats, fisheries, and domestic drinking water supplies, clog irrigation systems, and degrade the aesthetic attraction of streams. Increased wind or water erosion of unstabilized, disturbed soils may result in the loss of topsoil and reduced soil productivity, also affecting the revegetation potential of those soils. Areas of prime farmland may be impacted by the conversion of agricultural production acreage to uses associated with project actions.

The following sections briefly describe impacts from fluid mineral activities that may result in losses of soil resources or soil productivity.

Preliminary Exploration Investigations

Field activities related to exploration have the potential to produce short-term impacts on fragile soil resources. The most common impact **that may** occur is localized soil compaction and erosion due to the movement of exploration trucks and equipment across off-road terrain, especially in sloped terrain or fragile soils. Recent geophysical projects on Crow Flats have shown damage on low-angle slopes of 4 to 5 percent. Soils have a higher susceptibility to impact during periods of rain or drought. Soil compaction may lead to decreased short-term productivity and potentially to erosion if vegetation is affected. Potential long-term impact created by accelerated soil erosion due to increased wind and water erosion of disturbed fragile soils include loss of topsoil and increased sedimentation in streams.

Construction Phase

Construction of the drilling site creates the greatest potential for impact on soils. As with the preliminary investigations, soils are more susceptible to impact during periods of rain or drought. Construction activities generally include the installation of a lease access road, well pad grading, and fluid reserve pit excavation. Predicted short-term impacts on fragile soils due to development includes increased or accelerated soil erosion, loss of topsoil, loss of prime farmland, and compaction. The use of petroleum-based drilling products or spillage of petroleum fuels has the potential to contaminate soils immediately around the drill site. Soil erosion may accelerate when vegetation is removed or damaged by compaction in areas disturbed by heavy equipment. Especially in sloped terrain areas, soil erosion also may accelerate in high traffic areas of the well pad, along access roads, or on portions of the well pad that have not been properly graded.

Specific areas of slope instability or failure have not been identified in the Planning Area; however, the potential for instability typically exists where slopes are greater than 30 percent. Steep slopes are present in Sierra County along the Fra Cristobal Range, Caballo Mountains, and San Andres Mountains. In Otero County, the potential for slope instability or failure includes areas along the Sierra Blanca, Sacramento Mountains, Brokeoff Mountains, and Guadalupe Mountains. Because surface disturbance on slopes in excess of 30 percent typically are avoided where possible, project activities would have minimal effect on slope stability. Where such disturbances cannot be avoided, mitigative measures implemented to reduce erosion and protect watershed resources typically are specified for the well/drilling site in the Surface Use Plan of Operation and approved by the BLM through the APD authorization process.

Potential long-term impacts include loss of topsoil, mixing of soil horizons, and impacts on subsurface soils resulting from the introduction of produced formation brine into unlined or leaking reserve pits. Mixing of soil horizons may occur due to improper soil stockpiling of the soil profile during the development of the drill pad and reserve pits.

Production Phase

Production activities potentially impacting soils include continuous use of the lease access road and areas immediately adjacent to the wellhead. Production phase impacts potentially would be long term as areas of the well pad and access road are maintained for vehicular traffic, resulting in periodic compaction. When the production is dry gas with no associated fluid, potential impacts on soils resulting from well production can include compaction, accelerated erosion, and loss of prime farmland. Associated fluid production or oil production increases the potential for spills/leaks from produced water and/or petroleum fluids (condensate or oil) storage and handling. On-site produced water disposal also could impact soil resources through increased erosion where water is discharged or from leaks and spills from on-site evaporation

ponds. Leaks and spills of concentrated brines from evaporation ponds can impact the soil productivity in the short term and potentially in the long term. If flares are used, the area of the flare pit is susceptible to impacts on productivity.

Soils sustaining prime farmland, inclusive of nonirrigated areas, are shown on Map 3-5. Irrigated prime farmland is present in areas where a reliable water resource has been developed. These areas include the Rio Grande Valley of Sierra County and in the Tularosa River Valley and Crow Flats in Otero County. Well pad and access road development could remove some prime farmland from production for the life of the well (10 to 30 years), and potentially permanently. Loss of prime farmland may affect local economic conditions.

Compaction of soils can inhibit natural revegetation and potentially agricultural revegetation of disturbed areas. Loss of topsoil and a decrease in soil productivity from soil layer mixing and compaction impacts the natural vegetation supported in the area, which in turn may affect forage and habitat for wildlife.

Abandonment Phase

Abandonment activities typically are conducted to restore or reclaim the resource that has been impacted during the drilling and/or production of the well. Reclamation activities include regrading and revegetating the previously disturbed site. Short-term impacts described as part of the construction phase are applicable during the abandonment phase of the project. Long-term impacts on soils are highly dependent on the reclamation success.

Impacts by Basin

The Proposed Plan reflects existing management that normally would be required to meet resource condition objectives to manage the soil resource. Soils management under **the Proposed Plan** includes a stipulation for controlled surface use in areas where highly erosive or fragile soils and slopes are present. Occupancy or use of highly erosive or fragile

soils would be considered and controlled on a case-by-case basis. On those soils that are on slopes greater than 10 percent, mitigation measures may be applied (e.g., waterbars, reseeding, pad design changes, etc.).

Salt/Pecos River Basin

Within this basin area, highly erosive and fragile soils are found west of the Brokeoff Mountains in an area that is open to leasing with a stipulation to control surface use; however, the area is estimated to have a low potential for oil and gas resources. Three watershed activity areas are located in this basin area: Moccasin and Otto Draw, Wind and Chess Draw, and a watershed east of Crow Flats. These areas are open to leasing with standard lease terms and conditions; however, travel within these watershed areas is limited to existing roads and trails. Known and potential prime farmlands are located in the Decision Area; however, if the entire RFD were to occur in an area of prime farmland, less than 1 percent of the prime farmland would be affected and would be reclaimed as wells are abandoned. Impacts on highly erosive and fragile soils and prime farmland are not anticipated to be significant.

Tularosa Basin

Although the majority of the highly erosive soils and known and potential prime farmland occurs within areas closed to leasing and outside of BLM's Decision Area, there are highly erosive and fragile soils located within BLM's Decision Area, mostly north of Alamogordo and known and potential prime farmland located south of Alamogordo. Two watershed activity areas occur in this basin: Three Rivers Watershed and a watershed east of Tularosa and south of Tularosa River. Under the Proposed Plan, these watershed areas are open to leasing with standard lease terms and conditions. Assuming that best management practices would be implemented and reclamation were successful, impacts on soils and prime farmlands would be minimal.

Jornada del Muerto Basin

No highly erosive and fragile soils were identified in BLM's Decision Area within this basin. Known and potential prime farmlands are located in the southern portion of the basin in an area estimated to have a medium potential for oil and gas resources. The area of known and potential prime farmlands is open to leasing with standard lease terms and conditions. Assuming that best management practices and (if needed) site-specific mitigation measures would be implemented and reclamation were successful, impacts on known and potential prime farmland would be minimal.

Rio Grande/Mimbres/Gila River Basins

Highly erosive and fragile soils are located primarily along the Rio Grande and the drainages emanating from the west and into the Rio Grande. Known and potential prime farmlands occur in association with these soils. Other smaller areas of concern occur to the east of the Rio Grande. The area west of the river is estimated to have a moderate potential for oil and gas resources. The majority of BLM's Decision Area in this basin area is managed as open to leasing with standard terms and conditions or a stipulation to control surface use. Assuming that site-specific mitigation measures would be implemented and reclamation were successful, impacts on soils and known and potential prime farmlands would be minimal.

4.2.1.4 Groundwater

Issues

The public expressed concern that the exploration and development of fluid minerals potentially may contaminate or deplete the scarce water resources of the Planning Area. Because water is scarce throughout the Planning Area, the perception that a new water user may be competing for the limited supply is of concern to current local water users. Additionally, due to the

water scarcity the potential for contamination is of concern.

General Impacts

Water needs of fluid minerals exploration and production are small, but due to the scarcity of water, impacts may result from the water requirements for drilling and development activities. Potential contamination impacts on groundwater resources may result during well drilling, waste management activities, and re-injection of produced water from fluid minerals development.

Impacts associated with the preliminary, construction, production, and abandonment phases of the project are described below.

Preliminary Exploration Investigations

Preliminary exploration activities typically do not encounter groundwater or require water to perform the activities. Therefore, no impacts on groundwater resources would occur during this phase.

Construction Phase

All alternatives would require water for well drilling and development, construction of roads, well pads, and dust suppression. The potential for impacts on groundwater quality would be limited to drilling, well development, and well testing activities.

Water requirements for a 5,000-foot water-based, mud-rotary-drilled well is approximately 168,000 gallons or 0.51 acre-foot (Burlington Resources 1999). In BLM's Decision Area, all groundwater is appropriated. The drilling and completion water needs for an oil and gas well typically would be purchased from already-appropriated water. However, a permit can be issued by the Office of State Engineer (OSE) for a water well within the declared basin without new appropriation if the amount of water does not exceed 3 acre-feet for a definite period not to exceed one year, and only if the State Engineer finds that the proposed use would not

permanently impair any existing water right (OSE 1995b). Therefore, in general, water wells for water used during the construction phase anywhere in the Planning Area can be drilled and pumped without a need for appropriation. Groundwater aquifers that produce water at rates less than 15 gallons per minute would not provide sufficient quantities of water for the construction phase without the use of storage tanks. A water supply well, if drilled to support oil and gas activities, often is turned over to the landowner, as appropriate with the State Engineer's rules and regulations of groundwater use (OSE 1995b).

Water quality requirements for the construction phase typically are less than 3,500 parts per million (ppm) total dissolved solids (TDS). Therefore, with the exception of the majority of the Tularosa Basin, the groundwater found in most of the basin deposits in the Planning Area would be of sufficient quality for use in the construction phase (see Management Situation Analysis, Map 12, Distribution of Dissolved Solids in Groundwater).

When drilling through sections of high-permeability rock, losses of drilling fluids may occur in the formation (these are called lost circulation zones). When drilling through shale formations, losses of such drilling fluids typically are minimal. Drilling fluid, which often is referred to as Amud,TM is a mixture of water, bentonite clay, and polymers. Drilling mud also may contain chemical additives such as caustic soda or barite in amounts to adjust the characteristic of the mud. Additives to drilling mud are controlled and are further diluted by the formation waters. Some minor loss of cement in the formation also may occur during the drilling process as lost circulation zones are plugged or during the cementing of the casings. Impacts on groundwater quality associated with drilling muds or cementing activities are restricted to the immediate vicinity of the well bore (within a few feet) and are not considered to be substantial because of the very small volume of groundwater that could be affected.

A majority of oil and gas wells are stimulated by a process that hydraulically fractures the targeted or producing formation from the well bore. Hydrofracturing is conducted to enhance the permeability of the formation in the vicinity of the well. Water and polymers are pumped into the well at high pressures causing the natural fractures to open and/or creating new fractures. Pressures are monitored to control and ensure that fracturing is maintained within the targeted formation. Sand or other propellant material is pumped into the well with the water and remains in the fractures after the hydraulic injection pressure is reduced, thereby holding the fractures open and increasing the effective permeability of the formation. Materials used to keep the fractures open are inert; therefore, no detrimental impact on groundwater quality would be caused by the hydrofracturing procedures.

The possibility of degradation of fresh water aquifers could result if leaks or spills occur from pits used for the storage of drilling fluids, or if cathodic protection wells associated with pipelines are installed in a manner that allows for the commingling of shallow surface aquifers. However, since impacts would occur only if the governing regulations fail to protect the resource, the impact is not quantifiable.

Production Phase

Oil and Gas: Production of an oil and gas well typically would not have a direct impact on groundwater resources. All oil and gas wells must have a casing and cement program that is planned and approved through the APD process in order to prevent the migration of oil, gas, or water from one horizon to another that may result in degradation of groundwater (43 CFR 3162.5). The surface casing must be set with sufficient cement to fill the annular space from the casing shoe to the surface and at sufficient depth to protect all usable water aquifers and provide adequate pressure control (Oil and Gas Order No. 2). Well casing programs also require isolation or coverage of oil and gas zones and any usable water sources. This requirement ensures that the interzonal flow of fluids behind the casing is minimized or precluded.

One potential impact of operation of an oil and/or gas well involves the associated gases. Both carbon dioxide and hydrogen disulfide are common associated gases of produced natural gas and oil. Carbon dioxide may cause corrosion by reacting with produced water to form carbonic acid. This condition may be precluded by sodium bicarbonate, which if present in produced water, may have a neutralizing effect on the acid. If corrosion is not monitored and corrected, the carbonic acid could corrode through the steel well casing. Once the acid is in contact with the cement in the annular space between the casing and the well bore wall, the cement would be dissolved and could form potential horizontal and vertical conduits within the annular space. Corrosion could provide a pathway for the natural gas and its associated gases to migrate into a groundwater aquifer. Methane is not a toxic substance, so it would not pose a health risk if ingested. However, methane within the aquifer could alter the aquifer to a reducing environment sufficient to encourage the production of hydrogen sulfide by anaerobic bacteria. Hydrogen sulfide is a toxic gas, and if present in sufficient quantities, it can present human health risks. Additionally, methane within the aquifer could preferentially migrate into the water well. If sufficient quantities of methane are present within a well or pumphouse, the methane could pose an explosive risk.

Mitigation and monitoring measures are used as standard practice in production wells to address this corrosive concern. Many operators treat for corrosion with active and batch chemical treatments, and some monitor for corrosion using coupons (pieces of metal, typically rectangular, of the same alloy as the casing) hung in the well.

As the conditions that would cause an impact are many and quite complex, it is not possible to quantify the impact. If a landowner's well is affected, the impact can be significant to the landowner; however, contamination is often localized. Based strictly on the potential lateral extent of the potential contamination, the regional impact on groundwater resources within the Decision Area would not be significant.

However, regardless of regional impact, any

exceedance in WQCC 20.6.2.3103 groundwater standards is a quantifiable impact on the groundwater in New Mexico. (All discharges from oil, natural gas, or geothermal installations that have the potential to contaminate groundwater are regulated by the New Mexico Oil Conservation Division [NMOCD] under the New Mexico Water Quality Control Commission [NMWQCC] regulations.)

Water requirements in the production phase of oil and gas production is minimal to nonexistent. Instead, water can be a waste product of the production. Typically, natural gas wells make little water and the water produced can be disposed through the use of evaporation ponds. Oil wells tend to make water, especially in the later portion of the well's life as oil production declines. Depending on the quantity of the water, it can be disposed on site or off site. On-site disposal may include release to a surface water feature if water quality is sufficient, or use of evaporation ponds. Off-site disposal can include the use of permitted UIC wells.

The potential for a disposal (UIC) well to impact groundwater quality is very low due to the casing and cement construction requirements in 40 CFR 146.22, which typically are met by filling all the annular space between the casing and the well bore with cement.

Injection of the produced water into a target zone with poorer quality than the produced water is consistent with BLM policy and the U.S. Environmental Protection Agency (EPA) UIC Permit Program (40 CFR Part 144). The formations used for water disposal must meet the following criteria:

- the aquifer does not currently serve as a source of drinking water
- the aquifer currently cannot, or will not in the future, serve as a source of drinking water because it is:
 - mineral, hydrocarbon, or geothermal-energy producing or can be demonstrated to contain minerals or hydrocarbons that, considering their

- quantity and location, are expected to be commercially producible
- situated at a depth or location that makes recovery of water for drinking water purposes economically or technologically impractical
- contaminated to an extent that it would be economically or technologically impractical to render the water fit for human consumption
- the TDS content of the groundwater is more than 3,000 milligrams per liter (mg/L) but less than 10,000 mg/L and it is not reasonably expected to supply a public water system

Disposing of produced water by injecting it into a deeper, poorer quality aquifer would result in a loss of the resource within the original aquifer and potential degradation of the resource. Once the produced water has been injected into the disposal reservoir, it could be more expensive to retrieve than it was in a shallower formation. Also, it would be more saline than it was in the original formation due to mixing with the poorer quality of the disposal reservoir. However, the loss of the water from the producing formation does not constitute a significant impact because this produced water is not a water source. If TDS concentrations within the produced water are less than 3,000 ppm, the water typically would be put to a beneficial use or released to a surface water system to naturally recharge the water cycle rather than be disposed.

Disposal of production water by injection would increase formation pressures locally and generally decrease salinity within the formation of injection. Since all disposal wells are designed for "well injection" of wastewater, the wells are subject to the permitting and regulatory control provisions of the Federal Safe Drinking Water Act's UIC Program (40 CFR Part 144). The NMOCD, with oversight of the EPA, administers and implements the UIC program in the Planning Area. A permit from the NMOCD is required prior to drilling a new well or recompleting an existing well. Injection pressures and volumes are monitored to ensure that potable aquifers are not affected adversely by injection of produced

water. Potential cross-contamination of groundwater supply aquifers from disposal wells is unlikely because of the required use of appropriate well construction (e.g., entire well bore cased and cemented), restrictions on injection pressures, completion of mechanical integrity testing, and completion of detailed monitoring of produced and injected water volumes.

Potential accidental spills of produced water or leaks from evaporation ponds could result in an impact on shallow groundwater. However, due to the probable low volumes of spilled or leaked materials and localized geographic extent of such spills or leaks, the impact is not anticipated to be significant.

Geothermal: Using water to convey geothermal heat to the surface requires a State-approved appropriation if the project is located within a declared groundwater basin. As an appropriation hearing would be conducted as part of the geothermal well permitting process, the impact of appropriation would not be considered significant if the well is permitted by the OSE. Additionally, any fresh water supply wells for the facility also would have to be permitted and the water allotted by the OSE.

Once the heat is removed, typically through the use of heat exchangers, the water is reinjected or released. The OSE encourages the beneficial use of this wastewater. All reinjection wells must comply with the UIC program, as described above. Any chemical treatments to discourage scaling or reduce corrosion within the heat exchangers would need to be neutralized or approved with the UIC program prior to reinjection.

Water production from geothermal production would not affect the supply potential of the shallow domestic and stock use aquifers of the Planning Area. Geothermal water quality is likely to have higher TDS and may have other associated gases such as hydrogen sulfide and carbon dioxide. The same potential impacts of producing and handling petroleum-related produced water, described above, apply to

geothermal-produced water. Geothermal waters would be expected to be of poorer quality than the first available groundwater; therefore, surface spills and leaks from a production/injection well could degrade water quality. However, the impacts would tend to be limited to the area of the geothermal production facility and, therefore, probably would not be significant to the groundwater system. The geothermal production facility is likely to need fresh water also. Therefore, the facility would have an added incentive to ensure the protection of the groundwater supply.

Degradation of the groundwater up to the limit of the standard of WQCC 20.6.2.3103 is allowed; however, no degradation of the groundwater beyond this limit is allowed. Any leaks or spills from a New Mexico Environment Department-regulated facility are required to be reported under WQCC 20.6.2.1203; while any leaks or spills from a NMOCD-regulated facility must report under the discharge notification requirements promulgated by the NMOCD. In either situation, if WQCC 20.6.2.3101 groundwater standards are exceeded for any constituent in first groundwater, the operator is required to abate groundwater pursuant to WQCC 20.6.2.4000 regardless of whether the impact is on a local or regional groundwater scale.

Abandonment Phase

Little potential exists for fluid migration between formations after injection and production wells have been plugged and abandoned. Present-day methods used for plugging and abandonment of oil and gas wells reduce the potential of leakage and/or migration of fluids after abandonment.

Impacts by Basin

Salt/Pecos River Basins

This area is underlain by a groundwater basin that was declared by the OSE in September 2000. Groundwater is found mostly in consolidated rock with TDS typically between 1,000 and 3,000 ppm. In all parts of the Planning Area a water supply

well typically can be drilled without requiring an operator to receive a water allotment. The permit application allows the OSE to review the water requirements to ensure that no existing water right is permanently impaired. Without this review, the water supply may be impacted. Depressed water levels were reported as early as the 1950s with the concern that increased depletion of the water reserves would decrease water quality (BLM 1999a). The annual recharge of the basin is estimated to be less than 100,000 acre-feet, which is still much greater than the 12.24 acre-feet/year estimated for the period of greatest development under the RFD (24 wells drilled/year at 0.51 acre-feet per well). Therefore, the impacts on groundwater resources are expected to be minimal.

Tularosa Basin

The area is underlain by high TDS groundwater (typically greater than 3,000 ppm) found in basin fill deposits. Fresher waters (less than 3,000 ppm), which can be used for stock or potentially domestic uses, can be found in the deep consolidated aquifers of the Otero Platform, Sacramento, and San Andres Mountains and typically are not underlain by Federal minerals. Most of the basin with Federal fluid mineral rights is closed to leasing due primarily to military lands (White Sands Missile Range and McGregor Range) and on lands open for leasing the groundwater TDS concentrations are high. Estimated annual recharge for the basin is only 5,000 acre-feet/year. While high TDS water may indicate that the water likely would not be degraded by project activities, the water probably would not be of sufficient quality to be used for drilling makeup water. Impacts on groundwater resources are expected to be minimal.

Jornada del Muerto Basin

Groundwater in this basin typically is shallow (less than 500 feet) with TDS concentrations between 1,000 to 3,000 ppm. This basin is considered a closed basin; that is, what flows

in does not flow out. Therefore, water quality could be highly susceptible to contamination. Annual recharge of the basin has not been estimated but occurs mainly by infiltration from flash floods in the arroyos. As the largest annual water need is only 12.24 acre-feet, the impact on the water supply is not expected to be significant. The closed nature of the basin with its relatively fresh water could be impacted by contamination, the extent of which would not be expected to be great; therefore, impacts on groundwater resources are expected to be minimal.

Rio Grande/Mimbres/Gila River Basins

Groundwater in this portion of Sierra County typically is shallow and of good quality (less than 3,000 ppm TDS). Water quality is slightly better in the Palomas Basin (typically less than 1,000 ppm TDS) than in the Engle Basin (typically less than 3,000 ppm TDS). Recharge is from flash floods in the mountain arroyos as well as infiltration from the Rio Grande and its associated reservoirs. The impacts on groundwater resources are expected to be minimal.

4.2.1.5 Surface Water

Issues

Issues identified regarding surface water include protection of surface water quality and quantity. Specific areas of concern are riparian and wetland areas, playas, and designated protected watersheds.

General Impacts

In general, direct impacts on surface water quantity or quality include sedimentation resulting from erosion during drill site, pipeline, and/or road construction or contamination resulting from spills. Indirect impacts may include contaminants migrating into the groundwater system and surfacing in the form of seeps or springs, or reduced flows due to water depletions.

Impacts on surface water resources identified for each phase of activity are expected to be the same but may vary in the degree of impact.

Preliminary Exploration Investigations

Impacts related to field exploration activities are expected to be localized and short term.

Decreased infiltration due to soil compaction by vehicle traffic and geophysical vibrosourcetrucks may lead to increased runoff, but the degree of impact on surface water is dependent on proximity to surface water bodies. Using existing stream crossings for vehicle traffic would minimize impacts on surface water resources.

Construction Phase

The magnitude of potential impacts on surface water quality and quantity is dependent on the (1) extent of surface disturbance, (2) hydrologic characteristics of disturbed areas, (3) runoff control measures, and (4) proximity of well pads and rights-of-way to surface water bodies and their drainages. Impacts on perennial streams and rivers also are dependent on the time of year due to seasonal flow considerations and the actual lifespan of the construction phase.

Water Quality: In general, direct impacts on surface water quality are related to the areal extent of surface disturbances associated with road or pipeline construction, and well construction. Well construction could affect surface water within the immediate vicinity of drill pads, whereas road, **power line**, or pipeline construction could affect surface water along the right-of-way corridors. These impacts generally would be localized and short term, and are related to accelerated erosion from storm events that occur when surface soil is exposed, such as during and after construction and earthmoving. Increased runoff and erosion also would have a detrimental impact on stream channels, leading to increased bank erosion, channel scour, and on- and off-site sedimentation.

The magnitude of impacts also is dependent on the time of year due to seasonal changes in

rainfall and snowmelt runoff, and length of time the soil is exposed. Runoff events occurring while surface areas are exposed have the potential to increase streamflow and sediment production. Increased flows would have a self-perpetuating effect on the sediment yield by increasing bank erosion and channel scour, and changing the shape and sinuosity of stream channels. Those sites located in well-vegetated areas can expect little or no erosion effects beyond the immediate vicinity of the site. However, many of the impacts from the installation of roads and culverts can be long term.

Potential indirect impacts on surface water quality are primarily dependent on the proximity of the construction site (e.g., drill pad) to receiving bodies of water. Increased sediment production, particularly from storm events or snowmelt runoff, presents the greatest potential risk to surface water quality. The predicted small areas of disturbance associated with individual well development and an enhanced buffer distance of the development site from surface waters would minimize potential impacts. In addition, implementation of best management practices would mitigate erosion and sedimentation impacts.

Potential direct impacts on surface water quality also could occur from accidental contaminant releases associated with machinery fuels, lubricants, and drilling fluids used during the construction phase. Small bermed ponds, which are often lined, are used to contain these fluids in the event of an accidental release, thereby reducing the potential for migration off the site.

Water Quantity and Use: Potential impacts on surface water resources also may occur as a result of depletions from water requirements for well drilling. All alternatives would require water for construction of roads, well pads, well drilling and development, and dust suppression.

The greatest water use would occur during the construction phase. Water is required for drilling, cleaning equipment, cooling engines, and other construction activities. The average amount of

water used to drill and complete a 5,000-foot well has been estimated to be approximately 0.51 acre-foot (Burlington Resources 1999). Under the RFD, expected water usage for both drilling and completion is not expected to exceed 12.24 acre-feet per year based on the maximum number of wells estimated to be drilled in any one year (24 wells drilled per year [7 wildcats and 17 development wells] at 0.51 acre-foot per well).

The primary water source is expected to be purchased from existing water allotments (surface and groundwater) or from a site-specific water supply well and would be trucked or pumped to the site. No significant impact on streamflow in ephemeral or perennial streams in the Planning Area is anticipated.

Production Phase

Potential direct impacts on surface water quality during production could be caused by accidental releases of produced inferior quality water. Although most produced waters are brackish to highly saline, some are fresh enough for surface discharge and/or use. If produced water is to be discharged to surface waters, it must meet water quality standards and have a separate permit from the EPA National Pollution Discharge Elimination System. Produced water, which cannot be directly discharged (e.g., brackish/saline or of poor water quality due to entrained hydrocarbons or other contaminants), is either evaporated from lined pits or transferred into temporary storage tanks prior to transport to off-site disposal (e.g., disposal well). Produced petroleum fluids (condensate or oil) also are commonly stored at the well site prior to transport. Water evaporation pits and water and petroleum storage and transfers present potential for surface water contamination through spills. Evaporation pits can be susceptible to leaks and possible breaching if not maintained or built to accommodate residual stormwater runoff from the site. Spills and leaks can impact surface water directly depending on proximity, or indirectly via stormwater runoff and/or groundwater interactions.

Produced water, if not disposed on site, will be transferred to a centralized disposal facility. The facility may be either a large evaporation pond or UIC well. Impacts on surface water are similar to those associated with the on-site storage and disposal facility, with the exception that the scale of leaks or spills may be larger. These disposal facilities are permitted with the NMOCD and the NMWQCC.

Any indirect impacts on surface water flow associated with withdrawal of water during production would require a hydraulic connection between the geologic formation from which water is produced and an ephemeral or perennial stream channel. Due to the anticipated depths of production, water quantity is unlikely to be affected by production from oil and gas or geothermal resources.

Abandonment Phase

Impacts from well abandonment would be similar to construction impacts and would result from grading and recontouring of disturbed areas associated with drill pads and access roads. Impacts would be mitigated using site reclamation **techniques prescribed specifically for each site**. After grading the area to a useful layout, restoring the landform as near as possible to its original contour, and using erosion control devices, the area would be reseeded to minimize erosion.

Site restoration and abandonment would adhere to standards and requirements of BLM and APD conditions of approval. Regulations require that production wells be filled with drilling mud and cement. Therefore, little potential exists for direct impacts on surface water from the flow of liquids or gases from within the wells.

Impacts by Basin

Salt/Pecos River Basins

Although the area of disturbance projected during development in the RFD is relatively minor compared to the total area of the Salt/Pecos River Basin, those areas where

perennial flow occurs are subject to the greatest potential impacts. The upper Sacramento River and the headwaters of the Rio Penasco represent the only perennial flow of consequence within this basin area. Piñon Creek drains the northern Salt Basin and terminates in Crow Flats. Scott Able Creek is a short stretch of perennial flow that joins the Sacramento River near its headwaters (BLM 1985b).

In general, to minimize impacts on wetlands associated with perennial streamflow and on playas, the operator would comply with Section 404 of the Clean Water Act and adhere to the stipulation of no surface occupancy within 0.25 mile of a riparian/other wetland/playa area. Additionally, the Wind and Chess Draw watershed area, Moccasin and Otto Draw watershed area, and the watershed east of Crow Flats already are protected partially through the limitation on travel to use of existing roads and trails. Based on protection of surface waters as provided by management direction, impacts within the Salt/Pecos River Basins are expected to be minimal.

Tularosa Basin

Areas of specific concern within the Tularosa Basin include all areas where perennial flow occurs. Within the Tularosa Basin perennial streamflow occurs in the upper reaches of Three Rivers although the most important stream is Tularosa Creek. Springs in the head canyons and tributaries in the northern Sacramento Mountains contribute to the flow of Tularosa Creek. Perennial flow occurs in the upper Three Rivers Canyon and in Indian Creek. La Luz Creek also is perennial, fed by springs along La Luz and Fresnal Canyons and tributaries north of Alamogordo. Alamo Creek flows to the Tularosa Basin from the Sacramento Mountains and Salt Creek drains the Malpais and the San Andres Mountains. The basin is intermontane and also contains many playas such as Lake Lucero.

Areas sensitive to additional degradation in water quality include perennial portions of Three Rivers from U.S. Highway 54 to the White Mountain Wilderness boundary, designated as “not supported” due to high conductivity and temperature probably from agriculture, and the Tularosa Creek from the town of Tularosa to the headwaters, designated as “partially supported” although the specific pollutant or threat is unknown.

In general, to minimize impacts on wetlands associated with perennial streamflow and on playas, the operator would comply with Section 404 of the Clean Water Act and adhere to the stipulation of no surface occupancy within 0.25 mile of a riparian/other wetland/playa area. Additionally, the Three Rivers watershed and the watershed east of Tularosa and south of the Tularosa River already are protected partially by limiting travel to existing roads and trails. Based on protection of surface waters as provided by management direction, impacts within the Tularosa River Basin are expected to be minimal.

Jornada del Muerto Basin

The Jornada del Muerto Basin contains all surface water flows within its boundaries. Although there are no perennial streams in the basin, it does contain many playas fed by stormwater runoff during the rainy season. Springs occur in the surrounding mountains but most yield only small quantities of unpotable water (Weir 1965).

Activities more likely to occur during the rainy season have the greatest potential to impact surface water quality or quantity within the Jornada del Muerto Basin. Potential direct impacts on surface waters include soil erosion and resulting runoff and sedimentation into receiving surface waters, as well as accidental releases of contaminants.

Based on protection of surface waters as provided by management direction and the lack of perennial flows, impacts on surface

waters within the Jornada del Muerto Basin are expected to be minimal.

Rio Grande/Mimbres/Gila River Basins

Those areas of specific concern within the Rio Grande/Mimbres/Gila River Basins include all areas where perennial flow occurs. In addition to the Rio Grande, a few perennial streams occur in the mountains, but in general the area is drained by ephemeral channels. The primary drainages to the Rio Grande emanate from the west and include Alamosa Creek, Cuchillo Negro Creek, Las Palomas Creek, Las Animas Creek, Seco Creek, and Percha Creek. Elephant Butte and Caballo Reservoirs (not in BLM's Decision Area) are maintained primarily to store irrigation water although the Elephant Butte Reservoir has a secondary function as a hydroelectric power producer.

In general, to minimize impacts on wetlands associated with perennial streamflow and on playas, operators would comply with Section 404 of the Clean Water Act and adhere to the stipulation of no surface occupancy within 0.25 mile of a riparian/other wetland/playa area. Based on protection of surface waters as provided by management direction, impacts within the Rio Grande/Mimbres/Gila River basins are expected to be minimal.

4.2.1.6 Air Quality

Issues

Air quality could be affected by activities associated with fluid minerals exploration, development, and production.

In particular, emissions of fine particulate (particles having diameter less than 10 microns, or PM₁₀) could create localized impacts that could exceed National Ambient Air Quality Standards, or similar standards promulgated by New Mexico. Proper quantification of PM₁₀ emissions is necessary for a specific proposed action, to determine whether these standards would be

jeopardized. However, for the type of developments considered in this RMP, the most substantial PM₁₀ impacts would usually be limited to construction phase activities, with far lower emissions occurring during the production phase.

During the production phase, the routine emissions of pollutants from natural gas and/or fluid mineral process equipment (e.g., hydrocarbons and sulfur dioxide), and internal combustion engines (carbon monoxide, nitrogen oxides, and sulfur dioxide) represent the probable causes of potential impact. The topography surrounding a project site also influences the extent of impact. Project sites surrounded by mountainous terrain likely would have higher local impacts due to pollutant transport to elevated areas than those in flat, open areas.

General Impacts

In general, impacts on air quality could result from fugitive dust from ground disturbance, emissions from equipment, release of underground gases, and well fires. Both the construction and use of roads and drill pads could contribute to the amount of carbon monoxide, nitrogen dioxide, PM₁₀, and small amounts of sulfur dioxide (sulfur is a trace element in diesel fuel).

Since it is not clear the location and extent of each specific activity that may occur in Sierra and/or Otero Counties, the emission factors presented in each of the following scenarios are general instead of actual pollutant concentrations. These emission estimates would be applicable for each specific activity throughout the two counties. Exact pollutant concentrations for specific activities at specific locations would not be known until atmospheric dispersion modeling has been performed. This modeling would incorporate dimensions, locations, frequency, and duration of proposed or existing activities. Such information is now available.

The following sections briefly describe **air pollutant emission factors, which could be used to predict potential impacts from fluid minerals activities. It should be recognized that individual fluid mineral development projects would have different levels of air quality impact. The potential air quality impacts associated with a particular proposed action would have to be assessed and disclosed during subsequent analysis. Appropriate analyses would include a review of construction phase impacts, production phase impacts, and cumulative air quality effects due to multiple projects that may occur in a given area.**

To the extent that fluid mineral development projects are sited in complex, or mountainous terrain, the air pollutant impacts would be accentuated. The types of emission sources associated with site preparation, well drilling, and ancillary activities are generally ground-level fugitive sources of particulate emissions. The pollutant releases from such sources can be transported directly to mountain slopes in the vicinity of the project by daily upslope wind flows as the afternoon temperature rises. As noted in the following discussion, there are a few measures that effectively can reduce fugitive dust emissions. For sufficiently large project, the requirements of existing New Mexico air permitting programs must be met. This often requires specific dust abatement measures, such as road watering, limits on vehicle speed, or application of dust palliatives.

Preliminary Exploration Investigations

Most of the activities associated with the preliminary investigation phase do not emit significant amounts of pollutants into the atmosphere. Aerial photograph and map review (topographic, geologic, seismic, etc.) activities generally are conducted prior to on-site visits **to define the study area and limit the range of off-road travel.** Vehicle travel along established roads and off-road is the main source of particulate emissions. In some cases, preliminary

investigations require small amounts of drilling and the use of explosives. These activities usually occur off established roads, incorporate more and larger vehicles, may require creating new roads, and, therefore, may cause greater emissions into the air.

The EPA's *Compilation of Air Pollutant Emissions Factors* (EPA 1999) AP-42 Section 13.2.2 Miscellaneous Sources, Unpaved Roads provides an equation to assess particulate emissions from vehicle travel on unpaved roads like those likely to be present in the study area. The following equation is used to estimate emissions per vehicle miles traveled:

$$E = k(5.9) (s/12) (S/30) (W/3)^{0.7} (w/4)^{0.5} (365-p/365)$$

E = emission factor in pounds (lb) per vehicle miles traveled (VMT)

K = particle size multiplier (dimensionless) – 0.36 for PM₁₀

S = silt content of road surface material (percent) C12 percent mean silt content for dirt rural roads

S = mean vehicle speed (miles per hour [mph])—mean speed assumed to be 35 mph

W = mean vehicle weight (ton)—mean weight assumed to be 2 ton (small) and 15 ton (large)

W = mean number of wheels assumed to be 4 (small) and 10 (large)

P = number of days with at least 0.01 inch of precipitation per year—average of 60 days per year across the Planning Area

$$E = (0.36)(5.9)(12/12)(35/30)[(2/3)^{0.7}][(4/4)^{0.5}](365-60/365)$$

E = 1.6 lb/VMT for small vehicles

$$E = (0.36)(5.9)(12/12)(35/30)[(15/3)^{0.7}][(10/4)^{0.5}](365-60/365)$$

E = 10.1 lb/VMT for large vehicles

The emission factor for particulates (PM₁₀) from unpaved roads from small vehicles (e.g., pickup trucks) is 1.6 lb/VMT. For drill rigs and significantly larger trucks the emission factor is 10.1 lb/VMT. The emission factor for large vehicles assumes a vehicle weight of 15 tons, vehicle speed of 35 mph, and 10 wheels. These emission factors would be used for vehicle travel

over unpaved roads for all activities in the study area.

Preliminary exploration activities for an envisioned development would be centered around a specific number of sites. Once a candidate development site is located and the equipment is positioned, then activities including site preparation, test bore drilling, geotechnical investigations, and sonic characterization of underground structure may be carried out. The air pollutant emissions from such actions are similar to, although of generally smaller magnitude than, the construction phase activities discussed in the next section.

If the preliminary investigation requires the use of explosives, the following emission factors would be used. Table 11.9-2 in Section 11.9, Western Surface Coal Mining presents a PM₁₀ emission factor for blasting of overburden of 0.52 lb/blast. Table 11.9-4 in Section 11.9, Western Surface Coal Mining presents a total suspended particulates (TSP) emission factor for drilling of overburden of 1.3 lb/hole drilled. The conservative assumption that TSP emissions equal the PM₁₀ emissions would be used.

Construction Phase

***Exploratory Drilling:* Air pollutant emission sources during exploratory drilling will be “fugitive” sources of particulate and PM₁₀, in that these emissions are not practically captured in a vent or stack and abated using control equipment. A diverse range of activities that would release particulates, including PM₁₀, would occur on a relatively limited scale compared to the construction phase. Activities during exploratory drilling would consist of creation of temporary dirt/gravel roads that can support drilling rigs and other equipment, clearing and preparation of a drill pad, and for larger efforts the placement of temporary water/drill mud storage tanks and crew housing. Supply and personnel vehicles also would use temporary roadways during the drilling**

activity and, thus would contribute to fugitive dust emissions.

Because of this diverse range of construction sources, particulate emissions during exploratory drilling, would be reasonably quantified using a generalized construction activity emission factor. The AP-42 Section 13.2.3 Miscellaneous Sources, Heavy Construction Operations provides information on emission factors to assess particulate emissions from road construction. The road construction emissions include demolition and debris removal (drilling, bulldozing, truck loading and unloading of debris, truck travel), site preparation (bulldozing, scrapers, truck loading and unloading), and general construction (vehicular traffic). A conservative emission factor for construction activity operations is 1.2 tons of TSP per acre per month. This emission factor is not applicable for PM₁₀ emissions, therefore PM₁₀ emission estimates, which are assumed to equal TSP emissions, would be conservatively high. This emission factor was derived using soils with moderate silt contents, a medium activity level, and a semi-arid climate. This emission factor is acceptable for use in the study area.

A typical exploratory well site may have average dimensions of 350 by 300 feet and may be as large as 600 by 600 feet. The reserve pit can be 200 by 200 feet, depending on drilling depth. An average site size is approximately 600 feet by 600 feet (approximately 8.3 acres). Using the conservative TSP emission estimate of 1.2 tons per month per acre, clearing and creating a well site would generate approximately 10 tons of TSP per month (30 days) of activity.

***Demolition and Debris Removal:* The air pollutant emissions associated with the construction of a fluid minerals development would be similar to those of an exploratory drilling activity, but usually be of larger scale. The initial site preparation would comprise of demolition of existing features, creating access to the resource, often by drilling and blasting of overburden, and removal of debris. As is typical of construction emission sources, these**

emissions would be considered fugitive sources.

Earthmoving equipment of various types (bulldozers, scrapers, end-loaders, etc.) would be utilized to prepare soil contours, and remove overburden after drilling/blasting.

Table 11.9-4 in Section 11.9, Western Surface Coal Mining presents a TSP emission factor for drilling of overburden of 1.3 lb/hole drilled.

Table 11.9-2 in Section 11.9, Western Surface Coal Mining presents a PM₁₀ emission factor for bulldozing of overburden of 0.75 lb/ton moved.

Each soil load picked up and deposited on a storage pile or haul vehicle represents a “batch drop” for which emissions are calculable using a standard emission factor correlation depending on the prevailing wind speed and moisture content of the material. Generally, these material handling emissions can be abated with water sprays, if a source of water is available near the project site. Emissions from movement of the haul vehicles can be estimated with the same generalized factors discussed for the preliminary exploration phase.

The truck loading and unloading emission factor comes from Section 13.2.4, Aggregate Handling and Storage Piles. The equation for material handling is as follows:

$$E = k(0.0032) (U/5)^{1.3}/(M/2)^{1.4}$$

$$K = 0.35 \text{ for PM}_{10}$$

U = mean wind speed (assumed to be 5 mph)

M = moisture content (7.4 for sand)

E = 1.8E-4 pounds of PM₁₀ emitted for each ton of material moved

The AP-42 Section 13.2.2, Miscellaneous Sources, Unpaved Roads provides an equation to assess particulate emissions from vehicle travel on unpaved roads. The emission factor for particulates (PM₁₀) from unpaved roads from small vehicles (e.g., pickup trucks) is 1.6 lb/VMT, **for larger haul vehicles (heavier than 15 tons gross vehicle weight) a suitable estimate for PM₁₀ is obtained by using 10.1 lb/VMT.**

The potential for significant air quality impacts for a proposed action would tend to increase as the distance increases that such haul vehicles must travel to dispose or utilize excavated material. For haul roads used in most large-scale earthmoving projects, State air quality permits are required. These permits stipulate control measures, such as limited vehicle speeds and/or road watering, to mitigate fugitive dust emissions.

Site Preparation: **The potential for air quality impact as a result of site preparation would depend on the size of the site, the quantity of material moved, and the distances that construction vehicles must travel over unpaved roads. The types of sources comprising this activity would include the same types of fugitive emissions described for demolition and debris removal, such as bulldozing of overburden and truck loading. An additional type of source would be a class of earthmoving equipment that levels the surface and shapes ground contours, generally termed “scrapers.” Emissions from such activities usually are mitigated, to the extent practical, by limiting vehicle speed and/or watering of the active work areas and unpaved roads.**

Accepted references provide different emission factors for bulldozing, scraper, and haul truck operations. The appropriate use of such factors to characterize the emissions from a given project requires sufficient detail about the normal operating pattern of the equipment; data needs would include the daily distances traveled and quantities of material moved. Table 11.9-2 in Section 11.9, Western Surface Coal Mining presents a PM₁₀ emission factor for bulldozing of overburden of 0.75 lb per ton moved. The AP-42 Section 11.9, Western Surface Coal Mining, Table 11.9-4 provides a TSP emission factor of 0.04 lb per ton for scraper unloading of topsoil. Table 11.9-1 in the AP-42 Section 11.9, Western Surface Coal Mining provides a PM₁₀ emission factor of 0.6 lb/VMT for a scraper in travel mode. Table 13.2.3-1 in the AP-42 Section 13.2.3, Heavy Construction Operation provides a TSP emission

factor of 20.2 lb/VMT for scrapers removing topsoil.

The truck loading and unloading emission factor is 1.8E-4 pounds of PM₁₀ emitted for each ton of material moved.

Field Development: In addition to the earthmoving for site preparation, well drilling, and related emission sources, development of a more permanent facility for fluid resource recovery likely would involve construction of a more permanent nature. This would include installation of processing equipment, such as dehydrators, heat recovery units, compressors, and condensers. Buildings and enclosures also would be part of a permanent field development. In general, the air emissions from facility construction are of lower magnitude than for site preparation, overburden removal, etc.

For each new production well drilled, the emissions presented above for exploratory drilling would be duplicated. The main difference between the wildcat well and the production well is that the drill pad for a **production well** may be smaller. The emissions from demolition and debris removal, site preparation, and general construction generally would be the same.

The AP-42 Section 13.2.2, Miscellaneous Sources, Unpaved Roads emission estimate for PM₁₀ from unpaved roads from small vehicles is 1.6 lb/VMT and 10.1 lb/VMT for vehicles 15 tons or heavier. The amount of vehicle traffic is assumed to remain moderate to heavy.

Production Phase

Production of fluid mineral resources in a developed well field involves process equipment at the surface to prepare the resource for transport to an end-use, generally via pipeline. For natural gas, the surface processing involves condensation of hydrocarbon constituents, dehydration to remove water, and a sweetening step if the gas is “sour” (i.e., containing acid gases such as

hydrogen sulfide). Air pollutant emissions from the processing equipment can be estimated using standard EPA protocol, and are generally proportional to the number of fittings required and the quality of maintenance to minimize leakage. Glycol dehydrators used to remove water from fluid mineral resources may have volatile organic compounds (VOC) emissions from fittings, valves, and process vents. The emission estimation methods for these types of sources are found in the EPA document *Protocol for Equipment Leak Estimation* (EPA Document No. 453/R-95-017, 11/95). At typical emission levels, the extent of the impacts is consistently limited to the near vicinity of the project site, because the hydrocarbon emissions are released near ground level as a fugitive source.

Gas or geothermal fluid “sweetening” is generally accomplished using amine solution scrubbers that absorb acid gases and reduced sulfur gases. The VOC and other gaseous emissions are generally insignificant from these processes. The hydrogen sulfide emissions must be tightly controlled to avoid toxic exposure risk. The amine solutions used have very low volatility, so are not readily emitted. If sufficient sulfur is recovered, then there may be a supplemental byproduct in the form of elemental sulfur. The sweetening plant may release sulfur dioxide as reduced sulfur compounds are oxidized during processing. These emissions may be quantified for a particular project using methods in EPA Document AP-42, Section 5.3 Natural Gas Processing.

Typically, the engines used to power the production facility will be large, diesel fueled, internal combustion engines.

AP-42 Section 3.4, Large Stationary Diesel and All Stationary Dual-fired Engines covers emission factors for diesel engines with more than 600 horsepower (hp), primarily used in oil and gas exploration and production. Table 3.4-1 presents gaseous emission factors for these engines. These emission factors are averages

using data from many manufacturers and duty cycles. The emission factors for diesel fuel generally are greater than those used for dual-fired engines so the diesel emission factors are used. The uncontrolled nitrogen oxide (NO_x) (assume 100 percent conversion of nitrogen dioxide [NO₂]) emission factor is 0.024 lb/hp-hr. The carbon monoxide [CO] emission factor is 5.5E-03 lb/hp-hr. The PM₁₀ emission factor is 0.0007 lb/hp-hr. The sulfur oxides [SO_x] (assume 100 percent conversion of sulfur dioxide [SO₂]) emission factor is (8.09E-03) x S, where S is percent sulfur in the diesel fuel.

Vehicular traffic would remain relatively constant, but generally at a lower frequency than during other well field stages.

For estimating the emissions from vehicle traffic on unpaved roads, it is recommended that the same emission factors be used as described for the preliminary exploration phase. An emission factor of 1.6 lb/VMT can be used for vehicles less than 15 tons gross weight, traveling at 35 mph or less, and 10.1 lb/VMT for large vehicles above 15 tons gross weight.

Abandonment Phase

Upon abandonment, if the land is to be reclaimed and recontoured, then the same construction activity emission factors should be used as described the for preliminary exploration phase.

When a well is abandoned, the well hole is filled with concrete and capped. There may be an increase in vehicle traffic due to additional cement truck traffic for a short time until the hole is plugged.

After the well has been plugged and capped, the well site is reclaimed. For surface reclamation, the TSP emission factor for overburden replacement from AP-42 Section 11.9, Table 11.9-4, Western Surface Coal Mine, 0.012 lb/ton would be used.

4.2.1.7 Noise

Issues

Noise sensitive receptors are land uses associated with indoor and/or outdoor activities that may be subject to stress and/or significant interference from noise. They often include residential dwellings, mobile homes, hotels, motels, hospitals, nursing homes, educational facilities, recreational areas, and noise-sensitive wildlife species. An appropriate noise environment is necessary to prevent activity interference and annoyance.

General Impacts

Noise impacts associated with fluid minerals development vary according to the activities and processes used in exploration, development, and production phases. Construction phase noise levels would be associated with access roads and well pad construction, drilling, installation of compressor equipment, and construction of pipelines. Production phase noise levels would be associated with well completion and dewatering and compressor engine operation. Other production noise would be associated with well workovers and maintenance operations involving a variety of equipment and vehicles. Produced water not directed to a pipeline gathering system would be trucked to off-site water disposal wells or permitted evaporation ponds resulting in additional vehicle trips and noise.

Preliminary Exploration Investigations

During preliminary geophysical investigations, noise impacts are anticipated to be minimal and short term.

Construction Phase

Impacts from construction would be temporary and result primarily from heavy equipment operation and vehicle traffic. Ambient noise levels would increase as a result of clearing, grading, and construction of pads and access roads. Rigging up, drilling, and rigging down

would generate noise at all well sites. Specific noise-generating activities would include hauling equipment and supplies to the well site, constructing rigs, drilling wells to the required depth, and removing drilling equipment. This work would generate noise from diesel-fired drilling rig engines, and noise from operation of drilling rig drawworks, such as braking.

Equipment may include truck-transported drill rigs, cement, pumps, water trucks, miscellaneous hauling and pick-up trucks, cranes, bulldozers, backhoes, and welding equipment. Construction traffic carrying materials and heavy equipment to well sites would cause a temporary increase in vehicular traffic noise on access roads. Well completion and testing also would generate noise. Operation of equipment for cementing well casing, fracturing the well, and flaring of gas at the surface during completion would produce noise as well.

Typical noise levels from construction equipment and oil and gas activity are presented on Figure 4-1 and in Table 4-6. The sound levels

shown are at a distance of 50 feet. Estimates of noise attenuation can be made by reducing noise levels by a factor of 6 dBA (A-weighted sound levels) for each doubling of distance. This is a logarithmic relationship describing the acoustical spreading of a pure undisturbed spherical wave in air. The actual noise levels experienced by a receptor depend on the distance of the receptor from construction activities, topography, vegetation, and meteorological conditions. Residences located within approximately 2,800 feet and in direct line-of-sight to exploration and development activities could experience noise levels in excess of the EPA's 55 dBA guideline (EPA 1974). Recreational areas located within approximately 500 feet and in direct line-of-sight to could experience noise levels in excess of the EPA's 70 dBA guideline (EPA 1974). However, only a small percentage of the land area within the Planning Area is occupied by noise sensitive receptors; therefore, the overall potential for noise impacts on sensitive receptors (Figure 4-1) is predicted to be low.

**TABLE 4-6
NOISE LEVELS ASSOCIATED WITH OIL AND GAS ACTIVITY**

Noise Source	Sound Level and 50 Feet*
Well drilling	83 dBA
Pump jack operation	82 dBA
Produced water injection facilities	71 dBA
Gas compressor facilities	89 dBA

SOURCE: Woodward-Clyde 1988 Raw noise data. Portland, Oregon.

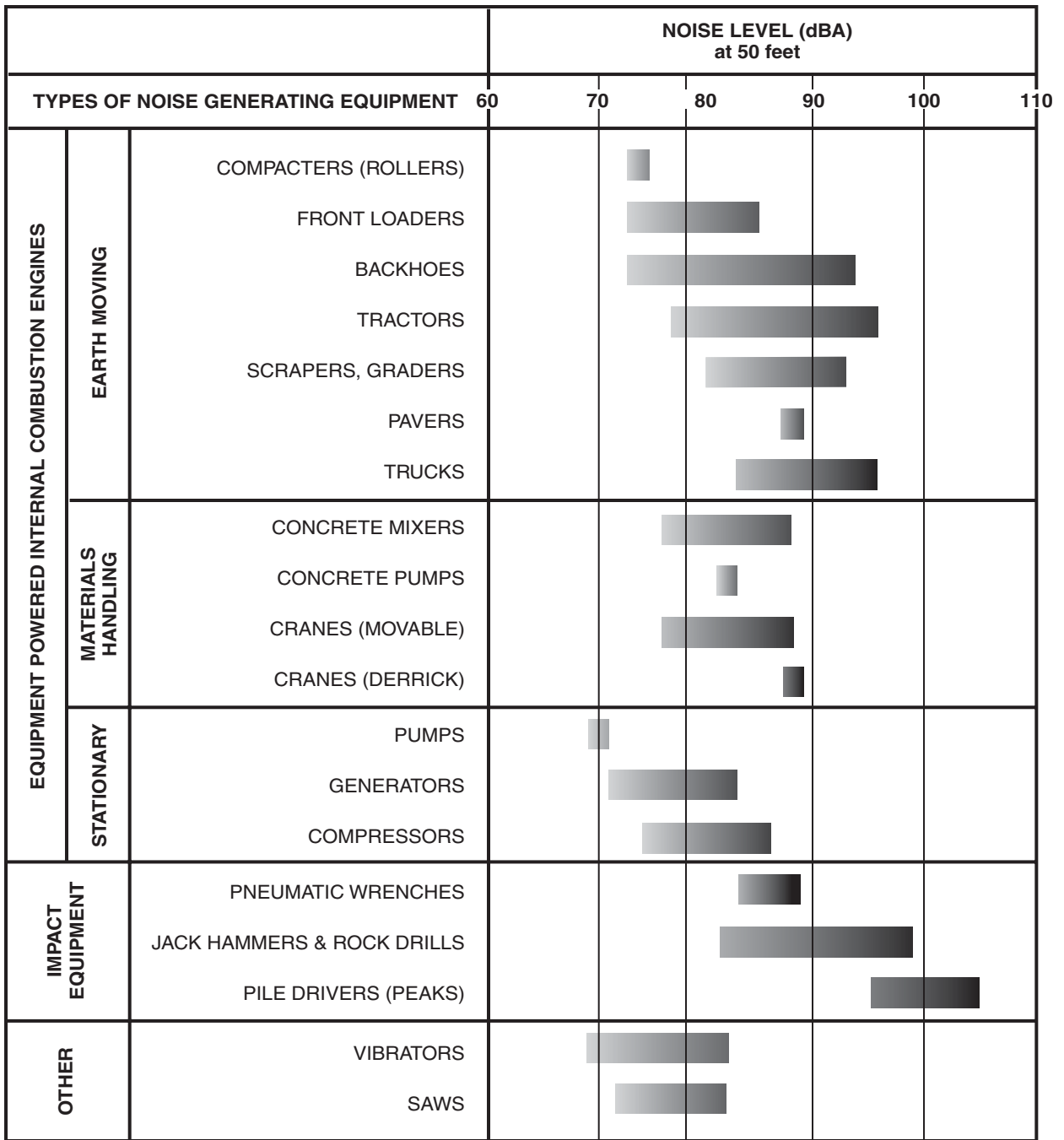
NOTE: * Sound levels are based on highest measured sound levels and are normalized to a distance of 50 feet from the source.

Production Phase

Typical noise impacts during production would include light vehicle traffic related to well supervision and vehicle traffic and tasks associated with maintenance of surface production equipment. Maintenance tasks could involve pump trucks, welding trucks, backhoes, and wench trucks. These activities would be expected to generate noise levels in the range of 50 to 80 dBA at 50 feet. In addition, it is anticipated that each well would be worked over using a truck-mounted rig on an annual basis. Noise levels from this source would be expected

to be in the range of 70 to 90 dBA and normally would require one day per work over.

Compressor station operations represent the greatest noise source associated with production. As part of a similar study of oil and gas development, sound levels were measured at existing oil and gas facilities. The average day-night sound levels (Ldn) ranged from 44 to 69 dBA, the highest value being recorded at a distance of 500 feet from a compressor station. A summary of the measured levels is presented in Table 4-6 above. Maximum sound levels were corrected to a reference value of 50 feet.



SOURCE: U.S. Environmental Protection Agency 1971

Typical Construction Equipment Noise Generation Levels

Figure 4-1

Compressors can be designed and operated to reduce noise to acceptable levels. The duration of compressor station operation is anticipated to be the period of project life.

Residences located within approximately 2,800 feet and in direct line-of-sight to production activities could experience noise levels in excess of the EPA's 55 dBA guideline (EPA 1974). Recreational areas located within approximately 500 feet and in direct line-of-sight to could experience noise levels in excess of the EPA's 70 dBA guideline (EPA 1974). However, a small percentage of the land area is occupied by noise sensitive receptors; therefore, the overall potential for noise impacts to sensitive receptors is predicted to be low. Also, incorporated cities, towns, and villages are closed to leasing in all alternatives.

