DOE/EA-1583

ROCKY MOUNTAIN OILFIELD TESTING CENTER / NAVAL PETROLEUM RESERVE NO. 3

FINAL

Site-wide Environmental Assessment

and

Finding of No Significant Impact

October 2008

U.S. Department of Energy
Rocky Mountain Oilfield Testing Center
907 N. Poplar Street, Suite 150
Casper WY 82601

Department of Energy
Washington, DC 20585

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Department of Energy
Naval Petroleum Reserve/ Rocky Mountain Oil Filed Testing Center
907 N. Poplar Street, Suite 150
Casper WY 82601

October 1, 2008

DOE/EA 1583

FINDING OF NO SIGNIFICANT IMPACT for the ROCKY MOUNTAIN OILFIELD TESTING CENTER / NAVAL PETROLEUM RESERVE NO. 3 SITEWIDE ENVIRONMENTAL ASSESSMENT

AGENCY: Department of Energy, Naval Petroleum Reserve No. 3 / Rocky Mountain Oil Filed Testing Center

ACTION: Finding of No Significant Impact

SUMMARY: The U.S. Department of Energy (DOE) is proposing to continue oil and gas production at Naval Petroleum Reserve No. 3 (NPR-3) and to expand the operation of the Rocky Mountain Oil Filed Testing Center (RMOTC), located within NPR-3, as a Center of Excellence for testing and demonstrating new energy development techniques and technologies. The Proposed Action—continued operations of NPR-3 and expanded operations of RMOTC—represents a shift in DOE policy from the proposed facility shut-down and transfer assessed in the *1998 Sitewide Assessment for Preparation for Transfer of Ownership of Naval Petroleum Reserve No. 3*).

The proposed action to continue operations and expand the site's mission under RMOTC required that DOE evaluate these actions in compliance with the NEPA (42 U.S.C. 4321) and with DOE's NEPA implementing regulations (10 CFR section 1021.330) and procedures. In the Sitewide Environmental Assessment (SWEA), DOE evaluated three alternative operating futures for NPR-3 and RMOTC over the next 5 years: the Proposed Action, the No Action Alternative, and the Decommissioning and Divestiture (D&D) Alternative.

Under the Proposed Action, oil and gas extraction would continue at levels comparable to current operations, and in addition, RMOTC would expand its program of testing and evaluating technologies and equipment that would enhance oil and gas field operations and production. Under the No Action Alternative, NPR-3 operations would also continue at current levels, as would RMOTC's operations; however, the specific new projects proposed for the next 5 years under the Proposed Action that would expand RMOTC's research and testing mission would not occur. Under the D&D Alternative, DOE would close uneconomical wells, remove buildings and other facilities lacking value for future operations, and reduce its future liabilities at the site. Additionally, depending upon the success of these actions and the residual value of the field, DOE could choose to sell or transfer ownership of NPR-3 and RMOTC to another entity under the D&D Alternative.

All discussions and findings related to the Proposed Action, the No Action Alternatives, and the D&D alternative are presented in the attached Final Environmental Assessment and Appendices. The Final EA is hereby incorporated by reference.

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On the basis of the information and analyses presented in the final SWEA, DOE has determined that the proposed action and alternatives do not constitute a major Federal action significantly affecting the quality of the human environment, as defined by NEPA. Therefore, preparation of an environmental impact statement is not required for the ULP and DOE is issuing this Finding of No Significant Impact (FONSI). Based on this determination DOE will continue operations of NPR-3 and RMOTC will implement the specific actions assessed in the SWEA as funding permits.

SUPPLEMENTARY INFORMATION:

Background

DOE operates the Teapot Dome Oil Field, also known as the Naval Petroleum Reserve No. 3 (NPR-3), as the only operating oil field in the continental United States owned by the U.S. Government. This field is located in Natrona County, Wyoming, approximately 35 miles (56 kilometers) north of the City of Casper, and covers an area of 9,481 acres (3,837 hectares). Production at NPR-3 peaked in 1981; since then, production has declined until the oil field has become a mature stripper field with an average well yielding less than 2 barrels per day.

Production facilities include pumping units, treaters, and tanks for storing petroleum and produced water; low-temperature-separation gas plant; water and gas injection facilities; wastewater disposal system; wastewater treatment facility; and flow lines. In addition, there are numerous support facilities, including electric power distribution systems; cathodic protection systems; potable water and sewer systems; roads; bridges and fences; and buildings for maintenance, production support, administration, safety, security, and environmental purposes.

In 2008, an average of 58 contractor and DOE personnel were employed in the field, and an average of 40 were employed in the Casper office.

RMOTC was established in 1993 as an industry-driven endeavor to utilize NPR-3 resources and facilities to help strengthen the domestic energy industry by testing new petroleum and environmental technologies in operating oil and gas fields owned by the U.S. Government. RMOTC is working with the National Petroleum Technology Office, private companies, national laboratories, and universities to develop partnerships and combine resources for selected projects.