Abandonment Phase

Noise associated with abandonment is from construction equipment used for plugging the wellbore and reclamation of the land surface to a stable and productive use. Sound levels would be less than those emitted during exploration and development **and would be more temporary**. The potential for overall noise impacts on sensitive receptors is predicted to be low.

4.2.1.8 Vegetation

Issues

The primary issue related to vegetation is its protection and management, particularly native plants and habitat types associated with special status species and sensitive species (e.g., grasslands, woodland/forest, and riparian areas).

General Impacts

Direct impacts on vegetation primarily result from clearing for drill pads, access roads, **power lines**, and pipelines. Also, direct impacts can occur from off-road travel by equipment, such as during seismic activities. Indirect impacts are associated mainly with accelerated wind and water erosion that affect areas adjacent to

construction and earth-moving operations, and from contamination by fuels and solvents that are used during operations. The potential also exists for noxious weeds to be spread at the expense of native vegetation as areas are cleared for construction of various facilities. Cumulative impacts result from a combination of land uses that result in surface disturbances (e.g., road building) and in consumptive use of vegetation (e.g., grazing), which reduce the native species composition and promote the spread of non-native species, or reduce the vegetative cover on the ground surface.

Preliminary Exploration Investigations

Impacts on vegetation **during this phase** are attributed primarily to soil disturbance and damage to vegetation structure. The use of vehicles for off-road travel, such as for seismic exploration, could compact soils, increase soil bulk density, change thermal conductivity, and increase soil erosion. Changes in these factors can influence plant growth (Hausenbuiller 1972). Higher compaction rates occur with wet soils and soils with multiple vehicle passes. Churning of soil by vehicle tires reduces soil strength and leads to erosion impacts. Furthermore, off-road vehicle travel can cause compaction and mortality of vegetation. On relatively flat terrain, there would be a small amount of mortality of herbaceous plants and short-term reduction of vegetative cover. Vehicles traveling on steeper slopes can severely churn and remove herbaceous vegetation. Off-road vehicle travel can push over shrubs; while this action is not likely to kill the plant, habitat structure and potentially valuable bird perching, feeding, and nesting substrates would be lost for long periods. Off-road travel generally increases soil erosion rates. Increases in erosion rates reduce soil structure and nutrient cycling, which reduces plant productivity. Such erosion also may affect receiving basins or areas that contain riparian and wetland communities. Reducing vegetation cover often increases the potential for weed species to become more widespread and problematic.

Construction Phase

Impacts on vegetation during construction occur primarily due to clearing activities that are needed for well pads, roads, **power lines**, pipelines, and ancillary facilities. Clearing operations result in a reduction in the amount of vegetation (habitat) in the area and have the potential to increase wind and water erosion, which may affect adjacent areas due to increased soil deposition. Contamination of soil from fuel spills and leaks and drilling mud also may affect vegetation locally (including wetland and riparian vegetation).

Production Phase

No additional impacts on vegetation would be anticipated during production. Accidental leakage of brackish/saline produced water could damage vegetation, which would be a long-term impact.

Abandonment Phase

Revegetation of previously disturbed surfaces would occur during project abandonment. Grasslands generally recuperate relatively quickly, while other vegetation types (e.g., piñon-juniper) grow more slowly. No additional impacts on vegetation are anticipated during abandonment.

Impacts by Basin

Stipulations for vegetation under **the Proposed Plan** vary from standard lease terms and conditions for desert scrub, arroyos, and various unclassified types to stipulations to control surface use for grassland, montane scrub, and woodland/forest vegetation. **Patches of remnant desert grasslands in the Nutt and Otero Mesa areas would remain open to leasing with a stipulation to control surface use by limiting industry's disturbance to no more than 5 percent of the leasehold at any one time and requiring new lessees to form exploratory units prior to commencing drilling activity. The purpose is to protect remnant Chihuahuan Desert grassland habitat and**

associated special status species of plants and wildlife through greater planning of future oil and gas development. Also, areas within 0.25 mile of riparian/other wetlands/playa vegetation would be managed with a stipulation of no surface occupancy. Playas have been grouped with wetlands because they are jurisdictional to Section 404 of the Clean Water Act as Waters of the United States. Within BLM's Decision Area, stipulations would apply to approximately **245,207 acres (33 percent)** of the Rio Grande/Mimbres/ Gila River Basins; **174,687 acres (23 percent)** of the Salt/Pecos River Basin; **136,350 acres (43 percent)** of the Tularosa Basin; and **4,208 acres (1 percent)** of the Jornada del Muerto Basin. Due to the stipulations and use of other mitigating measures, impacts on vegetation are expected to be minimal.

Salt/Pecos Basin

Vegetation types that are considered to be more sensitive because of forage production or revegetation include grasslands, woodland/forest, montane scrub, playas, and arroyos. Within BLM's Decision Area, grasslands constitute about 33 percent (249,530 acres) and within that are the remnant desert grasslands in the Otero Mesa area. Woodland/forest vegetation constitutes 9 percent (69,987 acres). Montane scrub, a minor component, occurs on 2 percent of the Decision Area. Playas occur on 3,152 acres and arroyos were identified on 45 acres, which combined to total less than 1 percent. No riparian or wetland areas were delineated within the Decision Area in this basin; however, if such areas were identified at the time of an APD and they meet the appropriate criteria, they would be protected under Section 404 of the Clean Water Act.

Tularosa Basin

Grassland vegetation constitutes 32 percent (100,412 acres) of the Decision Area within this basin. Woodland/forest occurs on 4 percent of the area. Montane scrub occurs on 2.5 percent of the area (7,780 acres).

Twenty-seven acres of playas are mapped. Riparian vegetation and wetlands occur for short stretches along Tularosa Creek, along the drainage systems north of Tularosa and again north of La Luz. These areas are managed as open to leasing, but no surface occupancy is allowed, which restricts development within 0.25 mile of these areas. This basin contains a number of noxious weed species. Areas cleared of vegetation often facilitate the spread of these plants, and measures would be identified as conditions of approval to avoid their spreading.

Jornada del Muerto Basin

The majority of BLM's Decision Area within this basin is desert scrub vegetation. Grasslands constitute 13 percent of the area, woodland/forest constitutes 1 percent, and arroyos comprise less than 1 percent. Playas are delineated on only 57 acres.

Rio Grande/Mimbres/Gila River Basins

The Decision Area within this basin is characterized by desert scrub vegetation, but also contains large areas of grasslands (198,702 acres, or 28 percent) and within that are the remnant desert grasslands in the Nutt area. Woodland/forest vegetation occurs on approximately 5 percent (33,393 acres). Arroyos and playas are relatively abundant, occurring on 18,988 acres (3 percent), and 115 acres, respectively. Arroyos and playas should be avoided by ground-disturbing activities.

4.2.1.9 Wildlife

Issues

The primary issue related to wildlife is to provide adequate protection and management, particularly for big and small game and raptors, and associated wildlife habitat. During scoping, concern was expressed about potential impacts of increasing human disturbance on wildlife and fragmenting habitat (e.g., by introducing roads), which may be important for wildlife movement.

It was suggested that areas providing high-quality or unique habitat and wildlife habitat management areas should not be leased for fluid minerals activities. Also, protective stipulations were suggested for breeding areas, nest sites, and winter and year-long use areas.

General Impacts

The magnitude of impacts on wildlife depends on the time of year, location, and amount of surface disturbance, sensitivity and adaptability of the wildlife species present, and duration of human activities associated with fluid minerals activities. Deviation in normal activity patterns and use of habitat by wildlife may affect the animal's energy budget and, therefore, the welfare and productivity of the animal.

Direct impacts on wildlife could include habitat loss and/or fragmentation, disturbance or displacement of wildlife, mortality of individuals, and hazards due to leaks or spills of or contact with harmful substances. Loss or fragmentation of habitat would result from clearing of vegetation to construct roads, well pads, pipelines, **power lines**, and other ancillary facilities. The magnitude of the impacts may be greater if the habitat affected is rare or used during critical time periods during the animal's life, or if the construction is near a water source used by wildlife. Increased noise and human activity may disturb or displace wildlife. Although wildlife species are likely to avoid areas where increased human activity is occurring, wildlife may be forced into less desirable habitat due to human presence. It also is possible to increase the number of animals into adjacent habitats beyond the carrying capacity of those habitats, potentially increasing the competition for limited resources. The increase in vehicular traffic, particularly during the construction phase, increases the potential for mortality of individuals. High mortalities in an area could result in a decrease of the prey base for larger mammals and raptors due to the loss of small mammals and reptiles. Vehicles and facilities at the well sites present possible hazards if leaks or spills of petroleum products occur.

Contaminated evaporation ponds or reserve pits may be harmful to wildlife.

Indirect impacts on wildlife could include an increased potential for recreational traffic if roads are upgraded or new roads are constructed into areas that previously were relatively undisturbed, thereby increasing the disturbance to wildlife. Other indirect impacts include the secondary effects from habitat fragmentation and the potential for soil erosion to affect revegetation and/or to result in increased sedimentation into streams, thereby affecting the aquatic habitat of fish as well as degrading the water sources for wildlife populations.

Habitat Fragmentation

Clearing of vegetation to construct roads, well pads, **power lines**, pipelines, and other ancillary facilities would result in fragmenting plant communities and wildlife habitat. This can result in direct, indirect, short-term, long-term, and cumulative effects.

Habitat fragmentation is the division of an extensive habitat into smaller habitat patches. Generally, the effects of habitat fragmentation include the (1) reduction of the total amount of a habitat type and apportioning the remaining habitat into smaller, more isolated patches (Harris 1984; Saunders et al. 1991; Wilcove et al. 1986); (2) creation of disturbed land which provides habitat for new, often exotic or weedy species (Harris 1984); and (3) increase in the amount of edge to remaining communities. This increases predation and modifies plant composition even within the undisturbed area because of micro environmental changes. Such subtle modifications impact on insect and seed production. Winter and Faaborg (1999) showed bird species in fragmented tall grass prairies were present but at lower densities and had lower nesting success than in unfragmented sites.

Helzer and Jelinski (1999) created a ratio between the amount of edge and the area of a grassland fragment. They then measured populations of six grassland nesting birds. They found, “species richness is maximized when

patches are large (greater than 50 hectares) and shaped so that they provide abundant interior areas, free from the impact of edges.”

Typically, habitat fragmentation begins with the formation of gaps (e.g., cleared areas such as roads) in the vegetative cover of the landscape. As the gaps become larger or more numerous, the connectivity of the original vegetation cover is broken. Fragmentation creates a mosaic of communities different than species have adapted to over time (Noss and Cooperrider 1994).

Beyond the creation of smaller habitat patches, subtle processes occur when habitats are fragmented or degraded. Some effects of fragmentation may be conspicuous almost immediately following the disturbance of the habitat while other effects may develop over several years. In the long term, fragmentation alters the biodiversity of the landscape. Leach and Givnish (1996) recensused 54 prairie remnants and found that between 8 and 60 percent of the original plant species were lost from individual remnants over a 32- to 54-year period.

Such changes impact the composition of the wildlife community as demonstrated by the birds studied by Herkert (1994). He examined Illinois grassland fragments. He determined that avian species were influenced by habitat area and vegetation structure. Some species required a minimum size of a given plant community while others had to have a specific composition to the plant community no matter what the size. Both these features of grasslands are impacted by fragmentation. Fragmentation can select against some birds by having too small of a contiguous habitat and it can select against other species by causing a shift in plant community composition.

The disturbed areas that divide fragments of the original community are more prone to invasive exotic species that further alter the community makeup. As the plant communities change, the wildlife composition of the area also shifts. Species able to adapt to such disturbances are more successful than those associated with the original habitat.

Harris and Gallagher (1988) identify the following four major consequences of fragmentation for wildlife:

- Loss may occur of area-sensitive species, those animals whose occurrence and successful reproduction are highly dependent on the size of the habitat patch in which they occur.
- Larger species that have wide ranges and occur at low densities, such as large predators, may be lost due to increased harassment and encounters with vehicles.
- There generally is an increase in exotic species or those species that readily adapt to human presence and disturbed habitats.
- Inbreeding may occur if population numbers are low and populations are isolated.

Concern about fragmentation within the Planning Area is not limited to the potential effects of Federal fluid mineral activities being considered in this RMPA/EIS. Historic degradation of habitats in the Planning Area, particularly desert grasslands, is well documented. As mentioned in Chapter 3 (Sections 3.10 and 3.11), encroachment of desert scrub into grasslands has been occurring over the past 80 to 90 years. This shift may be attributed cumulatively to a combination of climatic change, introduction of roads, intensive livestock grazing, and concurrent interruption of naturally occurring fire (Dick-Peddie 1975; Neilsen 1986).

Of particular concern are two remnant **Chihuahuan** Desert grassland areas that provide important habitat for pronghorn within BLM's Decision Area (these coincide with the Otero Mesa Habitat Management Area and Nutt Antelope Area). **According to the U.S. Fish and Wildlife Service (FWS 2001), within the Planning Area, Otero Mesa and, to a lesser extent, the Nutt grasslands are among the last remnants of high-quality unfragmented yucca desert grassland habitat.** The potential effects of Federal fluid mineral activities must be added to past degradation and impact of future activities. This could be a significant adverse impact if these cumulative effects occurred in the remnant desert grasslands. In an effort to protect

remaining desert grassland habitat from further degradation in these two areas, BLM is proposing to employ a stipulation to **control surface use by limiting industry's disturbance to no more than 5 percent of a leasehold at any one time and requiring new lessees to form exploratory units prior to commencing drilling activity. The purpose is to protect the Chihuahuan Desert grassland habitat areas and associated special status species of wildlife through greater planning of future oil and gas development.**

Preliminary Exploration Investigations

As mentioned in the vegetation section above, the movement of vehicles hauling equipment over unpaved surfaces results in soil compaction, which reduces soil productivity and damages vegetation. Vegetation changes may result in a loss of herbaceous vegetation (i.e., grasses and shrubs) utilized as forage by wildlife (including pronghorn and mule deer) and changes in the bird prey base until the vegetation recovers. The type of soil and vegetation present determines the recovery time for the area. In addition, there could be a small amount of direct mortality of small mammals, ground-nesting birds, and reptiles due to increased vehicular travel. Small mammals constitute an important prey base for raptors. If crossings through washes or drainages are required, there is an increased potential for increased erosion and sedimentation in aquatic habitats downstream of the crossings, particularly during storm events. Washes and arroyos support more dense vegetation than surrounding areas; therefore, these areas provide habitat for migrating birds and resident species. Loss of vegetation would eliminate these resources, negatively affecting wildlife.

Generally, disturbances associated with geophysical exploration (seismographic activity) during noncritical periods of an animal's life cycle seldom cause significant impacts. These activities are of short duration with minimal habitat disturbance, which results in the temporary displacement of big game species. Studies conducted on the effects of sonic booms on wildlife populations indicate that, in most

cases, mule deer and bighorn sheep exhibit minor behavioral reactions (Nevada Department of Wildlife 1989). Although there are some big game birthing areas present within identified herd unit boundaries, no specific birthing areas have been identified. If such areas are identified, effects of blasting and increased traffic during the birthing period could result in increased stress levels and decreased productivity of the animals.

Impacts on birds during the exploration phase could result in nest abandonment, loss of nests or potential nest sites, and elimination of important habitat components. Behavioral responses of birds often are influenced by increased human activity, although the responses vary between species of birds. Some individuals within a species may tolerate or habituate to a higher level of activity than others (Anderson et al. 1990). Holthuijzen (1989) observed that prairie falcons in construction and blasting zones showed no differences in their overall behavioral repertoire, productivity, or occupancy of traditional nesting areas; however, those in blasting zones showed longer readjustment times and reacted more strongly to activity than those in the construction zone. Bednarz (1984) conducted noise studies on prairie falcons in the Caballo Mountains, and concluded that although the effects of short-term activities have been shown to be negligible, this cannot be assumed for the long-term effects of mining or blasting on occupancy of raptor nest sites.

Other birds, such as shore birds and waterfowl, showed a flight response to blasting and human activities, but appeared to habituate over time (NDOW 1989). Effects to most passerine species are anticipated to be negligible, although there is the potential for loss of nest sites.

Construction Phase

As described above, impacts on wildlife during the construction phase would occur from the removal of vegetation (as forage, habitat, and cover) for well pads, roads, pipelines, **power lines**, and other facilities; and from disturbances from increased human activity. However, the

effects of increased human activity are greater than the seismic explosion and equipment noises of preliminary exploration investigations (Barry and Spencer 1976 in Hay 1985). Effects on wildlife would be determined during site-specific studies for individual APDs; however, typical impacts associated with construction are described below.

Impacts could result in loss or degradation of habitat. Habitat loss ranges from the removal of vegetation during construction within a discrete area to the loss of viable wildlife habitat due to human intrusion, noise, and the isolation of habitats. This would result in the disturbance and displacement of individual animals. The extent of effects on wildlife depends on the animal species, type and quantity of vegetation removed, and period of disturbance. Studies completed on the response of elk to drilling activities show varying degrees of severity. In Wyoming, elk moved 0.5 to 2.5 miles away often placing visual and auditory barriers between the herd and the well site (Hayden-Wing Associates 1990). Elk displacement away from activities has been shown sometimes to be significant (Johnson and Lockman 1979) and in other situations they appear to habituate to such activities.

The effect of habitat loss due to human disturbance is difficult to estimate for all species because each species differs in its tolerance to intrusion. Additionally, certain species are less tolerant of disturbance during critical time periods in their lives (i.e., nesting or fawning). If such areas are identified during site-specific studies for an individual APD, it may be necessary to alter the timing of construction to mitigate potential effects.

New road construction into previously unroaded or isolated areas could impact big game species significantly. Increased public access to these areas could result in increased legal take by hunters and higher levels of harassment, intentional (i.e., poaching) and accidental, to animals. This impact would be more critical if birthing areas are identified on a site-specific basis. The potential for deaths of big game species individuals would increase above

existing levels due to increased traffic along existing roads. Also, direct mortality of some other wildlife individuals could be expected as a result of encounters with construction vehicles.

For oil and/or gas, construction of various pipelines would be needed to move the products from the wells to storage and/or refineries. Effects of pipeline construction vary greatly depending on the type and length of pipeline, the construction method (i.e., laid on surface or buried), the type of vegetation, and terrain. Lines from the wells to collection pipes would be a smaller diameter and may be laid on the surface or buried. In either case, construction impacts would be limited to human presence. Gathering lines typically are a larger diameter and most likely would be buried adjacent to new or existing roads or other linear features. Effects of initial construction would be similar to construction of new roads (i.e., habitat disturbance, invasive of noxious weeds), but since these would be collocated with new or existing roads, impacts from installation of the pipelines would be minimized.

Similarly, effects from power line construction (e.g., installing poles, stringing conductor) vary depending on the type of vegetation, terrain, and length of power line.

Activities adjacent to permanent water sources where waterfowl nesting areas may occur could cause nest abandonment and decreased hatching success, although this has not been well-documented. It is not anticipated that small birds, such as passerines, would be affected directly by activities associated with fluid minerals development.

During construction, aquatic and semi-aquatic populations (i.e., fish, frogs) in and downstream of the Planning Area potentially could be affected by any reductions in the quantity and quality of the surface waters. Well drilling requires the use of water, although water requirements should be met by purchase of already-appropriated groundwater or from a new water well approved by the State Engineer for

drilling (refer to **Water Resources section**). Therefore, water usage would not impact fisheries through stream depletions. Fisheries resources are limited to a few sites in the Planning Area, including Caballo Reservoir, Elephant Butte Reservoir, portions of the Rio Grande, Three Rivers, and Tularosa Creek. Effects on fisheries could result from the removal of vegetation near or adjacent to the stream that could increase the potential for erosion and increased sedimentation especially following storm events. Fish populations could be affected adversely by contamination of surface waters from accidental spills or leakage of petroleum products from vehicles.

Production Phase

Impacts on wildlife associated with surface disturbance generally are anticipated to be low to nonexistent during the production phase. Grassland areas that have been reclaimed following disturbance during construction would provide forage for larger mammals and burrow sites for small mammals and reptiles.

Activities associated with the operation and maintenance of the field vary, but some activities are continual, which could have adverse effects on wildlife although other studies indicate that impacts are minimal during this phase (Hayden-Wing Associates 1990). There is an increased potential for disturbance resulting from activities associated with operation and maintenance. It has been estimated that the expected zone of disturbance for elk and deer can extend for up to a 0.25-mile radius from a well site, road, or compressor station after construction activities have been completed. Disturbances caused by human activity and the presence of vehicular traffic associated with production and maintenance activities at well sites and compressor stations are anticipated to be low for antelope, deer, and elk. Bighorn sheep tend to be more sensitive to human disturbance; therefore, increased levels of activity could result in potentially higher effects.

The number of **operation and maintenance** visits to compressor stations vary from **two** visits

per week to as much as two to five vehicle visits per day at larger stations. Servicing activities at well sites are generally intense for a short period of time, with an increase in human and motorized activity. Wildlife is likely to avoid these areas during servicing, if possible.

Effects of pipelines during the production phase would be limited to the potential for leaks and spills. Wildlife and vegetation could be harmed or killed in the vicinity of the spill. Habitat fragmentation and restriction of movements would be limited because above-ground pipes would be small, and underground pipes would be adjacent to existing roads or linear features, and revegetation actions would be implemented.

Saline levels in produced water can be high and the water cannot be released into surface waters. Other disposal methods include subsurface injection, lined or unlined pits, and other BLM-approved methods. State and/or EPA permits also are required. Evaporation ponds and skimmer pits present a hazard to waterfowl and other wildlife that may be attracted to the water, which may contain residual materials such as oil or other chemicals.

Abandonment Phase

Areas that were disturbed would be revegetated to a stable and productive state. Abandonment activities occurring near the sites could result in a short-term effect on nearby wildlife. Impacts associated with the increased noise and human activity during abandonment would be similar to those described for the construction phase. Closure of roads that are no longer needed would constitute a beneficial effect on wildlife by decreasing the accessibility of the area to other traffic. **Above-ground pipelines would be removed, eliminating any potential effects on wildlife species. Buried pipelines may be abandoned in place or, if buried pipelines are removed, impacts associated with soil disturbance described for the construction phase would be possible.** Reclamation efforts of surface disturbances in the arid Southwest are not always successful due to variable climate and

the presence of non-native species that are able to colonize a disturbed area.

Activities associated with abandonment should have no effect on fisheries populations except in areas where highly erodible soils occur in areas near streams or lakes. Measures to mitigate the effects of erosion would be effective in reducing potential harm to aquatic habitats.

Impacts by Basin

Fluid mineral activities generally would be allowed throughout the leased areas. **Standard lease terms and conditions allow BLM to identify site- or area-specific mitigating measures as conditions of approval at the time of an APD. However, wildlife and/or associated habitats that are resources of concern (e.g., riparian areas, Nutt and Otero Mesa grasslands) may require additional protection above that afforded by standard terms and conditions in order to minimize adverse impacts on them. Under the Proposed Plan, impacts on wildlife and wildlife habitat are expected to be minimal. The greatest impact would result if the three field developments, described as part of the RFD, occurred within one area, particularly the Nutt and Otero Mesa desert grassland habitat areas.**

Riparian and other wetland habitats and playas would be protected by a stipulation of no surface occupancy within 0.25 mile of these areas. Certain desert grassland habitat in the Nutt and Otero Mesa areas would be managed with a stipulation to control surface use, as described below.

Other wildlife habitat of concern include big game habitat and habitat occupied by or suitable for bighorn sheep. Both of these would be managed as open to leasing with standard lease terms and conditions. As stated above, standard lease terms and conditions allows BLM to develop site-specific mitigating measures as conditions of approval for each APD, which could provide the protection needed for those areas. In these areas,

industry should be encouraged to use existing roads and/or other utility corridors to minimize the potential for increased habitat fragmentation.

Salt/Pecos River Basins. **The Otero Mesa area contains one of the largest contiguous remnant Chihuahuan Desert grassland habitats in the State. Under the Proposed Plan, certain areas of these grassland habitat area would be managed as open to leasing with the stipulation to control surface use by limiting industry's disturbance to no more than 5 percent of the leasehold at any one time.** This protection would be consistent with BLM's management goal of providing adequate habitat for pronghorn. The stipulation to control surface use would be more effective than standard lease terms and conditions in reducing potential effects. This is especially important in areas adjacent to water sources and in areas where cover vegetation is present. Pronghorn utilize vegetation for cover as protection from predators or birthing. Controlling access into these areas would help reduce possible adverse effects on the productivity of the herd. Impacts associated with increased noise and activity levels would not be reduced. Mule deer habitat on Crow Flats would remain managed with standard terms and conditions.

Tularosa Basin. The westernmost portion of the Otero Mesa Habitat Area is within the Tularosa Basin area (refer to Maps 3-6 and 3-7). Refer to the relevant discussion in the paragraph above. The Sacramento Escarpment Deer Habitat Area **would be managed as open to leasing with standard lease terms and conditions, which would allow BLM to satisfy the management goal of providing adequate habitat for mule deer.** Maximizing the use of existing roads would help reduce possible adverse effects of increased access and habitat fragmentation resulting from new road construction.

The Sacramento Mountains have been identified as an area suitable for reintroduction of bighorn sheep. **Under the Proposed Plan, habitat suitable for bighorn sheep, identified by BLM, would be managed as open to leasing**

with standard lease terms and conditions, which would allow BLM to identify site-specific mitigating measures as conditions of approval at the time of an APD. This would reduce potential adverse effects to the productivity of a herd.

Jornada del Muerto Basin. The White Sands Antelope Area (Jornada Plain) is located within the Jornada del Muerto Basin. **This big game habitat area would be managed as open to leasing with standard lease terms and conditions, which would allow BLM to identify site-specific mitigating measures as conditions of approval at the time of an APD.** The purpose of delineating this habitat area in the 1986 RMP was to conduct studies to determine the biological factors limiting the distribution and numbers of pronghorn in this area. General management guidance states that forage will be provided for big game species in such delineated (herd unit) areas. Consistent with the management goal in the 1986 RMP, BLM's best management practice (Appendix B) encourages the use of existing roads to the maximum extent practical and minimizing new roads in unroaded areas and protection of habitat through avoidance

Rio Grande/Mimbres/Gila River Basins. The Nutt Antelope Area and Caballo Mountains Deer Habitat Area are located within this basin. Leases within these two big game habitat areas **would be managed as open to leasing with standard lease terms and conditions, which would allow BLM to identify site-specific mitigating measures as conditions of approval at the time of an APD.** The Nutt Antelope Area contains large patches of remnant Chihuahuan Desert grassland habitat. **Certain areas of the grassland habitat area would be managed as open to leasing with a stipulation to control surface use by limiting industry's disturbance to no more than 5 percent of the leasehold at any one time.** This protection would be consistent with BLM's management goal of providing adequate habitat for pronghorn and deer. The stipulation to control surface use in these areas would be more effective than standard lease terms and conditions in reducing

potential effects. One purpose is to protect against further habitat fragmentation. BLM management guidelines within the Nutt Antelope Area are the same as those for the White Sands pronghorn herd. That is, the area is to be used to conduct studies to determine the biological factors limiting the distribution and numbers of animals in this habitat. BLM guidance states that forage will be provided for big game species in this area. BLM's management objective for the Caballo Mountains Deer Habitat Area is to provide adequate habitat for mule deer. Limiting new road construction would reduce effects of fragmentation and increased access.

The Caballo Mountains have been identified as a potential reintroduction area for bighorn sheep. **Under the Proposed Plan, habitat suitable for bighorn sheep, identified by BLM, would be managed as open to leasing with standard lease terms and conditions, which would allow BLM to identify, as needed, site-specific mitigating measures as conditions of approval at the time of an APD.** This would reduce potential adverse effects to the productivity of a herd.

4.2.1.10 Special Status Species

Issues

The primary issue related to special status plant and wildlife species (i.e., Federally listed, State-listed, and other sensitive species) and their habitats is to provide adequate protection and management. During scoping, concern was expressed about potential fragmentation of threatened and endangered species habitats, and it was suggested that fluid minerals leasing should not be allowed in habitats of threatened and endangered species.

General Impacts

Effects on special status species are generally associated with ground disturbance and increased human access. Impacts that could affect special status plant and animal species are similar to those described for vegetation and wildlife in the previous two sections. Therefore, this section

provides a summary of impacts specific to the different groups of special status species known or likely to occur within the Decision Area as a result of the RFD. The RFD projects the development of three gas fields and associated facilities. It is estimated that all phases of oil and gas development over 20 years could result in the short-term disturbance of approximately **1,589** acres. The type of habitat disturbed and the effects on species associated with those habitats would be determined on a site-specific basis when an APD is submitted and processed.

The following provides a general discussion about potential adverse effects on groups of special status plant and wildlife species. Descriptions of the mitigation measures that are required under the various lease stipulations and the special status species that have the potential to occur within each of the hydrologic basins are discussed. Detailed information about the natural history and status of each species is provided in Appendix E. Effects on Federally listed species are presented in detail in the Biological Assessment, a copy of which is on file and can be reviewed at the BLM Las Cruces Field Office.

Wildlife

Mammals: Habitat suitable for one special status big game species, the desert bighorn sheep, occurs in the area. Areas suitable for the reintroduction of bighorn are located in the Caballo, Sacramento, Guadalupe, Brokeoff, and Cornudas Mountains. The Caballo Mountains provide a potential movement corridor for bighorn inhabiting the Fra Cristobal Mountains. Desert bighorn sheep are sensitive to human disturbance, especially during the breeding season. Increased access and human activity in bighorn sheep habitat could adversely affect the reproductive success of these animals. New roads and facilities could hinder the movement of animals and fragment suitable habitat. Placement of a field development in or near an area suitable for bighorn would likely eliminate that area from consideration for reintroduction of bighorn.

Small mammals include Arizona black-tailed prairie dog, gray-footed chipmunk, Guadalupe

southern pocket gopher, desert pocket gopher, White Sands woodrat, and New Mexico jumping mouse. There is likely to be increased mortality of small mammals due to the loss of local habitat. They generally **are** not able to move away from construction areas as readily as more mobile animals and are more vulnerable to disturbance and loss of habitat. Adjacent habitat may be marginal or populations of other animals may already inhabit those areas making it unlikely for displaced animals to reestablish a viable population. Increased traffic in the area could result in increased mortality due to collisions with construction vehicles. Loss of burrows and vegetation for shelter also could make these small mammals more vulnerable to predation by larger mammals and raptors. The level of impact would be determined by the size of the existing populations of mammals and the availability of unoccupied suitability habitat adjacent to the development, as well as the mobility and sensitivity of the species.

At least 16 bat species occur within the planning area, and several other species probably occur. The Cave myotis, Yuma myotis, little brown myotis, southwestern myotis, long-eared myotis, fringed myotis, long-legged myotis, California myotis, silver-haired bat, western pipistrelle, big brown bat, hoary bat, Townsend's big-eared bat, pallid bat, Mexican free-tailed bat, and big free-tailed bat are known to occur within the Planning Area. Other bats that potentially occur in the Planning Area include the small-footed myotis, eastern and western red bats, spotted bat, and pocketed free-tailed bat. A majority of these bat species occupy a variety of habitats within the area and would likely avoid areas during construction. They would be most vulnerable if construction occurs near roost sites or results in the loss of foraging areas. Water sources at the construction sites may attract insectivorous bats if the water is uncontaminated and supports increased insect populations.

Birds: Special status raptor species in the area are northern aplomado falcon, peregrine falcon, ferruginous hawk, northern goshawk, and bald eagle. Owls in the area include western burrowing owl and Mexican spotted owl. Effects

on raptors include loss or degradation of habitat, including nest sites, roosting sites, and foraging areas; lack of reproductive success due to nest abandonment in response to noise and increased activity; and a reduced prey base due to habitat loss in foraging areas. Different raptors species display varying tolerance levels for disturbances within their habitats. Additional effects of a project on raptors during the different phases of exploration and development are provided under **General Impacts**. Existing management guidance for raptors requires a 0.25-mile buffer around most active raptor nests. The buffer around an eagle's nest is 0.5 mile and is from 0.5 mile to more than 2 miles for peregrine falcons, depending on the surrounding terrain. Site-specific surveys would be conducted when an APD is submitted.

Bird species, other than raptors, include mountain plover, Baird's sparrow, loggerhead shrike, southwestern willow flycatcher, and yellow-billed cuckoo. Increased noise and activity levels during construction and development could result in nest abandonment and decreased reproductive success if such activity occurs during the breeding season. The southwestern willow flycatcher and yellow-billed cuckoo are riparian species and any loss or degradation of such habitat would constitute a loss of potential breeding habitat for these species. Mitigation requires the avoidance of riparian and aquatic habitats; therefore, such effects are not likely to occur. Construction occurring in proximity to these areas during breeding may cause a disturbance to nesting birds and could reduce reproductive success. In the case where a proposed well site is in an area adjacent to riparian woodlands, surveys for active nests would reduce the likelihood of disturbing a nest site. Loss of grasslands would reduce nesting and foraging opportunities for mountain plover, Baird's sparrow, and loggerhead shrike. Loggerhead shrikes and Baird's sparrow occupy other habitats as well and could be affected by loss of resources in desert scrub and montane habitats, as well.

Shorebirds that may breed in the area are white-faced ibis, interior least tern, and neotropic

cormorant. Breeding areas are generally located along shoreline and marsh habitats near open water. The black tern is an uncommon summer migrant that forages in vegetated marshes. Construction and development would not affect these habitat types in accordance with proposed lease stipulations.

Amphibians and Reptiles: Amphibians and reptiles in the area include the Texas horned lizard, gray banded kingsnake, mottled rock rattlesnake, Chiricahua leopard frog, and southwestern toad. Chiricahua leopard frog and southwestern toad inhabit riparian and wetland areas, which would be avoided by development **under the stipulation of no surface occupancy within 0.25 mile**. Road development and increased traffic that cross washes or arroyos would increase the potential for mortality of animals residing in those areas. The Texas horned lizard is associated with grasslands and deserts, as well as riparian and arroyo habitats. Both the gray banded rattlesnake and mottled rock rattlesnake occur in rocky areas within desert scrub, montane scrub, woodland/forest, and arroyo habitats. There would likely be some loss of suitable habitat for the horned lizard, kingsnake, and rattlesnake where development occurs. Increased traffic and human activity could result in direct mortality of individuals of these species inhabiting the area. The presence of new or upgraded roads and placement of facilities could cause the fragmentation of habitat or make it more difficult for these animals to move between areas of suitable habitat.

Invertebrates: Mineral Creek mountainsnail and Cornudas Mountains land snail are two special status invertebrate species that occur in the area. The Mineral Creek mountainsnail inhabits a very small area along Mineral Creek in **Sierra County**. Its habitat will not be affected by development because lease stipulations prohibit development along waterways. The Cornudas Mountains land snail is found within the Cornudas Mountains Area of Critical Environmental Concern (ACEC), although its range extends beyond the ACEC boundaries.

Fish: Longfin dace is the only special status fish species likely to occur in the area. It is present in streams and drainages, which are protected by lease stipulations.

Plants

Seventeen species of special status plants have been identified as occurring or potentially occurring within the decision area. Plants are susceptible to activities resulting in ground disturbance, as well as those that increase human access into an area. Increased human access into an area may result in the loss of plants that are collected for landscaping. Ground disturbance results in the direct loss of individual plants and may alter the habitat so that plants would not be re-established. In many cases, non-native species are able to out-compete native species and successfully colonize a disturbed area. Construction vehicles may spread non-native species farther as they travel to and from the construction site. Increased human and vehicular activity would result in trampling and soil compaction. Trampling increases direct damage to plants. Soil compaction causes water to run-off rather than infiltrating the soil where it would become available for use by plants. Long-term effects of the loss of vegetation include erosion that can result in the loss and continued degradation of habitat.

The sensitivity of the habitat type and the extent of ground disturbance would determine impact levels. Some plants are more susceptible to disturbance, while others can withstand or even thrive in disturbed environments. When an APD is submitted, site-specific surveys will be required to determine which plants are or could be present. Effects could be long-term where plants are associated with habitats that are difficult to re-establish. Appendix E provides information on each species including known occurrences and associated habitat type(s). This information can be used to determine what surveys should be conducted prior to construction and development in a specific area.

Impacts by Basin

General direction imposed by this alternative would manage the majority of special status species and their habitats under stipulations of controlled surface use, **which requires that operations would be designed to avoid known populations of special status species. Each exploration and development project would be evaluated for potential effects on known populations. In known population areas, surface-disturbing activities may be relocated beyond 0.125 mile, but not more than 0.25 mile. Seasonal restrictions may apply, depending on the need of the identified species.** Potential site-specific impacts would have to be identified through analysis at the time of an APD and prudent operation measures would be developed as conditions of approval attached to the APD. **Under the Proposed Plan, impacts on special status species are expected to be minimal.**

A list of special status species that could occur within each of the basins is provided in Appendix E, Table E-1.

4.2.1.11 Rangeland

Issues

Issues associated with rangeland and livestock grazing identified during the public scoping process are related to potential effects on forage and short- and long-term carrying capacity, and maintaining grazing improvements and management facilities.

General Impacts

Direct impacts on rangeland and livestock grazing are much the same as those described for vegetation and wildlife in **earlier sections**. Impacts on rangeland result primarily from removal of vegetation (forage) during clearing to construct roads, drill pads, pipelines, **power lines**, and other ancillary facilities. Off-road travel also causes vegetation damage, soil compaction, and associated decreases in soil productivity.

Indirect impacts include the potential for increased erosion rates in conjunction with vegetation removal and loss of topsoil in an area and sedimentation at a downgradient location, and the potential for water sources to be affected. Clearing existing vegetation often provides a pathway for the spread of noxious weeds, which can be harmful to the health of livestock. Other indirect impacts include disruption of existing grazing use, and the management of facilities such as fencing, water access, and livestock movement patterns. Cumulative impacts result from a combination of land uses that result in surface disturbances or interrupt existing grazing patterns and access.

In summary, surface disturbances reduce grazing capacity, and may change vegetation composition to include fewer forage species. Conversely, forage improvement can be implemented through revegetation.

Preliminary Exploration Investigations

Impacts on rangeland and livestock grazing during exploration consist primarily of vegetation and soil disturbance by off-road travel equipment. Off-road travel generally increases soil erosion rates, and causes compaction and rutting during wet conditions. These impacts reduce soil and vegetation productivity. If surfaces are disturbed and are not revegetated, they may provide an avenue for invasion by weedy species. Equipment operation also may disturb livestock or interrupt normal livestock movement patterns. Range improvements (fences, reservoirs, etc.) and range monitoring plots on public land should be avoided wherever possible.

Construction Phase

Impacts on rangeland during construction result primarily from the direct loss of vegetation during clearing operations. Clearing and earthmoving also increase the potential for increased erosion and sedimentation that may affect water sources, such as stock ponds. Construction equipment may disturb livestock from traditional use or movement patterns.

Contamination from fuel spills and drilling mud also **could** affect forage species locally.

Production Phase

No additional direct impacts would be anticipated during production. Leakage of brackish/saline produced water could reduce the forage production and would constitute a long-term impact, as salt is difficult to remove once it becomes part of the soil.

Abandonment Phase

Revegetation of previously disturbed areas with species that provide forage would occur during abandonment. Thus, impacts that originally occur in the exploration and production phases would be reduced.

Impacts by Basin

Under the Proposed Plan, regardless of which basin, livestock grazing would be managed under the terms and conditions as stipulated in the 10-year grazing permits. Potential site-specific impacts would have to be identified through analysis at the time of an APD and prudent operation measures would be developed as conditions of approval. Assuming that operators comply with conditions of approval, best management practices, and other guidelines, impacts on rangeland and livestock grazing should be minimal. The greatest impact would result if the three field developments, described as part of the RFD, occurred within one area where grazing patterns and/or access were affected.

4.2.1.12 Cultural Resources

Issues

The impact analysis addressed the issue of whether BLM's leasing program for Federal fluid minerals would directly or indirectly affect any significant cultural resources.

General Impacts

Impacts were assessed using criteria defined by regulations for *Protection of Historic Properties* (36 CFR Part 800). An effect is a direct or indirect alteration of the characteristics of a historic property that qualify it for inclusion in the National Register of Historic Places. Effects are adverse when the alterations diminish the integrity of a property's location, design, setting, materials, workmanship, feeling, or association. Examples of adverse effects include the following:

- physically destroying a property
- inappropriately altering a property by not following the Secretary of the Interior's Standards for Treatment of Historic Properties (36 CFR Part 68) and applicable guidelines
- moving a property from its historic location
- changing the physical features within the property's setting that contribute to its historical significance
- introducing visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features
- transferring, selling, or leasing a property out of Federal ownership or control without adequate restrictions to ensure preservation

Review of inventory data indicated that archaeological sites are the type of cultural resources most likely to be affected by fluid minerals leasing. Ground disturbance directly associated with fluid minerals leasing is anticipated to have the most potential for adversely affecting archaeological sites. The introduction of visual, atmospheric, or audible elements into the setting of such sites is not expected to affect the scientific information of archaeological sites, but possibly could degrade the integrity of such sites if they have other historic values such as for public interpretation or for traditional cultural associations.

Other impacts may be indirect. Ground disturbance could result from overland travel that might increase as a result of fluid mineral activities enhancing vehicular access into an

area. The simple increase of human presence in previously undeveloped areas also could result in inadvertent damage or intentional vandalism to archaeological sites.

It is anticipated that subsequent Section 106 (National Historic Preservation Act) reviews of individual projects undertaken as part of the BLM Federal fluid minerals leasing program would result in avoidance, minimization, or mitigation of any identified adverse effects. Any adverse effects on significant cultural resources that would not be avoided or mitigated through Section 106 consultations among the project proponents, BLM, State Historic Preservation Office, and other consulting parties would be considered to be significant.

The aggregate extent of disturbance forecasted by the RFD over the next 20 years accumulates to about 10 square miles. Current inventory data indicate that 10 to 20 archaeological sites typically are present within each square mile of Sierra and Otero Counties. This suggests that, **if the RFD is attained**, approximately 100 to 200 archaeological sites might be affected. The average density of archaeological sites varies across the landscape and the number of sites potentially affected could be greater or less depending on where activities are pursued. The potential to avoid impacts on most sites is quite high, but as site density increases this potential is diminished. There is a high potential for satisfactorily mitigating impacts by conducting studies to recover important archaeological information before any unavoidable sites are disturbed, but such studies can be costly.

Preliminary Exploration Investigations

Although the extent of ground disturbance resulting from geophysical exploration generally is characterized as relatively minimal and short term, many cultural resources, especially the type of archaeological sites found within the Planning Area, are quite fragile and even overland travel can damage such resources, especially if heavy equipment trucks are used.

Applicants for a permit to conduct geophysical exploration would be required to arrange for and fund an inventory of cultural resources that might be affected. Usually such exploration strategies are flexible and can be modified to avoid direct impacts on archaeological sites that may be present within the proposed exploration area. However, time and efforts are required on the part of BLM staff and the applicants to make such adjustments.

Although direct impacts usually are avoided by modifying geophysical exploration plans, individuals on field crews have been known to vandalize archaeological sites. In addition, geophysical exploration can result in informal two-track roads that can increase general public accessibility. Such enhanced access has resulted in inadvertent or intentional damage to archaeological sites in other areas managed by the BLM. The extent of such indirect effects is difficult to characterize, but they seldom are mitigated. However, BLM will take steps to minimize such indirect impacts by considering potential indirect effects in scoping resource surveys, working to control overland travel, limiting creation of informal roads, and educating work crews about penalties for unauthorized collection of artifacts.

The cultural resource inventories conducted for geophysical explorations would provide valuable information about the cultural resources present on public lands. However, the tendency is to conduct surveys only along the narrow transects of seismic lines and the resulting information often is less useful than the results of block surveys. The extent of survey (assumed to be 1 acre per linear mile of seismic line) would expand the average extent of annual inventory within the Decision Area by approximately 20 percent over the average rate of survey during the past one to two decades. However, exploration activities are likely to be sporadic and more intense during parts of the next 20 years. Therefore, staff review efforts are likely to be increased considerably more than 20 percent during some years.

Construction Phase

During the construction phase, the ground-disturbing impacts described above could result from clearing, grading, and slope cutting activities required for upgrading and new roads, well pads, pipelines, **power lines**, and other ancillary facilities. Applicants for permits to drill would be required to arrange for and fund cultural resource surveys of areas potentially affected by these activities. Review of individual projects, modification of projects to avoid or minimize adverse effects, potential to avoid direct impacts, and potential for indirect impacts are all similar to those for geophysical exploration.

Production Phase

During production, it is anticipated the amount of ground disturbance would be less than during construction. However, any new ground-disturbing activities (if needed) that were not permitted previously would require review and permitting. The potential to avoid direct impacts and the potential for indirect impacts are similar to those described above.

Abandonment Phase

Activities associated with abandonment must take place within the area permitted for and disturbed by previous activities to avoid impacts on cultural resources.

Impacts by Basin

As mentioned previously, potential impacts on other resources would be reviewed and considered in accordance with Section 106 of the National Historic Preservation Act using the procedures outlined in the previous discussion of common impacts. Implementation of such procedures is expected to result in avoidance of any identified adverse effects or satisfactory mitigation those effects.

Salt/Pecos River Basin

The ACECs would remain discretionarily closed to leasing. Surface use would be controlled

within 0.25 mile of the entire Butterfield Trail to protect this historic route.

Tularosa Basin

The Three Rivers ACEC would remain discretionarily closed to leasing. The stipulation for the Rattlesnake Hill Archaeological District would be no surface occupancy. Also, a larger adjacent area would be managed with a stipulation of **no surface occupancy**. The Lone Butte Archaeological District and Jarilla Mountains Archaeological District, currently closed to off-road vehicle (ORV) use, **also** would be managed with stipulations of **no surface occupancy**.

Jornada del Muerto Basin

Surface use would be controlled within 0.25 mile of the entire Jornada del Muerto Trail to protect this historic route.

Rio Grande/Mimbres/Gila River Basins

The Lake Valley Historic Townsite would be managed with a stipulation of no surface occupancy. In addition, surface use would be controlled within 0.25 mile of the Mormon Battalion Trail to protect this historic route.

4.2.1.13 Paleontological Resources

Issues

The primary issue related to paleontological resources is protection and management of potentially valuable paleontological resources.

General Impacts

Surface disturbance associated with geophysical exploration, construction of roads, well pads, pipelines, **power lines**, and other ancillary facilities may damage or destroy vertebrate or invertebrate paleontological resources that may be of scientific importance. The loss of the resource because of destruction or damage would be an adverse impact.

Indirect impacts may result from upgrading or constructing new roads that would increase the potential for access into areas relatively undisturbed previously. Improved access into areas could result in off-road travel, which may damage or destroy fossil resources. An increase in human visitations may result in vandalism of paleontological resources.

As previously described, ground disturbance associated with development of fluid minerals would occur during preliminary exploration investigations and construction. Limited disturbance is expected to occur during the production and abandonment phases.

Many portions of Sierra and Otero Counties have not been explored or surveyed for paleontological resources; therefore, effects on paleontological resources would be determined during site-specific reviews for geophysical exploration and for individual APDs. With adherence to the BLM requirements for surveying and evaluating paleontological resources, no adverse impacts on these resources are anticipated.

4.2.1.14 Recreation

Issues

The primary concern related to recreation is the potential for the displacement or significant alteration of existing recreation opportunities due to land requirements associated with fluid minerals development. Through scoping, issues raised included providing for the availability of recreation and preserving or enhancing the public's access to recreation. Most of the BLM-administered land in the Planning Area includes recreation among the multiple uses.

The BLM has identified specific recreation resources of concern. These include some sections of the Tularosa River and the Red Sands ORV area. ACECs, the Cornudas and Cuchillo Mountains areas, and Lake Valley Backcountry Byway also have been identified for consideration of impacts on recreation opportunities as well as visual resources.

General Impacts

Two major impacts on recreation resources could result from fluid minerals activities. First, the displacement of recreation areas may occur in order to locate well or production facilities. Second, a change in the character of outdoor recreation opportunities may occur as a result of proximity to facilities and the associated dust, noise, and human activity.

Under the RFD, the total acreage disturbed for oil and gas development is estimated to be **approximately 1,589** acres in the short term and 862 acres over the long term. Geothermal development is anticipated to disturb a total of 26 acres. All fluid minerals development is associated with the introduction of motorized activities. However, it is unlikely that fluid minerals development significantly would displace the opportunity for primitive recreation due to its informal and dispersed nature and the small amount of acreage that is required to achieve the RFD relative to public land available.

The areas that are primitive in character and are closed to ORV use often correspond with Wilderness Study Areas (WSAs) or ACECs, which are designated as such due to notable natural or scenic qualities. These areas are already closed to leasing.

Impacts by Basin

Under **the Proposed Plan**, some recreation resources are provided additional protection. **In the Tularosa Basin, the Tularosa River Recreation Area, which coincides with a riparian area, would be managed with a stipulation of no surface occupancy. In the Rio Grande/Mimbres/Gila River Basins, the Lake Valley Backcountry Byway would be managed with a stipulation of no surface occupancy within 0.5 mile of either side of the road. For proposed disturbances that would be between 0.5 and 1 mile from either side of the road, operators may be asked to provide mitigation to proposed development activities to be less visually intrusive, or otherwise provide visual screening. These stipulations,**

designed mainly to protect visual resources, also would increase the protection for more passive recreation opportunities as well. Impacts on these and other recreational uses are not anticipated to be significant.

4.2.1.15 Visual Resources

Issues

The primary visual resource issues surrounding fluid minerals leasing in Sierra and Otero Counties are the degree of visible changes to the characteristic landscapes within local and regional viewsheds, preservation of scenic quality of the landscape, and compliance with Visual Resource Management (VRM) classifications. Specific issues identified in scoping include the protection of visually sensitive locations such as the Otero Mesa, Sacramento Escarpment, and mountain foothills.

General Impacts

With implementation of **the Proposed Plan**, direct impacts on visual resources could include adverse effects on the character of sensitive settings and on residential, recreation, and roadway views. Types of impacts on visual resources as direct or indirect result of a project could include short-term and long-term adverse effects on the visual character of the setting.

Long-term, direct impacts include the removal of vegetation, changes to existing landform through site grading, and the addition of structural elements into an undeveloped setting visible from sensitive viewsheds. Short-term, direct impacts primarily would include actions associated with construction, such as increased dust, and the presence of temporary drilling equipment and associated lighting that would allow for work to occur 24 hours a day. Indirect impacts on visual resources include the potential for increased recreational traffic on access roads.

Potential impacts from project activities relate to project visibility and the introduction of elements of different form, line, color, and texture into the landscape. The extent of noticeable change to the

form, line, color and texture of the landscape as a result of project exploration, construction, production, and abandonment can be measured in levels of visual contrast. The contrast levels (strong, moderate, and weak) and types of visual contrast that could result from the project components are defined as follows:

- Strong—strong contrast occurs where project activities would attract attention and dominate the landscape setting.
- Moderate—moderate contrast occurs where project activities are noticeable and start to dominate the setting.
- Weak—weak contrast occurs where project activities would be noticeable but would not attract attention, and would be subordinate to the setting.

Components of the project with the highest potential to adversely affect visual resources include the visual character of the well pad and pipeline right-of-way clearing, as well as large solid components associated with oil and gas separation, treating, and storage facilities.

Preliminary Exploration Investigations

Activities associated with preliminary investigations could vary widely depending on the type of survey conducted. Gravity, geomagnetic, and seismic reflection surveys result in little or no surface disturbance or other visually evident impacts. Vibrosource surveys, however, require the use of several **ORVs** that **could** compact soils and vegetation. The compacted, disturbed areas created from this type of survey can take many years to revert to pre-existing conditions depending on the type of soils and vegetation impacted. Drilling and explosive surveys, whether surface or subsurface, do not result in any long-term visual impact. Subsurface charges are installed with small-diameter drills to depths of 100 to 200 feet, and result in little or no surface disturbance other than the drill hole itself.

Construction Phase

While impacts from exploratory drilling are usually short term, they typically would result in some of the most noticeable visual contrast. The greatest amount of human, vehicular, and equipment activity occurs during construction and drilling activities. Thirty to forty truckloads carrying equipment and/or water typically are necessary for the drilling of each well site. Drilling operations continue 24 hours a day and 7 days a week, and are accompanied by considerable noise and highly visible activity. Drilling activities, equipment, dust, traffic, and road construction likely would attract the greatest amount of attention during this phase. Similar to the preliminary exploration investigations phase described previously, visual impacts created during the exploratory drilling phase would vary depending upon the methods used.

Impacts on visual resources during field development primarily would occur from the removal of vegetation for well pads, roads, and other facilities; the addition of structural elements into a relatively undeveloped landscape; and potentially unnatural grading transitions within rolling or steep terrain. Major components of the analysis include the addition of structural elements into the landscape and vegetation modifications. Vegetation contrast results from clearing trees, shrubs, and grasses, and primarily is related to the density and type of vegetation cleared. Structure contrast results from the introduction of alternative facilities and primarily is related to the distance from which the well components are viewed. The typical structures associated with development such as well heads, condensate pits, meter houses, and chain link fencing are most dominant in the immediate foreground (0 to 300 feet) and less dominant in foreground views (300 feet to 0.25 mile). Well-related facilities become subordinate to the characteristic landscape in middleground views (0.25 mile to 1 mile), and noticeable to the casual observer in background views (1 to 5 miles). Other less common facilities (i.e., only one of these facilities would be required per development area) include larger facilities associated with resource processing

treating and storage, and are more visually obtrusive.

Production Phase

The occurrence of adverse impacts identified under construction for the potential well sites would continue to occur during production.

Abandonment Phase

At this phase, reclamation would be required for any surface disturbed that is not needed for continued well operation. Long-term positive effects on visual resources would result from abandonment and reclamation including recontouring and revegetation of well pads, and pipeline and flowline paths. No additional impacts on visual resources in form, line, color, or texture are anticipated during abandonment.

Impacts by Basin

VRM Class I areas are **discretionarily** closed to leasing, VRM Class II areas would be managed with the stipulation of controlled surface use, and VRM Classes III and IV areas would be managed with standard lease terms and conditions. Because areas designated as VRM Class I are closed to leasing, no visual resource impacts would occur in these locations as a result of field development.

In VRM Class II areas, the stipulation of controlled surface use would allow for short-term impacts as long as long-term impacts are consistent with the VRM Class II objectives. BLM guidance for areas of VRM Class II requires that changes in any of the basic elements in the characteristic landscape, caused by management activity should not be evident in the characteristic landscape, and that contrast may be seen but must not attract attention. Within an area of VRM Class II, requirements of controlled surface use may include painting facilities to blend with the surrounding vegetation and landscape and maximizing use of existing roads and utility corridors. Sensitive siting and mitigation planning of each site should reduce impacts on visual resources to be in compliance

with BLM VRM classifications, and to less than significant levels.

In areas designated as VRM Class III and IV, where standard lease terms and conditions apply, field development within areas designated as VRM Class III potentially could result in significant visual impacts and noncompliance with BLM VRM objectives. Field development within areas designated as VRM Class IV is unlikely to result in noncompliance with BLM VRM objectives; however, significant impacts on sensitive viewers could occur within these locations.

Salt/Pecos River Basins

Within this basin area, approximately 5,850 acres are designated as VRM Class I, all of which is closed to leasing. These VRM Class I areas include the Cornudas Mountains, Wind Mountain, and Alamo Mountain ACECs.

VRM Class II areas within BLM's Decision Area portion of this basin constitute 109,933 acres including portions of the Guadalupe Escarpment WSA and Brokeoff Mountains WSA. The RFD could be widely distributed throughout BLM's Decision Area or it could be concentrated within designated VRM Class II areas open to leasing with a stipulation of controlled surface use within the basin area. According to BLM VRM guidelines, development within areas designated as VRM Class II should follow the basic elements in the characteristic landscape, and contrast resulting from this development must not attract attention.

VRM Class III areas within BLM's Decision Area portion of this basin area constitute approximately 26,808 acres. These lands primarily occur along the State highways and land surrounding the town of Piñon within the Decision Area. According to BLM VRM guidelines, development within areas designated as VRM Class III should remain subordinate to the existing landscape. The majority of Decision Area lands within this

basin are designated as VRM Class IV, totaling 589,711 acres, and would be managed according to those objectives.

Tularosa Basin

Within the Tularosa Basin 3,347 acres are designated as VRM Class I, all of which is closed to leasing. These VRM Class I areas include parts of the Sacramento Escarpment ACEC.

VRM Class II areas, open to leasing with a stipulation of controlled surface use, within the Tularosa Basin portion of BLM's Decision Area constitutes 12,493 acres, primarily skirting the foothills of the Sacramento Mountains and portions of the Sacramento Escarpment WSA. However unlikely, the RFD could be concentrated within areas designated as VRM Class II within the Tularosa Basin; impacts should not be visually evident.

VRM Class III areas within BLM's Decision Area constitute 76,553 acres. These lands primarily occur along the State highways within BLM's Decision Area. The majority of Decision Area lands within the Tularosa Basin are designated as VRM Class IV, totaling 210,222 acres, and would be managed according to those objectives. According to BLM VRM guidelines, development within areas designated as VRM Class III should remain subordinate to the existing landscape.

Jornada del Muerto Basin

No VRM Class I areas exist within this basin. VRM Class II areas within the basin portion of BLM's Decision Area constitute 4,212 acres, including the Jornada del Muerto WSA. The RFD could be concentrated within areas designated as VRM Class II open to leasing within the basin; however, impacts should not be visually evident.

VRM Class III areas within BLM's Decision Area constitute 3,035 acres. These lands primarily occur along the east side of the

Caballo Mountains within BLM's Decision Area. The majority of Decision Area lands within this basin are designated as VRM Class IV, 270,055 acres, where impacts may begin to dominate the landscape. According to BLM VRM guidelines, development within areas designated as VRM Class III should remain subordinate to the existing landscape.

Rio Grande/Mimbres/Gila River Basins

No VRM Class I areas exist within this basin area. VRM Class II areas open to leasing within BLM's Decision Area portion of this basin area constitutes 59,467 acres, primarily skirting the foothills of the Caballo Mountains and Reservoir. The RFD could be concentrated within areas designated as VRM Class II within the basin area, although visual impacts should not be evident.

VRM Class III areas within BLM's Decision Area constitute 204,340 acres. These lands primarily occur along the interstate and State highways within BLM's Decision Area. The majority of Decision Area lands within this basin area are designated as VRM Class IV, 453,856 acres. According to BLM VRM guidelines, development within areas designated as VRM Class III should remain subordinate to the existing landscape.

4.2.1.16 Special Management Areas

Issues

During scoping, it was expressed that special management areas such as WSAs and ACECs should be protected from impacts associated with fluid minerals development. The WSAs in the Planning Area are managed according to BLM Manual H-8550-01, the Interim Management Policy and Guidelines for Lands Under Wilderness Review, commonly known as the IMP. The IMP directs nondiscretionary closure to leasing. The ACECs within the Planning Area were designated by the 1986 RMP and the Otero County ACEC RMPA (BLM 1997b) and were discretionarily closed to leasing. Also, management of the eight nominated ACECs in

BLM's Decision Area included those reasonable measures necessary to protect significant resource values until the area is fully evaluated through the resource management planning process.

Management for fluid minerals development in McGregor Range also is previously determined in the McGregor Range RMPA (BLM 1990a). The decisions described in that document will be carried forward unchanged.

General Impacts

Because the WSAs, ACECs, and the majority of McGregor Range are closed to leasing, there would be no direct impacts on those areas. There may be indirect impacts on biological or visual resources within special management areas as a result of project activities occurring on adjacent leaseholds. The potential for such impacts is discussed in the respective resource sections.

4.2.1.17 Social and Economic Conditions

Issues

The principal socioeconomic issues associated with **the Proposed Plan** arise from potential changes in land use, employment of labor and capital in exploration and development activities, and generation of revenues in the form of royalties and taxes. If economic development is anticipated to be significant, related impacts of growth and the ability to provide required community services may become concerns.

The issue of environmental justice is included in this section. Title VI of the Civil Rights Act of 1964 and related statutes ensure that individuals are not excluded from participation in, denied the benefit of, or subjected to discrimination on the basis of race, color, national origin, age, sex, and disability. Executive Order 12898 on Environmental Justice directs that programs, policies, and activities not have a disproportionately high adverse impact on affected minority or low-income populations.

General Impacts

Socioeconomic impacts generally result from disturbances to customary living patterns of the inhabitants of an area where some activity is proposed that will involve significantly altering conditions and uses of the local environment. In this analysis, impacts could occur in areas where leasing of Federal lands for exploration and development of fluid minerals would lead to clearing patches of land and temporary or permanent placement of facilities for finding and extracting oil, natural gas, or geothermal fluids. Current uses of such lands would be displaced, including livestock grazing, hunting, and recreational uses. Loss of such uses, often temporary, would involve depriving individuals of the economic or cultural benefits of customary uses. Mitigating measures may be necessary to compensate such persons with established property rights on the affected lands.

Besides these displacement impacts, there would be positive economic impacts from the employment and wages generated directly by the exploration and, particularly, development activities as well as the secondary (i.e., indirect and induced) effects on local businesses from spending by workers and contractors in communities in the vicinity. State and county governments would benefit from royalties on any production, while local governments would continue to accrue revenues from Federal government payments in lieu of property taxes on the leaseholds and other Federal lands in the counties. Cumulative impacts would occur in the event that fluid mineral development is anticipated to produce a boom-bust effect on local economies, potentially in conjunction with other proposed projects.

An important concern for socioeconomic impacts is the frequency and dispersion of exploration and development activities. The more concentrated they are in time and space, the more likely that local communities would experience a mix of beneficial and adverse effects. It is true, however, that any adverse disturbances would be of relatively brief duration, while the fiscal benefits would be long term.

Impacts on specific communities cannot be determined in this EIS; however, clusters of population that may be affected can be identified. If adverse impacts are anticipated, the potential for environmental justice concerns can be assessed by identifying clusters of the population that are characterized by a disproportionate number of minority or low-income residents.

Environmental Justice

Environmental justice concerns are based on the location of well facilities, which could produce positive economic benefits or adverse impacts if the sites disproportionately impact minority or low-income communities. Demographic information for population centers in each county suggests that many of the larger communities reflect racial and income characteristics of the counties as a whole. A notable exception, however, is the Mescalero Apache Indian Reservation including the town of Mescalero, and the town of Tularosa. These areas comprise disproportionate percentages of minorities (American Indian and Hispanic), lower median incomes, and a higher percentage of the population with incomes below the poverty level. Significant adverse socioeconomic impacts are not anticipated; however, any specific environmental justice concerns may be addressed on a site-specific basis in the APDs.

Oil and Gas

Impacts of oil and gas activities common to all alternatives include the land and labor needs, costs, revenue, and royalty rates associated with achieving the RFD. This section illustrates a likely scenario to accompany the RFD.

Preliminary Exploration Investigations:

Exploratory investigations are associated with certain financial risks and are not anticipated to generate returns every time. No significant socioeconomic impacts are anticipated during this phase.

Construction Phase: One oil or gas well and its associated pad and infrastructure occupies 9 acres of land (based on well sites on the

Bennett Ranch Unit), and can cost anywhere from \$600,000 to upwards of \$2 million to equip, drill, and complete (dry hole or successful). In 1997, the average cost for a completed onshore exploration well in the continental United States was \$1.685 million, drilled to a depth of 8,900 feet (Energy Information Administration [EIA] 1998). The average cost for a dry hole was \$2.042 million (average depth 10,400 feet). Development wells were less expensive—completed wells averaging \$870,000, drilled to 7,400 feet; dry holes averaging \$668,000, drilled to 6,400 feet (EIA 1998). An onshore well typically could be completed in less than a month's time, employing two crews of a dozen or more workers splitting 12-hour shifts around the clock (and oftentimes living in a remote work camp, to maximize worker productivity).

For purposes of this impact assessment, it was assumed that a maximum development scenario would consist of two drilling rigs drilling simultaneously over a period of approximately four years.⁴ This scenario presumes that if a promising strike were to occur, the operator would quickly drill additional wells near the strike to define the field. In such an instance, it is possible that as many as a dozen wells could be drilled in a wellfield area within a few months' time.

Specifically, the RFD scenario envisions 39 wildcat wells (three of which are successful), and four appraisal wells for each successful wildcat

⁴ A “**maximum development**” scenario is postulated in order to define the maximum extent of socioeconomic impacts that might occur. If only one drilling rig were used, socioeconomic impacts would be spread over approximately six to seven years, as opposed to four years under the two-drilling-rig scenario. This parameter is based on the fact that a typical well takes approximately 21 days to drill, thus limiting the annual output of one drilling rig (under optimal conditions) to 17 (Kerri Sitler, NewFields, Inc., Denver. Personal communication with Robert Mott, November 29, 1999). This analysis assumes that with a total of 141 wells to be drilled, two drilling rigs together drilling a total of 34 wells per year would require about four years to complete the RFD scenario.

(see Table A-5). Subsequently, 30 gas development wells and 60 oil development wells would be drilled. The total number of new wells that would be drilled in Sierra or Otero County (or both) would be 141. Geographical concentration of activity would, of course, increase the scale of impacts on a local area. Using a nominal cost of \$1.3 million per well (the unweighted average of the cost figures cited earlier), the maximum development scenario would yield a total outlay of \$183.3 million over a period of approximately four years. The value of \$183.3 million represents the value of labor, materials, equipment, and other supplies that would be consumed to sustain a program of wildcat and production well drilling in Sierra and Otero Counties. In addition, per the RFD, 100 miles of gas transmission pipelines would be constructed, the cost of which is estimated at \$15 million.⁵

For purposes of assessing the regional socioeconomic impacts of the RFD, the IMPLAN input-output modeling system was used (Minnesota IMPLAN Group, Inc. 1999). IMPLAN estimated the secondary (indirect and induced) economic effects of well field development on the basis of projected direct expenses to be incurred in the Planning Area (i.e., Sierra and Otero Counties), and the resulting values were used to project any demographic and other social impacts of oil and gas exploration and development activities. Table 4-6 presents the results of the modeling, displaying the changes in regional total output, value added components, and employment, disaggregated by 1-digit SIC industry sector.

In terms of relative magnitude of impact on the regional economy, the RFD would be less than significant. The direct annual output associated with exploration and development would be approximately \$23.9 million. The additional

⁵ Based on a nominal cost of \$15,000 per inch per mile (Personal communication between Eileen Dey, Burlington Industries, and Cindy Smith, November 29, 1999) for 10-inch gas transmission pipelines over a total of 100 miles (Personal communication between Kerri Sitler, NewFields, Inc., and Robert Mott, April 27, 2000).

indirect and induced output resulting from the direct output stimulus would be approximately \$6.6 million (a multiplier effect of 1.28). Total output attributable to the exploration and development phase of this project would be over \$30.5 million annually, which represents approximately 1.6 percent of total industry output in the study area.⁶

The number of jobs associated directly with exploration and development would be 275, which would result in an additional 105 indirect and induced jobs. In total, annual average employment would be 381 employees over four years, representing approximately 1.2 percent of total 1997 employment in the Planning Area. The increase in value added in the Planning Area (equivalent to change in gross regional product) would be \$9.4 million (a direct result of exploration and development), resulting in indirect and induced value added of approximately \$3.7 million, for a total of \$13.2 million in value added annually. This would represent less than 1 percent of the Planning Area's total value added/gross regional product. As noted above, Table 4-7 presents an industry sector breakdown of impacts on the Planning Area economy. Note that the indirect and induced impacts are a result of the multiplier effect. The indirect impact component represents the effects of the exploration and development contractors' purchases of goods and services from local vendors. The induced impact component (which is the larger portion of the secondary impacts), is largely manifested in the trade and services sectors, arising from increases in the consumption spending of Planning Area residents who earn income from the project.

In addition to these economic impacts, any removals of grazing land would impact ranchers holding grazing leases. Based on average carrying capacity of lands (in Animal Units), which vary with the quality of soils and precipitation), estimates of well field leases on ranchers can be developed on a site-specific basis.

Fluid minerals development would cause spillover into local communities in the form of jobs, supply contracts for construction materials and services, sales of retail goods and services to workers, taxes, and any associated requirements for police, fire, health, and welfare services and facilities. Of concern is the capacity of the community to accommodate an influx of non-local workers and business. If it has the capacity, then the area prospers; if not, then some residents may suffer inconveniences or even losses from project-induced pressure on local resources. The construction phase offers the main opportunity for socioeconomic problems to develop, because it contains the bulk of labor force, logistical, and capital spending effects.

The foregoing analysis indicates that the RFD scenario would not likely stress local community resources. This is due in part because the exploration and development activities would be carried on largely by nonlocal contractors (none are located in either Sierra or Otero Counties), who would bring in their workers from centers of oilfield activity in the Permian Basin; also, the well sites mostly would be in remote areas, where the contractors would have to provide transient living accommodations for workers, thus isolating the activities. Another factor reducing the local economic stimulus of the exploration and development activities would be the leakage of income due the high proportion of imported (i.e., nonlocal) exploration and development-related goods and services that would be employed in the wellfield activities.

⁶ Estimated impacts exclude those impacts that would occur outside Sierra and Otero counties, and expresses dollar amounts in 2000 dollars. The total output was converted to 1997 dollars to estimate the percentage of total study area output.

Production Phase: Once drilling is completed and production facilities are in place, well field activities are largely low-level. The principal economic benefits of the projects are generated during the operating phase, in the form of fiscal flows to local governments from royalties and taxes on production. In 1997, oil and gas wells on Federal lands in New Mexico generated

\$287.9 million in royalties for disbursement to the state and counties (USDI, MMS 1999). This sum was based on production of 14.4 million barrels of oil and 531.4 billion cubic feet of gas, which was about one-half of total gas production

**TABLE 4-7
OIL AND GAS EXPLORATION AND PRODUCTION IMPACT ANALYSIS
EXPLORATION AND DEVELOPMENT PHASE**

Total Industry Output	Impact of Year 2000 Dollars			
Sector	Direct	Indirect	Induced	Total
Agriculture	0	3,130	15,067	18,197
Mining	0	4,621	2,126	6,747
Construction	23,864,096	54,464	56,072	23,974,632
Manufacturing	0	240,350	45,495	285,845
Transportation and Utilities	0	1,360,962	211,288	1,572,250
Wholesale and Retail Trade	0	454,944	609,016	1,063,960
Finance, Insurance, and Real Estate	0	613,389	523,613	1,137,001
Services	0	1,577,554	689,741	2,267,295
Government	0	57,087	99,955	157,042
Total Impact	23,864,096	4,366,502	2,252,371	30,482,970
Agriculture	0	2,426	11,211	13,637
Mining	0	2,997	1,333	4,330
Construction	9,416,122	27,954	26,904	9,470,980
Manufacturing	0	75,491	12,544	88,035
Transportation and Utilities	0	540,513	124,291	664,804
Wholesale and Retail Trade	0	299,139	423,739	722,878
Finance, Insurance, and Real Estate	0	438,516	388,216	826,732
Services	0	939,641	346,223	1,285,864
Government	0	28,249	48,905	77,154
Total Impact	9,416,122	2,354,926	1,383,366	13,154,414
Total Labor Income	Impact of Year 2000 Dollars			
Agriculture	0	1,542	6,853	8,395
Mining	0	1,197	426	1,623
Construction	5,108,695	26,341	25,331	5,160,367
Manufacturing	0	59,295	8,701	67,996
Transportation and Utilities	0	338,583	54,324	392,907
Wholesale and Retail Trade	0	180,621	271,704	452,325
Fire, Insurance, and Real Estate	0	120,358	64,225	184,583
Services	0	800,011	295,263	1,095,274
Government	0	19,645	29,673	49,318
Total Impact	5,108,695	1,547,593	756,500	7,412,788

TABLE 4-7
OIL AND GAS EXPLORATION AND PRODUCTION IMPACT ANALYSIS
EXPLORATION AND DEVELOPMENT PHASE

Total Industry Output	Impact of Year 2000 Dollars			
Sector	Direct	Indirect	Induced	Total
Other Property Income				
Impact of Year 2000 Dollars				
Agriculture	0	797	3,956	4,753
Mining	0	1,595	803	2,398
Construction	3,735,548	1,387	1,346	3,738,281
Manufacturing	0	14,491	3,556	18,047
Transportation and Utilities	0	164,227	55,660	219,887
Wholesale and Retail Trade	0	57,615	71,284	128,899
Finance, Insurance and Real Estate	0	274,798	271,883	546,681
Services	0	110,687	40,947	151,634
Government	0	8,604	19,231	27,835
Total Impact	3,735,548	634,201	468,666	4,838,415
Indirect Business Taxes				
Impact of Year 2000 Dollars				
Agriculture	0	86	402	488
Mining	0	205	104	309
Construction	571,880	226	227	572,333
Manufacturing	0	1,705	287	1,992
Transportation and Utilities	0	37,703	14,307	52,010
Wholesale and Retail Trade	0	60,903	80,751	141,654
Finance, Insurance, and Real state	0	43,360	52,108	95,468
Services	0	28,944	10,012	38,956
Government	0	0	0	0
Total Impact	571,880	173,132	158,198	903,210
Employment				
Impact in Number of New Jobs				
Agriculture	0	0	0	1
Mining	0	0	0	0
Construction	275	1	1	277
Manufacturing	0	2	0	3
Transportation and Utilities	0	14	2	16
Wholesale and Retail Trade	0	10	18	28
Finance, Insurance, and Real Estate	0	5	3	8
Services	0	32	15	47
Government	0	1	1	2
Total Impact	275	65	40	381

NOTE: Model – Sierra-Otero.iap

on Federal lands that year upon which one-half of the royalties went to the Federal government and one-half to the state and local governments. The average royalty statewide amounted to \$1.534 per barrel (Bbl) of crude oil and \$0.229 per thousand cubic feet (MCF) of natural gas, yielding a total of \$144 million to New Mexico jurisdictions, with the rate accruing to the individual counties ranging upwards of \$0.2 to \$0.25 per MCF.

In order to estimate the economic impacts of these wells with the IMPLAN model, it is necessary first to estimate average levels of production per year and their associated values. The RFD postulates drilling of 30 gas production wells and 60 oil production wells. Assuming in addition that 3 of the wildcat wells and all 12 of the definition wells become successful producers, the RFD would yield a total of 105 producing wells. An analysis of oil and gas production data for the southeastern area of New Mexico indicates that the average producing gas well produces 75,530 MCF dry gas and 595 Bbl of condensates per year (Broadhead 2000). The average oil well produces 3,107 Bbl of crude per year plus 10,597 MCF of natural gas.⁷ (Broadhead 2000) The IMPLAN model database is as of 1997, so wellhead prices for oil and gas in that year were applied to the production averages to obtain an estimate of the value of new output, value added, and employment that would be associated with the new wells (the results were converted to their year 2000 equivalents for presentation later). According to the New Mexico Bureau of Mines and Mineral Resources, spot wellhead prices for southeast New Mexico crude averaged about \$21 per barrel in 1997, while gas fetched \$1.76 per MCF. Applying these values to the above outputs yields a value of \$83,897 per well per year in crude oil and associated casinghead gas for oil wells. For gas wells, the corresponding value for dry gas and natural gas liquids (i.e., condensates) is \$145,421 million per well per year. Multiplying

⁷ New Mexico Bureau of Mines and Mineral Resources. Well counts and production data as of 1993 (latest available consolidated statistics). Personal communication with Ron Broadhead by Robert Mott, April 27, 2000.

these values by the corresponding numbers of new producing wells (70 oil, 35 gas, respectively),⁸ yields values of annual production for the overall RFD of \$5,872,787 for the oil wells and \$5,089,728 for the gas wells, for a grand total of \$10,962,514 per year. This is the “direct effect” of the RFD upon which the IMPLAN analysis is based.

Using IMPLAN, the indirect and induced annual output that would result from direct output of \$10.96 million (actually \$11.04 million in year 2000 prices) would be approximately \$2.93 million, for a total annual output of approximately \$13.97 million (a multiplier effect of 1.27). Direct annual employment associated with production would be 63 employees. Combined with indirect and induced employment of 36, a total of 99 new jobs would develop as a result of production. In terms of annual value added, direct value added due to the project would be \$6.91 million. Total value added would be \$8.68 million per year, including \$1.77 in indirect and induced impacts to value added. These impacts would represent less than 1.0 percent of total annual economic activity in the study area. Table 4-8 presents the detailed IMPLAN impact analysis results. Again, the multiplier would largely affect the trade and services industry, because the stimulus would originate from increased consumer spending.

Assuming average royalty rates of \$1.534 per Bbl of crude oil and \$0.25 per MCF on gas production from leases in Sierra and Otero Counties and the nominal production rates cited above, the royalties that would accrue to the State would amount to approximately \$1.21 million per year. These royalties would be in addition to the Federal government’s ongoing payments in-lieu of taxes that have been paid to local governments as compensation for the exemption of Federal lands from local property

⁸ It was assumed that the 3 successful wildcat wells and the 12 definition wells would be divided between oil and gas production in the same proportion as the development wells (i.e., 10 would be for oil and 5 for gas).

**TABLE 4-8
OIL AND GAS EXPLORATION AND PRODUCTION IMPACT ANALYSIS
PRODUCTION PHASE**

Total Industry Output	Impact of Year 2000 Dollars			
Sector	Direct	Indirect	Induced	Total
Agriculture	0	1,574	6,285	7,859
Mining	11,036,740	470,245	887	11,507,872
Construction	0	715,019	23,389	738,408
Manufacturing	0	12,966	18,977	31,943
Transportation and Utilities	0	113,217	88,137	201,354
Wholesale and Retail Trade	0	35,566	254,045	289,611
Finance, Insurance, and Real Estate	0	442,073	218,416	660,490
Services	0	170,148	287,712	457,859
Government	0	33,362	41,695	75,058
Total Impact	11,036,740	1,994,171	939,544	13,970,455
Total Value Added	Impact of Year 2000 Dollars			
Agriculture	0	1,189	4,677	5,866
Mining	6,911,231	294,472	556	7,206,259
Construction	0	287,981	11,222	299,203
Manufacturing	0	4,585	5,233	9,817
Transportation and Utilities	0	56,963	51,848	108,810
Wholesale and Retail Trade	0	23,526	176,760	200,286
Finance, Insurance, and Real Estate	0	312,543	161,937	474,479
Services	0	93,755	144,423	238,178
Government	0	15,027	20,400	35,427
Total Impact	6,911,231	1,090,040	577,055	8,578,325
Total Labor Income	Impact of Year 2000 Dollars			
Agriculture	0	883	2,859	3,742
Mining	2,195,367	93,547	178	2,289,092
Construction	0	167,431	10,566	177,997
Manufacturing	0	3,531	3,630	7,160
Transportation and Utilities	0	26,034	22,661	48,695
Wholesale and Retail Trade	0	14,451	113,339	127,790
Finance, Insurance, and Real Estate	0	51,584	26,792	78,376
Services	0	78,426	123,166	201,593
Government	0	8,875	12,378	21,253
Total Impact	2,195,367	444,762	315,568	2,955,698
Other Property Income	Impact of Year 2000 Dollars			
Sector	Direct	Indirect	Induced	Total
Agriculture	0	262	1,650	1,912
Mining	4,176,547	177,947	335	4,354,828
Construction	0	104,531	562	105,092
Manufacturing	0	959	1,483	2,442
Transportation and Utilities	0	24,351	23,219	47,569
Wholesale and Retail Trade	0	4,384	29,736	34,119
Finance, Insurance, and Real Estate	0	210,336	113,409	323,745
Services	0	12,175	17,080	29,255

**TABLE 4-8
OIL AND GAS EXPLORATION AND PRODUCTION IMPACT ANALYSIS
PRODUCTION PHASE**

Total Industry Output	Impact of Year 2000 Dollars			
Sector	Direct	Indirect	Induced	Total
Government	0	6,152	8,022	14,174
Total Impact	4,176,547	541,095	195,496	4,913,13
Indirect Business Taxes	Impact of Year 2000 Dollars			
Sector	Direct	Indirect	Induced	Total
Agriculture	0	43	168	211
Mining	539,318	22,978	43	562,339
Construction	0	16,020	95	16,114
Manufacturing	0	95	120	215
Transportation and Utilities	0	6,578	5,968	12,546
Wholesale and Retail Trade	0	4,691	33,685	38,376
Finance, Insurance, and Real Estate	0	50,623	21,735	72,358
Services	0	3,154	4,176	7,330
Government	0	0	0	0
Total Impact	539,318	104,182	65,990	709,490
Employment	Impact in Number of New Jobs			
Sector	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0
Mining	63	3	0	65
Construction	0	8	0	9
Manufacturing	0	0	0	0
Transportation and Utilities	0	1	1	2
Wholesale and Retail Trade	0	1	8	8
Finance, Insurance, and Real Estate	0	3	1	5
Services	0	3	6	9
Government	0	0	0	1
Total Impact	63	20	17	99

NOTE: Model – Sierra-Otero.iap

taxes (costs of which as well as other administrative and management expenses the Federal government recovers from bonuses, rents, and royalties on leases of mineral and grazing rights).

Abandonment Phase: When it comes time to abandon production facilities, impacts are also relatively benign, because the manpower and equipment required for capping and plugging wells and removing other facilities is small.

4.2.2 Geothermal Resources

Only areas exhibiting a “high” potential for geothermal resources in BLM’s Decision Area

(refer to Map 3-4) are evaluated and, therefore, only potential impacts within the Rio Grande/Mimbres/Gila River Basins are presented below.

4.2.2.1 Lands and Access

As projected by the RFD, a total of approximately 26.6 acres would be disturbed for development of geothermal resources. Due to the small area of surface disturbance and closure to leasing of incorporated cities, towns, and villages, impacts on land use are expected to be minimal. For geothermal development, needed access is expected to total approximately 12 acres. In general, geothermal resources are

used on site and drilling activities can be conducted along existing access routes. Geothermal resources likely would be applied to a direct use; specific land use or traffic impacts that may be associated with that use may be addressed in the APD.

4.2.2.2 Minerals

The production of geothermal resources (heat) is a renewable resource; therefore, no impact on the resource has been identified. Surface and subsurface management within the Planning Area has the potential to impact the ability to explore for or exploit the geothermal resources.

Three areas of high geothermal potential were identified in this basin area. Two of these areas are along the Rio Grande and its associated reservoirs, and one is located in the vicinity of the town of Truth or Consequences. Therefore, only limited portions of these two high potential areas overlie Federal fluid minerals. Under the **Proposed Plan**, these lands are open to leasing with standard lease terms and conditions and no impact on the ability to explore for and exploit geothermal resources is anticipated.

4.2.2.3 Soils

Nickel-bluepoint soils are located in the areas of high potential for geothermal resources in the vicinity of Derry and Truth or Consequences. These soils are identified as fragile and as known or potential prime farmland. No fragile soils or known or potential prime farmland are identified in the Hillsboro area, also an area of high potential for geothermal resources; however, the area contains slopes with high grades.

Predictable short-term impacts include loss of topsoil and increased erosion, which are likely to be limited to new development. Long-term impacts on soil resources in the form of increased roadway construction and construction of production facilities, are similar to the oil and gas activities. Since the development of hydroponic crop production or aquaculture is a likely end use of the geothermal resource, if known or potential prime farmland is taken out

of production, the resulting land use may increase the productivity of the land though not the soils themselves.

Subsidence may occur as a result of geothermal development. However, it is expected to be minor and could be mitigated through the use of injection wells.

Overall, the impacts on soil resources from geothermal activities are anticipated to be similar to those anticipated under oil and gas activities.

4.2.2.4 Groundwater

Impacts on groundwater resources are identified **previously under General Impacts of Section 4.2.1.4** and as described for the Rio Grande/Mimbres/Gila River Basins in the oil and gas section above. An important issue related to water quality is the method of disposal of spent geothermal fluids. As geothermal facilities pump and manage water entirely at the facility and do not require any trucking of wastewaters, the anticipated impacts from spills would be less. However, the amount of wastewater generated is likely to be much greater for the geothermal facility and therefore the likelihood of impact on-site becomes greater. Impacts on groundwater resources are expected to be minimal.

4.2.2.5 Surface Water

Impacts on surface water resources are anticipated to be the same as those **described previously in the General Impacts section**. Spills of produced water, which could be highly mineralized, likely would be of most concern. Activities more likely to occur near surface water features have the greatest potential to impact surface water quality. Potential direct impacts on surface waters include detention pond leaks or breaches resulting in discharge of highly saline or highly mineralized water into receiving surface waters, as well as accidental releases of contaminants.

4.2.2.6 Air Quality

Potential impacts on air quality would be the same as those for oil and gas operations. The **air pollutant emissions** associated with construction are the primary concern, and can be mitigated.

4.2.2.7 Noise

Impacts from noise would be similar to noise impacts described for oil and gas operations.

4.2.2.8 Vegetation, Wildlife, and Special Status Species

Types of impacts on vegetation (e.g., direct loss of vegetation), wildlife (e.g., increased human activity, traffic, and noise), and special status species would be similar to those described previously for oil and gas. Potential impacts on vegetation, wildlife, and special status species would be identified, through site-specific investigation, as APD conditions of approval. Due to the small amount of surface disturbance and assuming that the operators comply with conditions of approval, best management practices, and other guidelines, impacts on vegetation, wildlife, and special status species are expected to be minimal.

4.2.2.9 Rangeland

Impacts on rangeland and grazing from geothermal **activities** are expected to be minimal.

4.2.2.10 Cultural Resources

No cultural resources of particular concerns have been specially designated within BLM's Decision Area in the areas of high potential for geothermal resources. In general, potential impacts on cultural resources would be reviewed at the time of an APD and considered in accordance with Section 106 of the National Historic Preservation Act using the procedures outlined in the previous discussion of impacts common to all alternatives. Implementation of such procedures is expected to result in

avoidance of any identified adverse effects or satisfactory mitigation of those effects.

4.2.2.11 Paleontological Resources

Potential impacts on paleontological resources would be reviewed at the time of an APD, and if needed, measures would be developed as conditions of approval to mitigate the impacts.

4.2.2.12 Recreation

Impacts on recreation resources from geothermal development would be similar to those described **previously** for oil and gas, although the acreage disturbed would be much less.

4.2.2.13 Visual Resources

Potential impacts on visual resources from geothermal development are anticipated to be more localized than those resulting from oil and gas development. In geothermal development all of the facilities would be located at the source of the resource in a single location. Best management practices for reducing impacts on visual resources are summarized in Appendix B.

4.2.2.14 Social and Economic Conditions

Fluid mineral development potentially could cause spillover into local communities in the form of jobs, supply contracts for construction materials and services, sales of retail goods and services to workers, taxes, and any associated requirements for police, fire, health and welfare services and facilities. Of concern is the capacity of the community to accommodate an influx of nonlocal workers and business. If it has the capacity, then the area prospers; if not, then some residents may suffer inconveniences or even losses from project-induced pressure on local resources. The construction phase offers the main opportunity for socioeconomic problems to develop, because it contains the bulk of labor force, logistical, and capital spending effects.

The geothermal resources most likely to be developed in the RFD study area are located in Sierra County in the vicinity of towns and communities such as Truth or Consequences,

Arrey, and Derry. The resources are relatively low in temperature, i.e., less than 100 degrees Celsius, and relatively shallow (less than 500 feet) (Geo-Heat 1998). As such, they could be exploited with conventional water well drilling technology. The capital costs to explore for, develop, and produce such a resource (including pumps, piping, and reinjection wells) run in the neighborhood of \$500,000 to \$750,000. Annual operating costs are on the order of \$40,000 to \$45,000 per year (excluding capital recovery). The manpower and material resources represented by these values are relatively insignificant, and as such would have very little impact on the local socioeconomic milieu. Local contractors could probably supply most of the inputs (including workers), so most of the economic benefit would accrue to the local communities. But the magnitude of the worker income and local procurements would be negligible in terms of economic stimulus.

4.3 CUMULATIVE EFFECTS

Regulations prepared by the Council on Environmental Quality for implementing the National Environmental Policy Act require Federal agencies to analyze and disclose effects that result from incremental impact of an action “when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7).

Cumulative effects could result from fluid minerals activities occurring in the same or adjacent areas simultaneously. However, this RMPA/EIS is broad in scope and analyzes the fluid minerals program of the Las Cruces Field Office of BLM. The RMPA and Record of Decision will disclose the lands that are available for leasing and how those lands and resources will be managed for fluid minerals activities. At this level of analysis and the uncertainty of the location(s) of the potential fluid minerals activities, it is difficult to define the functional, temporal, and spatial relationships between

potential fluid minerals activities and other past, present, and reasonably foreseeable future actions. Therefore, past, present, and potential reasonably foreseeable future actions are addressed generally here and **subsequent actions, such as lease nominations and APDs, will be reviewed and evaluated to ensure compliance with NEPA.**

By comparing the direct and indirect impacts of the RFD with the potential effects of other actions, the relative contribution of the RFD to the cumulative impact or the effect that other actions may have on the ability for industry to achieve the RFD may be estimated.

Major past, present, and potential reasonably foreseeable future actions in BLM’s Decision Area are briefly described below.

4.3.1 Past Actions

- Within the Planning Area, a total of approximately 2,042,200 acres of lands are nondiscretionarily closed to leasing for military, recreation and preservation, and protective purposes.
- Within BLM’s Decision Area, approximately 46,047 acres of land are nondiscretionarily closed to leasing and approximately 17,673 acres of land currently are discretionarily closed to leasing.
- *Livestock grazing and rangeland improvements*—Ranching and livestock grazing has been a predominant use of the land dating back to the 1880s when railroads arrived in the territory. Historically, grazing on public land has been authorized and numerous rangeland improvements such as fencing and watering sources have been developed.
- *Habitat fragmentation*—Encroachment of desert scrub into grasslands has been occurring over the past 80 to 90 years. This shift may be attributed to a combination of climatic change, introduction of roads, intensive livestock grazing, and concurrent interruption of naturally occurring fire (Dick-Peddie 1975; Neilsen 1986).

- *Copper Flat Mine*—Copper has been pursued in the Copper Flats area northwest of Hillsboro since the mid 1950s, beginning with a small copper leaching operation and exploration. Exploration continued into the 1970s when sufficient reserves were defined to begin development. In 1982, an open pit copper mine was developed and operated. Operation continued intermittently until 1986.
- *Navajo Pipeline*—The Navajo Pipeline is a 12.75-inch-diameter pipeline that delivers petroleum products from the Navajo Refinery in Artesia, New Mexico to El Paso, Texas. The pipeline crosses through Otero County (across Otero Mesa).
- *Diamond Shamrock Pipeline*—The Diamond Shamrock Pipeline is a 10-inch-diameter petroleum products pipeline that parallels the Navajo Pipeline through Otero County.

4.3.2 Present Actions

- *Livestock grazing and rangeland improvements* Existing authorizations for livestock grazing and rangeland improvements occur on public land throughout the Planning Area.
- *Habitat fragmentation* Authorizations resulting in removal of vegetation (habitat) and possible ongoing impacts from past habitat fragmentation continue to affect habitat.
- *Bennett Ranch Gas Exploration* Existing lands have been leased in this area and exploration activities have begun.
- *Otero Platform Geophysical Exploration* Notices of intent to explore for fluid mineral resources have been approved in this area.

4.3.3 Reasonably Foreseeable Future Actions

- *BLM Actions Per Year* As summarized in Table 4-9 below, BLM estimates that there are approximately 356 acres disturbed each year due to miscellaneous actions.

- *Proposed RMPA/FEIS for New Mexico Standards for Public Land Health and Guidelines for Livestock Grazing Management* This Proposed RMPA/FEIS was released in January 2000. The Proposed Statewide RMPA/FEIS documents the effects of adopting standards for public land health and guidelines for livestock grazing management on BLM-administered public land in the State. The standards describe conditions needed for healthy sustainable public rangelands and provide the measure of resource quality, condition, and function upon which the health of public land will be assessed. Changes to existing grazing practices may result to attain the new standards for public land health, based on the need to retain the integrity of the soil and the continued sustainability of ecological processes. The Record of Decision for this project was signed on April 5, 2000. Following the signing of the Record of Decision, the standards and guidelines were sent to the Secretary of the Interior for review and approval. **The final Record of Decision was signed by the Secretary of the Interior on January 12, 2001.**
- *Spaceport Initiative* Private industry currently is evaluating the opportunity to site a spaceport or assembly site for a next-generation reusable launch vehicles. **The State of New Mexico is focusing on a 27-square-mile site for the project (for which 14 other states also are competing) that is located near Upham on the border of Sierra and Dona Ana Counties. A Draft EIS was completed for the Southwest Regional Spaceport in July 1997 as required as part of the process for licensing by the U.S. Department of Transportation and Federal Aviation Administration.**

**TABLE 4-9
ESTIMATED SURFACE-DISTURBING ACTIONS PER YEAR**

Type of Action	Average Number of Actions Per Year	Acres of Disturbance Per Action	Average Acres of Disturbance Per Year
Mining notices	7	1.5	10.5
Mining plans of operation	0.5	5.8	2.9
Mineral material sales	45	0.5	22.5
Fences	7	0.6	4.2
Pipelines	5	5.0	25.0
Troughs	10	0.1	1.0
Wells	1	1.0	1.0
Storage tanks	1	0.1	0.1
Prescribed burns	1	2.0	2.0
Wildfires	4	25.0	100.0
Leases 2920	1	20.0	20.0
Permits 2920	2	5.0	10.0
Recreation and Public Purpose Patents and Leases	1	20.0	20.0
Linear Right-of-way	8	15.0	120.0
Site Right-of-way	3	5.0	15.0
Vegetative products removal	0.1	0.0001	0.00001
Erosion control	1	1.0	1.0
Spring development	1	0.1	0.1
Umbrella catchments	1	0.1	0.1
Exclosures	2	0.25	0.5
Total		108.1	355.9

SOURCE: Bureau of Land Management, Las Cruces Field Office, July 23, 1999h

Overall, the cumulative impacts for leasing activities are anticipated to be minimal for most resources over the 20-year planning time frame, due to the limited nature of expected surface disturbance unless a substantial amount of development were to occur in one area that has sensitive resource concerns. However, there is potential for cumulative impacts to result in substantive effects on visual resources, wildlife habitat, and water resources. Potential cumulative impacts may be anticipated to occur on visual resources, wildlife habitat, groundwater levels, surface water quality, and socioeconomic resources, as described below.

Because of the open and undeveloped landscape within BLM's Decision Area, the potential exists for cumulative visual impacts if fluid mineral development occurs in visual proximity to other past, present, or reasonably foreseeable future actions. The greatest concern is if the combination of visual effects of the proposed

action and other development were to result in a moderate to strong visual contrast to the setting. The potential for significant effects would be greater if this occurred on BLM VRM Class II or III lands. These types of cumulative impacts may be mitigated through siting and other proposed mitigation measures.

The volume of road development is not large relative to the existing road network; however, the density or location of new access may have a cumulative effect on a previously undisturbed area. Well spacing in gas and oil fields can suggest the density of road development that may be anticipated. According to the RFD, the three gas fields are expected to have 320-acre spacing, with the total field covering approximately 6 square miles. Each gas field will contain an oil field developed on 40-acre spacing. Although the associated road networks would not be particularly dense, especially given the existing access in the Planning Area and possibilities for

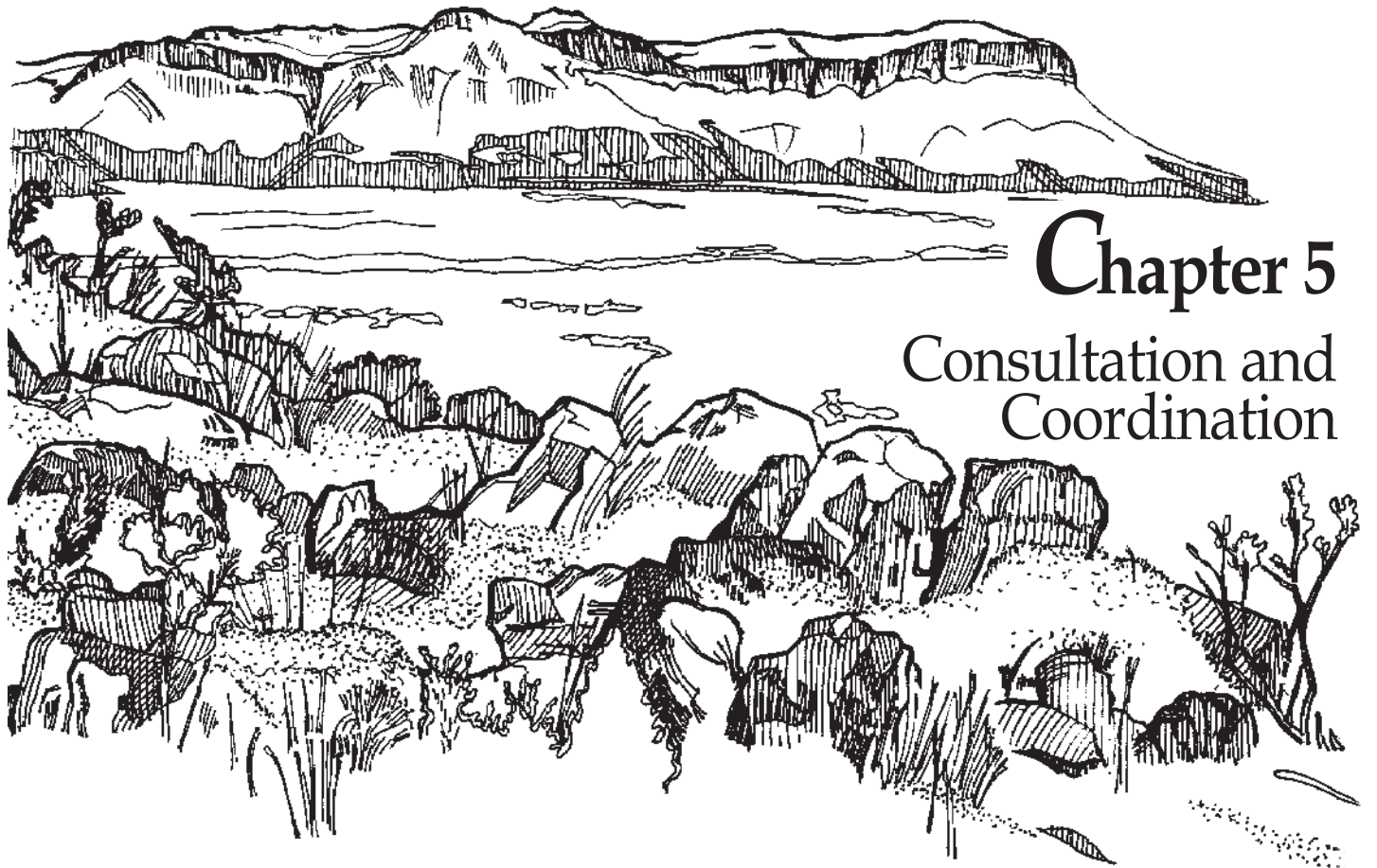
collocation, the cumulative direct and indirect effects may be notable in terms of habitat fragmentation for larger wildlife.

Although the water requirements for fluid minerals development are not anticipated to cause significant impacts, the other water demands such as irrigation and domestic needs due to population growth potentially could make even a small water demand a burden to the water system. Water table declines are monitored by the OSE, and the water right allotment and well permit system are in place to ensure that all interested parties have access to their allotted water. Declining water levels are of concern to residents of the area. However, fluid minerals development on non-Federal land is not expected to greatly increase the water supply demands in the Planning Area by more than twofold. None of the other potential projects are believed to impact the supply of groundwater resources.

Indirect impacts on surface water quality also can be cumulative in nature because the impact source could include one or more areas. For example, the Rio Grande flows through the

western portion of the Planning Area and then flows to Dona Ana County, through New Mexico and into Texas. Incremental impacts of the actions taken within the Planning Area when added to other past, present, and future actions could adversely affect downstream receiving waters.

Development of hydrocarbons or geothermal fluids could produce positive primary and secondary effects on local economies (through employment and purchases of goods and services) as well as generate royalties and tax revenue for state and local governments. The magnitudes, however, would be small; thus, the total positive benefits are not anticipated to produce a significant impact as defined by this study (10 percent increase or recession) based on the level of potential for fluid mineral resources. As a result the adverse impacts associated with stress on communities due to rapid growth is not anticipated as a long-term significant impact. No mitigating measures are called for, due to the low levels of economic and social impacts likely to be associated with the RFD scenarios.



Chapter 5

Consultation and Coordination

CHAPTER 5 – CONSULTATION AND COORDINATION

5.1 INTRODUCTION

During the planning process for this Resource Management Plan Amendment (RMPA)/ Environmental Impact Statement (EIS), formal and informal efforts were made by the Bureau of Land Management (BLM) to involve other Federal agencies, State and local governments, and the public. BLM initiated the planning process in October 1998 by requesting comments to determine the scope of issues and concerns that needed to be addressed during the studies and in the document. As part of the resource inventory, members of the interdisciplinary team formally and informally contacted various relevant agencies to request data to supplement BLM's existing resource database. **The Draft RMPA/EIS was distributed to relevant agencies and the interested public for review and comment, which are addressed in this Proposed RMPA/Final EIS (PRMPA/FEIS).**

The sections of this chapter describe these efforts including the formal consultation required, how this RMPA/EIS is consistent with other finalized plans, public participation activities throughout the process, and public review of the Draft RMPA/EIS including public comments and agency responses.

5.2 AGENCY CONSULTATION

BLM is required to prepare its EISs in coordination with any studies or analyses required by the Fish and Wildlife Coordination Act (16 USC Sec. 661 et seq.), Endangered Species Act of 1973 (16 USC Sec 1531 et seq.), National Historic Preservation Act of 1966 (16 USC Sec. 470 et seq.), and other environmental review laws and executive orders.

A description of the formal consultation relevant to this RMPA/EIS follows.

Consultation with the U.S. Fish and Wildlife Service (FWS) is required prior to initiation of any project by BLM that may affect any Federally listed special status species or its habitat in

accordance with Section 7 of the Endangered Species Act of 1973. This RMPA/EIS is considered a major planning effort, and consultation has been initiated. On January 5, 1999, the FWS provided a list of Federally listed species that may occur in Sierra and Otero Counties. This letter is on file in the Las Cruces Field Office of BLM. An informal consultation meeting was held between the BLM and FWS on February 17, 1999 to discuss the scope of the RMPA/EIS and efforts to address Federally listed, proposed, and candidate species. **A Biological Assessment has been prepared and provided to the FWS for review. The BLM determined that the implementation of the Proposed Plan is “not likely to adversely affect” the 10 species on which BLM consulted with FWS. The FWS has concurred with BLM's determination via memorandum dated October 14, 2003.**

The New Mexico Department of Game and Fish and the New Mexico Natural Resources Department also have been contacted in regard to State-listed threatened and endangered plant and animal species. This is consistent with legislation protecting State-listed species. Coordination and consultation with the State will continue throughout the planning process and during implementation of the RMPA.

In addition, the BLM cultural resource management program operates in accordance with 36 CFR, Part 800, which provides specific procedures for consultation between the BLM and State Historic Preservation Office (SHPO). The SHPO has been consulted during the development of the RMPA concerning cultural resources. A copy of the Draft RMPA/EIS was sent to the SHPO for review and comment. However, formal consultation with the SHPO is not required since no ground-disturbing activities will result from this RMPA/EIS for Federal fluid minerals leasing and development.

In accordance with the National Historic Preservation Act, efforts were made to identify and consider traditional cultural places. Letters were sent to five American Indian Tribes to

initiate discussions. The five Tribes include the following:

- Fort Sill Apache Tribe
- Mescalero Apache Tribe
- San Carlos Tribe
- White Mountain Apache Tribe
- Ysleta del Sur Pueblo

To date, written responses have been received from the San Carlos Tribal Council, Mescalero Apache Tribe, and Ysleta del Sur Pueblo. In addition, a meeting was held in October 2002 with representatives of the Ysleta del Sur Pueblo to provide further clarification of the planning effort.

5.3 CONSISTENCY WITH OTHER PLANS

The BLM planning regulations require that resource management plans (RMPs) be “consistent with officially approved or adopted resource-related plans, and the policies and procedures contained therein, of other Federal agencies, State and local governments, and Indian Tribes, so long as the guidance and RMPs also are consistent with the purposes, policies and programs of Federal laws and regulations applicable to public lands” (43 CFR 1610.3-2). In order to ensure such consistency, finalized plans were solicited from Federal, State, and local agencies as well as Tribal governments listed in Table 5-4. These same agencies received copies of the Draft RMPA/EIS for review and comment, **and will receive copies of this PRMPA/FEIS.**

Section 202 of the Federal Land Policy and Management Act (FLPMA) of 1976 requires the BLM to coordinate land use planning activities with other Federal agencies, State and local governments, and Indian Tribes. FLPMA also requires BLM to ensure that consideration is given to non-BLM plans that are pertinent to the development of the RMPA, assist in resolving inconsistencies between Federal and non-Federal government plans, and to provide for meaningful public involvement of other Federal agencies, State and local government officials, and Indian Tribes in the development of the RMPA.

There are no known inconsistencies between any of the alternatives and officially approved and adopted resource-related plans of other Federal agencies, State and local governments, and Indian Tribes. **Coordination and consultation will continue throughout the planning process and implementation of the RMPA.**

5.4 PUBLIC PARTICIPATION

The public participation process for the RMPA/EIS has been ongoing throughout the development of the RMPA/EIS and will continue to the Record of Decision. In addition to formal public participation activities, informal contacts occur frequently with public land users, industry, and interested persons through meetings, field trips, telephone calls, or letters. All public participation applicable to the RMPA/EIS has been documented and analyzed as part of the planning process and kept on file in the Las Cruces Field Office.

5.4.1 Identification of Issues

The RMPA/EIS and scoping process officially began on October 15, 1998, with the publication in the *Federal Register* of BLM’s Notice of Intent to amend the RMP, prepare an EIS, and conduct public scoping meetings. This notice invited the general public as well as Federal, State, and local government agencies to identify issues and submit comments regarding the RMPA/EIS.

In addition to the Notice of Intent, the BLM prepared a scoping notice to send to interested parties. The scoping notice included a brief letter from the Las Cruces Field Office Manager, a newsletter, and a comment form. The notice provided background information and descriptions of fluid minerals leases and RMPs, announced the preparation of the RMPA and EIS, explained the planning process, project schedule, agency responsibilities, and announced the public scoping meetings and other public participation opportunities. The scoping notice was distributed to approximately 700 agencies, interested organizations, and individuals in early October 1998. The mailing list has been and will continue

to be reviewed and updated throughout the RMPA/EIS process.

Also, a media release introducing the project and announcing the scoping meetings was prepared and issued on October 21, 1998 by the BLM to local and regional newspapers, television, and radio.

Three public scoping meetings were held in early November 1998 to obtain input on issues and planning criteria, and determine the scope of the

RMPA/EIS. Several displays illustrating or explaining components of the RMPA/EIS were stationed around the meeting room for those in attendance to review. Each meeting began with a presentation by BLM representatives after which comments and questions were received from the public. Table 5-1 summarizes the public meeting attendance and number of oral comments.

**TABLE 5-1
PUBLIC SCOPING MEETING ATTENDANCE AND COMMENTS**

Meeting Date	Meeting Location	Number in Attendance	Number of Speakers
Monday, November 2, 1998	Roswell, New Mexico	65	18
Wednesday, November 4, 1998	Alamogordo, New Mexico	15	8
Thursday, November 5, 1998	Truth or Consequences, New Mexico	22	9
Total		102	35

In addition to the comments received during the meetings, a total of 36 comment forms and letters were submitted to BLM. Scoping ended on November 16, 1998; however, additional comments were accepted after that date.

A Summary Scoping Report was issued in January 1999 that described the scoping process and summarized the public comments and issues obtained.

5.4.2 Public Review of the Draft RMPA/EIS

The Draft RMPA/EIS was filed with the U.S. Environmental Protection Agency (EPA) on November 7, 2000. A Notice of Availability was published by BLM and EPA in the *Federal Register* on November 16 and 17, 2000, respectively; the later date marked the beginning of the 90-day public review and comment period.

In late December 2000, during the 90-day period, the BLM Las Cruces Field Office received a letter written by the Independent Petroleum Association of America requesting an extension of 60 days to the comment period. The extension was granted.

Subsequently, based on a request by an Otero County Commissioner, the comment period was extended an additional 45 days.

At the time the Draft RMPA/EIS was distributed for review, BLM planned to conduct public hearings in January 2001 to listen to and understand the public’s comments on the Draft RMPA/EIS. The dates and locations of the hearings were announced in the Notice of Availability and the “Dear Reader Letter” at the beginning of the Draft RMPA/EIS. An open house preceded each hearing to provide opportunity to view maps and other informational displays and to ask questions about the planning process and its results. A hearing officer conducted the hearings allowing individuals to provide formal comments on the Draft RMPA/EIS. The dates, locations, and number of attendees and speakers are shown in Table 5-2.

In addition, following the first set of hearings in January 2001, a second set of three public hearings was conducted in April 2001. The dates, locations, and numbers of attendees and speakers are shown in Table 5-3.

**TABLE 5-2
JANUARY 2001 PUBLIC HEARINGS ATTENDANCE AND COMMENTS**

Hearing Date	Hearing Location	Number in Attendance	Number of Speakers
January 9, 2001	Roswell, New Mexico	16	9
January 10, 2001	Alamogordo, New Mexico	25	6
January 11, 2001	Truth of Consequences, New Mexico	11	3
Total		52	18

**TABLE 5-3
APRIL 2001 PUBLIC HEARINGS ATTENDANCE AND COMMENTS**

Hearing Date	Hearing Location	Number in Attendance	Number of Speakers
April 3, 2001	Roswell, New Mexico	12	6
April 4, 2001	Alamogordo, New Mexico	60	21
April 5, 2001	Truth of Consequences, New Mexico	8	5
Total		80	32

The extensions to the review and comment period and added set of public hearings were intended to provide ample opportunity for public comment on the Draft RMPA/EIS.

BLM carefully reviewed the numerous written and oral comments. Based on the comments, BLM developed a modification of Alternative A that was reviewed by and received input from BLM management as well as the New Mexico Resource Advisory Council (RAC). The RAC is a statewide body of citizens, chartered under the Federal Advisory Committee Act, representing a diversity of interests advising the BLM about public land issues and solutions. Following a recommendation by the RAC, BLM agreed to fund the services of a professional mediator to allow for further discussions regarding the Otero Mesa area. The mediator, selected by the RAC, was tasked with convening a RAC subcommittee to develop a consensus for an alternative plan regarding how leasing would take place on Otero Mesa. Following an assessment period, the mediator determined that mediation, as identified by the RAC and BLM, would not be successful. Even though mediation did not proceed, the BLM has been a part of a number of discussions with the RAC, which have aided in the development of portions of the Proposed Plan.

All written and oral comments received during the 195-day period were compiled, analyzed, and addressed. A summary of the most common comments received is provided in Section 5.5.1, and all written and oral comments and responses to those comments are provided in Appendix G (Volume II).

In addition to comments received during the formal public comment period, the Las Cruces Field Office received additional letters, postcards, and electronic mail messages regarding the RMPA/EIS and future publication of the PRMPA/FEIS. The comments are briefly summarized in Section 5.5.2.

In March 2003, the Las Cruces Field Office and Otero County Board of Commissioners entered into a Memorandum of Understanding that formalized the County's involvement as a cooperating agency in the development of this PRMPA/FEIS.

Following publication of a Notice of Availability in the *Federal Register*, distribution of the PRMPA/FEIS, a 60-day Governor's Consistency Review, and a 30-day public protest period, the BLM will issue a Record of Decision summarizing the findings and decisions regarding the Proposed Plan and its determination regarding compliance

with NEPA and other regulations. Also, the RMPA will be prepared to document the resource management decisions and complete the BLM's resource management planning process for Federal fluid minerals in Sierra and Otero Counties, New Mexico.

Table 5-4 is a partial list of various Federal, State, and local agencies, organizations, Indian Tribes, and individuals to whom this PRMPA/FEIS has been sent.

The RMPA/EIS was prepared by an interdisciplinary team of resource specialists. Table 5-5 lists the team members, job titles, and responsibility associated with the RMPA.

5.5 SUMMARY OF COMMENTS AND RESPONSES

5.5.1 Comments Received During Formal Comment Period

A total of 256 letters and postcards were received and 50 people provided oral comments during the formal comment period. Of the written submittals, approximately 166 were from organized campaigns including postcards and form letters.

Every comment was considered in the content analysis process, whether it came repeatedly from many people with the same message(s) or from a single person raising a technical or

personal point. Emphasis was placed on the content of the comment rather than the number of times a comment was received. Responses have been made to all substantive comments. Substantive comments were considered to be those that addressed either the adequacy of the Draft RMPA/EIS or the merits of the alternatives or both. The results of the content analysis were important to the development of the PRMPA/FEIS.

Generally, the majority of comments focused on interests regarding the Otero Mesa area. Considering the gas discovery in the Bennett Ranch Unit, representative interests of the oil and gas industry indicate that an alternative plan that favors leasing and development on public land is preferred and the alternatives in the Draft RMPA/EIS are too restrictive. On the other hand, considering the remnant patches of unfragmented Chihuahuan Desert grassland habitat and the wildlife species it supports, interests in support of protecting and preserving the area indicated a preference for more protective restrictions.

A summary of the most common public comments with BLM responses is provided in Sections 5.5.1.1 and 5.5.1.2. All of the written and oral comments are provided in Appendix G (Volume II).