Commercial field testing at RMOTC began in 1995. The majority of the technology and processes field-tested at RMOTC have primary applications in drilling, oil production, enhanced recovery, alternative/renewable energy, and/or production cost reduction. Environmental testing and technology have been large growth areas and areas of increasing importance in both the domestic and worldwide industries.

Purpose and Need

DOE is mandated by Congress to produce oil and gas from NPR-3. As a part of this mission, DOE is committed to the utilization of NPR-3 to explore and develop new techniques and equipment that would enhance NPR-3 production and have applicability to the oil and gas industries. The proposed activities represent a substantial change to the scope and character of operations assessed in a 1998 Sitewide Assessment for Preparation for Transfer of Ownership of Naval Petroleum Reserve No. 3 (NPR-3) (DOE 1998). Consequently, new NEPA documentation was required.

Proposed Action

Under the Proposed Action, oil and gas resources would continue to be extracted from the NPR 3 reserves. Oil and gas extraction would involve the following principal activities:

- **Installing and Operating New Wells**: estimated at 6 to 10 wells per year with the needed support infrastructure of roads, power, and pipelines for produced water, oil, and gas from each well.

- **Plugging and Abandoning Wells** that are no longer economical to operate or useful for testing and demonstration purposes: estimated at 8 wells per year

Also under the Proposed Action, RMOTC's activities would focus on testing and evaluating energy-related technologies to extract oil and gas by methods that are more cost-efficient, safer, and less damaging to natural resources. These activities can be categorized as follows:

- **Oil and Gas Field Development Testing and Demonstration** would include conventional exploration methods, research and development (R&D) of new drilling methods, testing logging tools, and special test facilities to address problems associated with oil and gas extraction and transmission. Specific projects proposed for the next 5 years, which are evaluated in detail in this SWEA, include the Flow Assurance Loop Facility (FALF) and the Complex Well Technology Test Facility (CWTTF).

- **Enhanced Techniques for Oil Recovery** would evaluate techniques aimed at increasing the yields within existing oil and gas fields. One specific project, the Enhanced Oil Recovery (EOR) Technology Project, is currently proposed for the next 5 years and is evaluated in detail in this SWEA.

- **Application and Integration of Renewable Energy Sources** would demonstrate the feasibility of using renewable energy to extend the life of the field and increase the percentage of oil and gas extracted and to lower operating costs. Specific projects proposed for the next 5 years, which are evaluated in detail in this SWEA, include Geothermal Energy Enhancement Facilities and the Wind Turbine Pilot Project.

Environmental Impacts

For all alternatives assessed in the SWEA, impacts would be limited to varying acreages of surface and subsurface disturbance typical of oil field development that has been occurring at NPR-3 for many decades. Some of this disturbance would be offset by reclamation of old wells that would be plugged and abandoned. The principal environmental resources that would be affected by this disturbance would be biological and cultural. With the exception of an off-site pipeline that would bring carbon dioxide to NPR-3 for enhanced oil recovery (EOR) under the Proposed Action, all impacts would occur within the boundaries of NPR-3 for all alternatives.

Based on site surveys in areas that would be subject to disturbance under the alternatives assessed in this SWEA, there would be no disturbance of sensitive or protected plants or animals, nor would sensitive cultural, historical, or archaeological resources be disturbed. It is important to note that although there are known areas of sensitive biological and cultural resources on the NPR site, they would not be impacted by the proposed actions because: their locations are known by DOE and treated as confidential information to protect these resources; the resources exist outside the core areas of development which are generally centrally located within the NPR-3 site; all proposed actions would occur in this central core area; and DOE's site procedures restrict access to sensitive resource areas by site personnel and the public. Furthermore, because new cultural resources may be encountered even within the core development area during surface and subsurface disturbance activities, DOE has in place cultural resource protection procedures which assess each site prior to disturbance activities, and which will mitigate impacts to resources that might be encountered. Additionally, DOE has worked directly with interested Native American tribes who have determined that there are no traditional cultural properties at NPR-3.

Under the Proposed Action and the No Action Alternative, impacts would continue for the next 5 years assessed in the SWEA and beyond. Under the D&D Alternative, surface disturbance-related impacts would continue until the site was sufficiently reclaimed to allow closure and/or transfer. However, the cessation of oil and gas extraction under the D&D alternative would also eliminate the discharge of produced waters into site

drainages and the subsequent loss of miles of wetland habitat (both on-site and off-site) and a water source for wildlife, for which NPR-3 discharges are the principal supporter.

COPIES OF THE FINAL EA ARE AVAIALBLE FROM:

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DETERMINATION:

Based on the information presented in the Final SWEA (DOE/EA 1583), DOE determines that the proposed action and alternatives do not constitute a major Federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act. Therefore, the preparation of an Environmental Impact Statement is not required, and DOE is issuing this Finding of No Significant Impact. Based on this determination DOE will continue operations of NPR-3 and RMOTC will implement the specific actions assessed in the SWEA as funding permits.

Issued in Casper, Wyoming this 1ST day of Oct, 2008.