**TABLE 5-4
PARTIAL LIST OF DOCUMENT RECIPIENTS**

Federal Agencies

Department of Agriculture
 Agriculture Research Service
 Jornada Experimental Range
 Agricultural Stabilization and Conservation Service
 Animal Damage Control
 Rural Development
 Forest Service
 Natural Resources Conservation Service
 Department of Commerce
 Department of Defense
 Department of the Air Force
 Holloman Air Force Base
 Department of Army
 Corps of Engineers
 Fort Bliss
 McGregor Range
 White Sands Missile Range
 Department of Energy
 Western Area Power Administration
 Department of Justice
**Immigration and Naturalization Service Border
 Patrol**
 Department of the Interior
 Bureau of Indian Affairs
 Bureau of Reclamation
 Fish and Wildlife Service
 Geological Survey
 National Park Service
 White Sands National Monument
 Natural Resources Library

Office of Environmental Policy and Compliance

Department of Transportation
 Department of Treasury
 Customs Service
 Environmental Protection Agency
 Federal Highway Administration
 International Boundary and Water Commission

New Mexico State Agencies

Agriculture Department
 Agricultural Programs and Resources Division
 Livestock Board
 Bureau of Mines and Mineral Resources
 Commerce and Industry Department

Department of Finance and Administration
 Office of Cultural Affairs
 Museum of New Mexico
 Historic Preservation Division
 Department of Game and Fish
 Department of Public Safety
 State Police Division
 Energy and Minerals Department
 Forestry and Resources Conservation Division
 Energy Conservation and Management Division
 Mining and Minerals Division
 Oil, Gas, and Minerals Division
 Parks and Recreation Division
 Governor's Office
 Environment Department
 Environmental Protection Division
 Waste and Water Management Division
 Surface Water Quality
 Highway and Transportation Department
 Human Services Department
 Office of Indian Affairs
 Land Office
 Commissioner's Office State Land
 State Land Office
 New Mexico State University
 New Mexico National Guard
 General Services Department
 Radio Communications Bureau
 Interstate Stream Commission
 State Engineer
 Taxation and Revenue Department
 University of New Mexico

**Congressional Delegation and New Mexico State
 Legislators**

U.S. Senator Jeff Bingaman
 U.S. Senator Pete V. Domenici
 U.S. Congressman Steve Pearce
 State Senator, District 35
 State Senator, District 39
 State Senator, District 40
 State Representative, District 51
 State Representative, District 52
 State Representative, District 53

Local and Regional Governments, Agencies, and Indian Tribes

Chambers of Commerce (Alamogordo, El Paso, and Truth or Consequences)
Caballo Soil and Water Conservation District
Cities of Alamogordo, El Paso, and Truth or Consequences
El Paso County Commissioners
Elephant Butte Irrigation District
Fort Sill Apache
Jornada Resource Conservation and Development Council
Mescalero Apache Tribe
Otero County Commissioners
Otero County Electric Cooperative, Inc.
Otero County Public Land Use Advisory Council
Otero Soil and Water Conservation District
San Carlos Apache Tribe
Sierra County Commissioners
Sierra County Livestock Committee
Sierra Soil and Water Conservation District
Southeastern New Mexico Economic Development District

Village of Tularosa
Village of Williamsburg
White Mountain Apache
Ysleta del Sur

Other Groups/Individuals

Addwest Minerals Company
AMOCO Production Company
Bartoo Sand & Gravel, Inc.
Brighton Corporation
Burlington Resources

Cibola Energy Corporation
Exxon Coal and Minerals Company
Gas Company of New Mexico
Grazing Permittees in Sierra and Otero Counties (160)

Greystone
Harvey E. Yates Company
Horne Engineering Services
Independent Petroleum Association of Mountain States
Marathon Oil
Mobil Oil
New Mexico Cattle Growers Association
New Mexico Farm & Livestock Bureau
New Mexico Oil & Gas Association
PermitsWest, Inc.
People for Preservation of the Caballo Mountains
Prairie Dawgs Motorcycle Club
PRESCO, Inc.
Public Service Company of New Mexico
Sierra Club
Southern New Mexico Group
Rio Grande Chapter
Sierra County Farm & Livestock Bureau
Southwest Center for Biological Diversity
Southwest Minerals Exploration Association
Southwest New Mexico Grazing Association
Southwest Research & Information Center
Sun Valley Corporation
T&E, Inc.
Texaco, Inc.
The Black Range Lodge
The Rudman Partnership
White Sands Cycling Club
Wildlife Management Institute

**TABLE 5-5
LIST OF PREPARERS AND REVIEWERS**

Bureau of Land Management		URS (formerly Dames & Moore)	
Name/Title	RMPA/EIS Responsibility	Name/Title	RMPA/EIS Responsibility
Theresa Hanley Archaeologist, Land Use Planner	Team Leader (October 1998 – October 1999)	Cindy Smith Associate	Project Manager
Tom Phillips Rangeland Specialist Land Use Planner	Team Leader (October 1999 – Present)	Leslie Ellwood Biologist	Project Coordinator Special Status Species
Russ Jentgen Geologist	Minerals	Jennifer Donahue Environmental Planner	Project Coordinator Lands, Access, Recreation, Special Management Areas, Social and Economic Conditions, Fire Management
Joe Torrez Geologist	Minerals	Mike Doyle Environmental Planner	Lands, Access, Recreation, Special Management Areas, Fire Management
Armando Lopez Petroleum Engineer	Minerals	Kerri Sitler Senior Hydrogeologist	Geology, Minerals, Groundwater
Joe Sanchez Natural Resource Specialist	Recreation, Visual Resources, Wilderness	Doreen Hoskins Project Hydrologist	Groundwater
Mark Hakkila Outdoor Recreation Specialist	Off-highway vehicles, Wilderness	Mike Crouse Senior Hydrologist	Surface Water
Bruce Call Soil Scientist	Soil, Water Resources	Pete Pendrak Project Hydrologist	Surface Water
Scott Archer Environmental Scientist	Air Quality, Noise	Bill Polivka Project Hydrogeologist	Soils
Ray Aguilar Rangeland Management Specialist	Vegetation, Livestock Grazing	A.E. Rogge, Director, Southwest Cultural Resources Services	Cultural Resources
Mike Howard Wildlife Biologist	Wildlife, Special Status Species	Tom Carr Project Meteorologist	Air Quality
Jim Silva Wildlife Biologist	Wildlife, Special Status Species, Biological Assessment	Jeff Fuller Senior Acoustician	Noise
Bill Merhege Wildlife Biologist	Special Status Species (Aplomado Falcon)	Loren Hettinger Senior Ecologist	Vegetation, Habitat, Livestock Grazing
Juan Padilla Realty Specialist	Land, Access	E. Linwood Smith Director, Biological Resources Study Group	Biological Resources Oversight
Lorraine Salas Realty Specialist	Land, Access	Kim Smith Otero Project Biologist	Wildlife
Pam Smith Archaeologist	Cultural Resources	Teresa Suter-O'Neil Landscape Architect/Planner	Visual Resources
Mike O'Neill Physical Anthropologist	Paleontological Resources	David Luhan GIS Manager	GIS Coordinator

**TABLE 5-5
LIST OF PREPARERS AND REVIEWERS**

Bureau of Land Management		URS (formerly Dames & Moore)	
Name/Title	RMPA/EIS Responsibility	Name/Title	RMPA/EIS Responsibility
Tom Custer Physical Scientist- Hazmat	Hazardous Materials	John Wieber GIS Manager	GIS Coordinator
Butch Wilson Fuel Management Team Leader	Fire Management	Jennifer Wennerlund GIS Coordinator	GIS
Jeanette Pranzo Social Economist	Social and Economic Conditions	Peter Martinez GIS Analyst	GIS
Rusty Stovall Geographer	GIS Coordinator	Shirley Wiley Editor	Editor
Rena Gutierrez Writer/Editor	Writer/Editor	Keryn Darr Technical Writer/Editor	Writer/Editor/Document Production
Bill Gilbert Natural Resource Specialist	Planning and Environmental Coordination	Jennifer Wallach Graphic Designer	Graphics
Tim Sanders Lands & Minerals Staff Supervisor	Management Oversight	Mitch Meek Graphic Designer	Graphics
David Sinclair Budget Officer	Contracting Officer's Representative		
Gary Stephens Geologist	New Mexico State Office Coordinator		
J.W. Whitney Planning and Environmental Coordinator	New Mexico State Office Planning and Environmental Coordinator		

5.5.1.1 Comments Expressing Desire for Less Restrictive Management Direction

Comment:

Is an amendment to the 1986 RMP needed? Leasing and development procedures are met by existing management direction. The existing RMP addresses leasing adequately. Additional restrictions will be a detriment to the oil and gas industry.

Response:

For its time, the 1986 RMP adequately addressed environmental protection given the minimal level of oil and gas development or interest. However, as stated in Chapter 1, Section 1.1, for current decisions, the 1986 RMP was found to lack enough information to make leasing decisions commensurate with the increased leasing nominations and potential subsequent exploration and development. BLM is conducting this RMPA/EIS to be consistent with current laws, regulations, and supplemental guidance for fluid minerals leasing.

Comment:

The RMPA/EIS fails to address an alternative for no leasing.

Response:

BLM considered an alternative of no new leasing, but eliminated it from further analysis. Refer to Chapter 2, Section 2.3.1.1.

Comment:

The Draft RMPA/EIS document indicates that the area has a low-to-medium potential for oil and gas occurrences. The area should be rated as a medium-to-high potential.

Response:

The find at the Bennett Unit on Otero Mesa provides physical evidence of the presence of oil and gas. However, data sufficient to

determine the extent of the resources have not been made available. A summary description of the geology that served as a basis for projecting the occurrence and development of the resources is in Chapter 3, Section 3.5.3.1.

Comment:

The reasonable foreseeable development (RFD) scenario does not provide adequate descriptions of the geology and current operations. The RFD is not based on current production data and does not provide sufficient support for the assumptions used. There is no estimation of technically recoverable resource and no discussion of the various plays in the area.

Response:

A summary description of the geology that served as a basis for developing the RFD is in Chapter 3, Section 3.5, Geology and Minerals. Other information used as a basis for the RFD is described in Appendix A, Reasonable Foreseeable Development. The RFD was developed in accordance with procedures outlined in the BLM Supplemental Program Guidance for planning for fluid mineral resources (BLM Manual Section [MS] 1624.2) as briefly described in Appendix A of this PRMPA/FEIS. The RFD, as described in this document, represents the reasonably foreseeable extent of development based on the best available data. Industry data from the Bennett Ranch Unit were not used in the analysis because the data were considered by industry to be proprietary and were not made available.

Comment:

The socioeconomic analysis in the RMPA/EIS is inadequate. The impact of oil and gas exploration and development on the economy of counties and the State would be beneficial and significant. The counties and the State would benefit greatly from the jobs and taxes the oil and gas industry would provide. The inability to pursue safe and expeditious exploration of fluid minerals is a detriment to

future businesses either growing or expanding in the area.

Response:

Chapter 4 Section 4.2.16 of the Draft RMPA/EIS states that oil and gas activities would be beneficial to the economy. While the commentors state the socioeconomic analysis is inadequate, they did not give any specifics of the inadequacies. The section relating to social and economic conditions in Chapters 3 and 4 of the RMPA/EIS adequately address the issues in the analysis of this document.

Comment:

Placing a stipulation of no surface occupancy on such large areas as in Otero Mesa is excessive and unjustified. It effectively precludes exploration and development in that area as (1) it cannot be reached efficiently through use of directional drilling and (2) such restriction affects access to adjacent interspersed State and private lands. Select the No-action Alternative for complete fulfillment of the RFD.

Response:

Based on the public comments received on the Draft RMPA/EIS, BLM re-evaluated the stipulation of no surface occupancy applied to the Otero Mesa and Nutt grassland habitat areas and determined that a less restrictive stipulation would provide protection to habitat and allow industry to achieve the RFD while providing adequate resource protection. BLM is required to impose the least restrictive constraints needed to provide adequate protection while allowing fluid mineral leasing and development. Therefore, BLM modified the Preferred Alternative (Alternative A). In the Proposed Plan, the large remnant patches of grasslands would remain open to leasing with a stipulation to control surface use by limiting industry's disturbance to no more than 5 percent of the leasehold at any one time and requiring new lessees to form exploratory units prior to

commencing drilling activity. The purpose is to protect remnant Chihuahuan Desert grassland habitat and associated special status species of wildlife through greater planning of future oil and gas development.

Comment:

Data are insufficient to substantiate the need for such restrictive measures to protect the aplomado falcon or pronghorn in the Otero Mesa area.

Response:

Rather than addressing the aplomado falcon or pronghorn as individual species, it is important to understand the habitat as a whole, one of the resource issues for which BLM is responsible.

Early in the planning process during scoping, a number of commentors expressed concern about potential effects on and protection of sensitive ecosystems including species of plants and wildlife. The planning criteria and issues derived from public and agency comments provided the direction for preparing the RMPA/EIS. BLM must address all of the relevant resource concerns and issues.

The concern for the remnant, large patches of Chihuahuan Desert grassland as habitat to a number of wildlife species on Otero Mesa is evident from the number of comments provided on the Draft RMPA/EIS. From an ecological perspective, it is believed that long-term viability of natural communities and associated species increase in proportion to the size of the area. Larger natural areas tend to have more intact natural processes. Therefore, protecting larger natural areas provides more opportunity for allowing ecological process to continue and maintain long-term viability of important communities and species. As indicated in the Draft RMPA/EIS, Sections 3.10, 3.11, and 4.28, historic degradation of desert grasslands in southern New Mexico is attributed to a

combination of climatic change, introduction of roads, intensive livestock grazing, and concurrent interruption of naturally occurring fire. Otero Mesa supports one of the few remaining large expanses of remnant Chihuahuan Desert grassland. The concern is that the potential effects of additional disruption by human activity would contribute to fragmentation and degradation of the area.

The grasslands on Otero Mesa support pronghorn and have the potential to support the northern aplomado falcon, just two species of concern associated with this habitat. Pronghorn, a big game species of economic importance, utilizes the habitat to such an extent that BLM identified Otero Mesa as an area to provide adequate habitat for the pronghorn (1986 RMP). The aplomado falcon is a Federally listed endangered species. The 1990 aplomado recovery plan states that habitat in the United States and Mexico should be identified and protected and stresses that particular attention should be directed toward suitable habitat on public land. According to the U.S. Fish and Wildlife Service (Draft RMPA/EIS, Appendix A-IV, letter dated January 5, 1999), "Otero Mesa (including McGregor Range) is a high priority recovery area for the falcon because of the combination of its overall size, relatively unfragmented natural condition, and its proximity to breeding aplomado populations in nearby Mexico." Although seldom observed, sightings have been reported in Otero County over the past ten years including a 1999 confirmed sighting on Otero Mesa by a qualified ornithologist. In addition, mountain plover, Baird's sparrow, western burrowing owl, and Arizona black-tailed prairie dog are special status species of concern associated with Otero Mesa.

5.5.1.2 Comments Expressing Desire for More Restrictive Management Direction

Comment:

There must be a clear public need for extractive activities on our public land before such activities are permitted.

Response:

As stated in Chapter 1, Section 1.1, fluid mineral leases provide the opportunity to explore for and produce domestic sources of fluid minerals to meet the national demand for energy and to reduce dependence on foreign sources. Federal lands are made available for fluid mineral leasing through the Minerals Leasing Act of 1920, as amended, and the Geothermal Steam Act of 1970. All public land is open to leasing unless a specific order has been issued to withdraw an area from leasing. The Minerals Leasing Act provides the Secretary of the Interior with the authority to issue leases on lands where the mineral rights are held by the Federal government. This authority has been delegated to the BLM State Directors.

Comment:

A more restrictive alternative should be selected to adequately protect the unique and important habitats found in the Planning Area, and that would result in modifications that would help BLM realize its mission "to sustain the health, diversity and productivity of public lands for the use and enjoyment of present and future generations."

Response:

BLM must balance management for protection and enhancement of the resources along with management for multiple use, sustained yield, and development of resources in accordance with FLPMA. BLM is required to impose the least restrictive constraints needed to adequately protect resource values while allowing for other uses. Each proposed

site would be investigated and, if site-specific conditions warrant more restrictive protection, such protective measures could be imposed through conditions of approval as part of an Application for Permit to Drill (APD).

Comment:

The Draft RMPA/EIS indicates a requirement for the maximum use of existing roads and/or utility corridors to minimize the potential for increased habitat fragmentation. However, the RMPA does not indicate how BLM intends to determine appropriate “roads” along which exploration will be permitted. Existing roads need to be identified, mapped, and verified in the field.

Response:

BLM used satellite imagery to identify existing roads (SPOT 10-meter Panchromatic imagery). Satellite imagery is the best, accurate data available for a large-scale planning effort such as this. Existing roads include primary, secondary, light-duty, and four-wheel-drive roads, which are BLM resource roads and available for use by the public. Roads, as well as other facilities, are reviewed on the ground in response to an APD to determine the potential impacts and appropriate mitigation to require as conditions of approval.

Comment:

No new roads should be constructed.

Response:

A lease is a contract that conveys to an operator the right to develop and produce fluid minerals for a specific period of time under certain agreed-upon terms and conditions. The issuance of a lease grants to the lessee exclusive rights to as much of the leased land as is needed to conduct exploratory drilling and development operations in the leasehold subject to stipulations attached to the lease; restrictions

derived from specific nondiscretionary statutes; and reasonable measures as may be required by the surface-management agency to minimize adverse impacts on other resource values, land uses, or users. BLM must allow access to the resource, unless leased with a stipulation of no surface occupancy.

BLM encourages the use of existing roads to the extent practical and minimizing new roads in unroaded areas. In the Otero Mesa and Nutt grassland areas, the stipulation adds an incentive to use existing roads to the extent possible. Where new roads are needed, construction, maintenance, rehabilitation, abandonment, and closure of the roads on public land will be in accordance with the BLM Manual 9113 - Roads, Surface Operating Standards for Oil and Gas Exploration and Development (“Goldbook”) (BLM and Forest Service 1989) and New Mexico State Office Road Policy, Standards and Procedures (Instruction Memorandum No. NM-95-031).

Comments:

Several commentors indicated that the following areas should be discretionarily closed to leasing and subsequent development.

- *The Otero Mesa and Nutt desert grassland areas are some of the best remnant grasslands remaining in the State. These grasslands provide critical habitat for pronghorn and many other species. Alternative A’s stipulation for no surface occupancy except within 150 meters [492 feet] of existing roads in the remnant grasslands does not adequately protect these critical areas.*
- *All eight Nominated Areas of Critical Environmental Concern (ACECs) should be discretionarily closed to leasing and subsequent development. BLM policy (1613.21E) requires that Nominated ACECs are managed to maintain their condition until they can*

be fully evaluated through the resource management planning process. Discretionary closure is the only way to ensure that their condition is maintained.

- *Watershed areas should be discretionarily closed and no geophysical exploration should be allowed in order to prevent accelerated erosion and degradation of watershed values.*
- *Essential habitat for special status species should be discretionarily closed. These include all Federally listed threatened and endangered species, species proposed for Federal listing, Federal candidates, BLM sensitive species, and State-listed species.*
- *Percha Creek Riparian Habitat Area should be discretionarily closed to leasing and subsequent development. Besides providing critical habitat for many desert species, this area also is suitable habitat for Federally endangered Southwest willow flycatcher.*
- *Visual Resource Management (VRM) Class II areas should be discretionarily closed to leasing and subsequent development. Oil and gas development is inconsistent with the requirement that “changes in any of the basic elements caused by a management activity should not be evident in the characteristic landscape. Contrasts are seen but must not attract attention.”*
- *Off-road vehicle (ORV) limited areas should be discretionarily closed to leasing and subsequent development. Also, geophysical exploration should not be allowed in these areas. If ORV use is restricted in areas to protect resources, then a drilling rig or vehicles used in seismic exploration should not be allowed in the area.*

- *The Cuchillo Mountains Piñon Nut Collection area should be discretionarily closed to leasing and subsequent development. It is important to many families.*

Response:

Generally, discretionary closure of these areas is deemed overly restrictive. BLM is required to impose the least restrictive constraints needed to provide adequate protection of the resources while allowing for other uses, such as Federal fluid minerals leasing and development. Each proposed site would be investigated and, if site-specific conditions warrant more restrictive protection, such protective measures could be imposed through conditions of approval as part of an APD. Responses to some of the specific resource concerns follow.

Otero Mesa and Nutt Desert Grassland Areas – BLM developed a stipulation to control surface use by allowing industry’s disturbance of no more than 5 percent of a leasehold at any one time and requiring new lessees to form exploratory units prior to commencing drilling activities.

Nominated ACECs – BLM re-evaluated the stipulation to control surface use, as presented in the Draft RMPA/EIS, in concert with the resource concerns associated with the nominated ACECs and determined that adequate interim protection would not be afforded to the resources. Therefore, BLM has imposed discretionary closure as interim protection based on BLM guidance that calls for the need to provide protection of the significant resource values until a decision is made on whether to designate them as ACECs.

Percha Creek Riparian Habitat Area – Adequate protection of Percha Creek Riparian Habitat Area would be afforded through a stipulation of no surface occupancy within 0.25 mile of the riparian area.

VRM Class II – The stipulation of controlled surface use would adequately protect VRM Class II because new disturbance would be minimized as follows: (1) short-term impacts would be allowed as long as the longer-term (one year) are consistent with VRM Class II objectives; (2) reclamation must occur as soon as possible; (3) conditions of approval would be imposed such as use of appropriate paint color, judicious siting of facilities, and maximum use of existing roads and utility corridors; and (4) proposed disturbance may be moved more than 0.125 mile to meet VRM Class II objectives.

ORV limited – As described in the Glossary, the term “ORV limited” applies to areas and trails where the use of ORVs is subject to restrictions such as limiting the number of vehicles allowed, dates and times of use (seasonal restrictions), and limiting use to existing or designated roads and trails. On designated roads and trails, use is allowed only on roads and trails that are signed for use. Combinations of restrictions, such as limiting use to certain types of vehicles during certain times of the year are possible. However, the designation of “ORV limited” does not preclude construction of a road for a new purpose.

Cuchillo Mountains Piñon Nut Collection Area – BLM re-evaluated the stipulation to control surface use placed on this area in the Cuchillo Mountains. The present stand of piñon trees is maintained as a piñon collection area. Standard lease terms and conditions would provide adequate management. In addition, a Lease Notice would notify operators that they would be required to implement necessary mitigation to reduce damage to piñon trees such as rerouting of access roads and modification of well pad locations.

Comment:

A part or all of Otero Mesa should be designated as a special management area to recognize and protect its unique resources.

Response:

Designating special management areas, including Otero Mesa, is beyond the scope of this RMPA/EIS. Adequate protection would be afforded the Otero Mesa area by the Proposed Plan. If site-specific conditions warrant more restrictive protection, such restrictive measures could be imposed through conditions of approval of an APD.

Comment:

Areas identified as crucial habitat that are not already protected by more stringent measures should have a stipulation of controlled surface use, rather than standard lease terms and conditions, to decrease the occurrence of habitat degradation and fragmentation.

Response:

Each proposed site would be investigated and, if site-specific conditions warrant more restrictive protection, such protective measures could be imposed through conditions of approval as part of an APD.

Comments:

There should be no surface occupancy or road construction allowed within 0.5 mile of riparian/wetland/playa areas. These areas are rare and critical to the survival of many species in the desert environment; they should be given maximum protection.

Response:

Adequate protection would be afforded to riparian habitat by imposing a stipulation of no surface occupancy within 0.25 mile of riparian areas, other wetlands, and playas. If site-specific conditions warrant more restrictive protection, such protective

measures could be imposed through conditions of approval of an APD.

Comment:

If the Jornada del Muerto and Brokeoff Mountains Wilderness Study Areas (WSAs) are not designated as wilderness, they should be discretionarily closed to Federal fluid mineral leasing and subsequent development. Areas designated as WSAs have met strict roadless requirements and some of the few remaining unspoiled areas in the State. They should remain roadless and wild and they deserve the maximum amount of protection available.

Response:

If the WSAs are released from WSA status by Congress, then leasing would be determined by the land use planning process.

Comment:

Oil and gas leasing and development should be delayed until completion and implementation of the aplomado falcon habitat model currently being developed by the U.S. Fish and Wildlife Cooperative Research Unit.

Response:

The aplomado falcon habitat model has been completed and was used to develop the Proposed Plan. Adequate protection of the grassland habitat would be afforded by imposing the requirements of the Proposed Plan. If site-specific conditions warrant more restrictive protection, such protective measures could be imposed through conditions of approval of an APD.

Comment:

None of the three alternatives presented in the Draft RMPA/EIS contain any stipulations for the protection of crucial habitats: grasslands, montane, and scrub. Crucial habitats encompass an area of approximately 729,457 acres. At the very least these areas of

crucial habitat should have a stipulation of controlled surface use.

Response:

Adequate protection of crucial habitats would be afforded through standard lease terms and conditions under the Proposed Plan. If site-specific conditions warrant more restriction protection, such restrictive measures could be imposed through condition of approval of an APD. In the Otero Mesa and Nutt grassland areas, the stipulation adds an incentive to use existing roads to the extent possible.

Comment

VRM Class III areas should have a stipulation of controlled surface occupancy. Oil and gas development are inconsistent with the requirement that “contrast to the basic elements, caused by a management activity is evident, but should remain subordinate to the existing landscape.”

Response

Adequate protection would be afforded to areas of VRM Class III by the Proposed Plan. If site-specific conditions warrant more restrictive protection, such protective measures could be imposed through conditions of approval of an APD.

Comment:

The oil and gas industry must be held accountable for all activities on public land and restore any sites disturbed. They are being provided an opportunity to capitalize on public resources so they should ensure the least disturbance, restoration of degraded areas, and clean up after implementation. All reclamation requirements should be strictly monitored and enforced.

Response:

Disturbance from extractive activities is inevitable. However, reduction of the effects from disturbance is accomplished by

(1) avoiding a certain action or part of an action, (2) employing certain construction measures to limit the degree of impact, (3) restoring an area to preconstruction conditions, (4) preserving or maintaining an area throughout the life of a project, or (5) replacing or providing substitute resources to the environment. Appendix B, Surface Use and Best Management Practices, describes various types of practices that are designed to minimize surface disturbance and effects on resources. The practices represent effective and practical means of accomplishing land and resource management goals and objectives, and are used as a guide when preparing plans and details that are specific to individual projects. As stated in Appendix B, a reclamation plan would be required for any surface disturbed that is not needed for continued operations (i.e., shrinking the pads of producing well sites or abandoned well sites). Additional reclamation measures may be required based on the conditions existing at the time of abandonment, and included as part of the conditions of approval of the Notice of Intent to Abandon.

5.5.2 Comments Received After the Formal Comment Period

As stated previously, 364 letters and postcards and approximately 3,200 electronic mail messages were received after the formal comment period.

The majority of messages expressed concern pertaining to Otero Mesa and that a new inventory of wilderness should be completed prior to issuing the PRMPA/FEIS. Although BLM has authority under FLPMA to conduct inventories of public land resources, FLPMA 603 authority to conduct wilderness review expired in 1993. BLM can manage resource values such as “naturalness,” “solitude,” “primitive/unconfined recreation,” but protecting or conserving them would be through goals and objectives describing desired future conditions, desired outcomes, allowable uses, and management to achieve

them. These values were not specifically identified for Otero Mesa through public scoping or subsequent analysis; however, the management proposed for Otero Mesa does provide appropriate protection to the unique resources such as the existing ACECs as well as minimizing disturbance to the identified grassland habitats.

Other messages were more specific and are summarized below with brief responses by BLM.

Letter from New Mexico Wilderness Alliance (February 18, 2003):

The letter is a request to consider a report by Dr. Walter G. Whitford, titled “Ecological Characteristics of Otero Mesa and Impacts of Gas Development,” in the EIS process. The report provides a description of the landscape and ecological setting of Otero Mesa, emphasizes the fragile nature of the grasslands, and describes potential impacts from development of well pads, roads, and pipelines. The report also identifies the challenge that is faced by restoring vegetation after the surface has been cleared.

Response:

Much of the information provided in the report supports the need to provide special attention to the Otero Mesa and Nutt Grassland resource and is, in part, one reason that BLM developed the stipulation to control surface use on public land by allowing disturbance to no more than 5 percent of a leasehold at any one time and requiring new lessees to form exploratory units prior to commencing drilling activities. BLM also agrees that vegetation restoration in this environment is difficult; however, the reclamation requirements identified in Appendix B, Best Management Practices, describe the standards to which this requirement would be measured.

Letter from Dr. John A. Peterson (April 12, 2003):

The letter is a request to consider a report by Dr. John A. Peterson titled “Tigua Cultural Affiliation with Alamo Mountain and Otero Mesa.”

Response:

BLM reviewed the report and determined that no new information was provided to suggest that the Proposed Plan would inadequately protect the cultural resources of the area. The Proposed Plan continues to exclude the Alamo Mountain ACEC from fluid minerals leasing and development. In addition, the Proposed Plan states that (1) any proposed surface disturbance would require on-the-ground cultural resource survey and (2) cultural resources are protected as needed. The area surrounding the Alamo Mountain and other mountains in the Cornudas complex are protected further by lease stipulations that call for maintaining the current VRM Class II designation for that area.

Letter from New Mexico Wilderness Alliance (May 20, 2003):

The letter is a request to consider four reports as new information: “Tigua Cultural Affiliation with Alamo Mountain and Otero Mesa;” “Birds of the Greater Otero Mesa Area New Mexico;” “Ecological Characteristics of Otero Mesa and Impacts of Gas Development;” and “Report on Black-tailed Prairie Dog Ecology and Impacts of Development for Fluid Minerals Greater Otero Mesa Region.”

Response:

The report titled “Tigua Cultural Affiliation with Alamo Mountain and Otero Mesa” is addressed previously in the response to the letter dated April 12, 2003. BLM reviewed the report titled “Birds of the Greater Otero Mesa Area New Mexico” and the information conforms to data BLM had available and no suggestions were made by the author to

improve or correct BLM’s analysis or decisions. The report titled “Ecological characteristics of Otero Mesa and Impacts of Gas Development” is addressed previously in the response to the letter dated February 18, 2003. The report titled “Report on Black-tailed Prairie Dog Ecology and Impacts of Development of Fluid Minerals Greater Otero Mesa Region” is addressed in the response to the letter dated July 21, 2003 below.

Letter from New Mexico Wilderness Alliance (June 13, 2003):

The letter requests the consideration of two documents by the New Mexico Wilderness Alliance as new information: “Citizen’s Wilderness Proposal for The Greater Otero Mesa-Crow Flats Region” (June 2002) and “BLM Wilderness Inventory Sierra and Otero Counties” (May 2003). The two documents identify 39 separate inventory units encompassing 523,000 acres as potential WSAs. The letter also suggests that the final RMPA/EIS decision should be delayed until BLM can reinventory the two counties for areas qualifying for Wilderness designation.

Response:

The documents submitted by the New Mexico Wilderness Alliance were received after the public comment period closed. However, the Las Cruces Field Office assessed the information in the New Mexico Wilderness Alliance’s wilderness inventory and proposal documents. That information should help BLM to make decisions through the upcoming land use plan revision that will enhance protection of significant natural resource values. Although BLM has authority under FLPMA to conduct inventories of public land resources, FLPMA 603 authority to conduct wilderness review expired in 1993. BLM can manage resource values such as “naturalness,” “solitude,” “primitive/unconfined recreation,” but protecting or conserving them would be through goals and objectives describing desired future conditions, desired outcomes, allowable uses,

and management to achieve them. These values were not specifically identified by the New Mexico Wilderness Alliance through public scoping or subsequent analysis; however, the management proposed for the Planning Area does provide appropriate protection to the unique resources such as the existing WSAs, ACECs, nominated ACECs, cultural resource areas, historic trails, and areas of visual resource importance, as well as minimizing disturbance to the important Chihuahuan Desert grassland habitats.

Letter from Thomas M. Power (June 20, 2003):

The letter requests consideration of a report by Mr. Power, titled “The Impact of Potential Oil and Gas Development on Otero County Finances,” as formal comment on the Draft RMPA/EIS.

Response:

The report, an independent analysis, supports BLM’s findings that the impact of oil and gas development in Otero County, although beneficial, would not be a significant impact on Otero County government finances or the Otero County economy.

Letter from Walter G. Whitford (June 21, 2003):

The letter provides comments and evaluations that were previously received from the New Mexico Wilderness Alliance (see letter above dated February 18, 2003).

Response:

See response to letter February 18, 2003.

Letter from New Mexico Wilderness Alliance (June 25, 2003):

Letter requests consideration of a report by Thomas M. Power titled “The Impact of Potential Oil and Gas Development on Otero County Finance.”

Response:

See response to letter dated June 20, 2003.

Letter from Lawry Sager (July 5, 2003):

The letter requests the inclusion of the report titled “Birds of Greater Otero Mesa, New Mexico” in the official record for the RMPA/EIS.

Response:

The report titled “Birds of Greater Otero Mesa, New Mexico” is addressed in the response to the letter dated May 20, 2003.

Letter from Prairie Ecosystems Associates (July 21, 2003):

The letter submits a report titled “Report on Black-tailed Prairie Dog Ecology and Impacts of Development for Fluid Minerals Resources, Greater Otero Mesa Region” to be considered as comment on the Draft RMPA/EIS. The report suggests that surface-disturbing activities should not be allowed in areas of prairie dog towns.

Response:

The Proposed Plan provides for controlling the surface use by requiring that operations be designed to avoid known populations. In areas of known populations, surface-disturbing activities may be relocated beyond 0.125 mile, but not more than 0.25 mile.

5.6 PROTEST PROCESS

Any person who participated in the planning process and has an interest that is or may be adversely affected by approval of the PRMPA may file a written protest with the Director of the BLM within 30 days following the date the EPA Notice of Availability is published in the *Federal Register*.

The protest must contain the name, mailing address, telephone number, and interest of the person filing the protest; a statement of

the issues being protested, raising only those issues that were submitted for the record during the planning process; a statement of the parts of the plan being protested; copies of all documents addressing the issues submitted during the planning process by the protesting party or an indication of the date the issues were discussed for the record; and a concise statement explaining why the State Director's proposed decision (Proposed Plan) is believed to be wrong. Any protests must be sent to the Director of the BLM at the following address (also refer to the "Dear Reader" letter at the beginning of this document for additional information):

Regular Mail:

**Director (210)
Attention: Brenda Williams
P.O. Box 66538
Washington, D.C. 20035**

Overnight Mail:

**Director (210)
Attention: Brenda Williams
1620 L Street, N.W.
Suite 1075
Washington, D.C. 20036**

5.7 RECORD OF DECISION

The RMPA for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties will be approved no earlier than 30 days after publication by the EPA of the Notice of Receipt of the PRMPA/FEIS in the *Federal Register*. Approval of the RMPA will be documented in a Record of Decision, which will be available for public review. Approval will be withheld on any portion of the RMPA protested until final action has been completed on the protests.



Maps

MAP USERS' GUIDE

The maps in this section illustrate data provided in the text of this Resource Management Plan Amendment/Environmental Impact Statement (RMPA/EIS) for Federal fluid minerals leasing in Sierra and Otero Counties.

A geographic information system (GIS) (ArcInfo version 6.1 software) has been used for data compilation, storage, management, and graphic and analytic output. For inclusion in the RMPA/EIS, the maps have been produced at a scale of 1:85,000; however, the maps are available at a large scale for review at the Bureau of Land Management (BLM) Las Cruces Field Office.

The maps are formatted to show the entire planning Area (that is, Sierra and Otero Counties). Every map includes the same base information such as topography, place and feature names, major highways and roads, jurisdictional boundaries (e.g., county boundaries), and map reference information.

Each map is identified by a figure number in the lower left corner. Each map consolidates and illustrates a variety of different information. The legend provides an explanation of the information unique to each map.

Proposed Plan Map

The first map (Map 2-1) of this section accompanies the text of Chapter 2 – Proposed Plan. Map 2-1A is an enlargement of the Otero Mesa area. The maps reflect the (1) land that is closed to leasing (nondiscretionary and discretionary closures) and (2) lands within BLM's Decision Area that are open for leasing and how those lands would be managed (through stipulations or standard lease terms and conditions). Refer to Chapter 2, Section 2.4, for more explanation of the **Proposed Plan**. It is important to note the following:

- The **Proposed Plan** is applicable only to BLM's Decision Area; that is, public land (administered by BLM) and private split

estate (privately owned surface overlying Federal fluid minerals).

- Major areas outside of BLM's Decision Area that are known to be nondiscretionary closures are shown for information only and were not included in the analysis (e.g., White Sands Missile Range; McGregor Range; incorporated cities, towns, and villages; land administered by the National Park Service).
- Lands administered or owned by entities other than BLM (e.g., Bureau of Reclamation, Forest Service, Mescalero Apache Indian Reservation, State Trust Land) are shown, but were not included in the analysis.
- Major areas where there were no Federal fluid minerals are shown. Surface area overlying no Federal fluid minerals that is administered by BLM is part of BLM's Decision Area and was included in the analysis.
- The set of surface ownership data and the set of environmental resource data originated from different sources. When the two sets are compiled to create the map, some of the boundaries do not coincide, resulting in a difference in totaling the acreage. The difference is approximately 6,000 acres, which is less than 1 percent of BLM's Decision Area.

Resource Maps

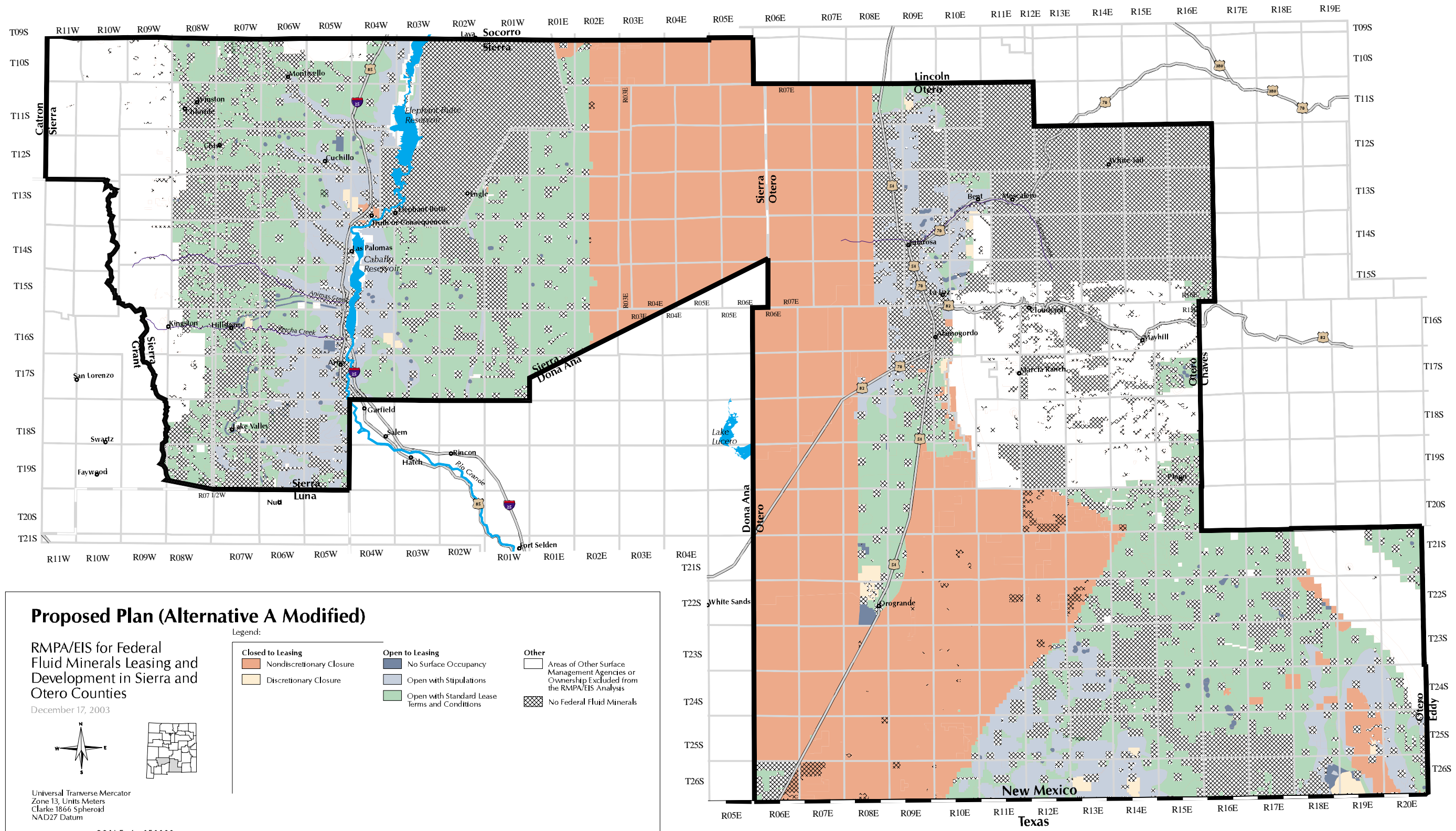
The remaining 10 maps accompany the text of Chapter 3 – Affected Environment. These maps, representing 10 themes of data, were developed from available data and represent an inventory of the existing resource concerns addressed in this RMPA/EIS. Other background information may be included to provide context. Where possible, the maps illustrate data for the entire Planning Area; however, data outside of BLM's Decision Area were not readily available for all resources.

A list of maps contained in this section is provided below. In addition, in developing the Management Situation Analysis, preparatory to this RMPA/EIS (refer to Chapter 1,

Section 1.3.4), several larger-scale maps were developed. These maps are listed in the Table of Contents and are available for review at the BLM Las Cruces Field Office.

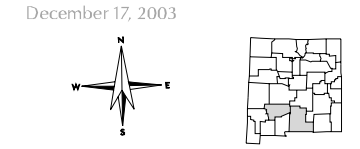
LIST OF MAPS

Map No.	Map Title	Map Content
Chapter 2 – Proposed Plan		
2-1	Proposed Plan (Alternative A Modified)	Availability of lands for leasing and management of those lands.
2-1A	Proposed Plan (Alternative A Modified) Otero Mesa Area	Availability of lands for leasing and management of these lands on the Otero Mesa area.
Chapter 3 – Affected Environment		
3-1	Jurisdiction and Federal Fluid Minerals	Surface ownership and location of Federal fluid minerals.
3-2	Land and Access	Major land uses, utilities, and transportation.
3-3	Potential for Oil and Gas Resources	Tectonic features and projected potential for oil and gas resources.
3-4	Potential for Geothermal Resources	Projected potential for geothermal resources.
3-5	Highly Erosive and Fragile Soils, Prime Farmlands, and Watershed Areas	Four highly erosive and fragile soils identified, potential prime farmland (including nonirrigated areas), and five designated watershed areas.
3-6	Water Resources	Declared underground water basins and hydrologic basins.
3-7	Major Vegetation and Habitat Management Areas	Nine vegetation types, six ecological study plots, and six wildlife habitat areas.
3-8	Special Status Species	Special management areas (i.e., Wilderness Study Areas [WSA], Areas of Critical Environmental Concern [ACECs], nominated ACECs, general locations of special status plant and animal species, secondary roads, and railroads.
3-9	Visual Resource Management Areas	Visual Resource Management Classes I-IV
3-10	Recreation and Special Management Areas	WSAs, ACECs, nominated ACECs, off-road vehicle areas, trails, other recreation areas.

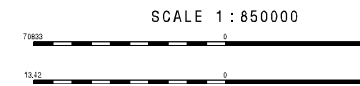


Proposed Plan (Alternative A Modified)

RMPA/EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties
December 17, 2003



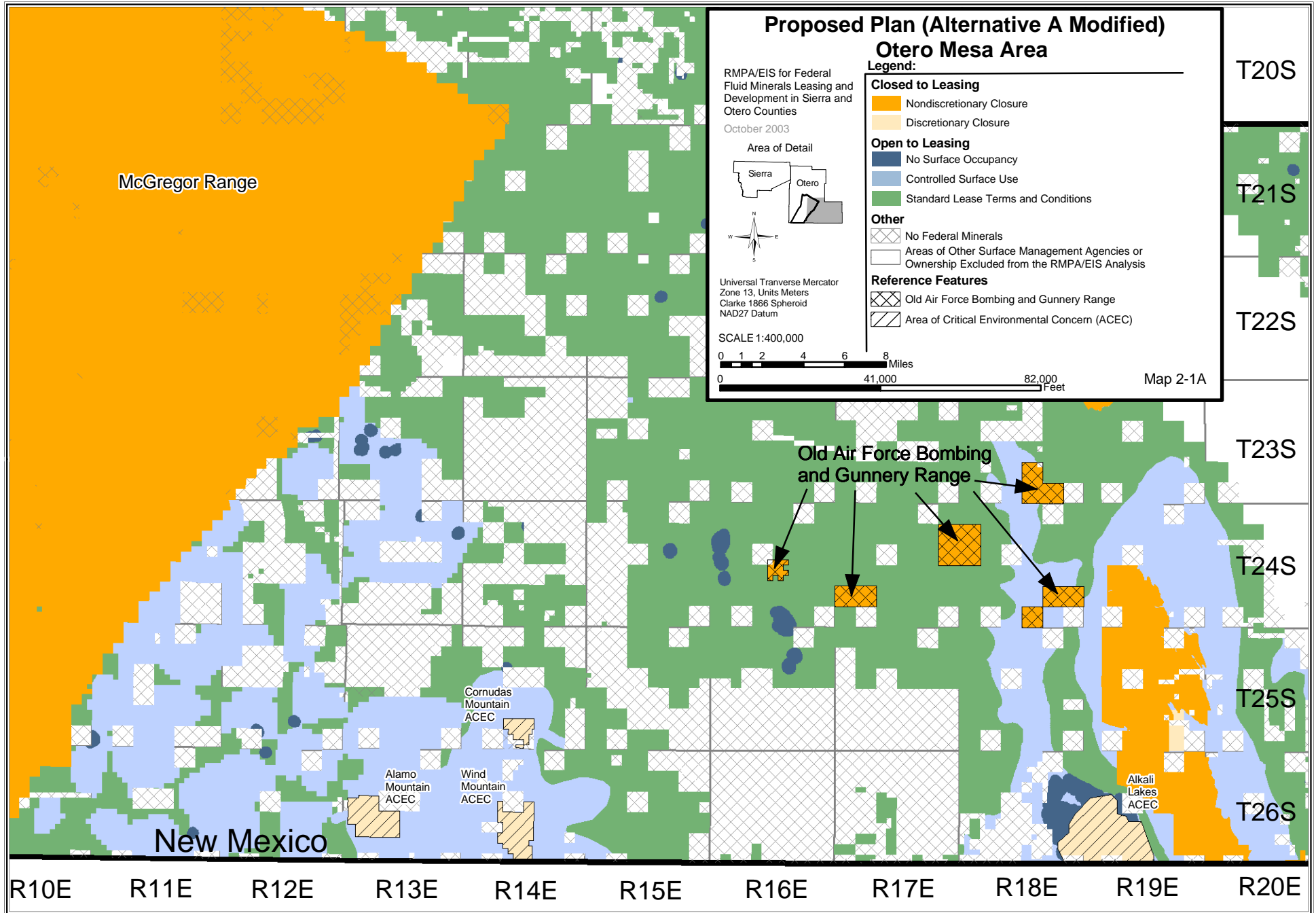
Universal Transverse Mercator
Zone 13, Units Meters
Clarke 1866 Spheroid
NAD27 Datum

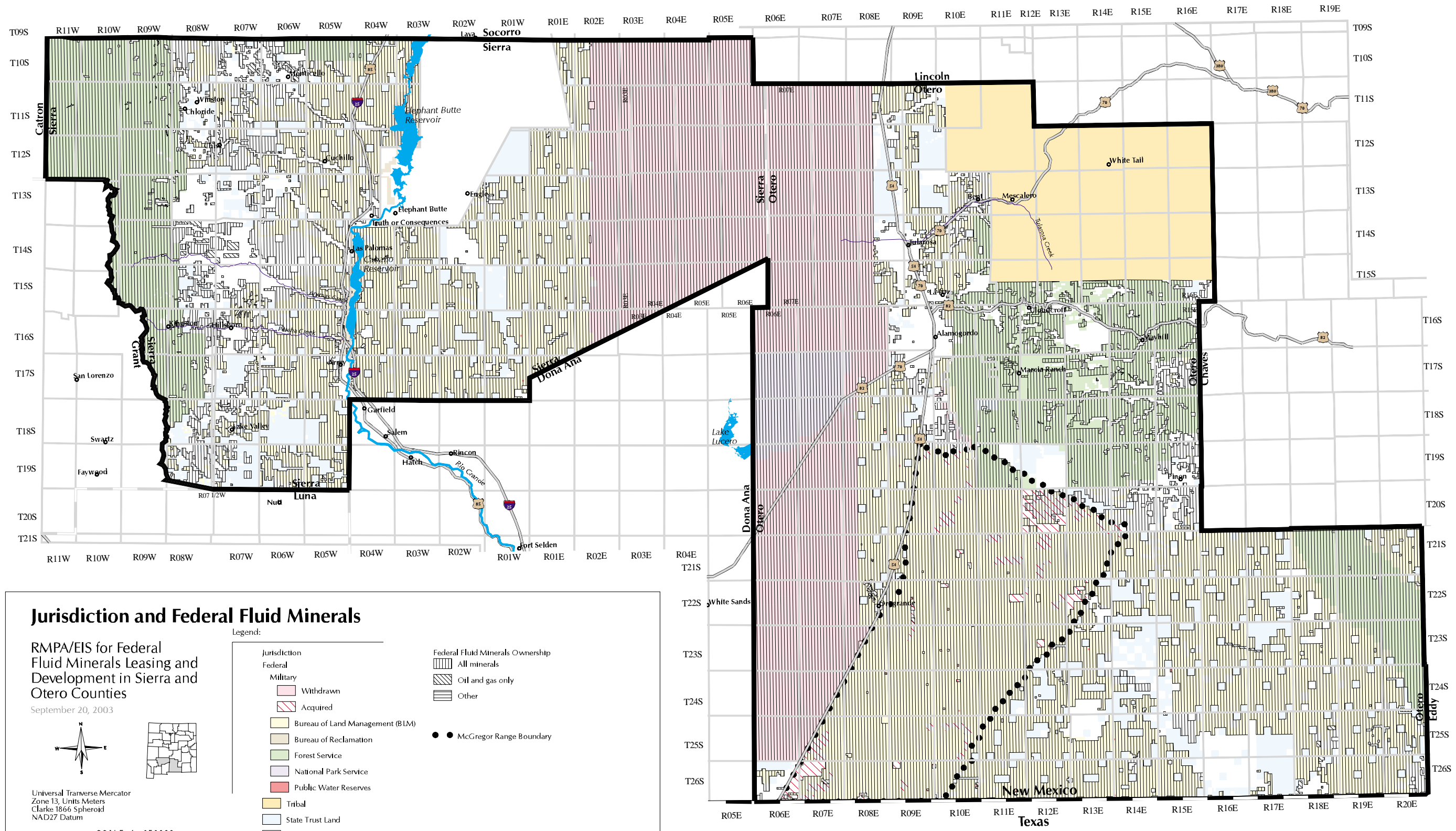


Legend:

Closed to Leasing	Open to Leasing	Other
Nondiscretionary Closure	No Surface Occupancy	Areas of Other Surface Management Agencies or Ownership Excluded from the RMPA/EIS Analysis
Discretionary Closure	Open with Stipulations	No Federal Fluid Minerals
	Open with Standard Lease Terms and Conditions	

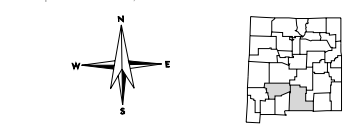






Jurisdiction and Federal Fluid Minerals

RMPA/EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties
September 20, 2003

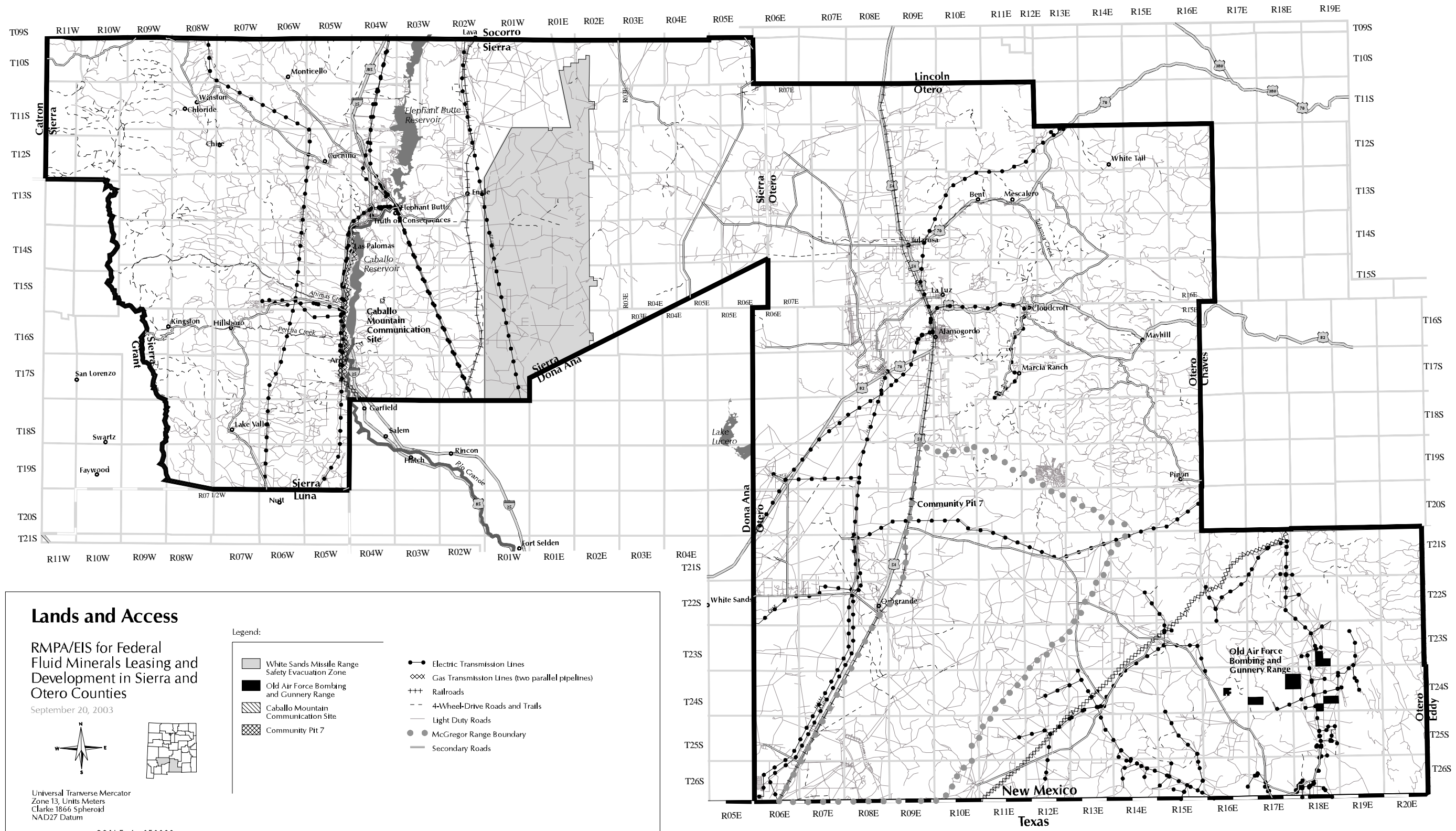


Universal Transverse Mercator
Zone 13, Units Meters
Clarke 1866 Spheroid
NAD27 Datum



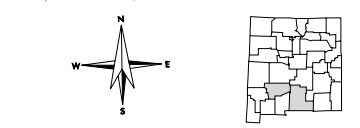
- Legend:
- | | |
|---------------------------------|---|
| Jurisdiction | Federal Fluid Minerals Ownership |
| Federal | All minerals |
| Military | Oil and gas only |
| Withdrawn | Other |
| Acquired | ● McGregor Range Boundary |
| Bureau of Land Management (BLM) | |
| Bureau of Reclamation | |
| Forest Service | |
| National Park Service | |
| Public Water Reserves | |
| Tribal | |
| State Trust Land | |
| Private | |



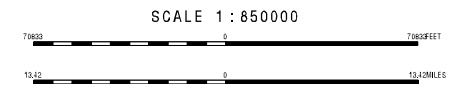


Lands and Access

RMPA/EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties
 September 20, 2003

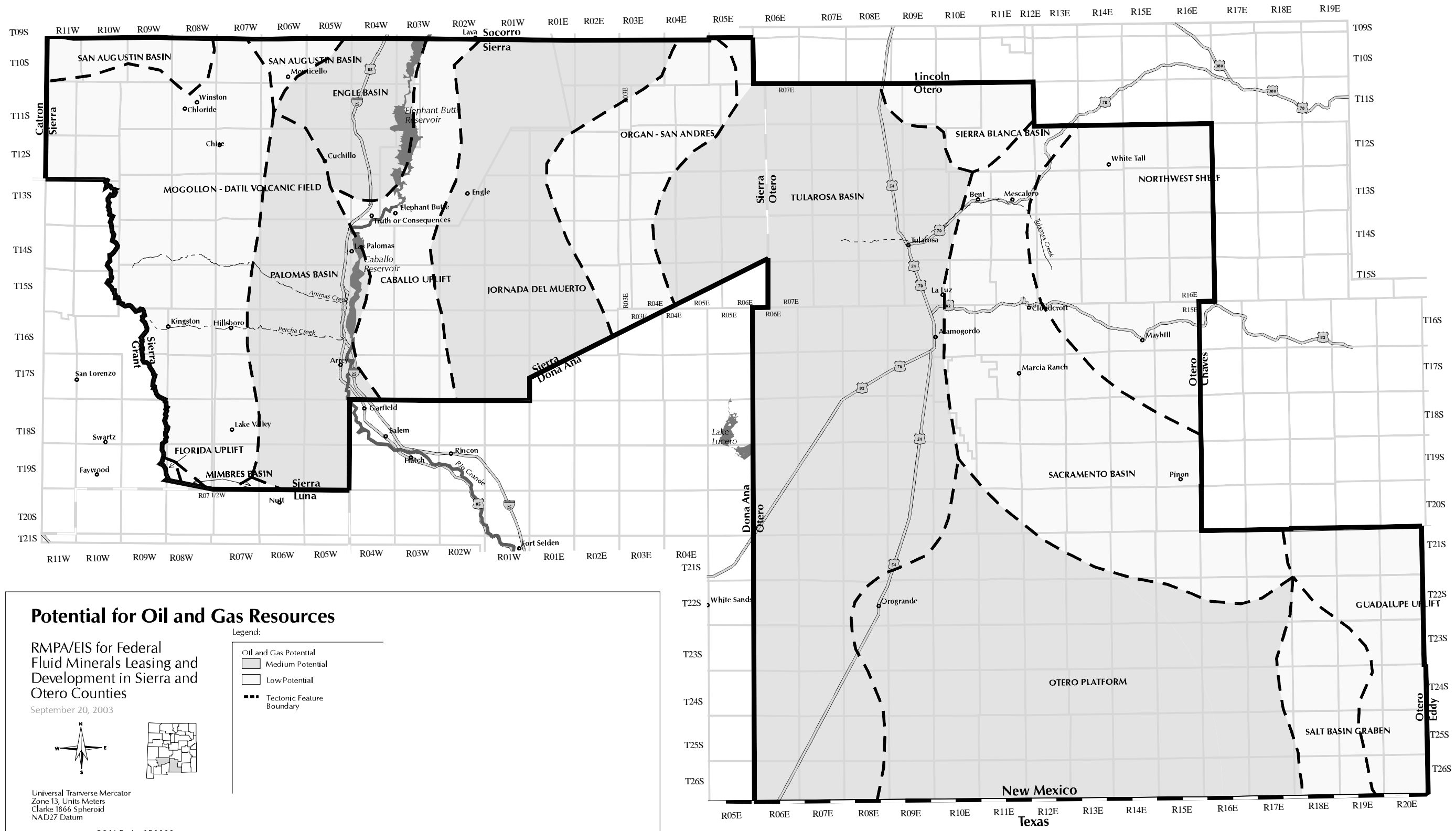


Universal Transverse Mercator
 Zone 13, Units Meters
 Clarke 1866 Spheroid
 NAD27 Datum



- Legend:
- White Sands Missile Range Safety Evacuation Zone
 - Old Air Force Bombing and Gunnery Range
 - Caballo Mountain Communication Site
 - Community Pit 7
 - Electric Transmission Lines
 - Gas Transmission Lines (two parallel pipelines)
 - Railroads
 - 4-Wheel-Drive Roads and Trails
 - Light Duty Roads
 - McGregor Range Boundary
 - Secondary Roads

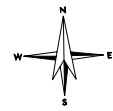




Potential for Oil and Gas Resources

RMPA/EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties

September 20, 2003



Universal Transverse Mercator
Zone 13, Units Meters
Clarke 1866 Spheroid
NAD27 Datum

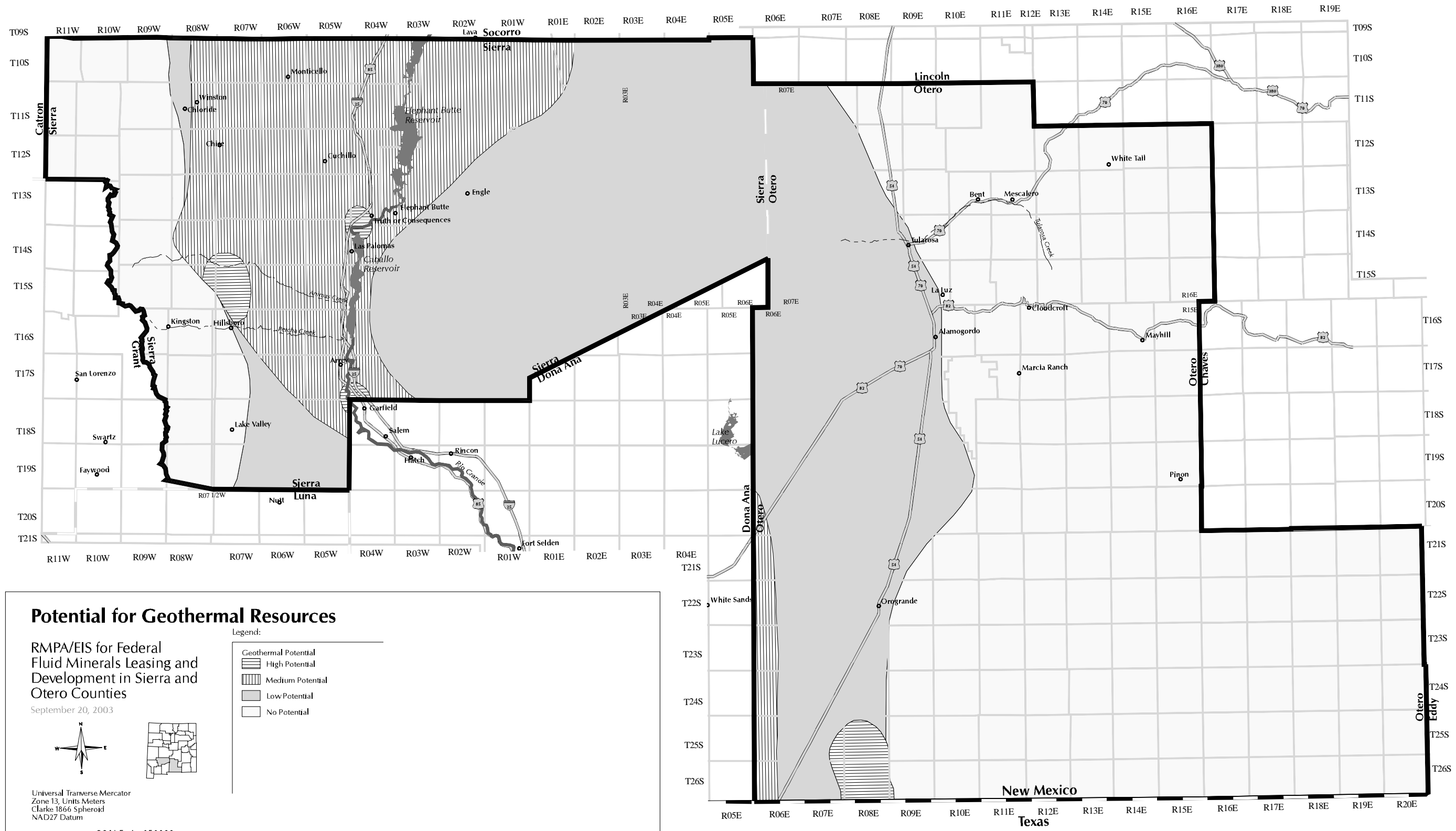
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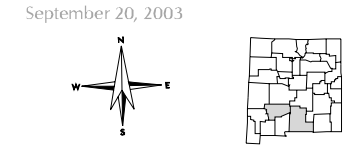
- Oil and Gas Potential
- Medium Potential
- Low Potential
- Tectonic Feature Boundary



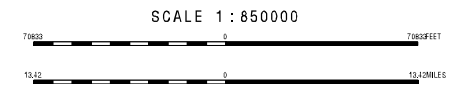


Potential for Geothermal Resources

RMPA/EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties
 September 20, 2003



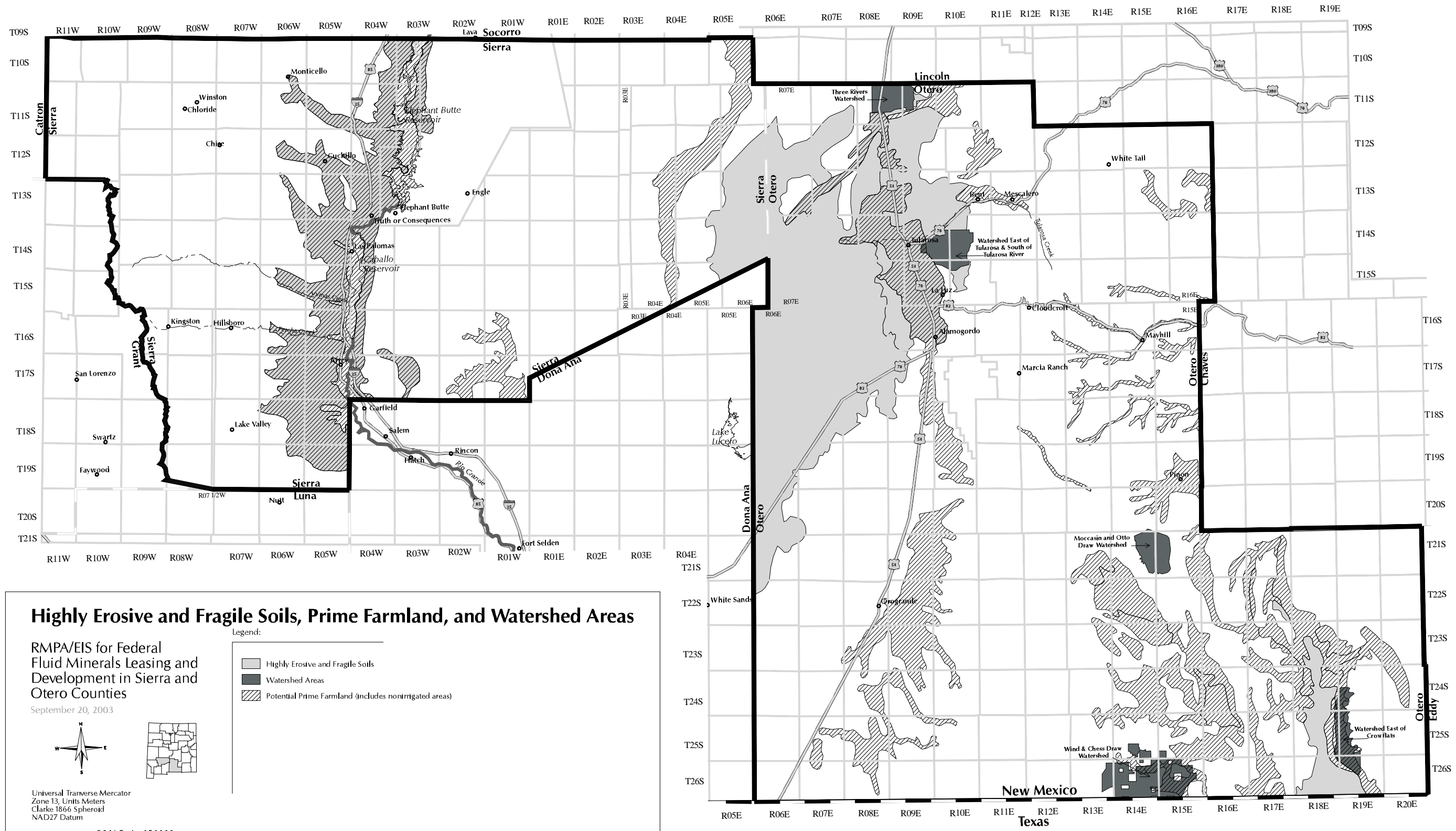
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 Clarke 1866 Spheroid
 NAD27 Datum



Legend:

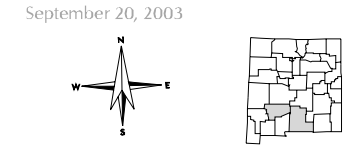
- Geothermal Potential
- High Potential (diagonal hatching)
- Medium Potential (vertical hatching)
- Low Potential (solid grey)
- No Potential (white)



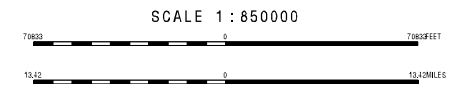


Highly Erosive and Fragile Soils, Prime Farmland, and Watershed Areas

RMPA/EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties
 September 20, 2003

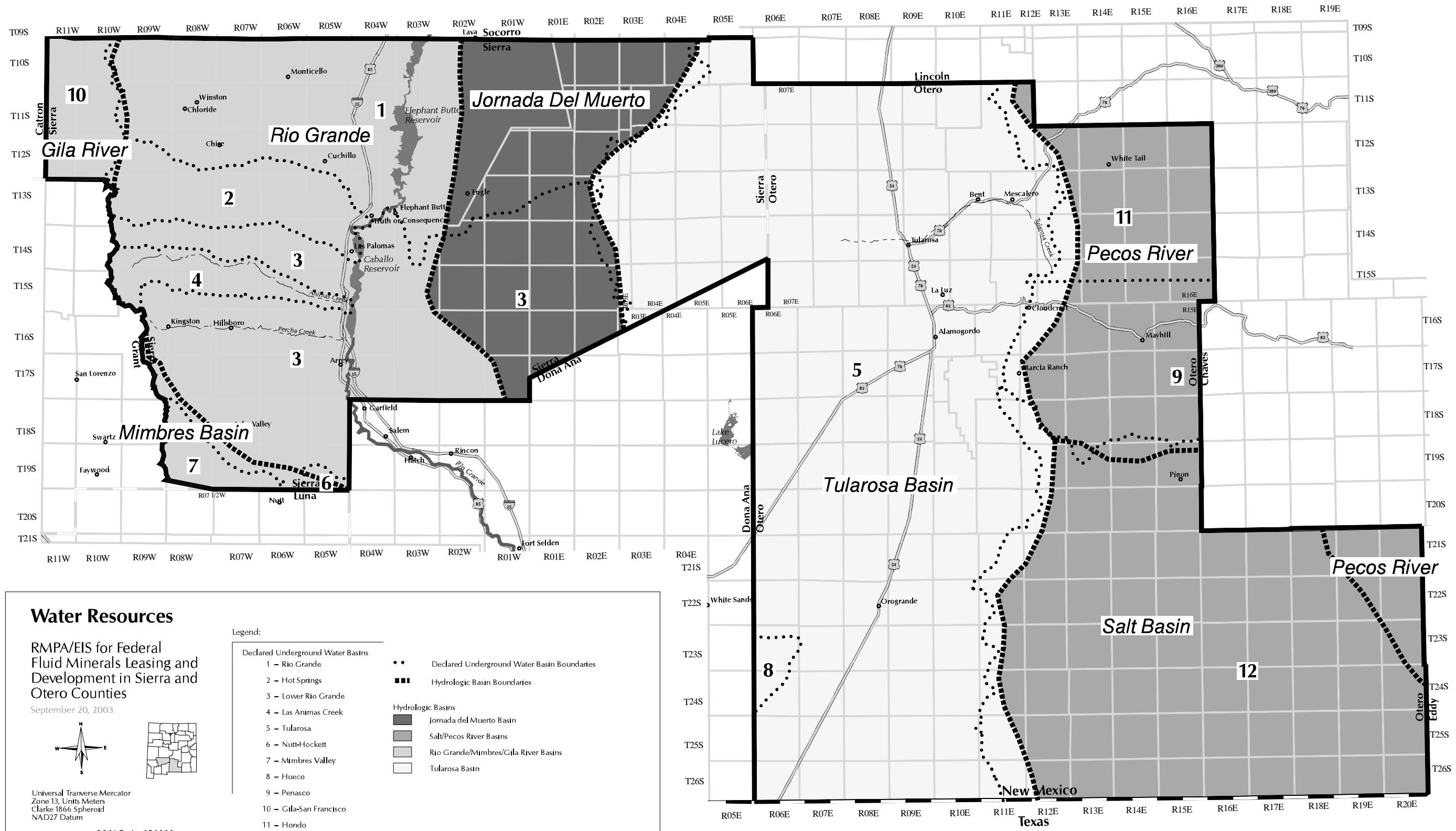


Universal Transverse Mercator
 Zone 13, Units Meters
 Clarke 1866 Spheroid
 NAD27 Datum



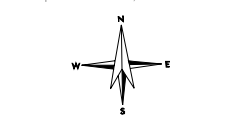
- Legend:
- Highly Erosive and Fragile Soils
 - Watershed Areas
 - Potential Prime Farmland (includes nonirrigated areas)



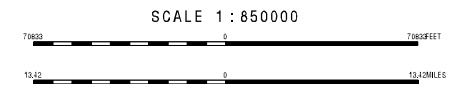


Water Resources

RMPA/EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties
September 20, 2003



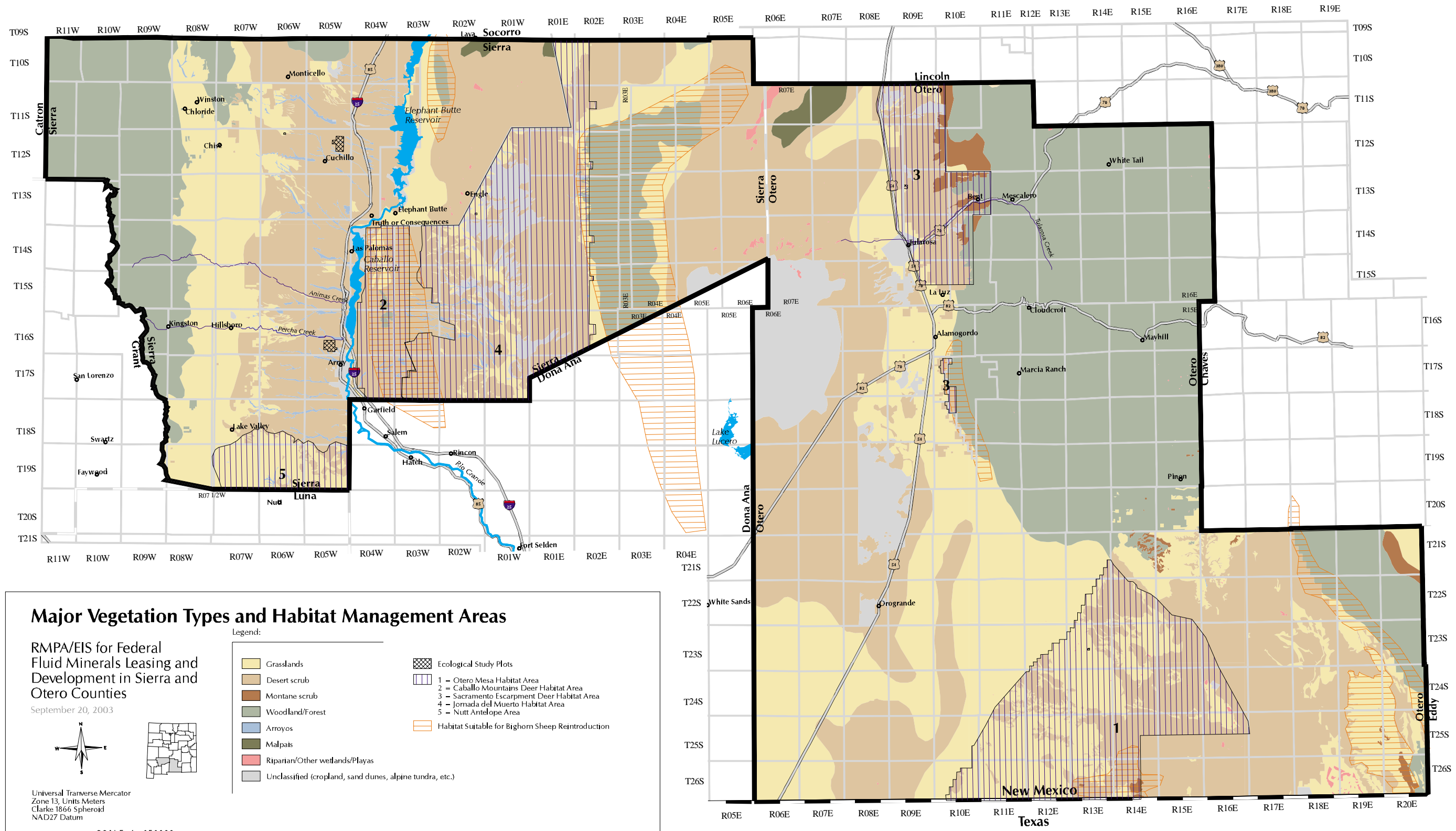
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Clarke 1866 Spheroid
NAD27 Datum



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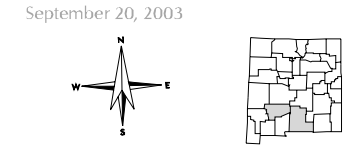
- | | |
|-------------------------------------|---|
| Declared Underground Water Basins | |
| 1 - Rio Grande | ••• Declared Underground Water Basin Boundaries |
| 2 - Hot Springs | ■■■ Hydrologic Basin Boundaries |
| 3 - Lower Rio Grande | |
| 4 - Las Animas Creek | |
| 5 - Tularosa | Hydrologic Basins |
| 6 - Nutt-Hockett | ■ Jornada del Muerto Basin |
| 7 - Mimbres Valley | ■ Salt/Pecos River Basins |
| 8 - Hueco | ■ Rio Grande/Mimbres/Gila River Basins |
| 9 - Penasco | □ Tularosa Basin |
| 10 - Gila-San Francisco | |
| 11 - Hondo | |
| 12 = Salt (Declared September 2000) | |



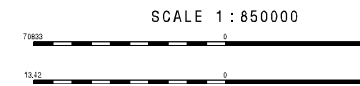


Major Vegetation Types and Habitat Management Areas

RMPA/EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties
September 20, 2003

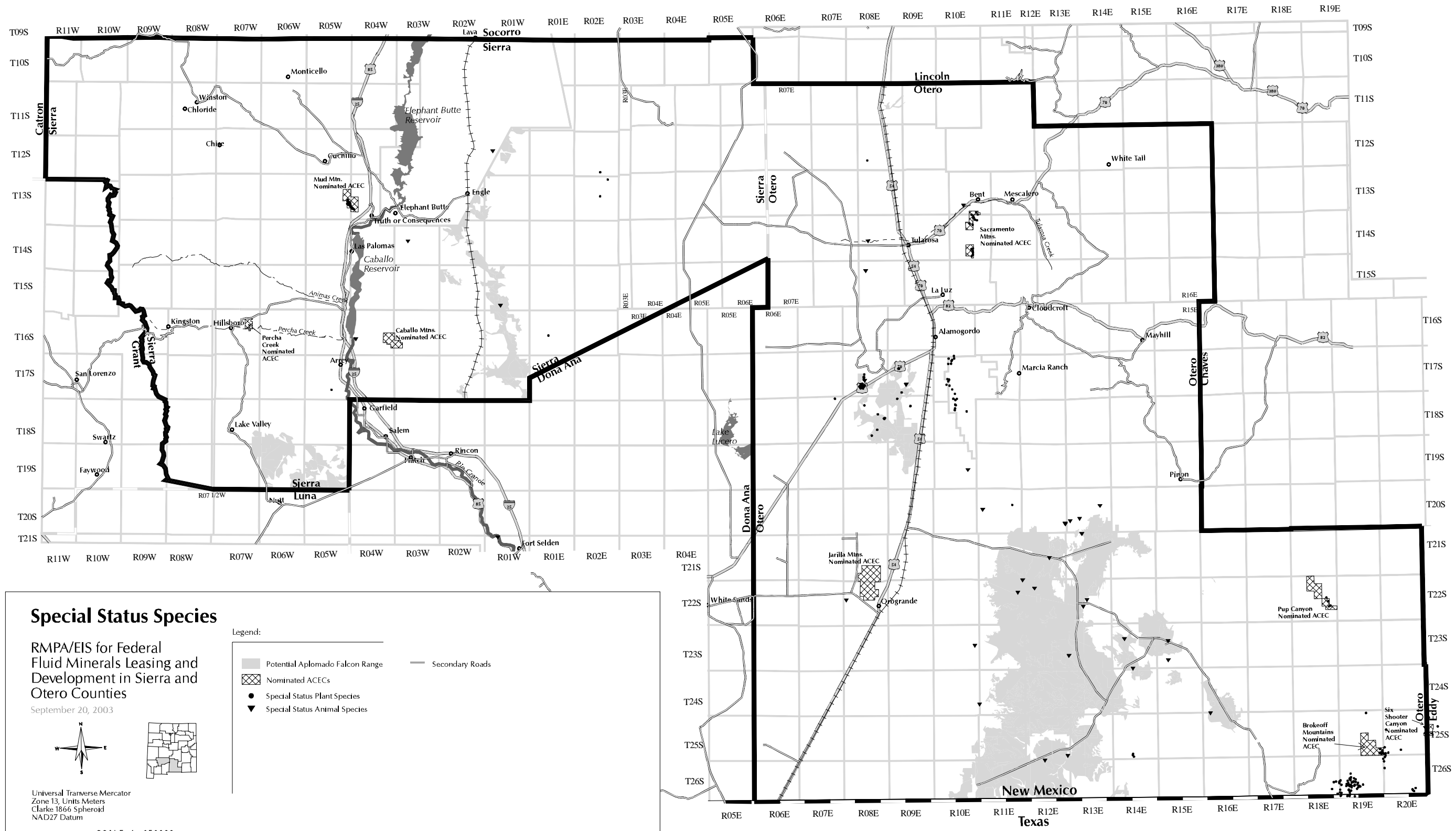


Universal Transverse Mercator
Zone 13, Units Meters
Clarke 1866 Spheroid
NAD27 Datum



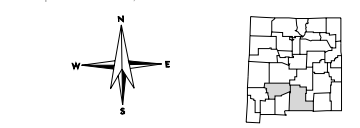
- Legend:
- Grasslands
 - Desert scrub
 - Montane scrub
 - Woodland/Forest
 - Arroyos
 - Malpais
 - Riparian/Other wetlands/Playas
 - Unclassified (cropland, sand dunes, alpine tundra, etc.)
 - Ecological Study Plots
 - 1 - Otero Mesa Habitat Area
 - 2 - Caballo Mountains Deer Habitat Area
 - 3 - Sacramento Escarpment Deer Habitat Area
 - 4 - Jornada del Muerto Habitat Area
 - 5 - Nutt Antelope Area
 - Habitat Suitable for Bighorn Sheep Reintroduction



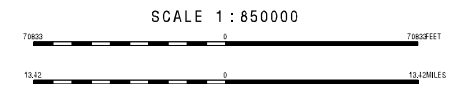


Special Status Species

RMPA/EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties
 September 20, 2003

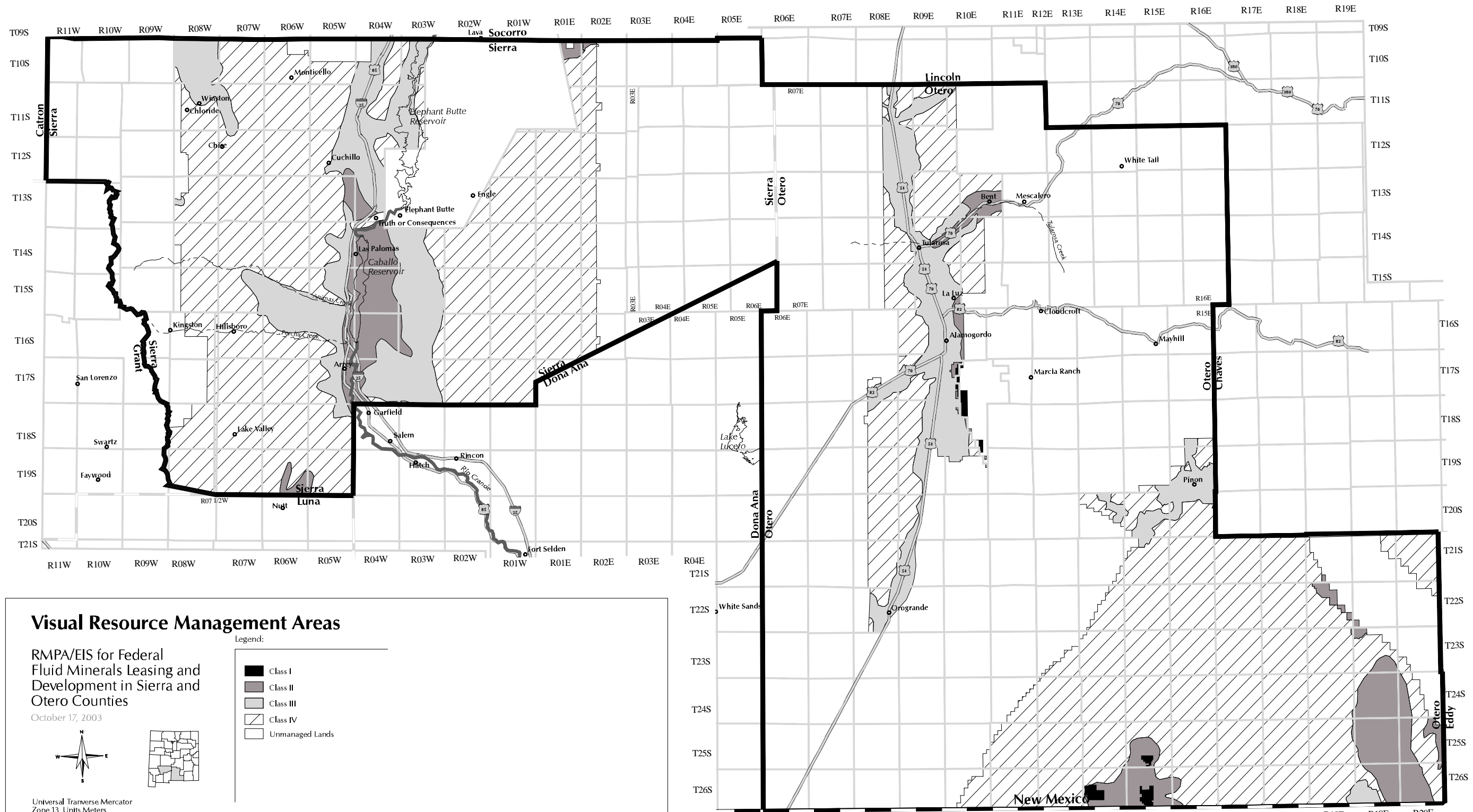


Universal Transverse Mercator
 Zone 13, Units Meters
 Clarke 1866 Spheroid
 NAD27 Datum



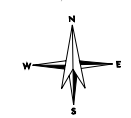
- Legend:
- Potential Aplomado Falcon Range
 - Nominated ACECs
 - Special Status Plant Species
 - Special Status Animal Species
 - Secondary Roads



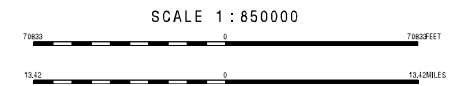


Visual Resource Management Areas

RMPA/EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties
 October 17, 2003



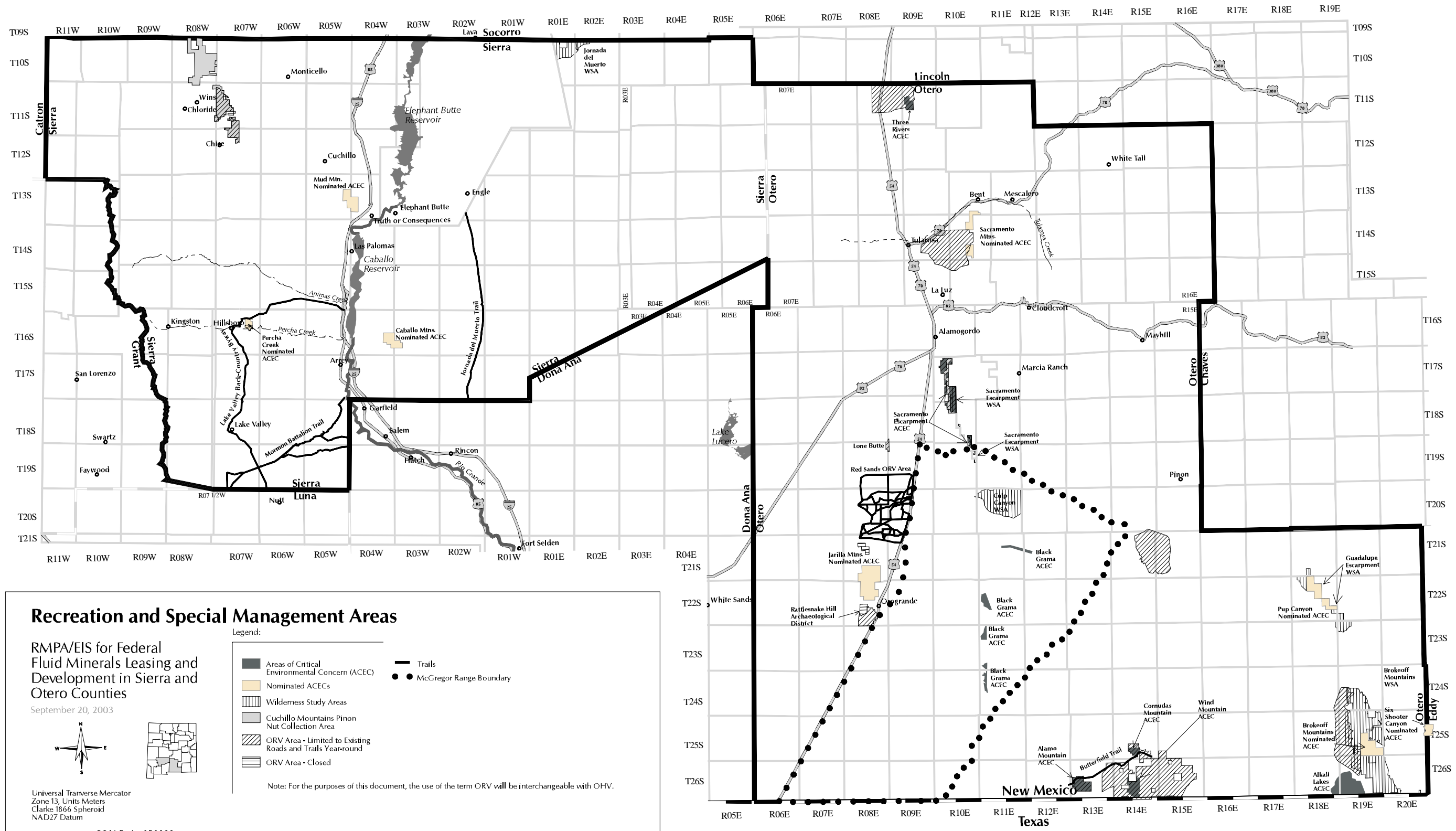
Universal Transverse Mercator
 Zone 13, Units Meters
 Clarke 1866 Spheroid
 NAD27 Datum



Legend:

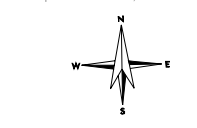
- Class I
- Class II
- Class III
- Class IV
- Unmanaged Lands



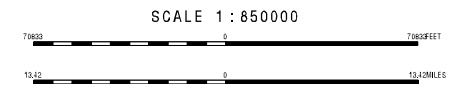


Recreation and Special Management Areas

RMPA/EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties
 September 20, 2003



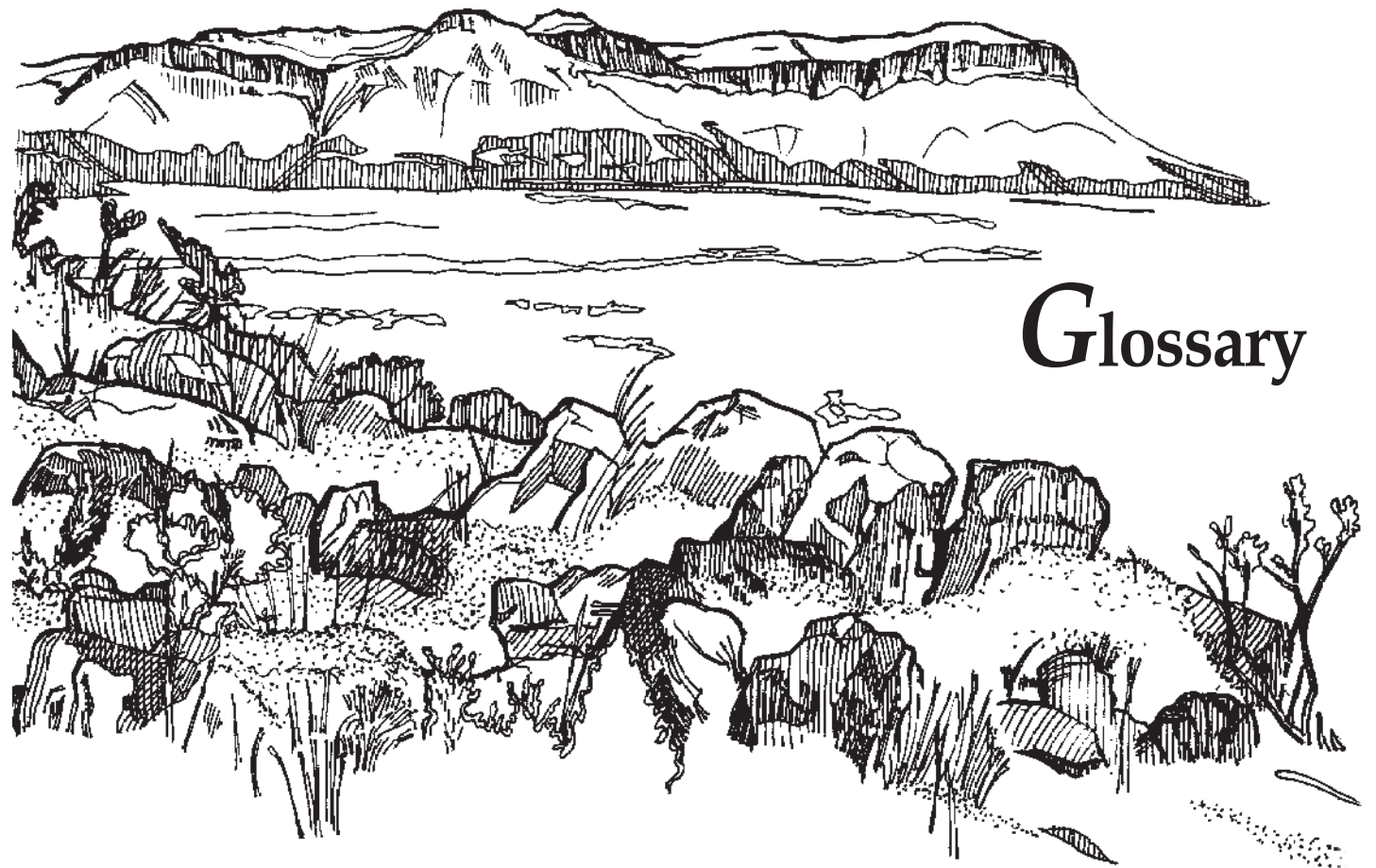
Universal Transverse Mercator
 Zone 13, Units Meters
 Clarke 1866 Spheroid
 NAD27 Datum



- Legend:
- Areas of Critical Environmental Concern (ACEC)
 - Nominated ACECs
 - Wilderness Study Areas
 - Cuchillo Mountains Pinon Nut Collection Area
 - ORV Area - Limited to Existing Roads and Trails Year-round
 - ORV Area - Closed
 - Trails
 - McGregor Range Boundary

Note: For the purposes of this document, the use of the term ORV will be interchangeable with OHV.





Glossary

GLOSSARY

Abandonment—Termination of fluid minerals operations, production operations, removal of facilities, plugging of the well bore, and reclamation of surface disturbances.

Adaptive Management—A systematic process for continually improving management policies and practices by learning from the outcomes of actions over time.

Affected Environment—Surface or subsurface resources (including social and economic elements) within or adjacent to a geographic area that potentially could be affected by gas development and production activities. The environment of the area to be affected or created by the alternatives under consideration (40 CFR 1502.15).

A-weighted—Weighting function applied to the noise spectrum, which approximates the response of the human ear.

Alkalinity—Quantity and type of compounds in water that collectively cause a pH shift to alkalinity.

Allotment (Range)—A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under management of an authorized agency.

Alluvial Plains—Floodplains produced by the filling of a valley bottom and consisting of fine mud, sand, or gravel.

Alternative—A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives. One of a number of plans or projects proposed for decision making.

Ambient (air)—The surrounding atmospheric conditions to which the general public has access.

Analysis Area—For this RMPA/EIS, refers to lands that overlie Federal fluid minerals, and excludes areas that are closed to leasing by statute and lands administered by surface management agencies other than BLM.

Animal Unit Months—Amount of forage required to sustain a cow/calf unit (one cow and one calf) for one month.

Annular—Having the form of a ring; ring-shaped.

Application—A written request, petition, or offer to lease lands for the purpose of fluid minerals exploration and/or right-of-extraction.

Aquifer—A water-bearing layer of permeable rock, sand, or gravel. A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to conduct groundwater and yield large quantities of water to wells and springs.

Areas of Critical Environmental Concern—A BLM designation pertaining to areas where specific management attention is needed to protect and prevent irreparable damage to important historical, cultural, and scenic values, fish or wildlife resources, or other natural systems or processes, or to protect human life and safety from natural hazards.

Arroyo—A term applied in the arid and semiarid regions of the southwestern United States to the small, deep, flat-floored channel or gully of an ephemeral stream or of an intermittent stream usually with vertical or steeply cut banks of unconsolidated material at least 2 feet high; it is usually dry, but may be transformed into a temporary watercourse or short-lived torrent after heavy rainfall.

Aspect—The direction in which a slope faces.

Barite (BaSO₄)—A mineral used to increase the weight of the drilling mud.

Basin—A depressed area having no surface outlet (*topographic basin*); a physiographic feature or subsurface structure that is capable of collecting, storing, or discharging water by reason of its shape and the characteristics of its confining material (*water*); a depression in the earth's surface, the lowest part often filled by a lake or pond (*lake basin*); a part of a river or canal widened (*drainage, river, stream basin*)

Basin and Range—Topography characterized by a series of tilted fault block mountain ranges and broad intervening basins.

Basin and Range Physiographic Province—A province in the southwestern United States characterized by a series of tilted fault blocks forming longitudinal ridges or mountains and broad intervening basins.

Benthic—Of, pertaining to, or living in or on the bottom of a waterbody.

Bentonite—A naturally occurring clay used to keep the cuttings in suspension as they move up the bore hole.

Big Game—Large species of wildlife that are hunted, such as elk, deer, bighorn sheep, and pronghorn antelope.

Biodiversity—The diversity of living organisms considered at all levels of organization including genetics, species, and higher taxonomic levels, and the variety of habitats and ecosystems, as well as the processes occurring therein.

Biogenic Rock—An organic rock produced directly by the physiological activities of living organisms, either plant or animal; e.g., coral reefs, shelly limestone, pelagic ooze, coal, peat.

Bioherm—A mound-, dome-, lens-, or reef-like or otherwise circumscribed mass of rock built up by, and composed almost exclusively of, the remains of sedentary organisms (corals, algae, foraminifers, mollusks, gastropods, stromatopods) and enclosed or surrounded by rock of different lithology.

Blowout—An uncontrolled expulsion of gas, oil, or other fluids from a drilling well. A blowout occurs when formation pressure exceeds the pressure applied to it by the column of drilling fluid and when blowout prevention equipment is absent or fails.

Bored Crossing—A subterranean crossing of a road, railway, river, or other obstacle, by a pipeline, transmission line, or other transport system.

Bradenhead Testing—The bradenhead is the portion of the wellhead that is in communication with the annular volume between the surface casing and the next smaller casing string. Conceptually, if there is positive pressure at the bradenhead, this indicates that a casing leak or an inadequate cement job could exist on a well.

Brine—A highly saline solution.

Bureau of Indian Affairs—An agency of the U.S. Department of the Interior responsible for encouraging and assisting American Indian people to manage their own affairs under the trust relationship to the Federal government; to facilitate, with the maximum involvement of American Indian people, full development of their human and natural resource potential, and promote self-determination by using the skills and capabilities of American Indian people in the direction and management of programs for their benefit.

Bureau of Land Management—An agency of the U.S. Department of the Interior responsible for managing most Federal government subsurface minerals. It has surface management responsibility for Federal lands designated under the Federal Land Policy and Management Act of 1976.

Cambrian—The oldest of the periods of the Paleozoic Era; also the system of strata deposited during that period.

Carbonaceous—Coaly; pertaining to, or composed largely of, carbon.

Casing—Steel pipes of varying diameter and weight, joined together by threads and couplings, “inserted” into the well bore for the purpose of supporting the walls of the well and preventing them from caving in. Surface casing is inserted from the ground surface to approximately 250 feet, production casing is inserted to the total depth of the well (smaller diameter pipe than surface casing), cemented in place and latter perforated for production.

Casual Use—Activities that ordinarily lead to no significant disturbance of Federal lands, resources, or improvements.

Centralizer—A device secured around the casing at various intervals to center the casing in the hole and provide a uniform cement sheath around the casing.

Christmas Tree—An assemblage of valves, located at the top of casing, from which tubing in the well is suspended.

Clean Air Act—Federal legislation governing air pollution. Prevention of Significant Deterioration **classifications define the allowable increased levels of air quality deterioration** above legally established levels include the following:

Class I – minimal additional deterioration in air quality (certain national parks and wilderness areas)

Class II – moderate additional deterioration in air quality (most lands)

Class III – greater deterioration for planned maximum growth (industrial areas)

Coal—A readily combustible rock containing more than 50 percent weight and more than 70 percent by volume of carbonaceous material including inherent moisture, formed from compaction and induration of variously altered plant remains similar to those in peat. Differences in the kinds of plant materials (type), in degree of metamorphism (rank), and in the

range of impurity (grade) are characteristic of coal and are used in classification.

Colluvium—A general term applied to loose and incoherent deposits, usually at the foot of a slope or cliff and brought there chiefly by gravity. Talus and cliff debris are included in such deposits.

Completion—The activities and methods to prepare a well for production. Includes installation of equipment for production from an oil or gas well.

Conditions of Approval—Conditions or provisions (requirements) under which an Application for a Permit to Drill or a Sundry Notice is approved.

Connate Water—Water entrapped in the interstices of a sedimentary rock at the time the rock was deposited.

Conspecific—Of or pertaining to the same species.

Controlled Surface Use (CSU)—A fluid minerals leasing constraint under which use and occupancy are allowed, but identified resource values require special operational limitations that would otherwise modify lease rights. CSU stipulations are described by resource concern in Appendix D.

Corridor—For purposes of this environmental assessment, a wide strip of land within which a proposed linear facility (e.g., pipeline, transmission line) could be located.

Council on Environmental Quality—An advisory council to the President of the United States established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the president on environmental matters.

Cow-Calf Livestock Operation—A livestock operation in which a base breeding herd of mother cows and bulls is maintained. The cows

produce a calf crop each year, and the operation keeps some heifer calves from each calf crop for breeding herd replacements. The operation sells the rest of the calf crop between the ages of 6 and 12 months along with old or nonproductive cows and bulls.

Critical Habitat—An area occupied by a threatened or endangered species “on which are found those physical and biological features (1) essential to the conservation of the species, and (2) which may require special management considerations or protection” (16 USC 1532 (5)(A)(I)1988). Unoccupied by suitable habitat for the threatened or endangered species is not automatically included unless such areas are essential for the conservation of the species (50 CFR 424.12(e)).

Crucial Habitat—An area that is essential to the survival of a wildlife species sometime during its life cycle.

Cultural Resource Inventory Classes:

Class I – Inventory of existing data: A study of a defined area designed (1) to provide a narrative overview (cultural resource overview) derived from existing cultural resource information and (2) to provide a compilation of existing cultural resource site record data on which to base the development of the BLM’s site record system.

Class II – The objectives of a Class II inventory are to identify and record, from surface and exposed profile indications, all cultural resource sites within a portion of a defined area.

Class III – An intensive field inventory designed to locate and record, from surface and exposed profile indications, all cultural resource sites within a specified area. A Class III inventory is appropriate on small project areas, all areas to be disturbed, and primary cultural resource areas.

Cultural Resources—Remains of human activity, occupation, or endeavor, as reflected in districts, sites, buildings, objects, artifacts, ruins, works of art, architecture, and natural features important in human events.

Cumulative Impact—The impact on the environment that results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Cuttings—Fragments of rock dislodged by the bit and brought to the surface in the drilling mud.

Debitage (cultural resources)—Waste flakes from tool-making activities.

Depth of Burial—The depth below the ground surface and/or thickness of overlying stratum over a particular rock unit of geologic interest. Coals buried at a depth of more than 4,000 feet do not have the flow capacity needed for economic methane gas development.

Depth to Coal Pay—The depth below the ground surface of a potential economic coal unit.

Desiccation—The removal of moisture; to become dried up.

Decision Area—Public land (BLM-administered) and private split-estate (i.e., private surface acreage overlying Federally owned fluid minerals) are referred to in this document as BLM’s Decision Area.

Development Well—A well drilled within the known or proven productive area of an oil field with the expectation of producing oil or gas from the producing reservoir.

Dewatering—The act of removing water.

Directional Drilling—The intentional deviation of a wellbore from a vertical position to reach subsurface areas off to one side from the drilling site.

Discretionary Closure—Those lands where the BLM has determined that fluid minerals leasing, even with the most restrictive stipulations, would not adequately protect other resources, values, or land uses.

Disposal Well—A well into which produced water from other wells is injected into an underground formation for disposal.

Distribution Line—An electric power line operating at a voltage of less than 69 kilovolts.

Diurnal—Describes a cyclic event recurring daily; or the nature or habit of an organism to be active during daylight hours.

Diversity—The relative abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area.

Drilling Fluids—The circulating fluid used to bring cuttings out of the wellbore, cool the drill bit, and provide hole stability and pressure control.

Drilling Rig—The derrick, draw-works, and attendant surface equipment of a drilling or workover unit.

Drilling—The operation of boring a hole in the earth, usually for the purpose of finding and removing subsurface formation fluids such as oil and gas.

Dry Hole—Any well incapable of producing oil or gas in commercial quantities. A dry hole may produce water, gas, or even oil, but not enough to justify production.

Easement—A right afforded a person or agency to make limited use of another's real property for access or other purposes.

Embargo—A restriction imposed on commerce by law; especially a prohibition of trade in a particular commodity.

Emission—Air pollutant discharge into the atmosphere, usually specified by mass per unit time.

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

Enhanced Recovery—The use of artificial means to increase the amount of hydrocarbons that can be recovered from a reservoir. A reservoir depleted by normal extraction usually can be restored by secondary or tertiary methods of enhanced recovery.

Environmental Impact Statement (EIS)—A document prepared to analyze the impacts on the environment of a proposed action and released to the public for review and comment. An EIS must meet the requirements of National Environmental Policy Act, Council on Environmental Quality, and the directives of the agency responsible for the proposed action.

Erosion—The group of processes whereby earthy or rocky material is worn away by natural sources such as wind, water, or ice and removed from any part of the earth's surface.

Ephemeral Stream—A stream that flows only in direct response to precipitation.

Evapotranspiration—Loss of water from a land area through transpiration of plants and evaporation from the soil.

Exception—Case-by-case exemption from a lease stipulation. The stipulation continues to apply to all other sites within the leasehold to which the restrictive criteria apply.

Exclosure—A fenced area designed to exclude livestock and/or wildlife.

Exploration Well—A well drilled in the area where there is no oil or gas production (also known as wildcat well).

Eyrie—The nest of birds of prey.

Fan—An accumulation of debris brought down by a stream descending through a steep ravine and debouching in the plain beneath, where the detrital material spreads out in the shape of a fan, forming a section of a very low cone.

Federal Candidate Species—Sensitive wildlife species currently under consideration for inclusion to the list of Federal threatened or endangered species.

Federal Land Policy and Management Act of 1976 (FLPMA)—Public Law 94-570 signed by the President of the United States on October 21, 1976. Established public land policy for management of lands administered by BLM. FLPMA specifies several key directions for the BLM, notably (1) management on the basis of multiple use and sustained yield; (2) land plans prepared to guide management actions; (3) public land management for the protection, development, and enhancement of resources; (4) public land retention in Federal ownership; and (5) public participation in reaching management decisions.

Federal Listed Species—Animal or plant species listed by the U.S. Fish and Wildlife Service as threatened or endangered.

Fiduciary—Held in trust.

Flare—An arrangement of piping and a burner to dispose of surplus combustible vapors, usually situated around a gasoline plant, refinery, or producing well.

Floodplain—The flat ground along a stream that is covered by water when the stream overflows its banks at flood stages.

Fluid Minerals—In this case, oil, gas, and geothermal resources.

Forage—All browse and herbaceous foods available to grazing animals, which may be grazed or harvested for feeding.

Foreground View—The landscape area visible to an observer within a mile.

Formation—A body of rock identified by lithic characteristics and stratigraphic position; it is prevailingly, but not necessarily tabular, and is mappable at the earth's surface or traceable in the subsurface (NACSN, 2984, Art. 24).

Fossil—Any remains, trace, or imprint of a plant or animal that has been preserved by natural processes in the earth's crust since some past geologic time.

Fractured—Fissured, broken, or cracked. See also Hydraulic Fracturing.

Fragile Soil—A soil that is especially vulnerable to erosion or deterioration due to its physical characteristics and/or location. Disturbance to the surface or the vegetative cover can initiate a rapid cycle of loss and destruction of soil material, structure, and ability to sustain a biotic community.

Fragmentation—See Habitat Fragmentation.

Free Market—An economic market operating by free competition.

Fugitive Dust—Airborne particulate matter emitted from any source other than through a stack or vent.

Geophysics—Study of the earth by quantitative physical methods.

Graben—Fault block valley; elongated, depressed crustal block bounded by faults on its long side.

Habitat—A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

Habitat Fragmentation—The disruption (by division) of extensive habitats into smaller habitat patches. The effects of habitat fragmentation include loss of habitat area and the creation of smaller, more isolated patches of remaining habitat.

Habitat Management Plan—A written and officially approved plan for a specific geographical area of public land that identifies wildlife habitat and related objectives, establishes the sequence of actions for achieving objectives, and outlines procedures for evaluating accomplishments.

Habitat Type—An aggregation of all land areas potentially capable of producing similar plant communities at climax.

Herpetofauna—Reptiles and amphibians.

Highest and Best Use—Use of a resource (i.e., property) that maximizes its potential.

Historic—Archaeological and archivally known sites related to the activities of non-native peoples, whether they be of Euro-American, Afro-American or Asian-American origin, in the period after the European discovery of the New World (circa A.D. 1492).

Hummocky—Like a hummock, full of hummocks (a low, rounded hill, knoll, hillock; a tract of wooded land higher than a nearby swamp or marsh).

Fracturing—A method of stimulating production by increasing the permeability of the producing formation.

Hydric Soils—Saturated soils.

Hydrocarbons—Organic compounds of hydrogen and carbon, whose densities, boiling points, and freezing points increase as their molecular weights increase. Although composed mostly of carbon and hydrogen, hydrocarbons exist in a great variety of compounds, owing to the strong affinity of the carbon atom for other atoms and itself. The smallest molecules are

gaseous; the largest are solids. Petroleum is a mixture of many different hydrocarbons.

Hydrogeologically Connected—The connection of two or more hydrologic systems, usually refers to separate aquifers in which water can pass and exchange with other aquifers.

Hydrophytic—Water-loving; ability to grow in water or saturated soils.

Hydrostatic Test—The testing of pipeline integrity by closing of all openings and pumping water into the pipe at a pressure greater than the normal operating pressure to determine whether or not leaks are present.

Immigrant—Individual who moves into the project area from another part of the country.

Impact—A modification of the existing environment caused by an action (such as construction or operation of facilities).

Incised Channels—Deeply and sharply cut stream channels.

Increments (air quality)—Maximum allowable increases over legally established baseline concentrations of pollutants covered by the Prevention of Significant Deterioration provisions designated as Class I, II, or III areas.

Indian Mineral Estate—A mineral estate owned by the Federal government and held in trust for the American Indian people. The Bureau of Indian Affairs and BLM, as agents of the Secretary of the Interior, have the responsibility for administering the leasing and development of oil and gas resources in such a case. However, under the auspices of the Indian Self Determination Act of 1968 and Indian Mineral Development Act of 1982, American Indian people may take a leadership role in the management of their mineral resources.

Indicator Species—A species of animal or plant whose presence is a fairly certain indication of a particular set of environmental conditions.

Indicator species serve to show the effects of development actions on the environment.

Indirect Impacts—Secondary effects that occur in locations other than the initial action or later in time.

Indurated—Said of a compact rock or soil hardened by the action of pressure, cementation, and especially heat. Also, said of an impure, hard, slately variety of talc.

Infrastructure—The facilities, services, and equipment needed for a community to function including roads, sewers, water lines, police and fire protection, and schools.