CLARKE D. TURNER
Director, NPR-3/RMOTC

lmc/msw/5430

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ABBREVIATIONS AND ACRONYMS

API	American Petroleum Institute
BLM	Bureau of Land Management
BMP	best management practice
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CO	carbon monoxide
CO_2	carbon dioxide
COD	chemical oxygen demand
CWTTF	Complex Well Technology Test Facility
dBA	A-weighted decibel
D&D	Decommissioning and Divestiture
DOE	U.S. Department of Energy
EA	environmental assessment
EIS	environmental impact statement
EOR	enhanced oil recovery
EPA	U.S. Environmental Protection Agency
ERD	extended reach drilling
ESA	Endangered Species Act
F	Fahrenheit
FALF	Flow Assurance Loop Facility
FPPA	Farmlands Protection Policy Act
HDPE	high-density polyethylene
IC	internal combustion
kph	kilometers per hour
kW	kilowatt
$\mu g/m^3$	micrograms per cubic meter
MBTA	Migratory Bird Treaty Act
mg/l	milligrams per liter
MMcfd	million cubic feet per day
mph	miles per hour
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NOx	nitrogen oxides
NO_2	nitrogen dioxide
NORM	naturally occurring radioactive material
NPDES	National Pollutant Discharge Elimination System
NPR-3	Naval Petroleum Reserve No. 3
NRCS	Natural Resources Conservation Service
OPS	Office of Pipeline Safety
pCi/l	picocuries per liter
PM	particulate matter
psi	pounds per square inch
psig	pounds per square inch gauge
R&D	research and development
RCRA	Resource Conservation and Recovery Act
RF	Ranching and Farming (District)
RMOTC	Rocky Mountain Oilfield Testing Center
ROW	right-of-way
SCADA	supervisory control and data acquisition

SO_2	sulfur dioxide
SPCC	Spill Prevention Control and Countermeasure (Plan)
SWEA	site-wide environmental assessment
TDS	total dissolved solids
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VAWT	vertical axis wind turbine
VOC	volatile organic compound
WAAQS	Wyoming Ambient Air Quality Standards
WDEQ	Wyoming Department of Environmental Quality
WGFD	Wyoming Game and Fish Department
WYPDES	Wyoming Pollutant Discharge Elimination System

SUMMARY

Introduction

The Department of Energy (DOE) is proposing an action consisting of various site development projects at the Naval Petroleum Reserve No.3 (NPR-3) site at Natrona County, Wyoming. These projects would focus on testing and evaluating energy-related technologies to extract oil and gas by methods that are more cost-efficient, safer, and less damaging to natural resources. These projects can be categorized under the following project types:

- Oil and Gas Field Development Testing and Demonstration Projects
- Enhanced Techniques for oil Recovery Projects
- Application and Integration of Renewable Energy Sources Projects

Under the Proposed Action, oil and gas resources would continue to be extracted from the NPR-3 reserves. Oil and gas extraction would involve the following principal activities:

- Installing and Operating New Wells
- Plugging and Abandoning Wells
- Maintaining and Replacing Infrastructure

In accordance with DOE and National Environmental Policy Act (NEPA) implementing regulations, DOE is required to evaluate the potential environmental impacts of DOE facilities, operations, and related funding decisions. The decision to use federal funds for this Proposed Action requires that DOE address NEPA requirements and related environmental documentation and permitting requirements.

In 1998, DOE issued the *Final Sitewide EA for Preparation for Transfer of Ownership of Naval Petroleum Reserve No. 3 (NPR-3) in Complex* and a Finding of No Significant Impact (FONSI) for the proposed site development activities (DOE/EA-1236) (DOE 1998). In compliance with the NEPA (42 U.S.C. 4321) and with DOE's NEPA implementing regulations (10 CFR § 1021.314) and procedures, DOE is examining the potential environmental impacts of the Proposed Action described above as an updated site-wide environmental assessment (SWEA) to the 1998 EA. The SWEA provides the analytical structure to assess the potential environmental impacts of the Proposed Action that is the topic of this SWEA. The 1998 site-wide EA is incorporated in its entirety into this SWEA by reference, and to the fullest extent possible, this SWEA tiers off the descriptions of the affected environment and the potential environmental impact assessments presented in the 1998 site-wide EA.

This SWEA has been prepared under DOE's regulations and guidelines for compliance with NEPA.

Purpose and Need

The purpose of this updated SWEA is to assess the individual and cumulative potential effects of the Proposed Action to determine if they would pose a significant impact to the human environment.

The purpose and need for the Proposed Action is to (1) allow DOE to explore and develop new techniques and equipment that would enhance NPR-3 production and have applicability to the oil and gas industries; (2) operate and produce NPR-3 energy reserves in a manner consistent with the best practices of the oil and gas industries; and (3) provide the site infrastructure necessary to support the proposed development activities, and improve the current oil and gas transmission infrastructure. This SWEA

addresses the continued operations of NPR-3 and the proposed expanded operations of the RMOTC over the next 5 years in pursuit of these mission objectives.