Injection—The forcing, under abnormal pressure, of material (downward from above, upward from below, or laterally) into a pre-existing deposit or rock, either along some plane or weakness or into a pre-existing crack or fissure.

Injection Well—A well used to inject fluids into an underground formation to increase reservoir pressure.

Insignificant or Nonsignificant Impacts—Impacts that are perceptible or measurable relative to those occurring naturally or due to other actions, and would not exceed significance criteria.

Intermittent Stream—A stream or reach of a stream that is below the local water table for at least some part of the year.

Joint Patterns—Patterns of fractures in rock, generally vertical or transverse to bedding, along which no appreciable movement has occurred.

Jurisdiction—The legal right to control or regulate use of a transportation facility. Jurisdiction requires authority, but not necessarily ownership.

K-factor—Soil erodibility factor.

Lacustrine—Of or pertaining to a lake.

Landscape—An area composed of interacting ecosystems that are repeated because of geology, landform, soils, climate, biota, and human influences throughout the area. Landscapes are generally of a size, shape, and pattern, which is determined by interacting ecosystems.

Landscape Character—Particular attributes, qualities, and traits of a landscape that give it an image and make it identifiable or unique.

Landscape Setting—The context and environment in which a landscape is set; a landscape backdrop.

Leasable Minerals—Those minerals or materials designated as leasable under the Mineral Leasing Act of 1920. They include coal, phosphate, asphalt, sulphur, potassium, and sodium minerals, and oil, gas, and geothermal.

Lease—(1) A legal document that conveys to an operator the right to drill for oil and gas; (2) the tract of land, on which a lease has been obtained, where producing wells and production equipment are located.

Lease Notice—Provides more detailed information concerning limitations that already exist in law, lease terms, regulations, and operational orders. A Lease Notice also addresses special items the lessee would consider when planning operations, but does not impose new or additional restrictions.

Lease Stipulation—A modification of the terms and conditions on a standard lease form at the time of the lease sale.

Lenticular—Shaped approximately like a double convex lens.

Level of Service—In transportation studies, a qualitative measure of traffic flow along a given road considering a variety of factors, including speed and travel time, traffic interruptions and freedom to maneuver. Levels of service are designated “A” through “F”; “A” being a free-flow condition with low volumes at high speeds and “F” being a congested condition of

low speeds and stop-and-go traffic. Intermediate levels describe conditions between these extremes. A level of service below “C” involves unstable to forced traffic flow in which a driver’s freedom to select a speed is restricted and in which traffic stoppages cause congestion.

Liquefaction—A change in the phase of a substance to the liquid state; usually a change from the gaseous to the liquid state, especially of a substance that is a gas at normal pressure and temperature.

Lithic Scatter—A scatter of chipped stone materials, which may include fragments, flakes, or stone tools.

Lithology—The physical characteristics of a rock, generally as determined megascopically or with the aid of a low-power magnifier.

Logging Tool—Electric tools that are able to be lowered down a well bore by wire cable and are capable of taking measurements of the physical properties of the rock formations downhole (i.e., resistivity, self-potential, gamma-ray, intensity, or velocity). The data are recorded and displayed on well logs that aid in defining physical rock characteristics such as lithology, porosity, pore geometry, and permeability.

Management Indicator Species—Those species that are commonly hunted or whose habitat requirements and population changes are believed to indicate effects of management activities on a broader group of wildlife species in the ecological community.

Management Situation Analysis—Assessment of the current management direction. It includes a consolidation of existing data needed to analyze and resolve identified issues, a description of current BLM management guidance, and a discussion of existing problems and opportunities for solving them.

Middleground View—One of the distance zones of a landscape being viewed. This zone extends from the limit of the foreground to 3 to 5 miles from the observer.

Migration (oil and gas)—The movement of liquid and gaseous hydrocarbons from their source or generating beds, through permeable formations into reservoir rocks.

Mineral Estate (Mineral Rights)—The ownership of minerals, including rights necessary for access, exploration, development, mining, ore dressing, and transportation operations.

Mineral Reserves—Known mineral deposits that are recoverable under present conditions but are as yet undeveloped.

Mineral Rights—Mineral rights outstanding are third-party rights, an interest in minerals not owned by the person or party conveying the land to the United States. It is an exception in a deed that is the result of prior conveyance separating title of certain minerals from the surface estate.

Reserved mineral rights are the retention of ownership of all or part of the mineral rights by a person or party conveying land to the United States. Conditions for the exercising of these rights have been defined in the Secretary of the Interior’s “Rules and Regulations to Govern Exercising of Mineral Rights Reserved Conveyance to the United States” attached to and made a part of deeds reserving mineral rights.

Mitigation—The abatement or reduction of an impact on the environment by (1) avoiding a certain action or parts of an action, (2) employing certain construction measures to limit the degree of impact, (3) restoring an area to preconstruction conditions, (4) preserving or maintaining an area throughout the life of a project, (5) replacing or providing substitute resources to the environment or (6) gathering archaeological and paleontological data before disturbance.

Modification—A fundamental change in the provisions of a lease stipulation, either temporarily or for the term of the lease. A modification may, therefore, include an exemption from or alteration to a stipulated requirement. Depending on the specific

modification, the stipulation may or may not apply to all other sites within the leasehold to which restrictive stipulation applies.

Multiple Use—Multiple use as defined by the Multiple Use – Sustained Yield Act 1960 means the management of all the various renewable surface resources so that they are used in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some land will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will be given the greatest dollar return or the greatest unit output.

National Ambient Air Quality Standards—The allowable concentrations of air pollutants in the air specified by the Federal government. The air quality standards are divided into primary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public health) and secondary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public welfare) from any unknown or expected adverse effects of air pollutants.

National Environmental Policy Act of 1969—An Act that encourages productive and enjoyable harmony between man and his environment and promotes efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; enriches the understanding or the ecological systems and natural resources important to the Nation, and establishes the Council on Environmental Quality.

National Natural Landmarks—Sites designated by the Secretary of the Interior as

containing the best representative examples of geologic features and natural communities composing the nation's natural history. The purpose of the designation is to encourage preservation of such sites through well-informed management and use, and consideration of these sites in public and private land use planning. Designation has no legal effect on land ownership, use, or management (National Park Service, no date, National Natural Landmark Designation).

National Register of Historic Places—A listing of architectural, historical, archaeological, and cultural sites of local, state, or national significance. The list of sites was established by the Historic Preservation Act of 1966 and is maintained by the National Park Service.

Negligible Impact—Impact that is small in magnitude and importance and is difficult or impossible to quantify relative to those occurring naturally or due to other actions.

Nondiscretionary Closure—Those lands that must be closed to leasing for reasons beyond the discretion of the BLM. These are lands specially precluded from fluid minerals leasing by law, regulations, Secretarial or Executive Order, or that otherwise have been closed formally by decisions reached beyond the scope of the BLM.

No Surface Disturbance—In general, this applies to an area where an activity is allowed so long as it does not disturb the surface.

No Surface Occupancy (NSO)—A fluid minerals leasing constraint that prohibits occupancy or disturbance on all or part of the lease surface to protect special values or uses. Lessees may exploit the fluid mineral resources under the leases restricted by this constraint through use of directional drilling from sites outside the NSO area. NSO stipulations are described by resource concern in Appendix D.

Notice of Review Species—A species that is being considered as a candidate for listing as either endangered or threatened under the Endangered Species Act of 1973, as amended.

Notice to Lessees—A written notice issued by the BLM to implement regulations and operating orders, and serve as instructions on a specific item(s) of importance within a state, district, or area.

Noxious Weed—An undesirable weed species that can crowd out more desirable species.

Off-Highway Vehicle—A vehicle (including four-wheel drive, trail bikes, all-terrain vehicles, and snowmobiles but excluding helicopters, fixed-wing aircraft, and boats) capable of traveling off road over land, water, ice, snow, sand, marshes, and other terrain.

Off-Road Vehicle—Any motorized vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain.

Off-Road Vehicle Designations

Closed – Applies to areas and trails where the use of ORVs is permanently or temporarily prohibited. Emergency use of vehicles is allowed.

Limited – Applies to areas and trails where the use of ORVs is subject to restrictions such as limiting the number or types of vehicles allowed, dates and times of use (seasonal restrictions), limiting use to existing roads and trails, or limiting use to designated roads or trails. Under the designated roads and trails designation, use is allowed only on roads and trails that are signed for use. Combinations of restrictions, such as limiting use to certain types of vehicles during certain times of the year, are possible.

Open – Areas where vehicles may be driven both on and off trails.

One-Hundred-Year Flood—A hydrologic event with a magnitude that has a recurrence interval of 100 years.

Operating Rights (working interest)—Any interest held in a lease with the right to explore for, develop, and produce leased substances.

Operator—Any person who has taken formal responsibility for the operations conducted on the leased lands.

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

Palustrine—A system of wetlands that includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens.

Particulate Matter—Particulate matter less than 10 microns in effective diameter (also called Fine Particulate Matter).

Patent—A grant made to an individual or group conveying fee simple title to public lands.

Piedmont—Lying or formed at the base of mountains.

Perennial Stream—A stream receiving water from both surfaces and underground sources that flows throughout the entire year.

Perforations—Holes that are made through the casing and cement, and extend some distance into the production zone.

pH—A numeric value that gives the relative acidity or alkalinity of a substance on a 0 to 14 scale with the neutral point at 7. Values lower than 7 show the presence of acids, and values greater than 7 show the presence of alkalis.

Physiognomic Physiographic Province—A region, all parts of which are similar in geologic structure and climate and which has consequently had a unified geomorphic history; a region whose pattern of relief features or landforms differs significantly from that of adjacent regions.

Plan of Development—A mandatory plan, developed by an applicant of a mining operation or construction project, that specifies the techniques and measures to be used during construction and operation of all project facilities on public land. The plan is submitted for approval to the appropriate Federal agency before any construction begins.

Planning Area—A geographical area for which land use and resource management plans are developed and maintained.

Plug—Any object or device that serves to block a hole or passageway, as a cement plug in a borehole.

Prehistoric—Archaeological sites resulting from the activities of aboriginal peoples native to this region, and because dating is often difficult, extending up to the reservation era (ca. A.D. 1868).

Prevention of Significant Deterioration—A regulatory program based not on the absolute levels of pollution allowable in the atmosphere but on the amount by which a legally defined baseline condition will be allowed to deteriorate in a given area. Under this program, geographic areas are divided into three classes, each allowing different increases in nitrogen dioxide, particulate matter, and sulfur dioxide concentrations.

Primary Range—Areas where the majority of livestock grazing is concentrated, due to high forage production, easy accessibility, nearby water sources, or other reasons.

Prime Farmland—Land that is best suited for producing food, feed, forage, fiber, and oilseed crops. The inventory of prime agricultural land is maintained by the USDA Natural Resources Conservation Service (formerly the Soil Conservation Service).

Primitive—Refers to areas that are almost completely free of management controls, are located more than 3 miles from the nearest point

of motor vehicle access, and have unmodified landscapes and little evidence of other people.

Production Well—A well drilled in a known field that produces oil or gas.

Proposed Action—Construction activities, alignments, and other activities proposed by the applicant.

Proppants—Sandgrains, aluminum pellets, glass beads, or similar materials used in hydraulic fracturing. When injected into the production formation, these materials leave channels allowing gas to flow through them into the well.

Public Land—Any land and interest in land (outside Alaska) owned by the United States and administered by the Secretary of the Interior through the BLM.

Quaternary—The younger of the two geologic periods or systems in the Cenozoic Era.

Rangeland—Land used for grazing by livestock and big game animals on which vegetation is dominated by grasses, grass-like plants, forbs, or shrubs.

Raptor—Bird of prey with sharp talons and strongly curved beak; e.g., hawk, owl, vulture, eagle.

Rare or Sensitive Species—Species that have no specific legal protection under the Endangered Species Act as threatened or endangered species, but are of special concern to agencies and the professional biologic community due to low populations, limited distributions, ongoing population decline, and/or human or natural threats to their continued existence.

Reasonable Foreseeable Development Scenario—The prediction of the type and amount of oil and gas activity that would occur in a given area. The prediction is based on geologic factors, past history of drilling, projected demand for oil and gas, and industry interest.

Reciprocation—A technique performed while cementing, whereby casing is moved up and down the wellbore in order to move the cement slurry uniformly around the wellbore to eliminate channeling and provide an effective cement bond on the casing and formation walls.

Reclamation—The process of converting disturbed land to its former use or other productive uses.

Recreation and Public Purposes Act—This act authorizes the Secretary of the Interior to lease or convey public lands for recreational and public purposes, under specified conditions, to states or their political subdivisions and to nonprofit corporations and associations.

Resource Management Plan (RMP)—A land use plan that establishes land use allocations, multiple-use guidelines, and management objectives for a given planning area. The RMP planning system has been used by the BLM since 1980.

Record of Decision—A document separate from, but associated with, an EIS that publicly and officially discloses the responsible official's decision on the proposed action.

Reserve Pit—(1) Usually an excavated pit that may be lined with plastic that holds drill cuttings and waste mud, (2) term for the pit that holds the drilling mud.

Reservoir (oil and gas)—A naturally occurring, underground container of oil and gas, usually formed by deformation of strata and changes in porosity.

Rift—A system of fractures (faults) in the earth's crust and the associated valley or depression.

Riparian—Situated on or pertaining to the bank of a river, stream, or other body of water. Normally used to refer to the plants of all types that grow along, around, or in wet areas.

Riverine—A system of wetlands that includes all wetland and deep-water habitats contained

within a channel that lacks trees, shrubs, persistent emergents, and emergent mosses or lichens.

Roadless—Refers to the absence of roads constructed and maintained by mechanical means.

Roads—Vehicle routes that are improved and maintained by mechanical means to ensure relatively regular and continuous use. (A way maintained strictly by the passage of vehicles does not constitute a road.)

Rotation—A technique performed while cementing, whereby casing is rotated in the hole in order to move the cement slurry uniformly around the casing to eliminate channeling and provide an effective cement bond on the casing and formation walls.

Salinity—A measure of the amount of dissolved salts in water.

Saline Water—Water containing high concentrations of salt (see also brine).

Scoping—A term used to identify the process for determining the scope of issues related to a proposed action and for identifying significant issues to be addressed in an EIS.

Scratchers—A device fastened to the outside of the casing that removes drilling mud from the wall of the hole to condition the hole for cementing. By rotating or moving the casing up and down as it is being inserted into the hole, the scratcher, formed of stiff wire, removes drilling mud so that cement can bond solidly to the formation wall.

Screened—The depth at which a well screen has been placed on a well. A well screen allows fluids to enter the well casing.

Secondary Range—Areas where livestock grazing occurs but at lower intensities than primary range, due to less favorable conditions of forage production, terrain, distance from water source, or other factors.

Secondary Succession—The process by which ecosystems recover toward pre-existing conditions after removal of a disturbance, such as the recovery process of a forest after a fire.

Sediment—Soil or mineral transported by moving water, wind, gravity, or glaciers, and deposited in streams or other bodies of water, or on land.

Sediment Yield—The amount of sediment produced in a watershed, expressed in tons, acre feet, or cubic yards, of sediment per unit of drainage area per year.

Sedimentary Rock—Rock resulting from consolidation of loose sediment that has accumulated in layers.

Selenium—A chemical element of the sulfur group.

Semiprimitive—Refers to areas that have very few management controls, are located between 0.5 mile (800 meters) and 3 miles from the nearest point of motor vehicle access (excluding four-wheel drive roads and trails), and have mostly natural landscapes and some evidence of other people.

Sensitive Plant Species—Those plant or animal species susceptible or vulnerable to activity impacts or habitat alterations.

Sensitivity Levels (visual resources)—A measure of people's concern for scenic quality.

Shut-in—An oil and gas well that is capable of production but is temporarily not producing.

Significant—An effect that is analyzed in the context of the proposed action to determine the degree or magnitude of importance of the effect, either beneficial or adverse. The degree of significance can be related to other actions with individually insignificant but cumulatively significant impacts.

Significance Criteria—Criteria identified for specific resources used to determine whether or not impacts would be significant.

Slope—The degree of deviation of a surface from the horizontal.

Slug Tests—A test used to calculate hydraulic conductivity, transmissivity, and the storage coefficient (i.e., the wells potential yield).

Soil Horizon—A distinct layer of soil, approximately parallel to the land surface, and different from adjacent, genetically related layers in physical, chemical, and biological properties or characteristics.

Soil Productivity—The capacity of a soil to produce a plant or sequence of plants under a system of management.

Soil Series—A group of soils having genetic horizons (layers) that, except for texture of the surface layer, have similar characteristics and arrangement in profile.

Soil Texture—The relative proportions of sand, silt, and clay particles in a mass of soil. Basic textural classes, in order of increasing proportions of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, and clay.

Split Estate—Refers to land where the mineral rights and the surface rights are owned by different parties. Owners of the mineral rights generally have a superior right.

Standard Lease Terms and Conditions—Areas may be open to leasing with no specific management decisions defined in a Resource Management Plan; however, these areas are subject to lease terms and conditions as defined on the lease form (Form 3100-11, Offer to Lease and Lease for Oil and Gas; and Form 3200-24, Offer to Lease and Lease for Geothermal Resources).

Stipulations—Requirements that are part of the terms of a mineral lease. Some stipulations are standard on all Federal leases. Other stipulations may be applied to the lease at the discretion of the surface management agency to protect valuable surface resources and uses.

Storage Coefficient—The volume of water released from storage in a vertical column of 1 square foot when the water table or other piezometric surface declines 1 foot.

Stratigraphy—The arrangement of strata, especially as to geographic position and chronological order of sequence.

Structural Trap—One in which entrapment results from folding, faulting, or a combination of both.

Suitability—As used in the Wilderness Act and FLPMA, refers to a recommendation by the Secretary of the Interior or the Secretary of Agriculture that certain Federal lands satisfy the definition of wilderness in the Wilderness Act. These lands have been found appropriate for designation as wilderness on the basis of an analysis of their existing and potential uses.

Sundry Notice—Standard form to notify of or propose change of approved well operations subsequent to an Application for Permit to Drill in accordance with 43 CFR 3162.3-2.

Surface Management Agency—Any agency, other than the BLM, with jurisdiction over the surface overlying Federal minerals.

Sustainability—The ability of an ecosystem to maintain ecological processes and functions, biological diversity, and productivity over time.

Sustained Yield—The achievement and maintenance, in perpetuity, of a high-level annual or regular periodic output of the various renewable resources on public lands consistent with multiple use.

Syncline—A fold of stratified rock inclining upward in opposite directions from both sides of its axis (opposed to anticline).

Tertiary—The older of the two geologic periods comprising the Cenozoic Era; also the system of strata deposited during that period.

Thermogenic—Of or pertaining to the rise in temperature in a body from reactions in that body, as by oxidation, or the decay of radioactive elements.

Threatened or Endangered Species—Animal or plant species that are listed under the Federal Endangered Species Act of 1973, as amended (federally listed), or under the New Mexico Endangered Species Act (state listed).

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

Thrust Fault—A reverse fault that is characterized by a low angle of inclination with reference to a horizontal plane.

Timing Limitation (Seasonal Restriction)—A fluid minerals leasing constraint that prohibits surface use during specified time periods to protect identified resource values. The constraint does not apply to the operation and maintenance of production facilities unless analysis demonstrates that such constraints are needed and that less stringent, project-specific constraints would be insufficient.

Toe-slope—The most distant part of a landslide; the downslope edge of a landslide or slump.

Total Dissolved Solids—A term that describes the quantity of dissolved material in a sample of material.

Total Suspended Particulates—All particulate matter, typically less than 70 microns in effective diameter.

Total Suspended Solids—A term that describes the quantity of solid material in a sample of material.

Transmissivity—The rate at which water is transmitted through a unit width of aquifer under a hydraulic gradient.

Trap—A body of reservoir rock completely surrounded by impervious rock; a closed reservoir.

Turbolator—A type of centralizer that induces turbulent flow for better drilling mud displacement and cement sheath placement.

Utilization (rangeland)—The proportion of the current year's forage production that is consumed or destroyed by grazing animals. Utilization is usually expressed as a percentage.

Vadose Zone—Zone of aeration.

Valid Existing Rights—Legal interests that attach a land or mineral estate and cannot be divested from the estate until those interests expire or are relinquished.

Vandalism—Willful or malicious destruction or defacement of public property; e.g., cultural or paleontological resources.

Vegetation Manipulation—Planned alteration of vegetation communities through use of prescribed fire, plowing, herbicide spraying, or other means to gain desired changes in forage availability or wildlife cover.

Vegetation Type—A plant community with distinguishable characteristics described by the dominant vegetation present.

Vent—An opening in a vessel, line, or pump to permit the escape of air or gas.

Visual Resources—The visible physical features of a landscape (topography, water, vegetation, animals, structures, and other features) that constitute the scenery of an area.

Visual Resource Management (VRM)—The inventory and planning actions taken to identify visual resource values and to establish objectives for managing those values. Also, management actions taken to achieve the established objectives.

Visual Resource Management Classes—VRM classes identify the degree of acceptable visual change within a particular landscape. A classification is assigned to public lands based on guidelines established for scenic quality, visual sensitivity, and visibility.

VRM Class I – This classification preserves the existing characteristic landscape and allows for natural ecological changes only. Includes Congressionally authorized areas (wilderness) and areas approved through an RMP where landscape modification activities should be restricted.

VRM Class II – This classification retains the existing characteristic landscape. The level of change in any of the basic landscape elements (form, line, color, texture) due to management activities should be low and not evident.

VRM Class III – This classification partially retains the existing characteristic landscape. The level of change in any of the basic landscape elements due to management activities may be moderate and evident.

VRM Class IV – This classification applies to areas where the characteristic landscape has been so disturbed that rehabilitation is needed. Generally considered an interim short-term classification until rehabilitation or enhancement is completed.

Visual Sensitivity—Visual sensitivity levels are a measure of public concern for scenic quality and existing or proposed visual change.

Vugo—(Petrology) A small cavity in a vein or in rock, usually lined with crystals of a different mineral composition from the enclosing rock. (Oil) A term used in petroleum geology for an

opening in a rock, from the size of a small pea upwards.

Waiver—Permanent exemption from a lease stipulation. The stipulation no longer applies anywhere within the leasehold.

Water Table—The surface in a groundwater body where the water pressure is atmospheric. It is the level at which water stands in a well that penetrates the water body just far enough to hold standing water.

Wetland—Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. BLM Manual 1737, *Riparian-Wetland Area Management*, includes marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas as wetlands.

Wilderness, Wilderness Area—An area formally designated by Congress as a part of the National Wilderness Preservation System.

Wilderness Characteristics—Qualities identified by Congress in the Wilderness Act of 1964 including size; naturalness; outstanding opportunities for solitude or a primitive and unconfined type of recreation; and supplemental values such as geological, archaeological, historical, ecological, scenic, or other features.

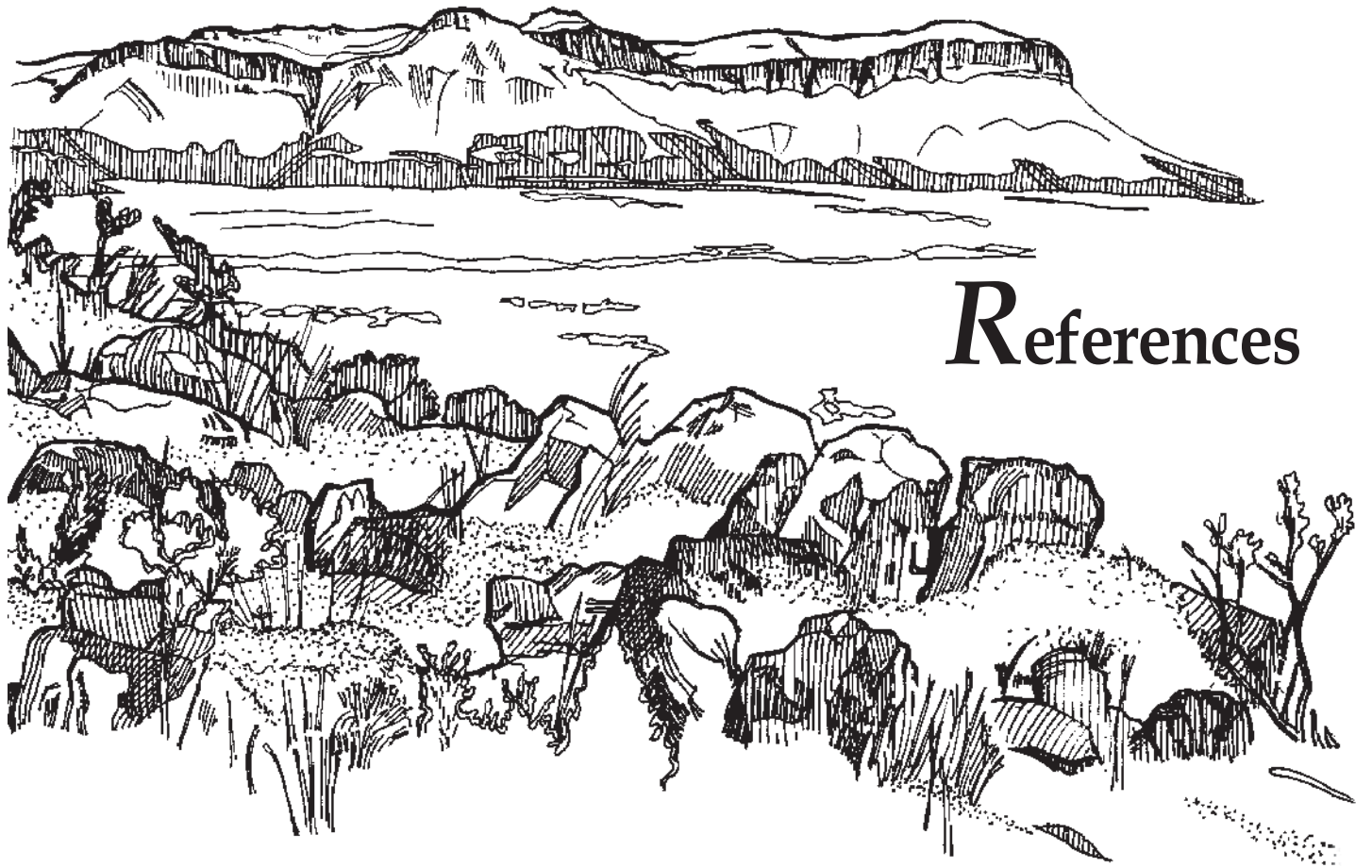
Wilderness Management Policy—The policy that describes the general objectives, policies,

and specific activity guidance applicable to all designated BLM wilderness areas. Specific management objectives, requirements, and decisions that implement administrative practices and visitor activities in individual wilderness areas are developed and described in a wilderness management plan for each unit.

Wilderness Study Area (WSA)—An area determined to have wilderness characteristics as described in section 603 of FLPMA and Section 2C of the Wilderness Act of 1964 (78 Stat. 891). WSAs are subject to interdisciplinary analysis through the BLM's land use planning system and public comment to determine their wilderness suitability. Suitable areas are recommended to the President and Congress for designation as wilderness.

Withdrawal—An action that restricts the use of public land and segregates it from the operation of some or all of the public land and mineral law. Withdrawals also are used to transfer jurisdiction of management of public lands to other Federal agencies.

Work Force—The total number of workers on a specific project or group of projects. The work force also is referred to as direct employment and primary employment.



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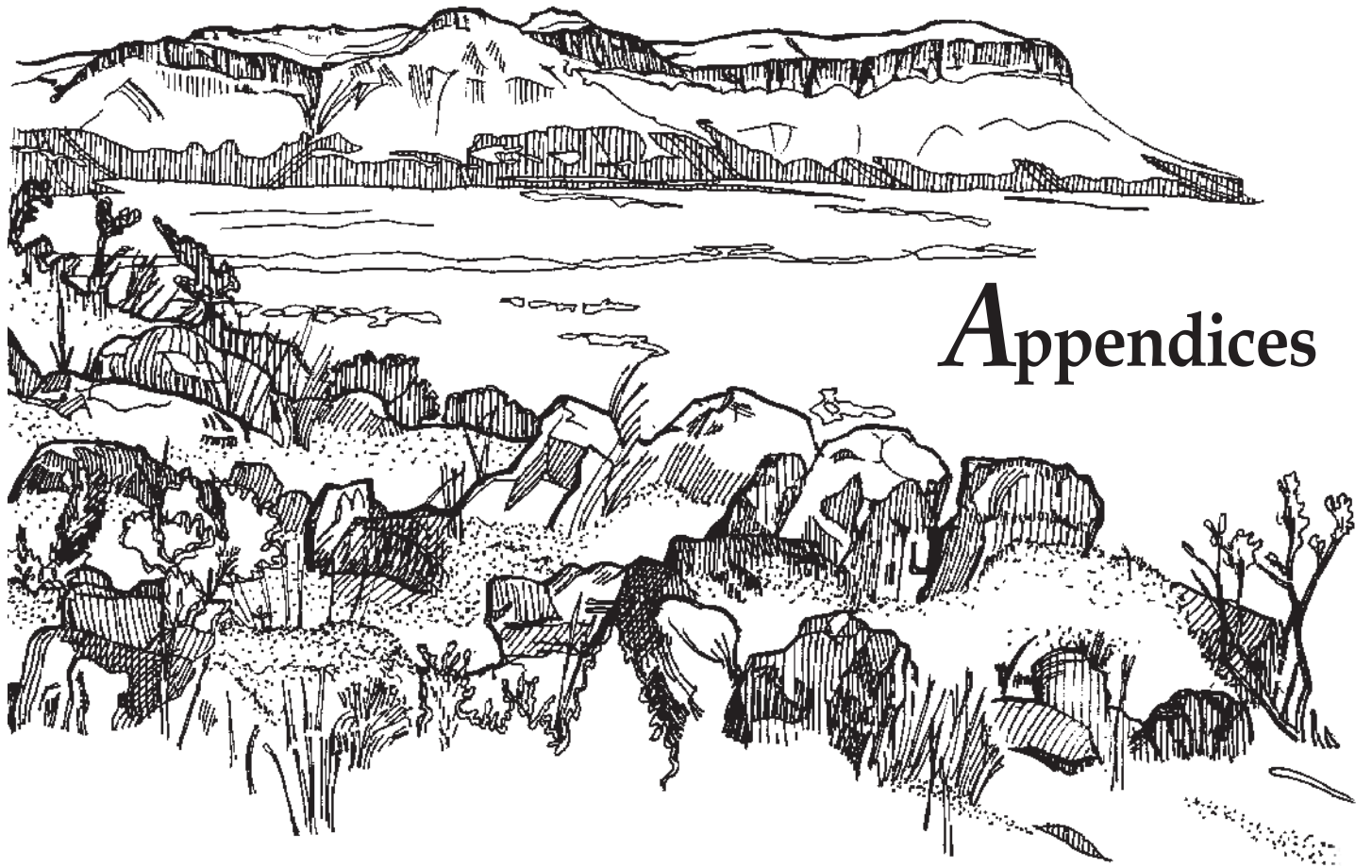
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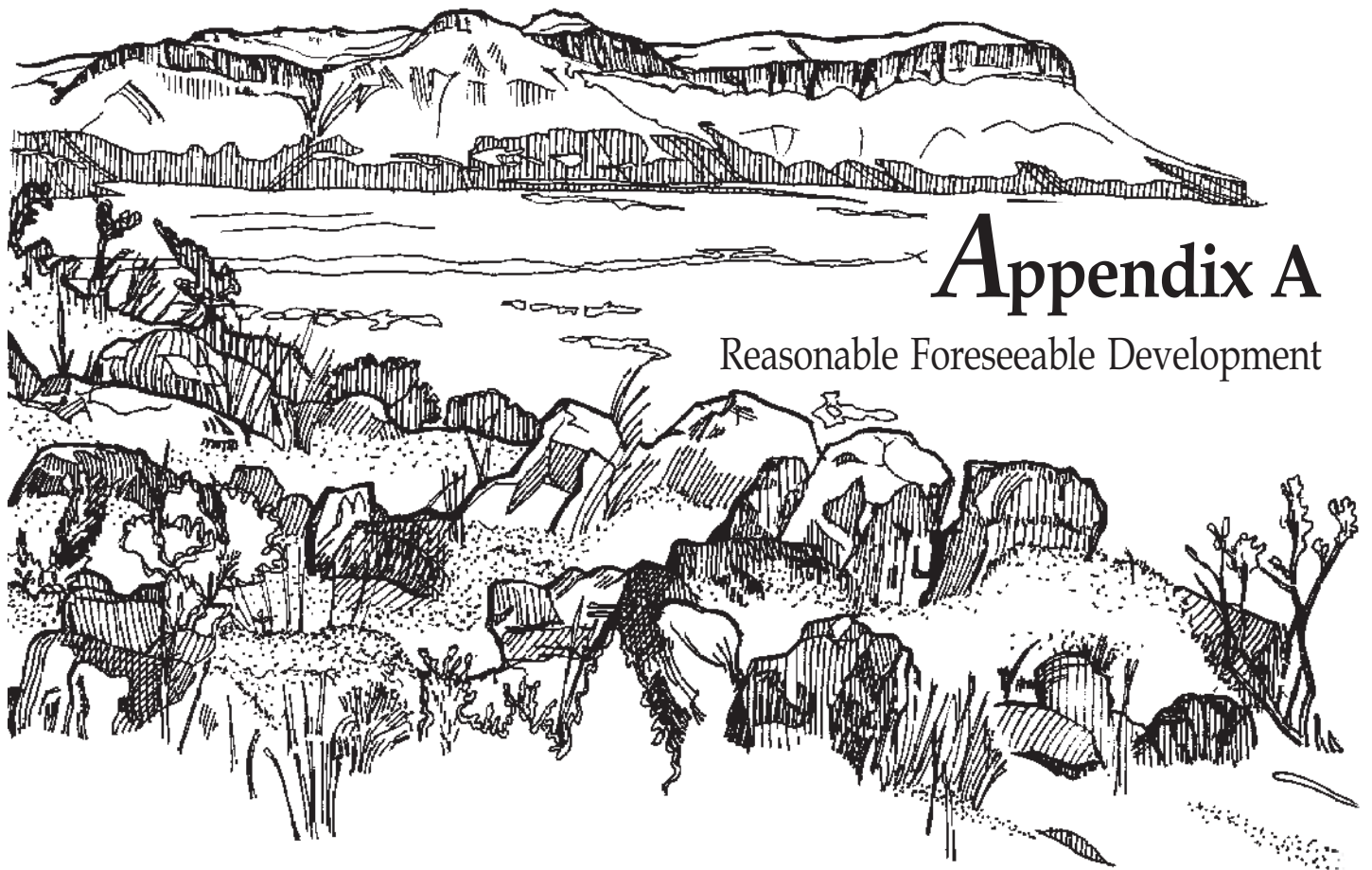
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Appendices



Appendix A

Reasonable Foreseeable Development

APPENDIX A REASONABLE FORESEEABLE DEVELOPMENT

INTRODUCTION

This appendix provides a summary of the exploration history, current lease status, and the 20-year projections for reasonable foreseeable development (RFD) in the Planning Area (Sierra and Otero Counties).

The Bureau of Land Management (BLM) Supplemental Program Guidance for planning for fluid mineral resources (BLM Manual Section [MS] 1624.2) identifies three factors of analysis that should be considered in making fluid mineral determinations in resource management plans (RMPs) or RMP amendments (RMPAs). These are (1) the potential for fluid mineral occurrence and development, (2) impacts (including cumulative) of RFD, and (3) the need for applying constraints or restrictions (stipulations) (BLM MS 1624.22).

The first factor, determining the potential for fluid minerals occurrence and development, is accomplished generally by identifying the major geologic trends, researching historical fluid mineral records (to the extent they are available), and predicting the resource capability and potential.

The next factor, RFD, is a projection of the fluid mineral actions and activities, including development, that are likely to occur in the Planning Area (Sierra and Otero Counties) over the life of the RMPA (in this case, approximately 15 to 20 years). The fluid minerals specialist focuses attention on projecting fluid minerals leasing, exploration, development, production, and abandonment activities likely to occur on public land managed by the BLM and other Federal surface management agencies. This projection includes the number, density, type of wells likely to be drilled, and the surface use requirements (to project the amount of surface disturbance).

Once the projection of RFD is established, the interdisciplinary team is in a position to analyze the potential impacts of each alternative, the third factor. These impacts include direct, indirect, and cumulative impacts of the exploration, development, production, and abandonment activities projected to occur over the next 15 to 20 years.

EXPLORATION HISTORY

The oil and gas industry has been exploring in Sierra and Otero Counties since at least 1925 when the first well was drilled in Otero County (Section 14, T. 23 S., R. 10 E., New Mexico Prime Meridian [NMPM]). Industry interest can be measured, in part, by evaluating the outward expression of that interest, which includes well drilling, seismic acquisition, and leasing activity.

At the time the RFD was projected, 98 wells had been drilled in Sierra and Otero Counties (35 and 63, respectively¹). A list of these wells is provided in Table A-1. Seventy-four of the 98 wells (76 percent) were drilled on Federal leases. Twenty-seven of all the wells drilled in the two counties reported shows of oil and gas; 21 of these shows were on Federal lands. Additionally, 11 wells were reported in the Planning Area (nine of which were on Federal leases) as plugged and abandoned, typically indicating a test was run prior to abandonment but did not report shows. Four wells within the Planning Area were reported by industry scouts either to be gas wells or to have temporarily waited on production; three of the four have since been plugged. Table A-2 presents the oil

¹Since the completion of the Draft RMPA/EIS, the Harvey E. Yates Company drilled another well on Otero Mesa, and is shut in. Also, in the summer of 2003, two exploratory wells were drilled by Threshold Development, Inc., in Crow Flats (east of Otero Mesa), and these have been plugged. Available data from these three wells do not suggest a change in the RFD; therefore, the RFD was not recalculated.

and gas wildcat wells (those drilled in the area where there is no oil or gas production) by county. Table A-3 summarizes the location and potential of the four highly potential wells. It should be noted that industry indicates that, prior to 1960, any well flowing small to moderate amounts of natural gas or with good gas shows was considered insignificant because there was no market for the natural gas.

Geophysical exploration increased significantly between 1978 and the mid 1980s due primarily to the oil embargo and resulting increase in the price of oil and gas. It should be noted that drilling of exploration wells in the Planning Area does not appear to correlate with the price of oil and/or gas.

**TABLE A-1
INVENTORY OF PETROLEUM WELLS DRILLED IN SIERRA
AND OTERO COUNTIES, NEW MEXICO**

Section	Township	Range	Date Drilled	Well Name	Total Depth	Status
14	10 S	6 W	1956	Allison #1	4,480	Temporarily abandoned, plugged and abandoned
27	10 S	1 W	1952	Victoria L&C #2	6,352	No oil or gas show at total depth, plugged and abandoned
25	10 S	1 W	1951	Victoria L&C #1	6,053	Recovered water from the perforations
22	11 S	9 E	1976	#1 Federal 'A-2'		Abandoned location
11	12 S	5 W	1950	Garner #1	6,524	Plugged and abandoned
7	12 S	4 W	1982	#1 W. Elephant Butte Federal	7,230	Dry and abandoned
3	12 S	4 W	1982	#2 W. Elephant Butte Federal	7,552	Dry and abandoned
8	12 S	4 W	1955	Brister #1	8,585	Dry and abandoned
8	12 S	4 W	1951	#1 Drew Mathews	7,125	Dry and abandoned
35	12 S	1 W	1976	#1K Sierra St.	7,860	Dry and abandoned
10	12 S	9 E	1976	#2 Lewelling	9,487	Dry and abandoned
12	12 S	9 E	1976	#1 Lewelling	9,360	Temporarily abandoned, plugged and abandoned
12	12 S	9 E	1975	1 N.M. 'A' Federal		Abandon location
25	12 S	9 E	1974	#1 State Lease 2748	715	Dry and abandoned
5	12 S	10 E	1975	#1 State L.G. '1453'	9,852	Dry and abandoned
2	13 S	4 W	1950	#1 Mimms	2,295	Dry and abandoned
2	13 S	4 W	1953	Mims #A-1	6,195	Temporarily abandoned
11	13 S	4 W	1948	#1 Mims	127	Abandon location
3	13 S	4 W	1982	#2 W. Elephant Butte Federal	7,556	Dry and abandoned
28	13 S	4 W	1947	#1 J. Scott	525	Plugged and abandoned
28	13 S	4 W	1947	Fred Bailey #1	625	Plugged and abandoned
28	13 S	4 W	1978	Fred Bailey #1-X		Abandon location
17	13 S	1 W	1965	#1 Leeman Field	7,346	Dry and abandoned

**TABLE A-1
INVENTORY OF PETROLEUM WELLS DRILLED IN SIERRA
AND OTERO COUNTIES, NEW MEXICO**

Section	Township	Range	Date Drilled	Well Name	Total Depth	Status
22	13 S	1E	1975	#3 Jornada del Muerto	2,320	Dry and abandoned
34	13 S	8E	1926	Tularosa Basin #1	3,965	Dry and abandoned
25	14 S	5 W	1940	Fee #1	2,100	Dry and abandoned
2	14 S	2 W	1944	Wofford #1	207	Dry and abandoned
7	14 S	2 W	1948	#1 Wofford	535	Dry and abandoned
8	14 S	2 W	1940	Graham #1	507	Plugged and abandoned
8	14 S	2 W	1949	Wofford #2	502	Dry and abandoned
18	14 S	2 W	1943	Winslow #1	587	Dry and abandoned
19	14 S	2 W	1926	McCall #1	2,910	Dry and abandoned
19	14 S	2 W	1947	State #1	700	Dry and abandoned
32	14 S	2 W	no date	#2	2,900	Dry and abandoned
17	14 S	1 W	1973	#1 Jornada del Muerto	9,800	Dry and abandoned
5	14 S	1 E	1974	#1 Beard Federal	8,850	Dry and abandoned
13	14 S	1 E	1977	#5 Jornada del Muerto	830	Dry and abandoned
23	14 S	10 E	1970	#1 Houston	3,040	Dry and abandoned
24	14 S	10 E	1972	#1 Federal 'A'	3,690	Dry and abandoned
36	14 S	10 E	1974	#1 State 3724	4,579	Dry and abandoned
7	14 S	11 E	1990	#1 Ysletano Canyon Federal	5,028	Gas well, waiting on pipe line, plugged and abandoned
20	14 S	11 E	1992	#1 Virden	4,991	Plugged and abandoned
2	15 S	3 W	1944	State #1	900	Dry and abandoned
32	15 S	3 W	1953	Gentry #1	5,418	Dry and abandoned
23	15 S	2 W	1982	#1 Federal '23'	2,630	Dry and abandoned
23	15 S	2 W	1959	N.M. - Federal #1	9,765	Dry and abandoned
2	15 S	1 E	1976	#4 Jornada del Muerto	2,105	Dry and abandoned
21	15 S	11 E	1962	#1 Walker	555	Dry and abandoned
20	16 S	1 E	1976	#1 Prisor Federal	11,650	Dry and abandoned
21	16 S	2 E	1952	Guame #2	3,507	Plugged and abandoned
21	16 S	2 E	1950	Guame #1	2,202	Dry and abandoned
5	17 S	12 E	1952	Cloudcrof Unit #1	4,701	Dry and abandoned
10	18 S	8 E	1969	#1 Federal USA 'E'	7,785	Dry and abandoned
33	18 S	8 E	1970	#1 Federal G	7,660	Dry and abandoned
30	18 S	10 E	1970	#1 Federal F	8,288	Plugged and abandoned
35	18 S	14 E	1981	#1 Mesa Verde	7,011	Dry and abandoned

**TABLE A-1
INVENTORY OF PETROLEUM WELLS DRILLED IN SIERRA
AND OTERO COUNTIES, NEW MEXICO**

Section	Township	Range	Date Drilled	Well Name	Total Depth	Status
				Ranch		
15	18 S	15 E	1983	#1 Dog Canyon 'YF' Federal	8,430	Plugged and abandoned, waiting on production test
18	20 S	9 E	1960	#1 Turquoise	5,436	Dry and abandoned
15	20 S	9 E	1954	Federal #1	7,585	Dry and abandoned
35	20 S	10 E	1954	Pearson #1	4,468	Dry and abandoned
14	20 S	14 E	1958	Federal 14 #1	5,043	Dry and abandoned
16	20 S	15 E	1963	#1 State 'Av'	4,027	Dry and abandoned
15	21 S	14 E	1953	Thorn Unit #1	4,646	Dry and abandoned
22	21 S	16 E	1962	#1 Federal	2,253	Dry and abandoned
18	21 S	18 E	1947	Scap Unit #1	2,664	Dry and abandoned
2	21 S	20 E	1977	#1 Burro Canyon UT	1,246	Junked and abandoned
2	21 S	20 E	1978	#1Y Burro Canyon UT	5,589	Dry and abandoned
5	22 S	10 E	1939	McGregor #1	1,730	Plugged and abandoned
34	22 S	13 E	1937	Everett #1	3945-30	Plugged and abandoned
30	22 S	14 E	1960	#1 Hurley	2,433	Dry and abandoned
17	22 S	16 E	1960	#1 Leonard Federal	65	Plugged and abandoned
17	22 S	16 E	1961	#1 Federal		Abandon location
6	22 S	19 E	1972	#1 Little Dog- Federal	4,130	Dry and abandoned
14	23 S	10 E	1925	State #1	2,168	Dry and abandoned
7	23 S	15 E	1960	#1 Liberman State	2,695	Dry and abandoned
7	23 S	16 E	1960	#1 Spanel	2,682	Dry and abandoned
19	23 S	18 E	1960	#1 Warren	2,353	Dry and abandoned
9	23 S	19 E	1962	#1 Thompson	3,848	Dry and abandoned
27	23 S	19 E	1961	#1 McMillan	3,189	Dry and abandoned, shows
21	24 S	12 E	1956	Federal #1	1,775	Dry and abandoned
21	24 S	12 E	1958	Federal #1 old well drilled deeper	1,855	Dry and abandoned
22	24 S	12 E	1931	Evans #1	3,763	Dry and abandoned
29	24 S	12 E	1984	1 State '29'		Abandon location
9	24 S	14 E	1960	#1 A.N. Spanel	1,873	Dry and abandoned
28	24 S	15 E	1935	Donahue #1	1,692	Dry and abandoned
20	25 S	7 E	1930	Located Land #1	1,328	Plugged and abandoned
20	25 S	7 E	1939	Located Land #1	3,941	Old well drilled deeper, plugged and abandoned

**TABLE A-1
INVENTORY OF PETROLEUM WELLS DRILLED IN SIERRA
AND OTERO COUNTIES, NEW MEXICO**

Section	Township	Range	Date Drilled	Well Name	Total Depth	Status
11	25 S	8 E	1937	State #1	263	Dry and abandoned
23	25 S	8 E	1948	Maris State #1	986	Plugged and abandoned
23	25 S	8 E	1949	Maris State #1	731	Dry and abandoned
23	25 S	8 E	1978	Marie #2	970	Plugged and abandoned
9	25 S	13 E	1946	McMillan #1	5,215	Plugged and abandoned
15	25 S	13 E	1978	#1 G.J. Ablah	5,305	Dry and abandoned
36	25 S	16 E	1959	#1 State	5,195	Dry and abandoned
28	25 S	17 E	1980	#1 Southland '28' State	2,970	Dry and abandoned
32	25 S	18 E	1980	#1 Southland St. '32'	3,635	Dry and abandoned
31	25 S	19 E	1970	#1 Alpha Federal	4,998	Dry and abandoned
18	25 S	20 E	1971	#1 W. Dog Canyon	4,570	Dry and abandoned
3	26 S	8 E	1949	#1 Wilmoth-Federal	206	Plugged and abandoned
8	26 S	11 E	1954	#1 Blanche Trigg- Federal	5,600	Dry and abandoned
17	26 S	11 E	1929	Wingo #1	450	Dry and abandoned
14	26 S	12 E	1997	#1 Bennett	2,643	Junked and abandoned
14	26 S	12 E	1997	#1Y Bennett Ranch	7,100	Gas well
5	26 S	16 E	1942	McMillan-Turner	2,175	Dry and abandoned
3	26 S	17 E	1980	1 Southland '2' State		Abandon location
14	26 S	20 E	1959	#1 Spiegel-Federal	4,578	Plugged and abandoned

SOURCE: Petroleum Information scout tickets and Dwight's scout reports

NOTE: List includes the 98 wells drilled as of October 2000, which served as the basis for the RFD.

**TABLE A-2
OIL AND GAS WILDCAT WELLS BY COUNTY**

County	Number of Wells	Number of Shows	Wells on Federal Mineral Estate
Otero	63	17	44
Sierra	35	10	30
Total	98	27	74

SOURCE: Petroleum information scout tickets and Dwight's scout reports

NOTE: List includes the 98 wells drilled as of October 2000, which served as the basis for the RFD.

**TABLE A-3
SUMMARY OF HIGHLY POTENTIAL WELLS**

Well	Location	Date Drilled	Scout Report
Summit Mims #A-1 (non-Federal lease)	T. 13S., R. 4W., Section 2, NMPM Engle Basin Sierra County	1953	Temporarily abandoned, completed in limestone (probably Penn), gas to surface in 9 minutes, 250 thousand cubic feet per day (MCFD) on drill string test, water from perforations.
Houston Oil #1 Lewelling (Federal lease)	T. 12 S., R. 9 E., Section 12, NMPM Tularosa Basin Otero County	1976	Temporarily abandoned, perforated Pennsylvanian, flowed 138 MCFD. Wolfcamp formation was tested at 168 MCFD through perforations at 5,140 to 5,170 feet.
Cibola #1 Ysletano Canyon (Federal lease)	T. 14 S., R. 9 E., Section 12, NMPM Tularosa Basin Otero County	1990	Gas well; perforated Atoka-Morrow, flowing 300 MCFD on 2-inch choke, no oil.
Harvey Yates #1Y Bennett Ranch (Federal lease)	T. 26 S., R. 12 E., Section 14, NMPM Tularosa Basin Otero County	1997	Perforated Upper Mississippian/Helms Calculated absolute open flow 3,615 MCFD, flow 4,400 MCFD after cleanup.

SOURCE: Petroleum information scout tickets and Dwight's scout reports.
NOTE: As of November 2000.

Seismic vendors offer 2-D (two-dimensional) seismic in both Sierra and Otero Counties. These data are publicly available and were acquired in the 1970s and 1980s. The Otero Platform and Salt Graben Basin recently have seen an increase in geophysical activity, which can be correlated to the recent discovery in 1997. These data primarily were acquired privately, although a large (55 sections) 3-D (three-dimensional) survey in the Salt Basin (Crow Flats 3-D Seismic Project) was a group shoot, and was completed in February 2000. The new surveys are both 2-D and 3-D. The 3-D surveys are acquired at a higher density than 2-D surveys and, therefore, are more expensive. Three-dimensional surveys tend to be used to delineate prospective areas rather than as exploratory tools in frontier areas. A speculative regional survey also has been discussed as a possible survey in the Otero Platform area. The new geophysical activity as well as the increased interest in leasing indicates an active industry interest in the areas.

Existing geothermal wells in the Planning Area are located in Truth or Consequences, an area long known for its traditional hot baths and

springs. Local Truth or Consequences motels use the resource for space and swimming pool heating. Additionally, a number of small businesses and public entities have used the geothermal waters for space heating, thermal baths, and swimming pools. Hatton (1978) indicated that several buildings in the city have been heated geothermally for many years. Two examples include the Truth or Consequences Senior Citizens' Center and the Carrie Tingley Hospital demonstration projects (Starkey and Icerman 1983).

Geothermal exploration in the Planning Area appears to be associated primarily with the military and New Mexico State University's (NMSU) efforts to locate geothermal resources. Exploration to date indicates that the geothermal resources are low temperature (generally less than 194 degrees Fahrenheit (90 degrees Celsius) and, therefore, would require a direct end use such as alternative space heating rather than electrical power generation. The price of natural gas also drives the exploration for geothermal resources; the higher the price of heating (due to the price of natural gas), the higher the incentive

for alternative heat sources. Industries in southern New Mexico that have demonstrated the use of low-temperature geothermal resources include green houses and aquaculture as well as building space and pool heating.

CURRENT LEASE STATUS

Table A-4 shows the total number of leases and lease acreage by county within Sierra and Otero Counties as of January 1, 1999.

**TABLE A-4
EXISTING FLUID MINERAL LEASES**

County	Oil and Gas		Geothermal	
	Number of Leases	Acres	Number of Leases	Acres
Otero	61	102,939.09 ^a	0	0
Sierra	0	0	0	0
Total	61	102,939.09	0	0

SOURCE: Bureau of Land Management 1999d

NOTE: ^a973.42 acres questionable (one lease established in 1979 should be expired); however, BLM records indicate that those acres still are authorized and not closed.

TWENTY-YEAR DEVELOPMENT PROJECTIONS

Oil and Gas

Current impact analysis policy regarding RFD of fluid mineral resource requires that a minimum discovery must be assumed in “frontier” areas for the purpose of impact analysis. With the recent discovery (1997) of the gas well in Otero County, interest in the Planning Area has increased ten-fold based on lease nomination requests and new geophysical permitting activity.

BLM’s Manual 1624-1, which provides guidance on how to develop an RFD, states that

“... projections should be based on past and present leasing, exploration, and development activity as well as professional judgment on geological and technological and economic factors. Extrapolations of historical drilling and/or production activity may be used as the basis for projections.”

Using the **past** 72 years of drilling activity to determine the average rate of wildcat drilling, approximately 1.4 wells per year are drilled in the Planning Area with one well per year drilled on Federal leases. Given a planning period of 20 years, one might assume 28 wells drilled in the Planning Area of which 20 would be on Federal

minerals. It should be noted that this Federal lease wildcat RFD is based on statistics with no regard to surface management (i.e., military, Forest Service, or Indian lands). However, only one previous well drilled on Federal lands was drilled in an area that would be open for leasing under other Federal surface management (this well was located within the boundaries of the Lincoln National Forest). Therefore, the assumption that all wells drilled on Federal lands would be under the surface jurisdiction of the BLM is appropriate.

Another possible development scenario would be to assume that the next 20 years would be similar to the most active 20-year period for each county. Again, using the past 72 years to base the statistics, the most active 20-year period for the Planning Area was from 1940 to 1960, with 38 wells drilled (27 on Federal minerals). However, the most active period for Federal minerals in the entire Planning Area was from 1960 to 1980, with 30 wells drilled on Federal minerals (37 wells total drilled). By county, the most active drilling period was 17 Federal wells out of a total of 22 wells drilled in Sierra County from 1940 to 1960, and 22 Federal wells out of a total of 29 wells drilled in Otero County from 1960 to 1980. Therefore, a potential wildcat RFD could be as little as 27 wells to 39 (17 + 22) wells drilled on Federal minerals. Due to the recent discovery on the Otero Platform, the RFD for the next 20 years assumes that the greatest number

(39) of exploration wells (wildcats) will be drilled. According to the Chevron web page,

“In the petroleum industry, the average U.S. wildcat well (an exploratory well drilled a mile or more from existing production) has a one in 10 chance of striking hydrocarbons. A rank wildcat well, drilled in an unproven, frontier area, stands a one in 40 chance. Thus, although today’s prospectors have better tools than their ancient counterparts, good luck still is a factor in the search for petroleum.”
(<http://www.chevron.com/explore/index.html>)

Using the wildcat success ratio for frontier areas of 1 in 40 wells (2.5 percent) (Chevron 1998), only one of these wells is likely to initiate a development situation of offset wells (called appraisal wells). However, with the new discovery in Otero County, BLM on the advice of industry is assuming a higher success ratio on the Otero Platform, especially given the active interest in the area, such as 3-D seismic exploration. Three wildcat wells will be assumed in the RFD to have a sufficient show of hydrocarbons that additional wells will be drilled to “appraise” the “discovery” or successful wildcat.

Four appraisal wells have been requested for the 1997 discovery well of the Bennett Ranch Unit; therefore, four wells per appraisal program have been assumed for the RFD. This is consistent with offsetting the discovery well in four directions to delineate the potential structure that might be trapping the hydrocarbons.

In the RFD, it is assumed that three fields will be developed from the Bennett Ranch Unit and/or the three RFD appraisal scenarios. Based on the Bennett Ranch discovery, it is assumed that these fields will be gas production; however, the potential for multiple pay zones and oil production also appears to be possible. It is likely that gas production from up to approximately 12 gas wells in one field would be needed to support the cost of bringing in the infrastructure to a field located in southern Otero County (Ron Broadhead, New Mexico Bureau of Mines and Mineral Resources, personal communication,

1998). The production, and potentially the resulting field size (number of wells), may need to be greater in other parts of the Planning Area due to the distance required to connect to existing gas pipelines. Therefore, additional wells would be drilled during development of the field. The RFD assumes up to 10 additional wells per field with at least 12 out of the 15 drilled wells per field producing gas (three wells are assumed to be noneconomic and will be plugged and abandoned within three years of drilling). Given the shows (refer to Table A-1) and industry’s indication for the potential for oil, each field developed in the RFD also is assumed to have an oil field developed on 40-acre spacing located within the gas field. The discovery and/or appraisal for the oil field is assumed to have been conducted by the gas wells, but none of the gas wells are assumed to produce oil. Therefore, the RFD assumes that 20 additional wells per field would be drilled to develop the oil pool and that 16 of these wells per field would produce oil (four of the wells are assumed to be noneconomic and would be plugged and abandoned). It is assumed that the oil would be trucked from the area rather than conveyed via pipeline. The oil may be stored at the wellhead or collected at a central location (bulk oil storage facility). A bulk oil storage facility would be assumed for each oil field. The oil wells may or may not produce formation water from the beginning but are assumed to produce water at some point during their production until abandonment (20 to 30 years). Gas wells also are assumed to produce formation water in their later years prior to abandonment (12 to 15 years). Therefore, one underground injection control (UIC) well is assumed to be permitted and drilled for each field. The production facilities (gas compression station and/or gas plant, bulk oil storage and transfer station, and UIC well) could occupy the same location and the surface acreage disturbed would probably be less than 15 acres; however, for the RFD it is assumed that each facility is separate.

The RFD includes the following:

- Thirty-nine frontier wildcat wells would be drilled; three would have an appreciable

show resulting in each well being offset by four appraisal wildcats (total of 12 appraisal wells).

- Three gas fields likely would be developed on 320-acre spacing per New Mexico Oil Conservation Division Rule 104 and nearby gas fields (areal size of the field approximately 6 square miles), resulting in 12 production wells per field. Ten additional development wells per field would be drilled with the assumption that three wells of the total number of wells in a field (discovery, appraisal, and development) would be noneconomic and the impact would be short term (total of 30 additional wells drilled).
- Each gas field would contain an oil field developed on 40-acre spacing per New Mexico Oil Conservation Division Rule 104 (areal size approximately 1 square mile), resulting in 16 production wells per field. Twenty additional wells drilled per field with the assumption that four of these wells would be noneconomic and the impact would be short term and the others are the producing wells.
- Typical life of a producing well is 10 to 12 years of gas production and 30 years for

oil operation; therefore, three to five gas production wells may be plugged during the planning period.

- Approximately 100 miles of transmission pipeline would be needed to transport the gas out of the Planning Area to market (assuming three pipelines with a Planning Area average distance).
- A compression/gas plant facility would be developed as part of each field's infrastructure (total of three).
- Bulk oil storage facility would be developed as part of each field (total of three).
- Three underground injection control wells would be permitted and installed to dispose the produced water (assuming one well per field and the fields not sharing a disposal well); these facilities are estimated based on the assumption that enough water would be produced in the field that off-site disposal would be required. This assumption may be overly conservative if the fields are gas or water production can be disposed on site via direct discharge over the next 20 years.

Table A-5 summarizes the oil and gas development over the next 20 years.

**TABLE A-5
TWENTY-YEAR PROJECTION FOR OIL AND GAS DEVELOPMENT¹**

Type of Action	Number of Actions on Federal Lands	Area Disturbed ²	Approximate Total Acres Disturbed	
			Short Term	Long Term
<i>Geophysical (miles)</i>	<i>5,000</i>	<i>On existing roads and trails and off-road (1 acre/mile)</i>	<i>5,000³</i>	<i>Minimal</i>
Frontier Wildcat Wells	39	Drill pads and access road	351 ⁴	101.4 ⁵
Appraisal gas wells (offsetting wildcat wells)	12	Drill pads, access road, pipelines, and power lines	108 ⁶	60 ⁷
Gas development wells	30	Drill pads, access road, pipelines, and power lines	228.6 ⁶	126.6 ⁷
Oil development wells	60	Drill pads, access road, and power lines	484.8 ⁸	268.8 ⁹
Gas production facilities	3	5 acres/site	15	15
Gas transmission pipeline (miles)	100	3.6 acres initial disturbance per mile, 2.6 acres stabilized per mile	360 ¹⁰	260 ¹⁰
Bulk oil storage facility	3	5 acres/site	15 ¹¹	15 ¹¹
UIC well	3	Drill pads, access road, and power lines	27 ¹²	15 ¹²
Total Acres Disturbed by Exploratory Drilling and Development			1,589.4	861.8

NOTES:

- 1 Not County-specific
- 2 Acreage estimates for each component from observed average disturbance in the Roswell/Carlsbad area as provided in Bureau of Land Management 1994 Appendix 18 unless otherwise noted.
- 3 **5,000 acres were the anticipated number of acres that could be disturbed during geophysical exploration and were used in assessing impacts as a potential associated action. However, geophysical exploration (bolded and italicized) is not included in the RFD because (1) different from drilling and field development, surface-disturbing activities associated with geophysical exploration are very temporary and typically are minimally intrusive on the environment and (2) geophysical exploration requires a discretionary approval that is not associated with leasing and subsequent activities.**
- 4 Wildcat well – assume 6 acres (400 by 600 feet) for drill pad (including worker camp) and 3 acres per access road = 9 acres. The source of this assumption is recent drill pad requests from the Bennett Ranch Operators and assumptions based on historical data made in the Roswell/Carlsbad Resource Areas of the BLM (1994).
- 5 2.4 acres per well not reclaimed immediately for all but three of the rank wildcats. Three of the wildcats are assumed to develop into production wells, which result in 5 acres per well not reclaimed immediately.
- 6 Appraisal and development gas wells - assume 4.4 acres drill pad and access road for all wells, 4.6 acres for associated pipelines and power lines for all producing wells, which are assumed to be economic (all appraisal wells and seven development wells per field). If a worker camp is needed, it is assumed that the one set up for the wildcat well can be used.
- 7 Production gas wells - 5 acres per producing well will not be reclaimed immediately. For the three wells per field that are assumed to be drilled but not economic, 2.4 acres per well are assumed not to be reclaimed within a three-year period after initial disturbance.
- 8 Development oil wells - assume 4.4 acres drill pad and access road for all wells (20 wells per field), 4.6 acres for associated pipelines and power lines for only producing wells which are assumed to be economic (16 producing wells per field). If a worker camp is needed, it is assumed that the one set up for the wildcat well can be used.
- 9 Production oil wells - 5 acres per well not reclaimed immediately. For the three wells per field that are assumed to be drilled but not economic, 2.4 acres per well are assumed not to be reclaimed within a three-year period after initial disturbance.
- 10 Gas transmission pipelines 3.6 acres per mile (30 feet wide) and reclaim to approximately 2.6 acres (8 to 9 feet) wide.
- 11 This facility could occupy the same acreage as the gas production facility or the UIC facility though the acreage for those facilities would increase. Therefore, for the purpose of estimating surface disturbance, all facilities are assumed to be separate.
- 12 UIC wells – assume a similar amount of acreage for drilling the well and constructing the facility as a production well (9 acres per well). Assume each well is reclaimed to 5 acres per well for long-term impacts.

Geothermal Resources

The production of geothermal resources for direct-use purposes could increase over the next 20 years. Space and pool heating are well known in the Truth or Consequences area, although expansion in the Truth or Consequences area would be primarily on private land. New Mexico State University is promoting geothermal use and provides entrepreneurs with advice and facilities for potential new ventures. Greenhouses for roses and other flowers and plants as well as fish farms are potential direct uses of the resource. There are currently three commercial greenhouses in Doña Ana County south of Sierra County, two of which use Federal geothermal resources. Expected development within the Planning Area would be in Sierra County. Most of the identified geothermal potential in Otero County is in military withdrawn land.

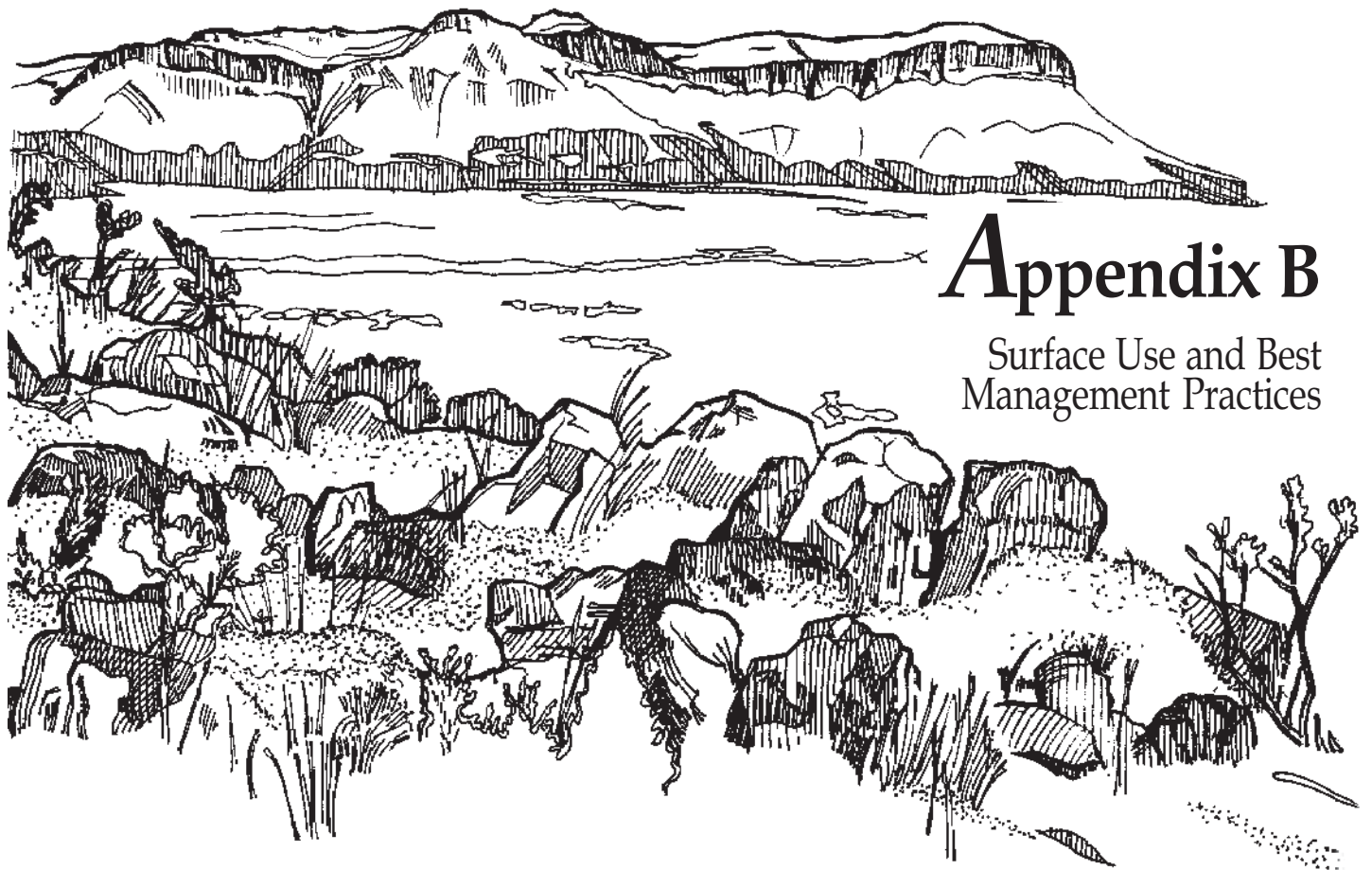
Development in the next 20 years is expected to be on a small scale. Over the planning period,

two temperature surveys of 30 wells each would be drilled. These drill sites would be located adjacent to existing roads and each site would disturb an area 25 feet by 25 feet. Five other various kinds of geophysical exploration permits (gravity, electrical, resistivity, and radon for instance) would be approved. Most of these activities would be conducted along existing roads and trails and would involve minimal surface disturbance.

Four test wells would be drilled. Each test well would disturb an area of 1 acre and require an access road 1.5 miles long by 16 feet wide. Only one of the four test wells will be assumed to become a commercial greenhouse facility. The facility would require an area of 10 acres for development and two production wells (the original test well and another well). Wastewater either would be reinjected or pumped into evaporation pits. Table A-6 summarizes geothermal development over the next 20 years.

**TABLE A-6
20-YEAR PROJECTION FOR GEOTHERMAL DEVELOPMENT**

Type of Action	Number of Actions on Federal Lands	Area Disturbed	Total Acres Disturbed
Geophysical permit	5	Primarily on existing roads and trails	Minimal
Temperature-gradient surveys	2	30 drill pads (0.01 acre)	0.6
Test wells and access roads	4	Drill pads (1 acre/pad) and access road (3 acres/well)	16.0
Production facilities	1	10 acres/sites (2 wells)	10.0
Total Acres Disturbed			26.6



Appendix B

Surface Use and Best
Management Practices

APPENDIX B

SURFACE USE AND BEST MANAGEMENT PRACTICES

INTRODUCTION

The locations of well sites are dictated by the geologic target to be drilled. Therefore, environmentally “ideal” locations for construction activities are not always coincident with the geologic target and avoidance of damage to surface resources is not always possible. It is neither possible nor practical to avoid all harm, and special practices or construction techniques may need to be employed to minimize impacts.

This appendix describes various types of practices that are designed to minimize surface disturbance and effects on other resources and retain the reclamation potential of the disturbed area. These practices may be general and apply nationwide, agency-wide, or regionally, or may be more specific and apply to a particular area or site. The practices represent effective and practical means of accomplishing the management goals and objectives of Bureau of Land Management (BLM) and should be used as a guide when preparing plans and details that are specific to individual projects.

Generally, the practices described in this appendix have been accepted and employed by industry for similar projects and/or have been derived from this Resource Management Plan Amendment (RMPA) analysis in response to issues identified during scoping and to address impacts identified during analysis.

The standard practices in this appendix should not be construed as rigid requirements that would be applicable to every situation. Rather, the ideas presented in this appendix communicate philosophy, approach, and examples that have been successful, from which site-specific applications can be developed. The operator and surface-management agency working together can develop the best approach to achieve the management objectives in each situation.

While operations of Federal fluid mineral leases are managed by the BLM, the operations are managed in cooperation with the surface-management agency or surface owner, if it is other than the BLM, in order to guide surface use and management. Where the surface is privately owned, the operator is responsible for reaching an agreement with the private surface owner (refer to Chapter 2, Section 2.2.1).

Surface use guidance and best management practices relevant to Federal fluid minerals are described briefly below.

SURFACE USE GUIDANCE

Onshore Oil and Gas Orders

Every oil and gas operation authorized under a Federal fluid minerals lease must comply with Federally mandated regulations and orders. Procedures are established for exploration of Federal oil and gas reserves in a series of Onshore Oil and Gas Orders, which are authorized by Title 43, Code of Federal Regulations Parts 3160 and 3180 (43 CFR 3160 and 3180). These orders detail uniform national standards for minimum levels of performance expected from lessees and operators when conducting oil and gas activities on Federal and American Indian lands. Two orders are particularly relevant to determining the potential for environmental impacts associated with a proposed project. These are Onshore Oil and Gas Order Nos. 1 and 2.

Onshore Order No. 1 requires lessees and operators to conduct their exploration, development, production, and abandonment operations in a manner as follows:

- conform with applicable Federal laws and regulations and with State and local laws and regulations to the extent that such State and local laws are applicable to operations on Federal or American Indian leases

- conform with the lease terms, lease stipulations, and conditions of approval
- ensure diligent development and efficient resource recovery
- protect the lease from drainage
- afford adequate safeguards for the environment
- ensure proper reclamation of disturbed lands
- conform with currently available technology and practice
- ensure that underground sources of fresh water will not be endangered by any fluid-injection operation
- otherwise ensure the protection of public health and safety

The order holds the lessee “fully accountable for their contractors’ and subcontractors’ compliance with the requirements of the approved permit and/or plan.”

Onshore Order No. 1 specifically requires survey work and a related report if the surface-management agency has reason to believe that properties listed, or eligible for listing, in the National Register of Historic Places are present in the area of potential effect. The order also requires the surface-management agency to identify any threatened and endangered species and/or critical habitat problems and other environmental concerns (e.g., wilderness and wilderness study areas, known or potential surface geological hazards, etc.).

BLM Manual 3160 provides guidelines and procedures for processing Applications for Permits to Drill (APDs) and subsequent operations. BLM Manual Handbook 3160-1 provides guidelines for review of technical and environmental considerations for APDs and subsequent activities.

Onshore Order No. 2 establishes specific and detailed requirements along with minimum standards for the following:

- well control during drilling
- casing and cementing
- drilling mud and circulating system
- drill-stem testing
- special drilling operations
- blowout preventer equipment to prevent the uncontrolled release of formation fluids to the surface
- related surface use
- abandonment of drilling operations

In some instances, Onshore Order No. 2 relies on existing standards prepared by the American Petroleum Institute, Occupational Safety and Health Administration, and other organizations or agencies.

Onshore Order No. 6 addresses operations with hydrogen sulfide (H₂S) associated when drilling, completing, testing, reworking, producing, injecting, gathering, storing, or treating operations are being conducted in zones that are known or reasonably could be expected to contain H₂S or that when flared, could produce sulfur dioxide in such concentrations that, upon release, could constitute a hazard to human life.

Geothermal Resources Operations

The Geothermal Resources Leasing and Operations Rule (43 CFR 3200, et al.) provides direction for conducting exploration operations (Subpart 3252), drilling operations (Subpart 3262), and abandonment (Subpart 3263).

Standard Lease Terms

Standard lease terms, which are disclosed on the standard lease forms, indicate that the operator is

responsible for diligent development and for conducting operations in a manner that minimizes adverse impacts on resources anywhere within the leasehold. Copies of Standard Form 3100-11, Offer to Lease and Lease for Oil and Gas, and Form 3200-24, Offer to Lease and Lease for Geothermal Resources are available at BLM offices.

In addition to the standard lease terms and conditions, the BLM Authorized Officer may require site-specific mitigation at the time of an APD at a specific site. These mitigation measures would be attached to the APD as conditions of approval (described below).

Lease Stipulations

Constraints in the form of stipulations are conditions included in a lease when environmental and planning analyses have demonstrated that additional and more stringent environmental protection is needed. Stipulations are provisions that modify the standard lease rights and are attached and made part of the lease. The operator would be expected to comply with the stipulations specific to resource concerns that are attached to a lease (as described in Chapter 2 and Appendix D).

Surface Operating Standards

Minimum standards for design, construction, and operations, primarily in the Rocky Mountain states, are set forth in the Surface Operating Standards for Oil and Gas Exploration and Development “Gold Book” prepared by the BLM and U.S. Forest Service Rocky Mountain Regional Coordinating Committee (January 1989). The Gold Book was developed to aid the operator in obtaining permit approval and conducting oil and gas operations on Federal lands during exploration, development, production, and abandonment. It is intended to give the operator general informational guidance on compliance with the operating requirements given in 43 CFR 3000, 36 CFR 228E, and Notice to Lessees that have, or will be, promulgated or issued. Information is provided for the preparation of surface use and drilling

programs and includes the following information and guidelines:

- responsibilities for geophysical operations on Federal lands
- procedures for oil and gas operations
- siting and construction procedures for well sites
- planning, location, design, construction, maintenance, and operations of roads and access ways
- design and construction of drainage structures
- drilling operations and related surface-disturbing activities
- production operation standards and objectives, approvals, reporting, notification, disposal of produced water, pollution control, hazardous waste management, inspections, and enforcement
- reclamation of pits, well pads, flowlines and pipelines, and roads
- abandonment inspection, approval, and release of bonds

Copies of the Gold Book are available in limited quantities from the BLM New Mexico State Office.

Conditions of Approval

Additional constraints may be necessary if the authority to manage the activity on the lease does not already exist under laws, regulations, or orders.

Constraints in the form of conditions of approval of an APD are site-specific requirements or measures imposed to protect resources or resource values. BLM would solicit involvement from public users (e.g., grazing permittees) to develop site-specific protection measures and

reclamation specifications. Conditions of approval must be reasonable and consistent with lease rights. The Authorized Officer has the authority to relocate facilities and impose other mitigation under Sections 2 and 6 of the standard lease terms (BLM Forms 3100-11 and 3200-24). Potential mitigation measures that could be conditions of approval are addressed in Chapter 4 of this RMPA/Environmental Impact Statement (EIS). The Authorized Officer has the right to relocate proposed facilities, control timing of operations, and impose other mitigation in accordance with Sections 2 and 6 of the standard oil and gas lease terms.

Best Management Practices

More specific to a region or area, a surface-management agency may have standards, or best management practices, to which an operation should conform. While the goals and philosophies regarding surface management are similar in intent, the operator must be responsible for understanding the requirements of the pertinent surface-management agency. Knowledge of the management plans of the surface-management agency, as well as agency operational standards, procedures, and environmental protection requirements, are intended to help an operator meet these standards. The best management practices described below were developed by the Las Cruces Field Office of BLM for this RMPA/EIS.

BLM BEST MANAGEMENT PRACTICES

The best management practices described below apply to any fluid minerals project on public land within the Planning Area, and supplement the standards and guidelines from sources described above.

Preliminary Investigations

Activities occurring during preliminary investigations may include remote sensing; mapping of rock outcrops and seeps (either of which result in little or no surface disturbance); and seismic, gravity, and magnetic surveys.

A lease is not required to conduct such preliminary investigations. However, the geophysical operator is required to file a completed Form 3150-4, "Notice of Intent to Conduct Oil and Gas Exploration Operations" for all operations on public lands.

In general, BLM requires an examination of resource values and development of appropriate surface protection and reclamation measures prior to beginning surface disturbing activities associated with preliminary investigations. BLM will solicit involvement from public land users (e.g., grazing permittees) to develop site-specific protection measures and reclamation specifications. Compliance monitoring should occur during and after seismic exploration activities when or if necessary. Compliance inspections during the operation ensure that requirements and guidelines are being followed. Compliance inspections upon completion of work ensure that the lines are clean and drill holes are plugged properly.

The frequency of authorized seismic exploration would be dependent upon resource conditions and seasonal restrictions (timing limitations) that may be imposed to reduce conflicts with watershed conditions, wildlife, and hunting. Management practices specific to wildlife and vegetation resources include the following:

- Prior to surveying/flagging routes for geophysical surveys or other preliminary activities during the raptor-breeding season, the project area will be surveyed for raptor nests. Surveys will be conducted by professional biologists approved by the Authorized Officer. The Universal Transmercator grid locations of all raptor nests will be reported to the Authorized Officer. All active raptor nests will be avoided by the required distances described under the Well Sites section. An "active raptor nest" is defined as any raptor or corvid nest being used during the current nesting season.
- In areas that constitute occupied or potential aplomado falcon habitat, a protocol survey

for this species will be conducted along with the general raptor nest survey described above, prior to surveying/flagging lines during the breeding season.

- During operations at any time, large (greater than 6 feet in height) trees or shrubs containing or capable of containing a raptor nest will be avoided by vehicular traffic or other activities likely to destroy them.
- Time activities to avoid wet periods.
- In areas that allow for off-road travel, minimize the off-road impact of large vehicles. Use wide, flat-tread, balloon tires (especially on seismic “thumper” trucks) where possible. Use all-terrain vehicles rather than large vehicles where possible.

Administrative Requirements

The operator and its contractors and subcontractors will conduct all operations in full compliance with all applicable Federal, State, and local laws and regulations; applicable lease stipulations; and guidelines specified in the APD unless a written modification, waiver, or exception from the Authorized Officer has been granted.

Prior to commencing construction activities, the operator and its contractors and subcontractors may conduct a preconstruction conference with the BLM Authorized Officer. Environmental and safety training will be part of the operator, contractor, and subcontractor training prior to construction. All employees will be familiarized with the resource protection policies of the BLM, requirements, and mitigating measures incorporated into each project.

The Authorized Officer will guide the project during all stages of the project including construction of roads and well pad, drilling and completion of the well, reclamation, preparation for production, and abandonment.

Surface Use

Roads and Access Ways

BLM encourages the use of existing roads to the maximum extent practical and minimizing new roads in unroaded areas.

- Where new roads are needed, construction, maintenance, rehabilitation, abandonment, and closure of the roads on public land will be in accordance with the BLM Manual 9113 - ROADS, BLM “Goldbook” Surface Operating Standards for Oil and Gas Exploration and Development, Chapter 3: Surface Use, Roads and Access Ways and BLM New Mexico State Office Road Policy, Standards and Procedures (Instruction Memorandum No. NM-95-031).

Road Classes

BLM Temporary Roads

These are low volume, single-lane roads built for a specific purpose or use. They normally have a 12-foot-wide travel way and are located, designed, and constructed for temporary use. In many cases they may be constructed with little or no grading or blade use. They are usually built for dry weather use, but may be surfaced, drained, and maintained for all-weather use if the Authorized Officer concurs. Such roads are to be made impassable to vehicle travel and returned to a near natural condition upon completion of use.

BLM Resource Roads

These are low volume, single-lane roads, which may be reclaimed after a particular use terminates. These roads normally have a 12- to 14-foot travel way with intervisible turnouts. They are usually used for dry weather, but may be surfaced, drained, and maintained for all-weather use. These roads connect terminal facilities, such as a well site, to collector, local, arterial, or other higher-class roads. They serve low average daily traffic and are located on the basis of the specific resource activity need rather than travel efficiency. They may be developed

for either long- or short-term service and operated either closed or open to use as determined by the Authorized Officer.

BLM Local Roads

These roads may be single- or double-lane with travel ways 12 to 24 feet in width, with intervisible turnouts. They are normally graded, drained, and surfaced and are capable of carrying highway loads. These roads provide access to large areas and for various uses. They collect traffic from resource or local roads or terminal facilities and are connected to arterial roads or public highways. The location and standard are based on both long-term resource needs and travel efficiency. They may be operated for either constant or intermittent service, depending on land use and resource management objectives for the area being served.

BLM Collector Roads

These roads are usually double-lane, graded, drained and surfaced, with a 20- to 24-foot travel way. They serve large land areas and are the major access route into development areas with high average daily traffic rates. The locations and standards often are determined by a demand for maximum mobility and travel efficiency rather than a specific resource management service. They usually connect with public highways or other arterials to form an integrated network of primary travel routes and are operated for long-term land and resource management purposes and constant service.

Design Specifications

BLM Temporary Roads

- Design speed is 15 miles per hour or less.
- Travel width is normally 12 feet.
- Recommended minimum horizontal curve radius will be 100 feet. Where terrain will not allow 100-foot-curve radii, curve widening is necessary.

- Normal road gradients should not exceed 8 percent except for short pitches of 300 feet or less. In mountainous terrain, grades greater than 8 percent may be allowed.
- Turnouts generally should be naturally occurring features, such as additional widths on ridges or other available areas on flat terrain.
- Drainage must be provided over the entire road. Usually this is accomplished by use of drainage-dips, in sloping, and naturally rolling topography. Ditches and culverts may be required in some situations, but are not expected as the norm.
- Generally, gravel surfacing is not required, but if all-weather access is needed, it may be necessary.

BLM Resource Roads

- Design speed 15 miles per hour.
- Travel way width will be a minimum of 12 feet with turnouts.
- Recommended minimum horizontal curve radius will be 100 feet. Where terrain will not allow 100-foot-curve radii, curve widening is necessary.
- Normal road gradients should not exceed 8 percent except for pitch grades (i.e., 300 feet or less in length). In mountainous terrain, grades greater than 8 percent may be possible.
- Turnouts are required on all single lane roads (travel way of 12 to 14 feet). Turnouts must be located at 1,000-foot intervals or be intervisible, whichever is less.
- Drainage control will be ensured over the entire road through the use of drainage dips, in sloping, natural rolling topography, ditch turnouts, or culverts. Culverts, drainage crossings, and other controls should be designed for a 10-year frequency or greater

storm, with an allowable head of one foot at the pipe inlet.

- Roadbed culverts should be used to drain inside road ditches when drainage dips are not feasible.
- Surfacing with gravel should be required where all weather access is needed.

BLM Local Roads

- Design speed 15 to 25 miles per hour.
- Travel way will be a minimum of 12 feet (single lane), maximum of 24 feet (double lane) with intervisible turnouts as may be required.
- Recommended minimum horizontal curve radius 100 feet. Where terrain will not allow 100-foot-curve radii, curve widening is necessary.
- Maximum grades should not exceed 8 percent. Pitch grades for lengths not to exceed 300 feet may be allowed to exceed 8 percent in some cases.
- All culverts must be sized in accordance with accepted engineering practices and any special environmental concerns. The minimum size culvert in any installation must be 18 inches.
- Turnouts will be required on all single-lane roads. Turnouts must be located at 750-foot intervals or be intervisible, whichever is less. The length should not be less than 100 feet with additional 25-foot transitional tapers at each end.
- Surfacing is required for all weather access. Aggregate size, type, amount, and application method would be specified by the Authorized Officer. Subgrade analysis may be required to determine load-bearing capacities.

BLM Collector Roads

- Design speed 20 miles per hour minimum unless otherwise directed.
- Travel width will be a minimum of 20 feet, maximum of 24 feet.
- Minimum horizontal curve radius will be 200 feet width unless shorter radius is approved.
- Design vertical curves for a maximum change of 2 percent per 50 feet of road length.
- Maximum grade 8 percent (except pitch grades not exceeding 300 feet in length and 10 percent in grade).
- All culverts will be designed for a minimum 25-year frequency storm with an allowable head of one foot at the pipe inlet. However, the minimum acceptable size culvert diameter is 18 inches. Show all culverts planned to accurate vertical scale on plan profile sheets.

Well Sites

In siting facilities at the well site, the following measures must be followed:

- Minimize disturbance to existing fences and other improvements on public land.
- Avoid residences, livestock facilities, and wildlife water supplies by 0.25 mile.
- Prior to surveying/flagging locations for pads, routes for roads, and other preliminary activities, during the raptor-breeding season, the project area will be surveyed for raptor nests. Surveys will be conducted by professional biologists approved by the Authorized Officer. All active raptor nests will be avoided during the dates and by the distances listed below. An “active raptor nest” is defined as any raptor or corvid nest being used during the current nesting season.

Distance:

- Eagle – 0.5 mile
- Peregrine falcon – 0.5 to 4.25 miles
- All other raptor species – 0.25 mile

Timing:

- Peregrine falcon – variable March 1 through October 16
- Aplomado falcon – January 1 through July 31
- All raptor species during observed nest establishment through fledgling

Conditions of approval may be applied as a result of BLM and U.S. Fish and Wildlife Service consultation.

- In areas that constitute occupied or potential aplomado falcon habitat, a protocol survey for this species will be conducted along with the above general raptor nest survey prior to surveying/flagging locations during the breeding season (January 1 through July 31).
- During operations at any time, large trees or shrubs (greater than 6 feet in height) containing or capable of containing a raptor nest will be avoided by vehicular traffic or other activities likely to destroy them.
- Site facilities to minimize in-channel excavation.
- Select site that provides topographic and vegetative screening when feasible.
- Well pads should not be allowed within 100-year floodplains
- Pits containing oil, other hydrocarbons, salt water, or any toxic substances will not be allowed in a floodplain.
- Locate fluid containers on the upslope side of drilling pads whenever possible to facilitate early detection of leaks and spills—produced or drilling fluids could cause long-term damage to soils, ground water, and vegetation.

In constructing the site:

- Construction must conform to the approved well site and layout plan in the Surface Use Plan of Operations (SUPO).
- Limit tree and vegetation clearing to the minimum area required.
- Time construction activities to avoid wet periods.
- All reserve pits will be constructed in 100 percent cut material.
- All reserve pits will be lined with approved materials.
- Reserve pits may not be breached, to facilitate drying.
- Surround reserve pits by BLM-standard four-strand barbed-wire fence.
- Aboveground structures will be painted to blend with the natural color of the landscape.
- Power lines will be constructed to standards outlined in the most recent version of “Suggested Practices for Raptor Protection on Power Lines” published by the Edison Electric Institute/Raptor Research Foundation, unless otherwise agreed to by the Authorized Officer. The holder is responsible for demonstrating that power pole designs not meeting these standards are “raptor safe.” Such proof will be provided by a raptor expert approved by the Authorized Officer. The BLM reserves the right to require modifications or additions to power line structures constructed under this authorization, should they be necessary to ensure the safety of large perching birds. The modifications and/or additions will be made by the holder without liability or expense to the United States.

Pipeline Siting

- Avoid locating pipeline routes adjacent to live watercourses or in proximity to steep hillsides to the extent practical to minimize the risk of petroleum spills and silt from construction entering streams.
- Locate pipelines along existing linear facilities (other pipelines and roads) to the maximum extent practical. Minimize pipeline crossing of undisturbed areas.
- Uprooted vegetation, soil, and rocks left as a result of construction or maintenance activity will be randomly scattered over the project area and will not be left in rows, piles, or berms, unless otherwise approved by the Authorized Officer, except that an earthen berm will be left over the ditch line to allow for settling back to grade.

Gravel Source

- The gravel pit will be constructed so that runoff and sediment does not drain into streams. This may require the installation of sediment traps or barriers (slash or straw bales) to ensure that runoff is adequately filtered.
- During reclamation, the gravel pit will be regraded to meet preconstruction conditions and revegetated.

Noxious Weed Control

BLM will determine the size and density of the noxious weed infestations requiring implementation of a control program.

- Mechanical, chemical, biological, or other methods approved by BLM will be used to control infestations of noxious weed in disturbed areas.
- The operator must include provisions for noxious weed prevention and treatment in the SUPO. These may include removal of weed sources that could be picked up and

transported by passing vehicles; limit seed transport into relatively weed-free areas, and/or retain shade to suppress weeds.

Pollution Control and Hazardous Substances Management

- Leaking equipment will be repaired promptly or removed from the site to prevent contamination from spills – any soil or water that has been contaminated will be placed in appropriate containers and removed from the site. Disposal of vehicle fluids on public lands will not be authorized.
- Copies of spill prevention, control, and countermeasure plans are required, and must be provided to the authorized officer.
- Use of pesticides and herbicides will comply with applicable Federal and State laws. Prior to use of pesticides, the BLM Authorized Officer will approve a plan for its use.
- Storage tanks will have a berm constructed around them, of sufficient dimensions to contain the contents of the largest tank, to serve as secondary containment should a spill occur.
- The concentration of hazardous substances in the reserve pit at the time of pit backfilling must not exceed the standards set forth in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).
- All drilling-related CERCLA hazardous substances removed from the location and not reused at another drilling location must be disposed of in accordance with applicable Federal and State regulations.
- All pits and tanks containing liquids or semi-liquids will be covered to prevent the entrapment or contamination of wildlife.

Drilling Operations

All proposed drilling operations and related surface-disturbing activities, as well as any change from an approved APD, must be approved before such activities are conducted. Approval occurs in accordance with (1) appropriate Onshore Oil and Gas Orders or Geothermal Resources Rule, (2) 43 CFR 3160, (3) Notices to Lessees, and (4) lease terms and conditions of approval.

Producing Operations

Portable and temporary facilities located on the drill pad are used to initiate the production from the reservoir. As drilling proceeds and reservoir limits are established, permanent production facilities are designed and installed. The type, size, and number of the facilities are determined by the number of producing wells, expected production rates, volumes of gas and water expected to be produced with the oil, and the number of separate leases involved. Any construction of new, permanent production facilities will conform to the best management practices described above and also must comply with the regulations, onshore orders, and applicable Notices to Lessees.

Additional considerations may arise from power systems that may be required for pumping (gas or electric) and generate noise; the siting and operation of facilities to separate water from oil, treatment and storage facilities; and the need to dispose of wastewater that may be saline via evaporation pits or fluid injection.

Fluid mineral operations are subject to the applicable laws, regulations, lease terms and stipulations, orders, notices, and instructions of the BLM Authorized Officer. These include, but are not limited to, conducting operations in a manner that ensures the proper handling, measurement, disposition, and site security of leasehold production; and protecting other natural resources, environmental quality, life, and property.

- All production equipment installed on Federal leases will be constructed to prevent birds and bats from entering them and, to the extent practical, to discourage perching and nesting.
- All unused portions of the drill pad (which are the disturbed areas no longer needed for production operations, normally outside the rig anchors), will be reclaimed.
- Reclamation will not be considered successful until ground cover with desired species is showing signs of stable establishment. Establishment would be indicated by the existence of healthy, mature annuals and perennials in the correct density and composition, as compared to the seed mixture established by the Authorized Officer.

Abandonment and Reclamation

A reclamation plan will be part of the SUPO. Additional reclamation measures may be required based on the conditions existing at the time of abandonment, and included as part of the conditions of approval of the Notice of Intent to Abandon.

- Include provisions for noxious weed prevention and treatment.
- Ensure proper disposal of debris.
- Ensure reclamation is per surface owner's specifications/recommendations if applicable.

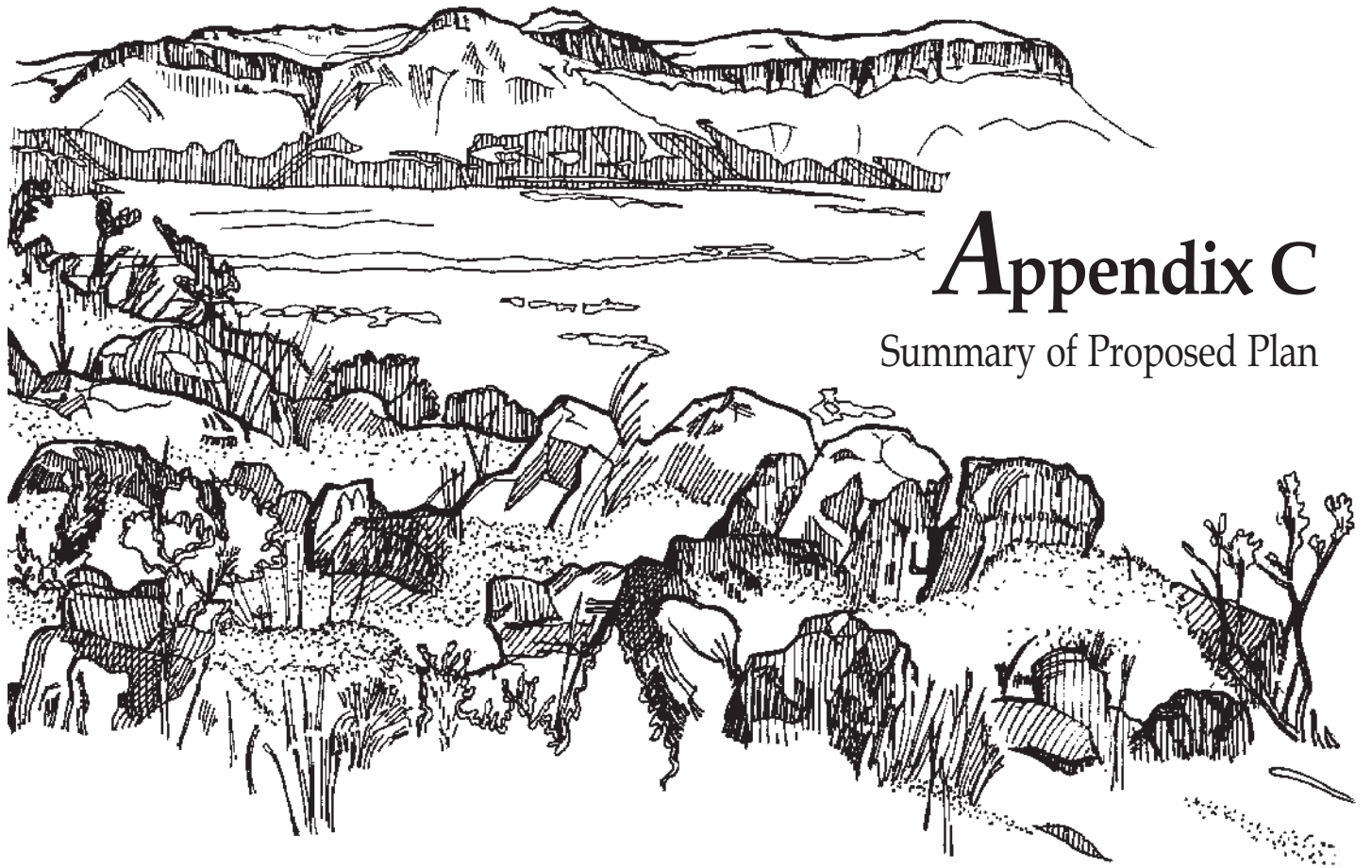
Well Site

- Wells will be plugged in accordance with BLM requirements.
- Wells will be plugged in a manner to prevent fluid migration and per State requirements.
- Re-establish vegetation quickly on bare ground to minimize the potential for erosion and spread of noxious weeds.

- Reclamation will not be considered successful until ground cover with desired species is showing signs of stable establishment. Establishment would be indicated by the existence of healthy, mature annuals and perennials in the correct density and composition, as compared to the seed mixture established by the Authorized Officer.
- A restoration plan for habitat of special status species will be developed in coordination with and approved by BLM.
- All fill material sources will be free of noxious weeds.
- All seed and plant mulch materials will be free of noxious weed seeds.
- Upon closure of the mud pits, bury all drilling products with at least 24 inches of cover to ensure successful revegetation.
- After abandonment and reclamation of a well pad, a BLM-standard four-strand barbed wire fence will be erected to exclude cattle for a minimum of two successful growing seasons.

Access Roads

- When roads are abandoned, the entire roadway and slopes will be ripped at least 12 inches deep, including turnouts and intersection approaches.
- The abandoned road will be returned to its natural contour to the extent practical.
- Roads being reclaimed will have all disturbed areas reseeded with a BLM authorized seed mix.
- Borrow pits and quarries will be reclaimed using the same procedures as roadway reclamation and all disturbed areas will be reseeded with a BLM authorized seed mixture.
- If necessary, removal of caliche may be required to facilitate successful reclamation.



Appendix C

Summary of Proposed Plan

APPENDIX C
SUMMARY OF PROPOSED PLAN

Table C-1, which follows, provides a list of the resource concerns reviewed and evaluated, and documents how existing management would be carried forward, modified, or dropped under the Proposed Plan.

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
Management Decisions								
C-1	Three Rivers Petroglyph Site and Picnic Area	T. 11 S., R. 09 E., New Mexico Prime Meridian (NMPM)	960	1986 Resource Management Plan (RMP), page 46, 1997 Resource Management Plan Amendment (RMPA), (2000 Draft RMPA/ Environmental Impact Statement (EIS) 2-15 and 2-17, Map 3-10)	X			Discretionarily closed as part of Three Rivers Area of Critical Environmental Concern (ACEC) (1997 RMPA).
C-2	Rattlesnake Hills Archaeological District	T. 22 S., R. 08 E, NMPM	640	1986 RMP, page 46 (2000 DRMPA/EIS 2-15 and 2-17, Map 3-10)		X		Modified to a stipulation of no surface occupancy. Previous protection measures were deemed inadequate to protect unrecorded features of the cultural resource area.
C-3	Alamo Mountain Petroglyphs Area	Designated no surface occupancy and closed to off-road vehicle (ORV) use to protect the Alamo Mountain petroglyphs. T. 26 S., R. 13 E., NMPM.	200	1986 RMP, page 46, 1997 RMPA, (2000 DRMPA/EIS 2-15 and 2-17, Map 3-10)		X		Discretionarily closed as part of the Alamo Mountain ACEC (1997 RMPA).
C-4	Lone Butte	ORV use was limited to existing roads and trails within a 100-acre parcel to protect cultural resources at Lone Butte. Section 6, T. 19 S., R. 09 E., NMPM.	352	1986 RMP, page 46 (2000 DRMPA/EIS 2-15 and 2-17, Map 3-10)		X		Modified to a stipulation of no surface occupancy. Previous protection measures were deemed inadequate to protect unrecorded features of the cultural resource area.

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RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
C-5	Jarilla Mountains	Closed to ORV use to protect cultural resources in a portion of the Jarilla Mountains. T. 20 S., R. 08 E., NMPM.	803	1986 RMP, page 46 (2000 DRMPA/EIS 2-15 and 2-17, Map 3-10)		X		Modified to a stipulation of no surface occupancy. Previous protection measures were deemed inadequate to protect unrecorded features of the cultural resource area.
C-6	Butterfield Trail	Areas within 0.25 mile of well-preserved segments (mapped) of the Butterfield Trail were closed to surface-disturbing activities. Ts. 25, 26 S., Rs. 12-14 E., NMPM.	4,333	1986 RMP, page 46 and 47 (2000 DRMPA/EIS 2-15 and 2-17, Maps 3-9 and 3-10)		X		Modified to a stipulation to control surface use. Closing the trail and 0.25-mile buffer area was deemed unnecessary since adverse impacts can be mitigated.
C-7	Jornada del Muerto Trail	Areas within 0.25 mile of well-preserved segments of the Jornada del Muerto Trail were closed to surface-disturbing activities. Ts. 13-20 S., Rs. 01, 02 W., NMPM.	14,018	1986 RMP, page 47 (2000 DRMPA/EIS 2-15, Maps 3-9 and 3-10)		X		Modified to a stipulation to control surface use. Closing the trail and 0.25-mile buffer area was deemed unnecessary since adverse impacts can be mitigated.
OGG-1	White Sands Missile Range Safety Evacuation Area	These lands shall be evacuated on those days that missiles are to be fired. Memorandum of Understanding between the Department of the Army and Department of the Interior, January 1960.	311,410	1986 RMP, page 18 (2000 DRMPA/EIS, Map 3-2)	X			BLM would issue a Lease Notice to ensure the lessee is aware that the White Sands Missile Range (WSMR) conducts testing of missiles, during which times WSMR requires that the area be evacuated.

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
OGG-2	Wilderness protection stipulations	Standard Bureau of Land Management (BLM) wilderness leasing protection. <ul style="list-style-type: none"> • Brokeoff Mountains WSA –Ts. 22-26 S., Rs. 17-19 E., NMPM • Jornada del Muerto WSA –T. 10 S., Rs. 01, 02 E., NMPM • Guadalupe Escarpment WSA – Ts. 17-19 S., R. 10 E., NMPM • Sacramento Escarpment WSA – Ts. 22-23 S., R. 18-19 E., NMPM 	30,838 4,320 3,197 6,956	1986 RMP, pages 18-20 (2000 DRMPA/EIS page 3-43, Map 3-10)	X			Wilderness Study Areas (WSAs) remain nondiscretionarily closed under the Interim Policy and Guidelines for Lands Under Wilderness Review.
OGG-3	Caballo Mountain Communication Site	No occupancy or other activity on the surface of the following described lands is allowed in order to protect the existing communications sites on Caballo Mountain. SW ¼, Section 26, T. 15 S., R. 04 W., NMPM.	161	1986 RMP, page 21 (2000 DRMPA/EIS, Map 3-2)			X	A stipulation of no surface occupancy was deemed unnecessary. Capitol investments at the site can be protected under standard lease terms and conditions.
OGG-4	Ecological study plots	No occupancy or other activity on the surface of the following described lands is allowed in order to protect their value as ecological study plots and demonstration areas. <ul style="list-style-type: none"> • Engle Ecological Study Plot, Section 35, T. 13. S., R. 02 W., NMPM • Cuchillo Ecological Study Plot, Sections 10, 11, 14, T. 12 S., R. 05 W., NMPM • Nordstrom Ecological Study Plot, Sections 27, 28, 33, 34, 35, T. 16 S., R. 05 W., NMPM • Trujillo Ecological Study Plot, Section 3, T. 12 S., R. 06 W., NMPM 	40 1,471 1,391 39	1986 RMP, page 21 (2000 DRMPA/EIS, Map 3-7)	X			A stipulation of no surface occupancy in these areas is pursuant to Public Land Order (PLO) 4038.

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
		<ul style="list-style-type: none"> • Danley Ecological Study Plot, Section 18, T. 13 S., R. 09 E., NMPM • Lee Ecological Study Plot, Section 21, T. 23 S., R. 13 E., NMPM 	179 40					
OGG-5	Rattlesnake Hill ORV designation	Vehicular use on all or portions of the lands contained in this area is limited to existing roads and trails in order to prevent damage to cultural resources (in accordance with the <i>Federal Register</i> Notice of July 31, 1980—Rattlesnake Hill Limited ORV Designation). Exceptions may be granted when the lessee/operator submits a surface use plan of operations that is satisfactory to the Authorized Officer of the BLM, for the protection of cultural resources. Section 21, T. 22 S., R. 08 E., NMPM.	2,932	1986 RMP, page 21 (2000 DRMPA/EIS, Map 3-10)		X		Modified to a stipulation of no surface occupancy. Previous protective measures were deemed inadequate to protect unrecorded features of the cultural resource area.
OGG-6	National Register of Historic Places (Rattlesnake Hill)	No occupancy or other activity on the surface of the following described lands (Rattlesnake Hills area) is allowed in order to protect sites listed on the State Register of Historic Places and sites nominated to the National Register of Historic Places. Section 21, T. 22 S., R. 08 E., NMPM.	640	1986 RMP, page 22 (2000 DRMPA/EIS, Map 3-10)	X			A stipulation of no surface occupancy was deemed appropriate to protect the cultural resource area.

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
OGG-7	National Register of Historic Places (Alamo Mountain)	No drilling or storage facilities would be allowed within 500 feet of sites on the leased lands in the Alamo Mountain area which are listed on the State Register of Historic Places and sites proposed for nomination to the National Register of Historic Places. This distance may be modified when specifically approved in writing by the Authorized Officer of the BLM, with the concurrence of the State Historic Preservation Officer. T. 26 S., R. 13 E., NMPM.	200	1986 RMP, page 22; 1997 RMPA, page 2-7 (2000 DRMPA/EIS, Map 3-10)	X			Discretionarily closed as part of the Alamo Mountain ACEC (1997 RMPA).
OGG-8	Tularosa River Recreation Area	No occupancy or other activity on the surface of the following described lands is allowed in order to protect recreational opportunities along the Tularosa River. Sections 29, 31, 32, T. 13 S., R. 11 E., NMPM.	119	1986 RMP, page 22 (2000 DRMPA/EIS, Map 3-10)	X			A stipulation of no surface occupancy was deemed appropriate to protect recreational opportunities along the river.
OGG-9	Sacramento Escarpment	No occupancy or other activity on the surface of the following described lands is allowed in order to protect the scenic quality of the Sacramento Escarpment. Ts. 17-19 S., R. 10 E., NMPM.	3,640	1986 RMP, page 22; 1997 RMPA, page 2-4 (2000 DRMPA/EIS, Map 3-10)		X		Discretionarily closed as part of the Sacramento Escarpment ACEC (1997 RMPA).
OGG-10	Recreation and Public Purpose (R&PP) Leases and Patents	The lessee is given notice that all or part of the lease or patent areas 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 is strictly prohibited.	Approximately 1,799	1986 RMP, page 22	X			A stipulation of no surface occupancy was deemed appropriate to protect any of the R&PP leases or patents.

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
R-2	Cuchillo Mountains Piñon Nut Collection Area	The Cuchillo Mountains Piñon Nut Collection Area is located in the northwest portion of the Planning Area. The trees in this area are maintained in order to provide personal and commercial piñon nut collection. Ts. 10-12 S., Rs. 07, 08 W., NMPM.	14,863	1986 RMP, page 47 (2000 DRMPA/EIS 2-2 and 2-10, Map 3-10)	X			Would be managed with standard lease terms and conditions. BLM would issue a Lease Notice to inform the lessee of the importance of the stand of trees as a nut collection area.
VR-1	Sacramento Escarpment ACEC	Sacramento Escarpment ACEC. Ts. 17-19 S., R. 10 E., NMPM.	5,365	1986 RMP, page 48; 1997 RMPA, page 2-4; (2000 DRMPA/EIS 2-17, Map 3-10)	X			Discretionarily closed as part of the Sacramento Escarpment ACEC (1997 RMPA).
VR-2	Brokeoff Mountains	Brokeoff Mountains ORV limited area. Ts. 24-26 S., Rs 18, 19 E., NMPM.	11,647	1986 RMP, page 48 (2000 DRMPA/EIS 2-17, Map 3-10)	X			Would be leased with standard lease terms and conditions (users would be required to observe the ORV designations).
VR-3	Cornudas Mountains	Cornudas Mountains ORV limited area. Ts. 25, 26 S., Rs. 13-15 E., NMPM.	2,533	1986 RMP, page 48 (2000 DRMPA/EIS 2-17, Map 3-10)	X			Would be leased with standard lease terms and conditions (users would be required to observe the ORV designations).
VR-4	Cuchillo Mountains	Cuchillo Mountains ORV limited area. T. 12 S., R. 11 W., NMPM.	5,947	1986 RMP, page 48 (2000 DRMPA/EIS 2-17, Map 3-10)	X			Would be leased with standard lease terms and conditions (users would be required to observe the ORV designations).

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
WL-2	Percha Creek Riparian Habitat Area	Protect riparian area for wildlife habitat, watershed values, recreation, and visual quality. T. 16 S., R. 07 W., NMPM.	940	1986 RMP, page 41 (2000 DRMPA/EIS 2-11 and 2-17, Map 3-8)		X		As of 1992, Percha Creek Riparian Habitat Area is part of the Percha Creek Nominated ACEC. Discretionary closure was deemed appropriate based on BLM guidance that calls for the need to provide protection of the significant resource values until the areas are evaluated fully and a determination has been made whether to designate them as ACECs.
Resource Concerns								
	Public water reserves	Executive Order (PWR 107, 1926) places surface use restrictions in areas of public water reserves. Specifically, the smallest legal subdivision surrounding a spring or water hole, or land within 0.25 mile of a spring or water hole on unsurveyed land, must be withdrawn from settlement, location, sale, or entry in order to reserve public use of the water reserve.	40	1986 RMP, page 12 (2000 DRMPA/EIS 2-3)	X			Would be leased with standard lease terms and conditions.
	Old Air Force bombing and gunnery range	PLO 2569 prohibits subsurface use of land that was used as an impact area on the former Air Force bombing and gunnery range until the restriction is removed. Ts. 23, 24 S., Rs. 16-18 E., NMPM.	8,264	1986 RMP, page 12 (2000 DRMPA/EIS 2-3, Map 3-2)	X			Nondiscretionarily closed pursuant to PLO 2569.

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
	Community Pit 7	Mineral materials pit about 25 miles south of Alamogordo available to community for sales of mineral materials. Section 9, T. 20 S., R. 09 E., NMPM.	30	Map 3-2		X		A stipulation of no surface occupancy is needed to protect the source of mineral materials that are extracted by the public and to regulate the area in order to minimize unnecessary degradation.
	Air navigation site	Secretarial Order 125. Sections 17 and 18, T. 13 S., R. 01 W., NMPM.	117		X			Leasing is precluded in this area by Secretarial Order to protect the air navigation facility.
	Berrendo Administrative Camp Site	BLM administrative site. Section 9, T. 23 S., R. 15 E., NMPM.	40			X		A stipulation to control surface use is deemed necessary to avoid land use conflicts and protect BLM administrative site facilities (structure and helipad).
	Highly erosive and fragile soils	Manage soils to maintain productivity and minimize erosion and stabilize the resources. Management activities in areas of high erosion potential would be designed to minimize surface disturbance to the extent possible.	1,050,348 (Planning Area) 310,367 (BLM's Decision Area)	(2000 DRMPA/EIS, Map 3-5)		X		A stipulation to control surface use is deemed necessary to avoid accelerated erosion or increased instability in these areas.

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
	Watershed areas	Limited ORV use on approximately to protect watershed values. <ul style="list-style-type: none"> • Wind and Chess Draw (Cornudas Mountains) Watershed Area (RMP Decisions W-1 and VR-3), Ts. 25, 26 S., Rs. 13-16 E., NMPM. Note: within this area, the Cornudas, Alamo, and Wind Mountains have all been designated as ACECs, and are closed to leasing. • Moccasin and Otto Draw (southwest of Piñon) Watershed (RMP Decision W-2), Ts. 20, 21 S., Rs. 14, 15 E., NMPM. • Watershed area east of Tularosa and south of Tularosa River (RMP Decision W-3), Ts. 14, 15, S., Rs. 09, 10 E., NMPM. • Three Rivers (north of Tularosa) Watershed (RMP Decision W-4), T. 11 S., Rs. 09, 92 E., NMPM. • Watershed area east of Crow Flats (RMP Decision W-5), Ts. 24, 25, 26 S., Rs. 18, 19 E., NMPM. 	34,499 13,662 17,046 12,741 14,890	1986 RMP, page 45 (2000 DRMPA/EIS 2-5 and 2-17)		X		Would be leased with standard lease terms and conditions (users would be required to observe the ORV designations).
	Riparian/other wetlands/playas	Avoid impacts on wetlands in compliance with Section 404 of the Clean Water Act, and on riparian habitats in accordance with BLM guidelines.	Approximately 10,497	(2000 DRMPA/EIS, Map 3-7)			X	A stipulation of no surface occupancy is deemed necessary to minimize impacts on riparian, other wetlands, and playas.
	Big game habitat areas	Provide adequate habitat for big game. Objective is to provide adequate habitat for big game. <ul style="list-style-type: none"> • Otero Mesa Habitat Area (pronghorn, desert grasslands 	690,729 427,275	1986 RMP, page 45 (2000 DRMPA/EIS 2-11, Map 3-7)	X		X	Generally, standard lease terms and conditions are deemed appropriate; adequate habitat for big game can be maintained in these areas.