Proposed Action

Under the Proposed Action, which is also DOE's Preferred Alternative, activities would focus on testing and evaluating energy-related technologies to extract oil and gas by methods that are more cost-efficient, safer, and less damaging to natural resources. These activities can be categorized as follows:

- **Oil and Gas Field Development Testing and Demonstration** would include conventional exploration methods, research and development (R&D) of new drilling methods, testing logging tools, and special test facilities to address problems associated with oil and gas extraction and transmission.

- **Enhanced Techniques for Oil Recovery** would evaluate techniques aimed at increasing the yields within existing oil and gas fields.

- **Application and Integration of Renewable Energy Sources** would demonstrate the feasibility of using renewable energy to extend the life of the field, increase the percentage of oil and gas extracted, and lower operating costs.

Under the Proposed Action, oil and gas resources would continue to be extracted from the NPR-3 reserves. Oil and gas extraction would involve the following principal activities:

- **Installing and Operating New Wells** with the needed support infrastructure of roads, power, and pipelines for produced water, oil, and gas from each well.

- **Plugging and Abandoning Wells** that are no longer economical to operate.

- **Maintaining and Replacing Infrastructure** to upgrade components of an aging system of buildings, roads, pipelines, transmission lines, pumps, storage tanks, flow lines, and treatment systems needed to support an operating oil and gas field.

Alternatives

DOE is considering two alternatives to the proposed action in this SWEA: the No Action Alternative and the Decommissioning and Divestiture (D&D) Alternative. Under the No Action Alternative, DOE would continue the ongoing oil and gas production activities of NPR-3, routine maintenance, and the ongoing test and evaluation activities of the Rocky Mountain Oilfield Testing Center (RMOTC), but the expansion of these activities planned under the Proposed Action would not occur. Under the D&D Alternative, DOE would close and abandon uneconomical wells and other facilities that would reduce the Department's future liability and would possibly sell or transfer the NPR field to another entity.

Scoping

On June 18, 2007, DOE distributed a scoping/consultation letter to the public and to county, state, and federal agencies and other organizations requesting public and agency comments on the Proposed Action (Appendix A). The scoping/consultation letter was also posted on the DOE RMOTC/NPR-3 website. DOE received comments from the U.S. Fish & Wildlife Service, the Wyoming Office of State Lands and Investment, and the Wyoming Game & Fish Department in response to the scooping/consultation letter;

these comments are summarized in Appendix B. DOE considered these comments when preparing the subject SWEA.

Comments on the Draft SWEA

DOE received comments on the draft SWEA from the United States Fish and Wildlife Service and Anadarko Petroleum Corporation. These comments were considered in the finalization of this SWEA and responses to all comments are provided in Appendix D.

Environmental Consequences

This SWEA considers the following environmental resource or impact areas:

- Land Resources
- Air Quality and Meteorology
- Water Resources
- Geology, Soils, and Prime and Unique Farmlands
- Biological Resources
- Cultural Resources
- Socioeconomics
- Waste Management
- Environmental Justice

For all alternatives assessed in this SWEA, impacts would be limited to varying acreages of surface and subsurface disturbance typical of oil field development that has been occurring at NPR-3 for many decades. Some of this disturbance would be offset by reclamation of old wells that would be plugged and abandoned. The principal environmental resources that would be affected by this disturbance would be biological and cultural. Based on site surveys in areas that would be subject to disturbance under the alternatives assessed in this SWEA, there would be no disturbance of sensitive or protected plants or animals, nor would sensitive cultural, historical, or archaeological resources be disturbed. Additionally, DOE has worked directly with interested Native American tribes who have determined that there are no traditional cultural properties at NPR-3. DOE has committed to continuing its relationship with the tribes and has procedures in place to mitigate impacts to any cultural resources that may be uncovered during surface- and subsurface-disturbing activities.

With the exception of an off-site pipeline that would bring carbon dioxide to NPR-3 for enhanced oil recovery (EOR) under the Proposed Action, all impacts would occur within the boundaries of NPR-3 for all alternatives.

Under the Proposed Action and the No Action Alternative, these impacts would continue for the next 5 years assessed in this SWEA and beyond. Under the D&D Alternative, surface disturbance-related impacts would continue until the site was sufficiently reclaimed to allow closure and/or transfer. However, the cessation of oil and gas extraction under the D&D alternative would also eliminate the discharge of produced waters into site drainages and the subsequent loss of miles of wetland habitat (both on-site and off-site) and a water source for wildlife, for which NPR-3 discharges are the principal supporter.

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1.0 INTRODUCTION

The U.S. Department of Energy (DOE) is proposing to continue oil and gas production at the Naval Petroleum Reserve No. 3 (NPR-3) and to expand the operation of the Rocky Mountain Oilfield Testing Center (RMOTC), located within NPR-3, as a Center of Excellence for testing and demonstrating new energy development techniques and technologies. NPR-3 and RMOTC are located in Natrona County, Wyoming, approximately 35 miles (56 kilometers) north of the City of Casper. This site-wide environmental assessment (SWEA) is being prepared under the regulations of the National Environmental Policy Act (NEPA) established by the Council on Environmental Quality (CEQ) and DOE.

The Proposed Action—continued operations of NPR-3 and expanded operations of RMOTC—represents a shift in DOE policy from the proposed facility shut-down and transfer assessed in the 1998 *Sitewide Assessment for Preparation for Transfer of Ownership of Naval Petroleum Reserve No. 3 (NPR-3)* (DOE 1998).

1.1 PROPOSED ACTIONS

Under the Proposed Action, RMOTC's activities would focus on testing and evaluating energy-related technologies to extract oil and gas by methods that are more cost-efficient, safer, and less damaging to natural resources. These activities can be categorized as follows:

- **Oil and Gas Field Development Testing and Demonstration** would include conventional exploration methods, research and development (R&D) of new drilling methods, testing logging tools, and special test facilities to address problems associated with oil and gas extraction and transmission. Specific projects proposed for the next 5 years, which are evaluated in detail in this SWEA, include the Flow Assurance Loop Facility (FALF) and the Complex Well Technology Test Facility (CWTTF).

- **Enhanced Techniques for Oil Recovery** would evaluate techniques aimed at increasing the yields within existing oil and gas fields. One specific project, the Enhanced Oil Recovery (EOR) Technology Project, is currently proposed for the next 5 years and is evaluated in detail in this SWEA.

- **Application and Integration of Renewable Energy Sources** would demonstrate the feasibility of using renewable energy to extend the life of the field and increase the percentage of oil and gas extracted and to lower operating costs. Specific projects proposed for the next 5 years, which are evaluated in detail in this SWEA, include Geothermal Energy Enhancement Facilities and the Wind Turbine Pilot Project.

Under the Proposed Action, oil and gas resources would continue to be extracted from the NPR-3 reserves. Oil and gas extraction would involve the following principal activities:

- **Installing and Operating an Estimated 6 to 10 New Wells** per year with the needed support infrastructure of roads, power, and pipelines for produced water, oil, and gas from each well.

- **Plugging and Abandoning an Estimated 8 Wells** per year that are no longer economical to operate or useful for testing and demonstration purposes.

- **Maintaining and Replacing Infrastructure** to upgrade components of an aging system of buildings, roads, pipelines, transmission lines, pumps, storage tanks, flow lines, and treatment

systems needed to support an operating oil and gas field. One specific project, the Wastewater Treatment Facility Upgrade, is currently proposed for the next 5 years.

1.2 NEPA AND RELATED PROCEDURES

The CEQ regulations for implementing the procedural provisions of NEPA (40 CFR Parts 1500-1508) and DOE's implementing procedures for compliance with NEPA (10 CFR Part 1021) require that DOE, as a federal agency:

- assess the environmental impacts of its proposed actions;
- identify any adverse environmental effects that cannot be avoided should a proposed action be implemented;
- evaluate alternatives to the proposed action, including a no action alternative;
- describe the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and
- characterize any irreversible and irretrievable commitments of resources that would be involved should the proposed action be implemented.

These requirements must be met before a final decision is made to proceed with any proposed federal action that could cause significant impacts to human health or the environment.

1.3 BACKGROUND

DOE operates the Teapot Dome Oil Field, also known as the Naval Petroleum Reserve No. 3 (NPR-3), as the only operating oil field in the continental United States owned by the U.S. Government. This field is located in Natrona County, Wyoming, approximately 35 miles (56 kilometers) north of the City of Casper, and covers an area of 9,481 acres (3,837 hectares) (Figure 1-1). Production at NPR-3 peaked in 1981; since then, production has declined until the oil field has become a mature stripper field with an average well yielding less than 2 barrels per day.

Production facilities include pumping units, treaters, and tanks for storing petroleum and produced water; low-temperature-separation gas plant; water and gas injection facilities; wastewater disposal system; wastewater treatment facility; and flow lines. In addition, there are numerous support facilities, including electric power distribution systems; cathodic protection systems; potable water and sewer systems; roads; bridges and fences; and buildings for maintenance, production support, administration, safety, security, and environmental purposes. Figure 1-2 shows the major facilities at NPR-3.

In 2008, an average of 58 contractor and DOE personnel were employed in the field, and an average of 40 were employed in the Casper office.