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
		habitat) (RMP Decision WL-4), (Ts. 21-26 S., Rs. 10-16 E., NMPM • Nutt and White Sands Antelope Areas (Jornada Plain) (RMP Decision WL-8), (Nutt Antelope Area is T. 19 S., Rs. 07, 06 W., NMPM; White Sands Antelope Area is Ts. 10-17 S., Rs. 01-04 W. and 01, 02 E., NMPM). • Caballo Mountains Deer Habitat Area (RMP Decision WL-5), Ts. 14-17 S., Rs. 03, 04 W., NMPM • Sacramento Escarpment Deer Habitat Area (RMP Decision WL-6), Ts. 11-15 and 17, 18 S., Rs. 08-10 E., NMPM. The southern portion of this area coincides with the Sacramento Escarpment ACEC.	529,559 (75,850 [Nutt] 453,709 [White Sands]) 93,179 170,275					However, portions of the Nutt and Otero Mesa areas would be managed with a stipulation of no surface occupancy. See “Nutt and Otero Mesa desert grassland habitat areas” below.
	Nutt and Otero Mesa desert grassland habitat areas	Protect portions of the remaining grassland community by minimizing habitat fragmentation.	121,141 (104,875 [Otero Mesa] 16,266 [Nutt])	(2000 DRMPA/EIS, Map 3-7)		X		A stipulation to control surface use by limiting industry’s disturbance to no more than 5 percent at any one time and requiring new lessees to form exploratory units prior to commencing drilling activity is deemed necessary to manage the amount of disturbance within the remaining areas of remnant, undisturbed Chihuahuan Desert grassland habitat.

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
	Special status species	Federally listed threatened and endangered species, species proposed for Federal listing, Federal candidates, BLM sensitive species, and State-listed species. All exploration and development activities will follow current requirements of Section 7 of the Endangered Species Act for Federally listed and proposed species, and current BLM policy for management of State-listed and BLM sensitive species.		(2000 DRMPA/EIS, Map 3-8)		X		A stipulation to control surface use is deemed necessary to minimize adverse effects on special status species and their habitats as required by BLM guidance.
	Habitat suitable for bighorn sheep	Sites with suitable habitat parameters for bighorn sheep are located in the Caballo, Sacramento, Guadalupe, Brokeoff, and Cornudas Mountains. The Caballo Mountains provide a potential movement corridor for bighorn sheep from Fra Cristobal Mountains.	199,020		X			Standard lease terms and conditions are deemed appropriate to protect potential habitat for bighorn sheep.
	Lake Valley Historic Townsite	The townsite and schoolhouse are both listed in the State Register of Cultural Properties. The site is eligible for listing in the National Register of Historic Places. Protection is through existing cultural resources regulations. The buildings are being stabilized and the site is open for public visitation. T. 18 S., R. 07 W., NMPM.	140	(2000 DRMPA/EIS, Map 3-10)		X		A stipulation of no surface occupancy is deemed appropriate to protect the townsite and schoolhouse, which are subject to existing cultural resource regulations since both are listed on the State Register of Cultural Properties (as site LA 50088) and are eligible for inclusion on the National Register of Historic Places.

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
	Red Sands ORV area	Red Sands ORV area is a trail network within a sand dune area between Alamogordo and Orogrande. The trails have been surveyed for cultural resources, and a plan to mitigate impacts on cultural resources is being implemented. Subsequently, the trails will be signed to encourage use of established trails and discourage proliferation of new trails. Ts. 19-21 S. Rs. 08, 09 E., NMPM.	33,600	(2000 DRMPA/EIS, Map 3-10)	X			The area is used infrequently; therefore, potential land use conflicts can be managed appropriately through standard lease terms and conditions. BLM would issue a Lease Notice to ensure that lessees are aware of the intermittent use of this recreation area.
	VRM Class I	The Class I classification preserves the existing characteristic landscape and allows for natural ecological changes only.	10,126	(2000 DRMPA/EIS, Map 3-9)	X			The only Class I areas in the Planning Area are ACECs, which are already closed to leasing (1997 RMPA).
	VRM Class II	The objectives for Visual Resource Management (VRM) Class II areas are to manage activities so that the changes may be seen but should not attract attention.	175,737	(2000 DRMPA/EIS, Map 3-9)		X		A stipulation to control surface use is deemed appropriate to protect visual resources in these areas.
	VRM Classes III and IV	The Class III classification partially retains the existing characteristic landscape. The level of change in any of the basic landscape elements due to management activities may be moderate and evident. The Class IV classification applies to areas where the characteristic landscape has been so disturbed that rehabilitation is needed.	309,797 (Class III) 1,522,972 (Class IV)	(2000 DRMPA/EIS, Map 3-9)	X			Standard lease terms and conditions are deemed appropriate to manage the impacts on visual resources in these areas.

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
	VRM and ORV limited areas	<p>Limited ORV use for protection of visual resources.</p> <ul style="list-style-type: none"> • Brokeoff Mountains VRM and ORV limited area (RMP Decision VR-2), T. 24-26 S., R. 18, 19 E., NMPM • Cornudas Mountains VRM and ORV limited areas (protection of watershed values and visual resources) (RMP Decisions W-1 and VR-3). [Note: within this area, the Cornudas, Alamo, and Wind Mountains have all been designated as ACECs, closed to leasing]; Ts. 25, 26 S., Rs. 13-15 E., NMPM. • Cuchillo Mountains VRM and ORV limited areas (RMP Decision VR-4), T. 12 S., R. 11 W., NMPM 	11,647 2,533 5,947	(2000 DRMPA/EIS, Map 3-10)	X			Would be leased with standard lease terms and conditions (users would be required to observe the ORV designations).
	Lake Valley Backcountry Byway	State Highway 152 from junction of Interstate 25, 18 miles south of Truth or Consequences, then west on Highway 152 to the historic town of Hillsboro. The Byway route then turns south onto Highway 27 towards Lake Valley and Nutt. The highway offers scenic views of the Black Range, Caballo, and Las Uvas Mountains and Cooke's Peak. Also, the route has high historic values founded on the basis of ranching and mining (Ts. 15-19 S., Rs. 05-07 W., NMPM).	9,352	(2000 DRMPA/EIS, Map 3-10)		X		A stipulation of no surface occupancy is deemed appropriate to protect visual resources along the byway.

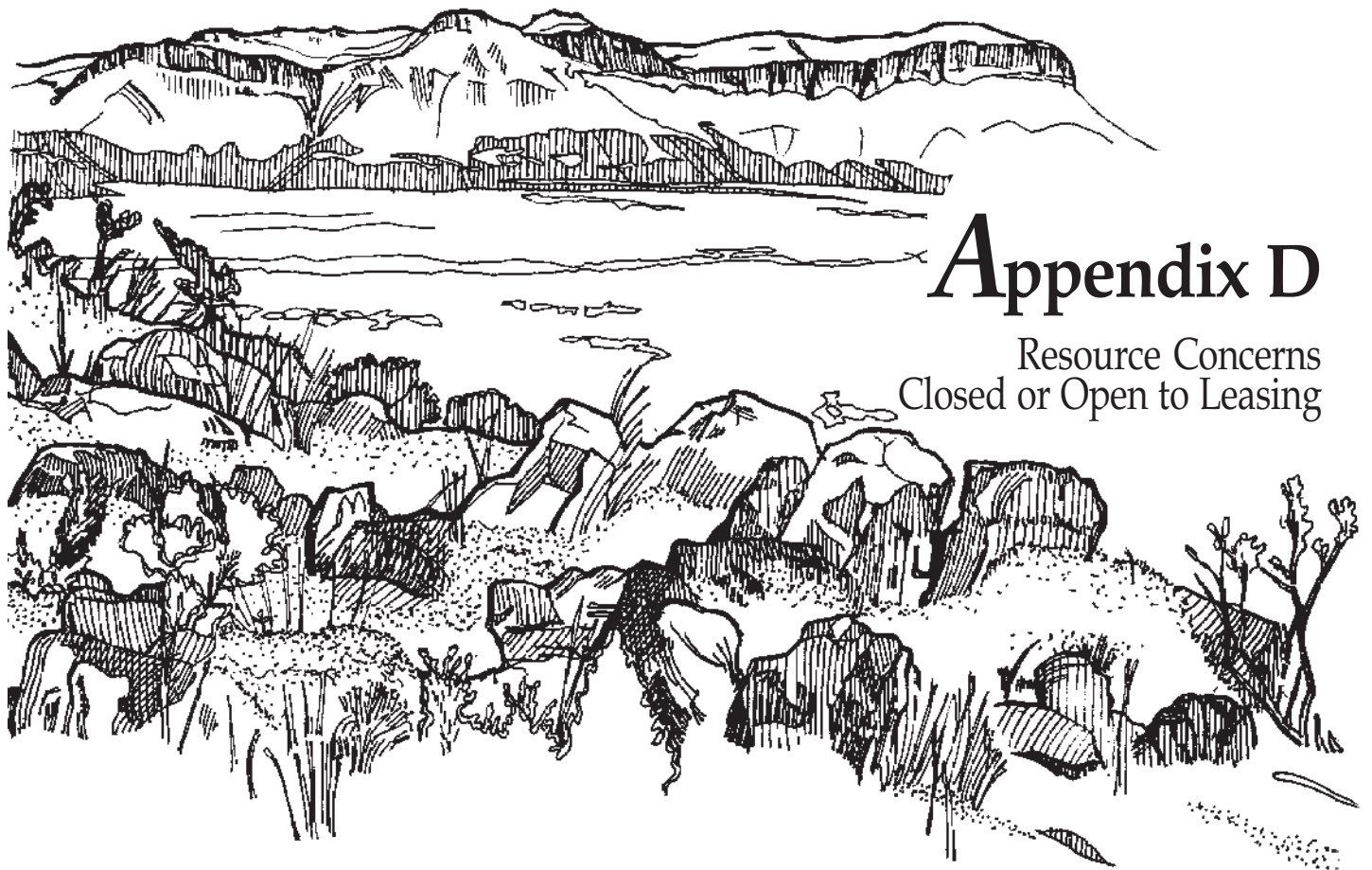
**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
	ACECs	<p>The 1997 Otero County ACEC RMPA decisions are being carried forward unchanged, including the decision to close these areas to leasing and geophysical exploration.</p> <ul style="list-style-type: none"> • Three Rivers ACEC; T. 11 S., R. 92 E., NMPM • Sacramento Escarpment ACEC; Ts. 17-19 S., R. 10 E., NMPM • Cornudas Mountain ACEC; T. 25 S., R. 14 E., NMPM • Alamo Mountain ACEC; T. 26 S., F. 13 E., NMPM • Wind Mountain ACEC; T. 26 S., R. 14 E., NMPM • Alkali Lakes ACEC; T. 26 S., Rs. 18, 19 E., NMPM 	<p>1,130</p> <p>5,365</p> <p>861</p> <p>2,525</p> <p>2,472</p> <p>6,903</p>	(2000 DRMPA/EIS, Map 3-10)	X			Discretionarily closed through the 1997 RMPA.

**TABLE C-1
RMPA MANAGEMENT GUIDANCE**

Decision Number (if applicable)	Management Decision/Concern	Description	Acres	Document/ Page/ Map No.	Modification of Decision/Guidance			Reason/Justification
					No Change	Modified	Dropped	
	Nominated ACECs	<p>Nominated as ACECs to protect resources as described below. BLM policy (Manual 1613.21E) is to manage nominated ACECs to maintain the conditions or resources of concern “until the area is fully evaluated through the resource management planning process.”</p> <ul style="list-style-type: none"> • Brokeoff Mountains Nominated ACEC; T. 25 S., R. 19 E., NMPM • Caballo Mountains Nominated ACEC; T. 16 S., Rs. 03, 04 W., NMPM • Jarilla Mountains Nominated ACEC; Ts. 21, 22, S., R. 08 E., NMPM • Mud Mountain Nominated ACEC; T. 13 S., Rs. 04, 05 W., NMPM) • Percha Creek Nominated ACEC; T. 16 S., R. 07 W., NMPM [Includes 276-acre Percha Creek Riparian Habitat Area.] • Sacramento Mountains Nominated ACEC; Ts. 13, 14 S., R. 11 E., NMPM • Six Shooter Canyon Nominated ACEC; T. 25 S., Rs. 21, 22 E., NMPM • Pup Canyon Nominated ACEC; T. 22 S., R. 18 E., NMPM 	3,834					Would be discretionarily closed to manage and protect resources of concern until the area is fully evaluated through the resource management planning process.
			2,213					
			7,032					
			2,580			X		
			940					
			2,381					
			1,060					
			3,677					

NOTE: Acreages are approximate.



Appendix D

Resource Concerns
Closed or Open to Leasing

APPENDIX D
RESOURCE CONCERNS CLOSED OR OPEN TO LEASING

This appendix contains brief descriptions of the resource concerns that, under the Proposed Plan, would be closed to leasing (Table D-1) or open to leasing with stipulations or Lease Notices (Table D-2). Stipulations are conditions included in a lease when environmental and planning analyses have demonstrated that additional and more stringent environmental protection are needed. They are provisions that modify the

standard lease rights and are attached and made part of a new lease. The operator would be expected to comply with the stipulations. Following the tables are brief descriptions of the type of restriction; objective; location(s); and waivers, exceptions, and modifications. Also included at the end of this appendix are three Lease Notices that would be issued with leases, as applicable.

TABLE D-1
RESOURCE CONCERNS CLOSED TO LEASING

Resource Concern	Appendix D Page No.
Nondiscretionary Closure	
Old Air Force bombing and gunnery range	D-2
Air navigation site	D-2
Wilderness Study Areas (WSAs)	D-2
Incorporated cities, towns, and villages	--
Discretionary Closure	
Areas of Critical Environmental Concern (ACECs) (6)	D-3
Nominated ACECs (8)	D-4

TABLE D-2
RESOURCE CONCERNS OPEN TO LEASING
WITH STIPULATIONS OR LEASE NOTICES

Resource Concern	Appendix D Page No.
No Surface Occupancy	
Protected cultural resource areas (3)	D-5
Recreation and Public Purpose Patents and Leases (R&PPs)	D-5
Community Pit 7	D-6
Riparian/other wetlands/playas	D-6
Ecological study plots (6)	D-7
Tularosa River Recreation Area	D-8
Lake Valley Historic Townsite	D-8
Lake Valley Backcountry Byway	D-9
Controlled Surface Use	
Berrendo Administrative Camp Site	D-9
Highly erosive and fragile soils	D-10
Desert grassland habitat areas (Nutt and Otero Mesa)	D-10
Designated historic trails (Mormon Battalion, Butterfield, and Jornada del Muerto)	D-11
Visual Resource Management (VRM) Class II areas	D-12
Special status species habitats	D-13
Lease Notices	
White Sands Missile Range Safety Evacuation Zone	D-13
Cuchillo Mountains Piñon Nut Collection Area	D-14
Red Sands Off-road vehicle area	D-14

CLOSED TO LEASING

Old Air Force Bombing and Gunnery Range

Decision: Nondiscretionary closure; subsurface closed until such time as the restriction is removed

Location: Ts. 23, 24 S., Rs. 16, 17, 18 E., New Mexico Prime Meridian (NMPM) (approximately 8,264 acres)

Objective: To ensure public safety of the former impact areas for the bombing and gunnery range

Previous Management: Public Land Order 2569, refer to RMP Decision L-2

Justification: Leasing is precluded in this area to ensure protection from previous military activities.

Air Navigation Site

Decision: Nondiscretionary closure

Location: Sections 17 and 18, T. 13 S., R. 01 W., NMPM (approximately 117 acres)

Objective: To provide public land for use as an air navigation facility

Previous Management: Secretarial Order, Air Navigation Site Withdrawal No. 125

Justification: Leasing is precluded in this area by Secretarial Order to protect the air navigation facility.

Wilderness Study Areas

Decision: Nondiscretionary closure

- **Jornada del Muerto WSA**
Location: T. 10 S., Rs. 01, 02 E., NMPM (approximately 4,320 acres)
- **Brokeoff Mountains WSA**
Location: Ts. 22-26 S., Rs. 17-19 E., NMPM (approximately 30,838 acres)
- **Guadalupe Escarpment WSA**
Location: Ts. 17-19 S., R. 10 E., NMPM (approximately 3,197 acres)
- **Sacramento Escarpment WSA**
Location: Ts. 22-23 S., R. 18-19 E., NMPM (approximately 6,956 acres)

Objective: To protect the high-quality wilderness values of this area

Previous Management: 1986 Resource Management Plan (RMP) Decision OGG-2, Interim Policy and Guidelines for Lands Under Wilderness Review

Justification: Designated WSAs are closed to leasing in accordance with the Wilderness Management Policy (BLM 1981c).

Areas of Critical Environmental Concern

Decision: Discretionary closure

- **Three Rivers ACEC**
Location: T. 11 S., R. 9½ E., NMPM (approximately 1,130 acres)
- **Sacramento Escarpment ACEC**
Location: Ts. 17-19 S., R. 10 E., NMPM (approximately 5,365 acres)
- **Cornudas Mountains ACEC**
Location: T. 25 S., R. 14 E., NMPM (approximately 861 acres)
- **Alamo Mountain ACEC**
Location: T. 26 S., R. 13 E., NMPM (approximately 2,525 acres)
- **Wind Mountain ACEC**
Location: T. 26 S., R. 14 E., NMPM (approximately 2,472 acres)
- **Alkali Lakes ACEC**
Location: T. 26 S., R. 18, 19 E., NMPM (approximately 6,904 acres)

Objective: To protect the high-quality resource values that have been identified in these areas

Previous Management: Otero County ACEC Resource Management Plan Amendment (RMPA) (BLM 1997b)

Justification: The decision to close this area to leasing was made in the Otero County ACEC RMPA (BLM 1997b), and these decisions will be carried forward unchanged.

Nominated ACECs

Stipulation: Discretionary closure

- **Brokeoff Mountains Nominated ACEC**
Location: T. 25 S., R. 19 E., NMPM (approximately 3,834 acres)
- **Caballo Mountains Nominated ACEC**
Location: T. 16 S., Rs. 03, 04 W., NMPM (approximately 2,213 acres)
- **Jarilla Mountains Nominated ACEC**
Location: Ts. 21, 22 S., R. 08 E., NMPM (approximately 7,032 acres)
- (Note: A portion of the area is closed to off-road vehicle use on approximately 705 acres to protect cultural resources, 1986 RMP Decision C-5.)
- **Mud Mountain Nominated ACEC**
Location: T. 13 S., Rs. 04, 05 W., NMPM (approximately 2,580 acres)
- **Percha Creek Nominated ACEC**
Location: T. 16 S., R. 07 W., NMPM (approximately 940 acres)
- **Sacramento Mountains Nominated ACEC**
Location: Ts. 13, 14 S., R. 11 E., NMPM (approximately 2,381 acres)
- **Six Shooter Canyon Nominated ACEC**
Location: T. 25 S., Rs. 21, 22 E., NMPM (approximately 1,060 acres)
- **Pup Canyon Nominated ACEC**
Location: T. 22 S., R. 18 E., NMPM (approximately 3,678 acres)

Objective: To protect the known and/or potential biological communities at each ACEC

Previous Management: Case-by-case environmental analysis

Justification: Closure is deemed necessary based on BLM guidance that calls for the need to provide protection of the significant resource values until the areas are fully evaluated and a determination on whether to designate them as ACECs has been made.

OPEN TO LEASING

Protected Cultural Resource Areas

Stipulation: No surface occupancy

- **Rattlesnake Hill**

Location: Parts or all of Sections 21, 22, 26, 27, 28, 33, 34, 35. T. 22 S., R. 8 E., NMPM (3,365 acres)

- **Lone Butte**

Location: Section 6, T. 19 S., R. 09 E., NMPM (352 acres)

- **Jarilla Mountains**

Location: T. 20 S., R. 08 E., NMPM (803 acres)

Objective: To protect cultural resources

Previous Management: 1986 RMP Decisions: C-2, C-4, C-5, OGG-5, and OGG-6.

Waiver: None

Exception: None

Modification: A modification of this stipulation of no surface occupancy may be granted if the leaseholder opts to conduct a full cultural survey of the parcel and particular locations can be found that lack cultural resources.

Justification: The areas that are stipulated for no surface occupancy is subject to existing cultural resource regulations due to its listing in the State Register of Cultural Properties and/or eligibility for listing in the National Register of Historic Places.

Recreation and Public Purpose Patents or Leases

Stipulation: No surface occupancy

Location: Various (approximately 1,799 acres total)

Objective: To ensure compatibility with the existing land uses in R&PP lease or patent areas.

Previous Management: 1986 RMP Decision OGG-10

Waiver: May be granted if fluid mineral development is considered compatible with the land use in a specific R&PP area.

Exception: Same

Modification: None

Justification: The more restrictive stipulation of no surface occupancy was determined to be appropriate in order to address the possibility for land use conflicts (i.e., R&PP). The ability to grant waivers provides flexibility for less significant land use conflicts. Under standard lease terms and conditions, the management of these areas would be the same.

Community Pit 7 (Escondido)

Stipulation: No surface occupancy

Location: Section 9, T. 20 S., R. 09 E., NMPM (approximately 30 acres)

Objective: To permit the continued use of this area by the public for mineral material extraction.

Previous Management: Standard lease terms and conditions

Waiver: None

Exception: May be granted if BLM determines that surface lease operations would not cause unnecessary effects on the use of the area.

Modification: None

Justification: Stipulating no surface occupancy is needed to protect the mineral materials that are extracted by the public, and regulate the area in order to minimize unnecessary degradation. Under standard lease terms and conditions, the requirements described above would be similar; however, the no surface occupancy stipulation informs the lessee of the resource concern at the time the lease is acquired.

Riparian/Other Wetlands/Playas

Stipulation: No surface occupancy

Location: Within 0.25 mile of riparian areas. Various (approximately 10,497 acres)

- BLM Las Cruces Field Office Riparian Database = 16 miles of riparian area (5,120 acres) and 12 springs (1,920 acres)
- Mapped playas = 3,457 acres

Objective: To minimize impacts on wetlands in compliance with Section 404 of the Clean Water Act and on riparian habitats in accordance with BLM guidelines.

Previous Management: Section 404 of the Clean Water Act, general management guidance

Waiver: May be granted if an on-site inspection reveals that the area does not qualify as riparian or wetland.

Exception: None

Modification: May be granted to allow some activities within 0.25 mile if it is determined from BLM analysis that there would be no adverse effect and that the area may be reclaimed effectively

Justification: Stipulating no surface occupancy is deemed necessary for areas that would not be avoided or protected under standard lease terms and conditions in compliance with the Clean Water Act. Closing such areas to leasing is deemed overly restrictive.

Ecological Study Plots

Stipulation: No surface occupancy

- **Engle Ecological Study Plot**
Location: Section 35, T. 13 S., R. 02 W., NMPM (approximately 40 acres)
- **Cuchillo Ecological Study Plot**
Location: Sections 10, 11, 14, T. 12 S., R. 05 W., NMPM (approximately 1,471 acres)
- **Nordstrom Ecological Study Plot**
Location: Sections 27, 28, 33, 34, T. 16 S., R. 05 W., NMPM (approximately 1,391 acres)
- **Trujillo Ecological Study Plot**
Location: Section 3, T. 12 S., R. 06 W., NMPM (approximately 39 acres)
- **Danley Ecological Study Plot**
Location: Section 18, T. 13 S., R. 09 E., NMPM (approximately 179 acres)
- **Lee Ecological Study Plot**
Location: Section 21, T. 23 S., R. 13 E., NMPM (approximately 40 acres)

Objective: To protect the existing ecological resources in these areas for research and scientific purposes.

Previous Management: 1986 RMP Decision OGG-4, Public Land Order 4038

Waiver: May be granted if the withdrawal is dropped and the study plot will no longer require this level of protection.

Exception: May be granted if it is determined that proposed development will not affect the resources that are being studied at the plots.

Modification: None

Justification: Stipulating no surface occupancy is deemed necessary to protect the existing ecological resources. Under standard terms and conditions, the requirements for protecting these areas would be the same.

Tularosa River Recreation Area

Stipulation: No surface occupancy (213 acres of acquired land not open to leasing)

Location: Sections 29, 31, and 31, T. 13 S., R. 11 E., NMPM (approximately 119 acres)

Objective: To protect recreational opportunities along the Tularosa River.

Previous Management: 1986 RMP Decision OGG-8, Tularosa Land Exchange

Waiver: None

Exception: None

Modification: None

Justification: Stipulating no surface occupancy is deemed necessary to protect recreational opportunities along the river. Closing the area to leasing is deemed overly restrictive in addition to the resource stipulations that would apply to this area.

Lake Valley Historic Townsite

Stipulation: No surface occupancy

Location: T. 18 S., R. 07 W., NMPM (approximately 140 acres)

Objective: To preclude surface occupancy and new surface-disturbing activities within this recreational and cultural site.

Previous Management: Existing cultural resources regulations

Waiver: None

Exception: None

Modification: None

Justification: Stipulating no surface occupancy is deemed necessary to protect the townsite and schoolhouse, which are subject to existing cultural resource regulations since both are listed on the State Register of Cultural Properties (as Site LA 50088) and are eligible for inclusion on the National Register of Historic Places. Closing the Lake Valley Historic Townsite to leasing is not considered necessary since impacts from operations can be mitigated by requiring no surface occupancy.

Lake Valley Backcountry Byway

Stipulation: No surface occupancy

Location: Ts. 15-19 S., Rs. 05-07 W., NMPM - on public lands within 0.5 mile of the Byway, which is approximately 44 miles long (9,352 acres)

No surface disturbance will be authorized within 0.5 mile of either side of the road. For proposed disturbances between 0.5 mile to 1 mile from either side of the Byway, operators also may be required to provide mitigation to proposed development activities such as siting facilities to be less visually intrusive where possible, or otherwise providing visual screening.

Objective: To protect the scenic resources along the Byway.

Previous Management: Case-by-case evaluation of proposed actions along the Byway corridor

Waiver: None

Exception: None

Modification: None

Justification: Stipulating no surface occupancy is deemed necessary to protect visual resources along the Byway. Closing the area along the Byway to leasing is deemed overly restrictive because the visual

intrusion can be mitigated by requiring no surface occupancy adjacent to the Byway and providing visual screening at distances beyond that.

Berrendo Administrative Camp Site

Stipulation: Controlled surface use

Location: Section 9, T. 23 S., R. 15 E., NMPM (approximately 40 acres)

Objective: To protect the BLM administrative camp site, no fluid mineral activities will be allowed within the fenced area and within 350 feet of the center of the helipad.

Previous Management: Public Land Order 6060, September 2, 1992; expires September 21, 2012

Waiver: None

Exception: None

Modification: May be granted to allow some activities if it is determined that there would be no adverse effect on administrative site facilities.

Justification: Controlled surface use is deemed necessary to avoid land use conflicts and protect BLM administrative site facilities (structure and helipad).

Highly Erosive/Fragile Soils

Stipulation: Controlled surface use. Surface-disturbing activities on fragile or highly erosive soils must incorporate applicable mitigation measures described in the best management practices section of the RMPA (**Appendix B**). Proposed siting of well locations or access routes, on fragile or highly erosive soils, **may be moved at the discretion of the Authorized Officer** in order to avoid steep slopes (greater than 10 percent).

Location: Highly Erosive and Fragile Soils: Includes areas that have been mapped by the Natural Resources Conservation Service as *Alamogordo-Gypsum Land-Aztec; Nickel-Bluepoint; Holloman-Gypsum Land-Yesum; or Prelo-Tome-Largo* soil types (approximately 310,367 acres total).

Objective: To manage highly erosive or fragile soils to maintain productivity and minimize erosion, and to protect watershed values in accordance with 1986 RMP Decisions W-1 W-2, W-3, W-4, W-5, (improve watershed values by reducing peak runoff rates, reducing sediment yields, improve water quality, and receive better on-site utilization of runoff in the long term).

Previous Management: General guidelines to manage soils in areas of high erosion potential to minimize surface disturbance to the extent possible. 1986 RMP Decisions W-1 W-2, W-3, W-4, and W-5.

Waiver: None

Exception: None

Modification: May be granted if an on-site inspection demonstrates that these soils are not present on the specific site, slopes are low, and reclamation will be effective in mitigating impacts. In addition, a

modification may be granted when it can be demonstrated that resource values will not be jeopardized and reclamation will be effective in mitigating impacts.

Justification: Surface-disturbing activities in these areas could cause accelerated erosion or increased instability, necessitating the stipulation of controlled surface use. This also will protect the watershed values and ensure minimal effect on the integrity and long-term appearance of the watershed areas, including the scenic quality and opportunities for recreation. Closing the area to leasing or stipulating no surface occupancy is deemed overly restrictive since BLM allows other surface-disturbing activities within the area.

Desert Grassland Habitat

Stipulation: Controlled surface use. The combined unreclaimed and un revegetated surface disturbance from exploration, drilling, production and other activities associated with lease operations cannot exceed 5 percent of the leasehold(s) at any one time. This limitation applies to all maintenance and operation of producing wells on this lease and any subsequent sublease or other assignments of any type. Surface-disturbing activities would not be authorized on the leasehold until the lessee has formed (or joined an existing) exploratory unit.

Location:

- **Otero Mesa Desert Grassland Area** – Ts. 21-26 S., Rs 10-16 E., NMPM (approximately 104,875 acres)
- **Nutt Desert Grassland Area** – T. 18-19 S., Rs. 05-07 W., NMPM (approximately 16,266 acres)

Objective: To protect the desert grasslands on Otero Mesa and Nutt and the associated threatened or endangered wildlife species

Previous Management: General management guidance

Waiver: None

Exception: None

Modification: May be modified only in the case of temporary surface disturbances that will be substantially unnoticeable within one year of initial disturbance (e.g., geophysical exploration) or in the case of demonstrated need for health or safety. Also may be modified where BLM requires additional surface disturbance to protect grassland or other natural resources.

Justification: The Otero Mesa and Nutt areas contain large blocks of generally undisturbed Chihuahuan Desert grassland habitat that are important to the maintenance of numerous desert grasslands species that inhabit them. A stipulation to control surface use is necessary to manage the amount of disturbance within these remaining areas. The areas in particular are two relatively large blocks of desert grassland habitat remaining in the region and particularly on public land.

Designated Historic Trails (Mormon Battalion, Butterfield, and Jornada del Muerto)

Stipulation: Controlled surface use

Locations:

- Mormon Battalion Trail – Ts. 18 and 19 S., Rs. 05-07 W., NMPM (approximately 17,724 acres)
- Butterfield Trail – Ts. 25 and 26 S., Rs. 12-14 E., NMPM (approximately 4,333 acres)
- Jornada del Muerto Trail – Ts. 13-20 S., Rs. 01 and 02 W., NMPM (approximately 14,018 acres)

New disturbance will be minimized as follows:

- No surface-disturbing activities within 0.25 mile from each side of the trails (entire length)
- Existing disturbance points could be used to cross the trails

Objective: To provide protection for existing cultural and scenic values associated with these trails.

Previous Management: Protection of Mormon Battalion Trail through existing cultural resources regulations. Butterfield Trail protected by RMP Decision C-6 and Jornada del Muerto Trail protected by 1986 RMP Decision C-7. These decisions stipulate no surface disturbance within 0.25 mile (400 meters) of well-preserved sections of trail.

Waiver: None

Exception: Granted if it is demonstrated in a surface use plan of operations that no surface-disturbing activities will be visible from the trails, and that existing disturbed points/areas would be used to cross the trail.

Modification: None

Justification: Stipulating controlled surface use is deemed necessary to minimize impacts on cultural resources. Closing the trails and a 0.25-mile buffer on either side of the trails to leasing or stipulating no surface occupancy is not considered necessary since impacts can be mitigated by requiring controlled surface use.

Visual Resource Management Class II Areas

Stipulation: Controlled surface use

Location: Various (254,112 acres)

New disturbance will be minimized as follows:

- Short-term impacts allowed as long as the longer-term impacts (one year) are consistent with the VRM Class II objectives
- Reclamation must occur as soon as possible
- Conditions of approval will be imposed such as paint color, judicious siting, and maximized use of existing roads and utility corridors
- Proposed disturbances may be moved more than 200 meters to meet VRM Class II objectives

Objective: To minimize contrasts to the characteristic landscape of each area.

Previous Management: BLM VRM objectives

Waiver: None

Exception: None

Modification: None

Justification: Stipulating controlled surface use is deemed necessary based on the need to protect visual resources in these areas. The objectives for VRM Class II areas are to manage activities so that the changes in any of the basic visual elements (form, line, color, texture) are not evident in the landscape. A contrast may be seen but should not attract attention. Closing these areas to leasing or stipulating no surface occupancy is deemed overly restrictive since BLM allows other surface-disturbing activities within these areas.

Special Status Species Habitats (including those not protected by the Endangered Species Act; that is, species proposed for Federal listing, Federal candidates, BLM sensitive species, and State-listed species)

Stipulation: Controlled surface use. Operations should be designed to avoid known populations of special status species. Each exploration and development project would be evaluated for potential effects on known populations of special status species. In known population areas, surface-disturbing activities may be relocated beyond 0.125 mile, but not more than 0.25 mile. Seasonal restrictions may apply, depending on the need of the identified species.

Location: Species-specific, would apply to known locations of special status species, which would be identified at the time of leasing. Currently this would apply to habitats for the following known species:

- **Plants:** Desert night-blooming cereus; Guadalupe rabbitbrush; Grama grass cactus; Guadalupe Mountains mesquite; Sheer's cory cactus
- **Animals:** Arizona black-tailed prairie dog; mountain plover; western burrowing owl

Objective: To avoid adverse impacts on individual species and their associated habitats

Previous Management: Endangered Species Act, New Mexico Plant Species Act (9-10-10 NMSZ) and attendant Regulation 19 NMAC 21.2, Wildlife Conservation Act (NMSA 17-2-37 through 17-2-46), general management guidance

Waiver: None

Exception: May be granted if surveys determine that no species occupy the leasehold

Modification: None

Justification: Stipulating controlled surface use is deemed necessary to minimize adverse impacts on special status species and their habitats, as required by BLM guidance. Closing these areas to leasing or stipulating no surface occupancy is deemed overly restrictive since BLM allows other surface-disturbing activities within the area. Under standard lease terms and conditions, the requirements described above would be the same; however, the stipulation for controlled surface use informs the lessee of the resource concern at the time the lease is acquired.

White Sands Missile Range Safety Evacuation Zone

Lease Notice

Location: Ts. 10-17 S., Rs. 01, 02 E. and 01 W., NMPM (approximately 311,410 acres)

Objective: To provide notice to lessees that they may be required to periodically evacuate this area when White Sands Missile Range conducts its missile firings.

Previous Management: 1986 RMP Decision OGG-1

Justification: To ensure that the lessee is aware that White Sands Missile Range conducts testing of missiles during which times White Sands Missile Range requires that the area be evacuated. Closing the area to leasing or attaching a stipulation to this lease is deemed overly restrictive since the area is viable for fluid minerals development during other times. Prior to beginning exploration activities, the lessee must contact the U.S. Army Corps of Engineers in Albuquerque and the Master Planning Branch at White Sands Missile Range to be advised of the terms of the safety evacuation agreement and missile-firing schedules.

Cuchillo Mountains Piñon Nut Collection Area

Lease Notice: Avoid destruction of piñon pine trees within this area. Operators will be required to implement necessary mitigations to reduce damage to piñon pine trees, such as rerouting of access roads and modification of pad locations.

Location: Ts. 10-12 S., Rs. 07, 08 W., NMPM (approximately 14,863 acres)

Objective: To maintain the current use of the stands of piñon pine trees as a public and commercial nut collection area.

Previous Management: 1986 RMP Decision R-2

Justification: A lease notice is deemed necessary to ensure continued use of the nut collection area. Closing the area to leasing or stipulating no surface occupancy or controlled surface use is deemed overly restrictive since the BLM allows other surface-disturbing activities within these areas.

Red Sands Off-road Vehicle Area

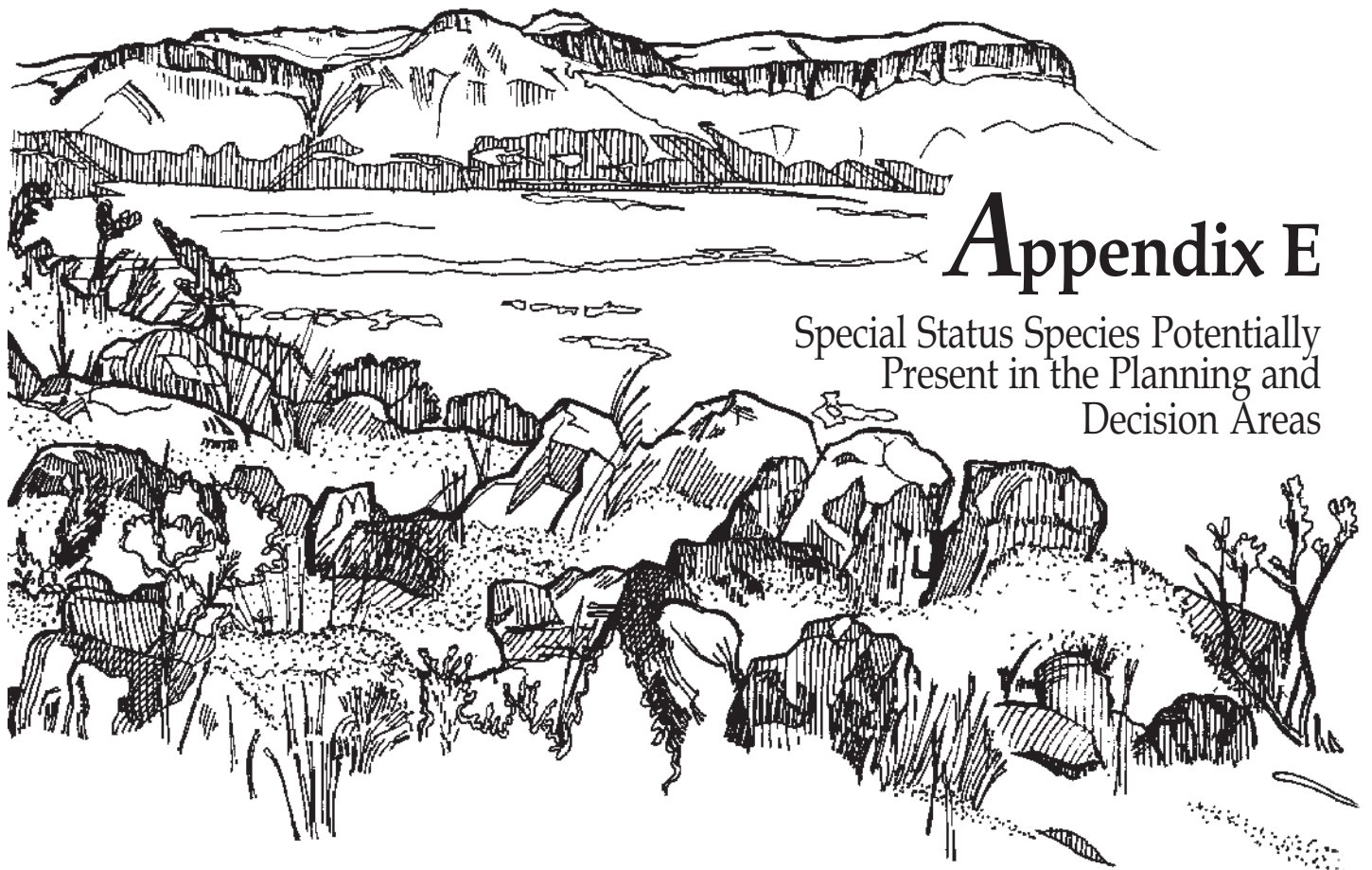
Lease Notice

Location: Ts. 19-21 S., Rs. 08 –09 E., NMPM (approximately 33,600 acres)

Objective: To provide notice to lessees that this is an area which has been identified for use by motorcycle riders. The area contains a number of trails and has been used annually for an enduro race, the Tarantula 100, as well as being frequently used on weekends.

Previous Management: Standard lease terms and conditions

Justification: To ensure that the lessee is aware that there are a number of people that frequent this area for motorcycle recreation use and that the operator may be required to place signs indicating their oil and gas activities at the main entry ways, prior to starting any drilling.



Appendix E

Special Status Species Potentially
Present in the Planning and
Decision Areas

**TABLE E-1
SPECIAL STATUS SPECIES
OCCURRENCE BY BASIN**

Salt/Pecos River Basin	Tularosa Basin	Jornada del Muerto Basin	Rio Grande/Mimbres/Gila River Basins
<p>Guadalupe rabbitbrush, Guadalupe Mountains mesquite, fish hook barrel cactus, gray sycamore, grama grass cactus, Kuenzler's hedgehog cactus, Todsens' pennyroyal, Glass Mountain coral root, gypsum blazing star, gypsum ringstem, aplomado falcon, peregrine falcon, Arizona black-tailed prairie dog, mountain plover, Baird's sparrow, loggerhead shrike, ferruginous hawk, western burrowing owl, gray-footed chipmunk, Mexican spotted owl, northern goshawk, Sacramento prickly poppy, southwestern willow flycatcher, bald eagle, ferruginous hawk, yellow-billed cuckoo, desert bighorn sheep, Guadalupe southern pocket gopher, Cornudas Mountain land snail, Texas horned lizard, gray-banded kingsnake, and numerous bat species</p>	<p>Sacramento prickly poppy, grama grass cactus, Todsens' pennyroyal, Wright's marsh thistle, Alamo beardtongue, aplomado falcon, peregrine falcon, ferruginous hawk, Mexican spotted owl, Baird's sparrow, loggerhead shrike, white faced ibis, black tern, least tern, Arizona black-tailed prairie dog, desert bighorn sheep, southwestern willow flycatcher, yellow-billed cuckoo, White Sands woodrat, desert pocket gopher, Texas horned lizard, gray-banded kingsnake, and numerous bat species</p>	<p>Grama grass cactus, aplomado falcon, loggerhead shrike, desert bighorn sheep, Texas horned lizard, and numerous bat species</p>	<p>Sheer's cory cactus, Duncan's cory cactus, Roetter's hedgehog cactus, bald eagle, southwestern willow flycatcher, yellow-billed cuckoo, loggerhead shrike, Neotropic cormorant, New Mexican jumping mouse, Chiricahua leopard frog, Arizona southwestern toad, longfin dace, Mineral Creek mountainsnail, Texas horned lizard, and numerous bat species</p>



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Endangered Species List

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List of species by county for New Mexico:

Counties Selected: Sierra

Select one or more counties from the following list to view a county list:

Bernalillo	<input type="checkbox"/>
Catron	<input type="checkbox"/>
Chaves	<input type="checkbox"/>
Cibola	<input type="checkbox"/>
Colfax	<input type="checkbox"/>

Sierra County

Common Name	Scientific Name	Listing Status	More Info
bald eagle	<i>Haliaeetus leucocephalus</i>	AD, T	<input type="checkbox"/>
black-footed ferret	<i>Mustela nigripes</i>	E, EXPN	<input type="checkbox"/>
black-tailed prairie dog	<i>Cynomys ludovicianus</i>	C	<input type="checkbox"/>
Chiricahua leopard frog	<i>Rana chiricahuensis</i>	T	<input type="checkbox"/>
Gila trout	<i>Oncorhynchus gilae</i>	E	<input type="checkbox"/>
Mexican spotted owl	<i>Strix occidentalis lucida</i>	T	<input type="checkbox"/>
northern aplomado falcon	<i>Falco femoralis septentrionalis</i>	E	<input type="checkbox"/>
Rio Grande silvery minnow	<i>Hybognathus amarus</i>	E	<input type="checkbox"/>
southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	E	<input type="checkbox"/>
Todsens's pennyroyal	<i>Hedeoma todsenii</i>	E	<input type="checkbox"/>
whooping crane	<i>Grus americana</i>	E, EXPN	<input type="checkbox"/>
yellow-billed Cuckoo	<i>Coccyzus americanus</i>	C	<input type="checkbox"/>



U.S. Fish & Wildlife Service

Endangered Species List

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List of species by county for New Mexico:

Counties Selected: Otero

Select one or more counties from the following list to view a county list:

Bernalillo	<input type="checkbox"/>
Catron	<input type="checkbox"/>
Chaves	<input type="checkbox"/>
Cibola	<input type="checkbox"/>
Colfax	<input type="checkbox"/>

[View County List](#)

Otero County

<u>Common Name</u>	<u>Scientific Name</u>	<u>Listing Status</u>	<u>More Info</u>
bald eagle	<i>Haliaeetus leucocephalus</i>	AD, T	F
black-footed ferret	<i>Mustela nigripes</i>	E, EXPN	F
black-tailed prairie dog	<i>Cynomys ludovicianus</i>	C	F
Kuenzler hedgehog cactus	<i>Echinocereus fendleri var. kuenzleri</i>	E	F
least tern	<i>Sterna antillarum</i>	E	F
Mexican spotted owl	<i>Strix occidentalis lucida</i>	T	F
northern aplomado falcon	<i>Falco femoralis septentrionalis</i>	E	F
Sacramento Mountains checkerspot Butterfly	<i>Euphydryas anicia cloudcrofti</i>	PE	F
Sacramento Mountains thistle	<i>Cirsium vinaceum</i>	T	F
Sacramento prickly poppy	<i>Argemone pleiacantha ssp. pinnatisecta</i>	E	F
southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	E	F
Todsens pennyroyal	<i>Hedeoma todsenii</i>	E	F

New Mexico Game & Fish - Animals in BISON-M

Search on:

Category = 'All'

County = 'NM-Sierra'

Status = 'State NM: Threatened'

Current Date: October 16, 2003

Number of Record(s) Found: 12

Records Last Updated on: January 06, 2000



Click on species name to see species report.

Category: Birds

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Cormorant, Neotropic	Phalacrocorax brasilianus
Eagle, Bald	Haliaeetus leucocephalus
Black-hawk, Common	Buteogallus anthracinus anthracinus (NM)
Falcon, Peregrine, American	Falco peregrinus anatum
Hummingbird, Lucifer	Calothorax lucifer
Vireo, Bell's	Vireo bellii
Vireo, Gray	Vireo vicinior
Sparrow, Baird's	Ammodramus bairdii
Bunting, Varied	Passerina versicolor

Category: Fish

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Trout, Gila	Oncorhynchus gilae
Pupfish, White Sands	Cyprinodon tularosa

Category: Molluscs

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Mountainsnail, Mineral Creek	Oreohelix pilsbryi
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Bat, Myotis, Fringed	<i>Myotis thysanodes thysanodes</i> (NM,AZ)
Bat, Myotis, Long-eared	<i>Myotis evotis evotis</i> (NM,AZ)
Bat, Big-eared, Townsend's, Pale	<i>Plecotus townsendii pallescens</i> (NM,AZ)
Prairie Dog, Gunnison's	<i>Cynomys gunnisoni</i>
Gopher, Pocket, Botta's	<i>Thomomys bottae opulentus</i> (NM)
Muskrat, Pecos River	<i>Ondatra zibethicus ripensis</i> (NM)
Ringtail	<i>Bassariscus astutus</i>
Skunk, Hog-nosed, Common	<i>Conepatus mesoleucus</i>

Category: Reptiles

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Slider, Big Bend	<i>Trachemys gaigeae</i>
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New Mexico Game & Fish - Animals in BISON-M

Search on:

Category = 'All'

County = 'NM-Otero'

Status = 'State NM: Threatened'

Current Date: October 16, 2003

Number of Record(s) Found: 13

Records Last Updated on: January 06, 2000



Click on species name to see species report.

Category: Amphibians

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Salamander, Sacramento Mtn.	Aneides hardii
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Category: Birds

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Cormorant, Neotropic	Phalacrocorax brasilianus
Eagle, Bald	Haliaeetus leucocephalus
Black-hawk, Common	Buteogallus anthracinus anthracinus (NM)
Falcon, Peregrine, American	Falco peregrinus anatum
Vireo, Bell's	Vireo bellii
Vireo, Gray	Vireo vicinior
Sparrow, Baird's	Ammodramus bairdii
Bunting, Varied	Passerina versicolor

Category: Fish

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Pupfish, White Sands	Cyprinodon tularosa
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Category: Mammals

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Bat, Spotted	Euderma maculatum
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Mouse, Jumping, New Mexican

Zapus hudsonius luteus (NM,AZ)

Category: Reptiles

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Rattlesnake, Rock, Mottled

Crotalus lepidus lepidus (NM)



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New Mexico Game & Fish - Animals in BISON-M

Search on:

Category = 'All'

County = 'NM-Sierra'

Status = 'State NM: Endangered'

Current Date: October 16, 2003

Number of Record(s) Found: 5

Records Last Updated on: January 06, 2000

Click on species name to see species report.



Category: Birds

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Pelican, Brown	<i>Pelecanus occidentalis carolinensis</i> (NM)
Falcon, Aplomado	<i>Falco femoralis septentrionalis</i> (NM)
Ground-dove, Common	<i>Columbina passerina pallescens</i> (NM)
Flycatcher, Willow, SW.	<i>Empidonax traillii extimus</i>

Category: Mammals

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Sheep, Bighorn, Desert	<i>Ovis canadensis mexicana</i> (endangered pops)
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New Mexico Game & Fish - Animals in BISON-M

Search on:

Category = 'All'

County = 'NM-Otero'

Status = 'State NM: Endangered'

Current Date: October 16, 2003

Number of Record(s) Found: 7

Records Last Updated on: January 06, 2000



Click on species name to see species report.

Category: Birds

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Pelican, Brown	<i>Pelecanus occidentalis carolinensis</i> (NM)
Falcon, Aplomado	<i>Falco femoralis septentrionalis</i> (NM)
Tern, Least, Interior	<i>Sterna antillarum athalassos</i> (NM)
Ground-dove, Common	<i>Columbina passerina pallescens</i> (NM)
Trogon, Elegant	<i>Trogon elegans canescens</i> (NM)
Flycatcher, Willow, SW.	<i>Empidonax traillii extimus</i>

Category: Mammals

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Chipmunk, Least, Penasco	<i>Tamias minimus atristriatus</i> (NM)
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New Mexico Game & Fish - Animals in BISON-M

Search on:

Category = 'All'

County = 'NM-Sierra'

Status = 'State NM: Sensitive taxa (informal)'

Current Date: October 16, 2003

Number of Record(s) Found: 20

Records Last Updated on: January 06, 2000



Click on species name to see species report.

Category: Amphibians

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Toad, Arizona	Bufo microscaphus microscaphus (NM,AZ)
Frog, Leopard, Chiricahua	Rana chiricahuensis

Category: Birds

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Goshawk, Northern	Accipiter gentilis
Plover, Mountain	Charadrius montanus
Owl, Spotted, Mexican	Strix occidentalis lucida (NM,AZ)

Category: Fish

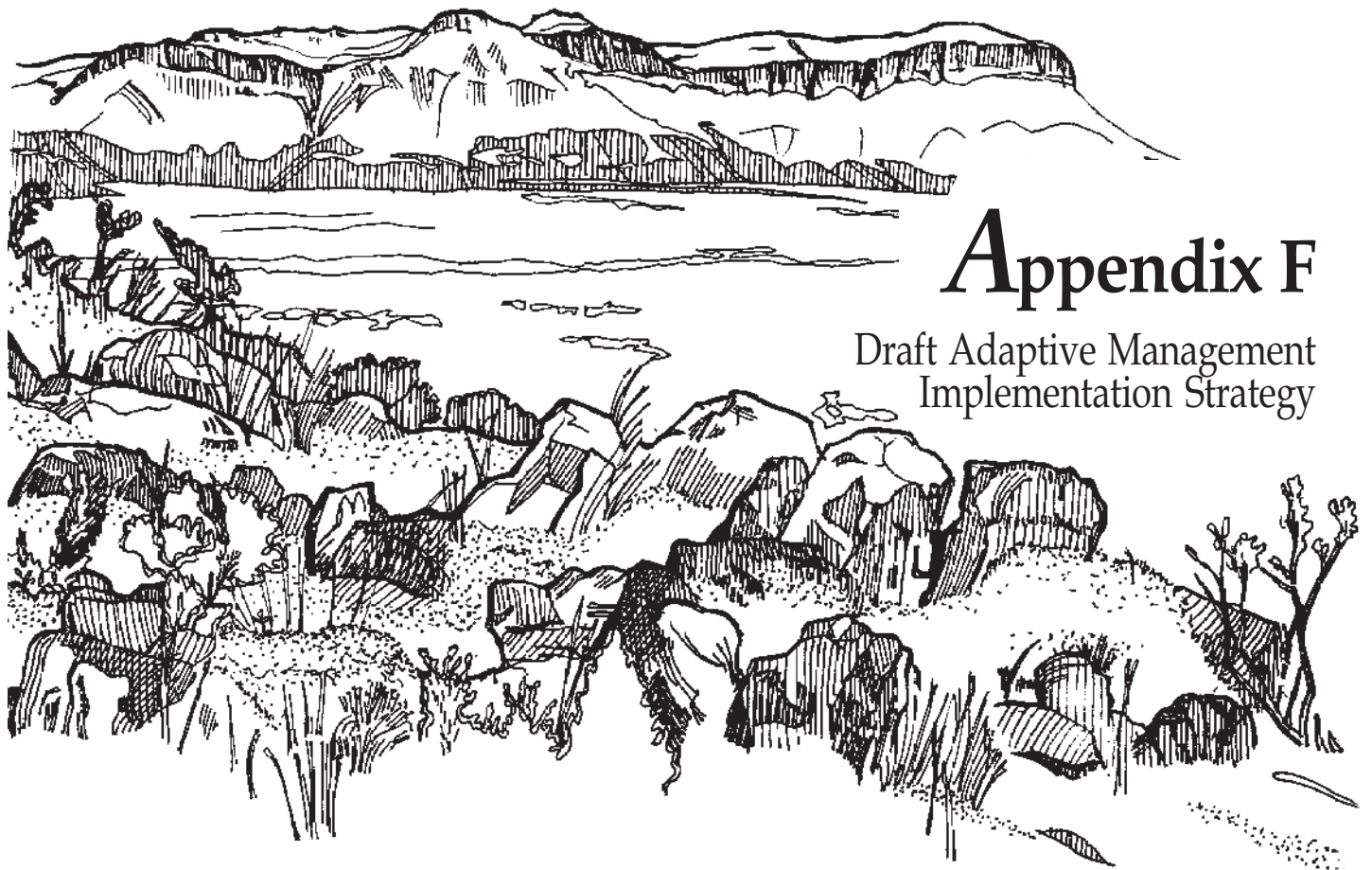
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Trout, Cutthroat, Rio Grande	Oncorhynchus clarki virginalis (NM)
Chub, Rio Grande	Gila pandora

Category: Mammals

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Bat, Myotis, Small-footed, W.	Myotis ciliolabrum melanorhinus (NM,AZ)
Bat, Myotis, Yuma	Myotis yumanensis yumanensis (NM,AZ)
Bat, Myotis, Brn., Little, Occult	Myotis lucifugus occultus (NM,AZ)
Bat, Myotis, Long-legged	Myotis volans interior (NM,AZ)



Appendix F

Draft Adaptive Management
Implementation Strategy

APPENDIX F

DRAFT ADAPTIVE MANAGEMENT IMPLEMENTATION STRATEGY

This appendix outlines the possible adaptive management implementation strategy for three core habitat areas for aplomado falcon in the Nutt and Otero Mesa desert grassland habitat areas (see Map F-1). Adaptive management is defined as management practice based on clearly defined outcomes, monitoring to determine if management actions are meeting the defined outcomes, and if not, facilitating management changes that will best ensure that the defined outcomes are met or to re-evaluate the outcomes. It is a systematic process for continually improving management by learning from the outcomes of actions over time.

The proposed decision for the Nutt and Otero Mesa desert grassland areas as stated in Section 2.4 (page 2-28) of this document is that those areas would remain open to leasing, but with a stipulation to control surface use by limiting industry's disturbance to no more than 5 percent of the leasehold at any one time and requiring the new lessees to form exploratory units prior to commencing drilling activity. The potential impacts of that decision are described in Chapter 4 of this document. However, because of the uncertainties of future oil and gas activities and their impacts in the Nutt and Otero Mesa grassland areas, three core habitat areas for aplomado falcon would be withheld from leasing until the effects are better known. The three core habitat areas are comprised of one

area within the Nutt grassland complex (8,094 acres) and two areas within the Otero Mesa grassland complex (11,483 acres and 16,213 acres). As part of the Bureau of Land Management's (BLM's) adaptive management, these areas and adjacent grasslands would be re-evaluated at 5-year intervals. Information on aplomado falcon use of the areas and oil and gas reserves would be evaluated to determine if adjustments are needed to protect the species and/or allow for orderly development of potential oil and gas reserves.

Monitoring of the Nutt and Otero Mesa grassland areas and evaluating at 5-year intervals based on the following factors:

- Level of oil and gas development throughout the leased areas that contain grassland habitat
- Status of aplomado falcon occurrence either by natural recolonization or released in accordance with the Endangered Species Act section 10(j).
- Evaluation of new information regarding aplomado falcons and/or their habitat

The results of monitoring would be available for public review in the Las Cruces Field Office.