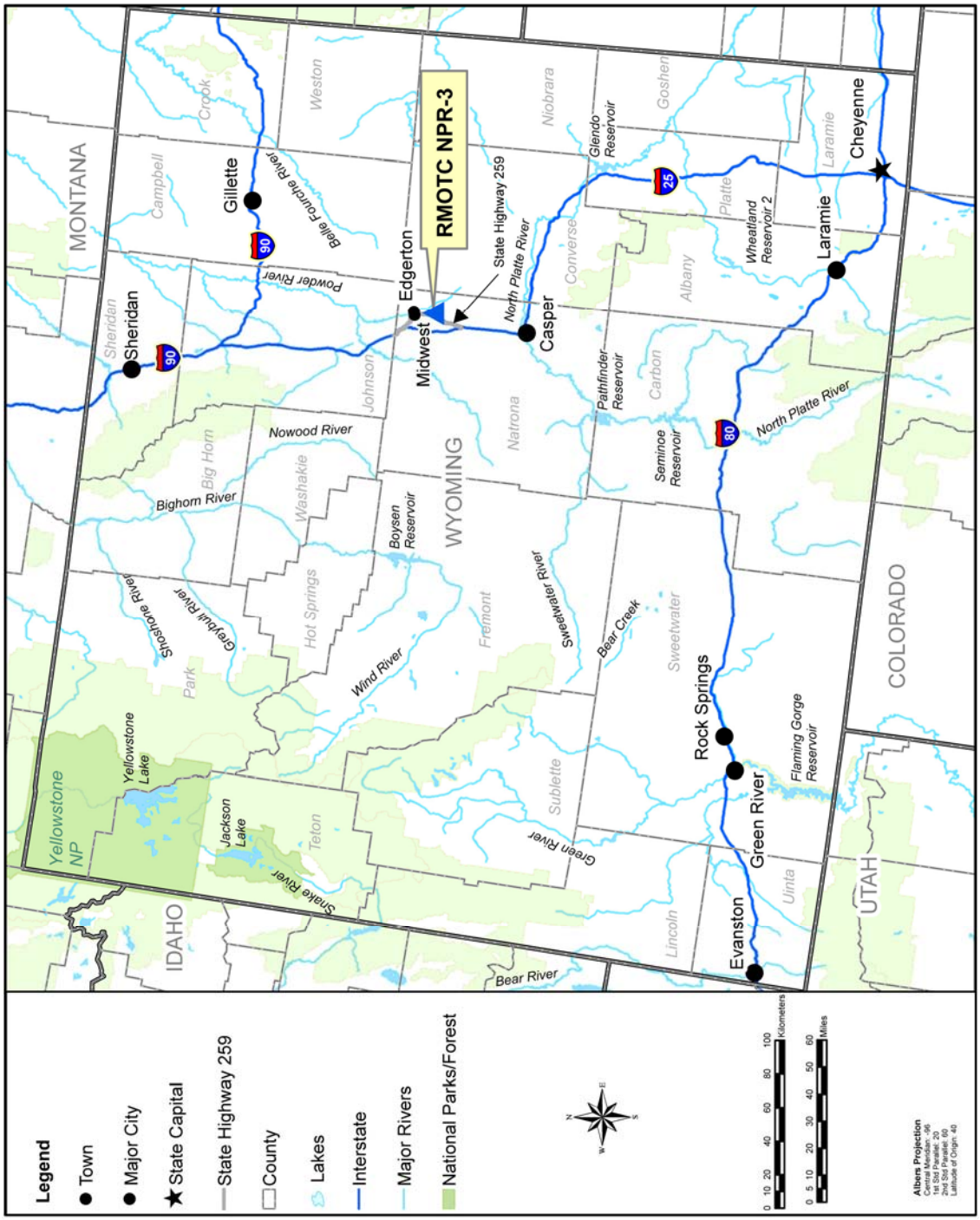

Figure 1-1. Geographic location of project site

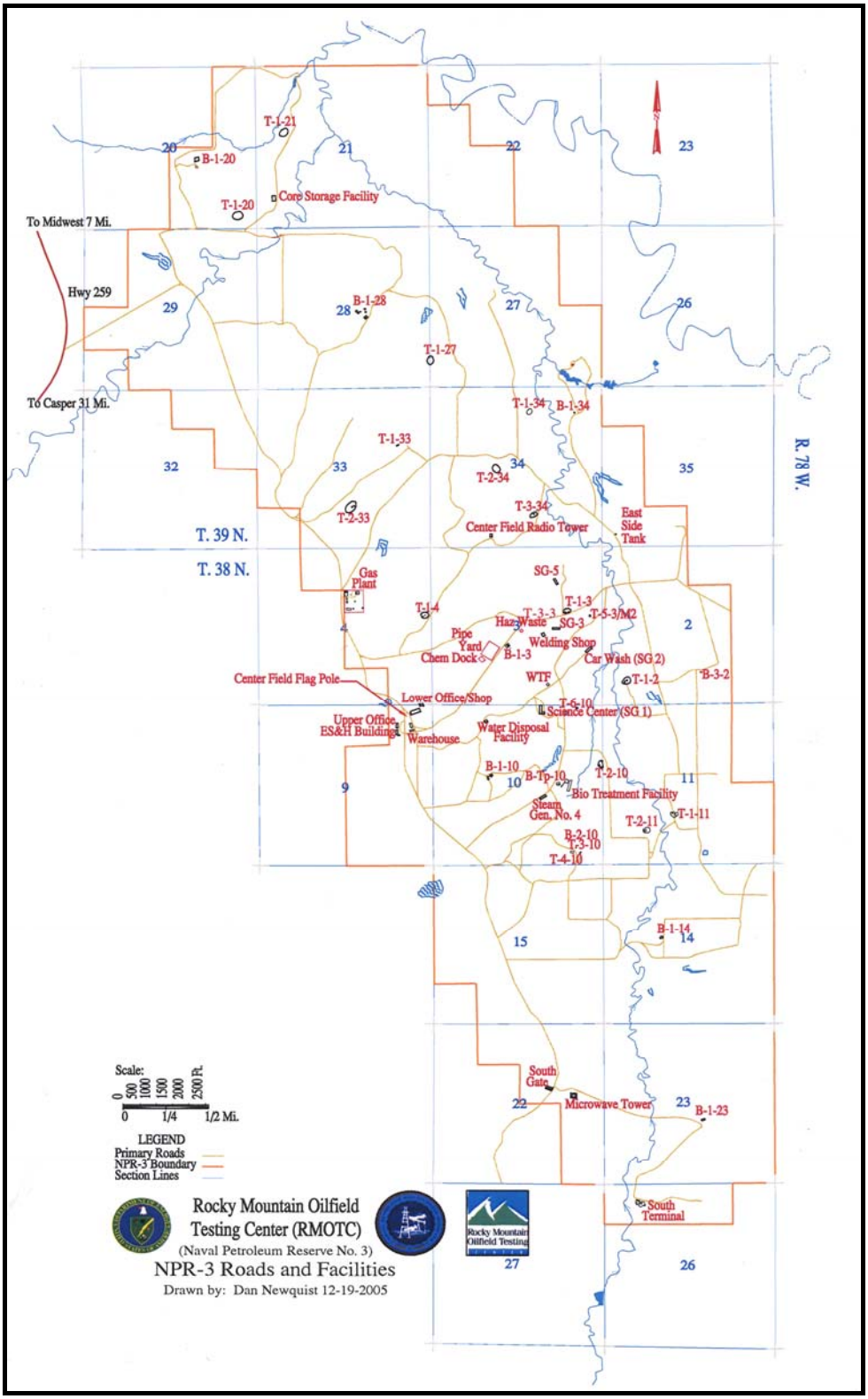

Figure 1-2. Major facilities at NPR-3

The downturn in oil prices in the middle 1980s caused major oil companies to cut their R&D budgets and begin concentrating their operations overseas. This caused a gradual shift in the operation of a majority of domestic oil production to independent producers with little or no R&D capabilities. The industry requested that DOE support more hands-on, applied field technology that could be better utilized by independents, in comparison to DOE's traditional role in larger laboratory and theoretical research efforts.

The RMOTC was established in 1993 as an industry-driven endeavor to utilize NPR-3 resources and facilities to help strengthen the domestic energy industry by testing new petroleum and environmental technologies in operating oil and gas fields owned by the U.S. Government. RMOTC is working with the National Petroleum Technology Office, private companies, national laboratories, and universities to develop partnerships and combine resources for selected projects.

The RMOTC concept quickly received support from industry and government alike. On December 7, 1993, the Interstate Oil and Gas Compact Commission, consisting of governors from 29 oil- and gas-producing states, passed a unanimous resolution supporting the concept of a demonstration and testing center at NPR-3. Industry organizations such as the Independent Petroleum Association of America, the Rocky Mountain Oil and Gas Association, the National Stripper Well Association, and the Independent Petroleum Association of the Mountain States, along with numerous universities and states, all endorsed RMOTC. These endorsements led to RMOTC being included in DOE's "Domestic Natural Gas and Oil Initiative," which outlined DOE's new focus in support of the oil and gas industry's needs.

Commercial field testing at RMOTC began in 1995. The majority of the technology and processes field-tested at RMOTC have primary applications in drilling, oil production, enhanced recovery, alternative/renewable energy, and/or production cost reduction. Environmental testing and technology have been large growth areas of increasing importance in the industry, both domestically and worldwide.

The current target markets for the field test services available at RMOTC are small to large oil field service and equipment manufacturers and suppliers; oil and gas exploration and production companies; federal and national laboratories; private and public research institutions; universities; industry consortia and joint industry projects; and entrepreneurs and inventors working within the petroleum and environmental industries. The broad range of testing-partner types and sizes indicates the wide spectrum of relevance that RMOTC possesses. This relevance manifests itself in the form of diverse, widely felt benefits for the industry and the nation.

1.4 SCOPING

In June 2007, DOE announced its intent to prepare this SWEA in local news media and to its mailing list of interested parties. The Notice Letter and the distribution list of agencies, Tribes, and members of the public are included in Appendix A.

Comments on the scope of this SWEA were received from the U.S. Fish and Wildlife Service (USFWS), the Wyoming Office of State Lands and Investments, and the Wyoming Game and Fish Department (WGFD). These comment letters are included in Appendix B.

Summary of USFWS Comments

The USFWS provided information on (1) threatened, endangered, and candidate species, (2) migratory birds, and (3) wetlands and riparian areas that could occur on or near NPR-3. DOE has reviewed this information and included it in the characterization of the affected environment (Chapter 4.0) and the assessment of impacts (Chapter 5.0). The USFWS also noted that Salt Creek is listed on the State of Wyoming's list for impaired waters of the state, because Teapot and Little Teapot Creeks, which traverse NPR-3, are tributaries of Salt Creek. The USFWS recommended (1) implementing best management

practices (BMPs) in order to control erosion and minimize sediment entering the stream, (2) stabilizing stream banks by incorporating plantings and seed mixtures of native species, and (3) using temporary sediment basins to control erosion during construction activities. DOE actively employs BMPs during all site-disturbing activities and in its reclamation actions. As a major contributor to the tributaries flowing to Salt Creek, DOE also carefully manages and monitors its discharges to Teapot and Little Teapot Creeks to assure compliance with its State of Wyoming discharge permits.

Summary of Wyoming Office of State Lands and Investments Comments

The Wyoming Office of State Lands and Investments noted that project proponents must comply with the rules and regulations adopted by the Board of Land Commissioners in accordance with W.S. 36-2-107 and W.S. 36-9-118, in the event it is necessary to traverse state lands. With the exception of possible off-site routing of a pipeline to bring carbon dioxide (CO_2) from an existing line near the town of Midwest, Wyoming, none of the proposed activities would traverse state lands. As currently proposed, even the CO_2 pipeline would not cross state lands; however, if the alternative routes changed, DOE would consult with the State of Wyoming and, if applicable, comply with the noted requirements.

Summary of Wyoming Game and Fish Department Comments

The WGFD requested that DOE consider exploring new avenues to improve reclamation practices to restore and enhance wildlife habitats impacted from oil and gas development. The Department also suggested consultations with the Department, the Bureau of Land Management (BLM), the Natural Resources Conservation Service (NRCS), the USFWS, and the Northeast Wyoming Local Sage-grouse Working Group to help identify and prioritize experimentation with innovative reclamation practices. DOE actively minimizes its surface-disturbing activities with each new well it installs and as rapidly as possible initiates reclamation activities when a well becomes operational. Similarly, as part of its well plugging and abandonment program, old well pads are routinely reclaimed. DOE welcomes the Department's suggestion of exploring new avenues that might enhance the success of its reclamation activities and welcomes the opportunity to work with the Department and agencies suggested.

1.5 COMMENTS ON THE DRAFT SWEA

DOE received comments on the draft SWEA from the United States Fish and Wildlife Service and the Anadarko Petroleum Corporation. These comments were reviewed by DOE and considered in the finalization of the SWEA and in DOE's final decision-making. Responses to al comments are provided in Appendix D.

1.6 ORGANIZATION OF SWEA

Chapter 1.0 of this SWEA provides an overview of the Proposed Action, background information, and a summary of scoping comments. Chapter 2.0 provides DOE's statement of purpose and need for its proposed actions. Chapter 3.0 defines the Proposed Action, the No Action Alternative, and the Decommissioning and Divestiture (D&D) Alternative. Chapter 4.0 characterizes the affected environment, and Chapter 5.0 assesses the impacts that the Proposed Action, the No Action Alternative, and the D&D Alternative would have on the affected environment if implemented. Chapter 6.0 summarizes the requirements and permits that apply to NPR-3. References cites throughout the SWEA are provided in Chapter 7.0, and a list of the agencies and persons consulted in the preparation of the SWEA is provided in Chapter 8.0.

2.0 PURPOSE AND NEED FOR AGENCY ACTION

DOE is mandated by Congress to produce oil and gas from NPR-3. As a part of this mission, DOE is committed to the utilization of NPR-3 to explore and develop new techniques and equipment that would enhance NPR-3 production and have applicability to the oil and gas industries. This SWEA addresses the continued operations of NPR-3 and the proposed expanded operations of the RMOTC over the next 5 years in pursuit of these mission objectives.

The proposed activities represent a substantial change to the scope and character of operations assessed in a 1998 *Sitewide Assessment for Preparation for Transfer of Ownership of Naval Petroleum Reserve No. 3 (NPR-3)* (DOE 1998). Consequently, new NEPA documentation is required. The activities associated with the operation of RMOTC include increased emphasis on testing and evaluating energy-related technologies. In parallel with testing and evaluation activities, RMOTC would operate and produce NPR-3 energy reserves in a manner consistent with the best practices of the oil and gas industries. The alignment of best practices in oil and gas production with the testing and evaluation of new technologies would result in the development of a Center of Excellence for oil and gas production.

The analyses in this SWEA will provide the basis for DOE to decide:

- whether the Proposed Action or alternatives raise any significant issues;
- whether the Proposed Action or alternatives would result in significant impacts to the environment; and
- whether an environmental impact statement (EIS) or a Finding of No Significant Impact would be the most appropriate response to this SWEA.

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3.0 PROPOSED ACTION AND ALTERNATIVES

In this SWEA, DOE evaluates three alternative operating futures for NPR-3 and RMOTC over the next 5 years: the Proposed Action, the No Action Alternative, and the D&D Alternative. Under the Proposed Action, oil and gas extraction would continue at levels comparable to current operations, and in addition, RMOTC would expand its program of testing and evaluating technologies and equipment that would enhance oil and gas field operations and production. Under the No Action Alternative, NPR-3 operations would also continue at current levels, as would RMOTC's operations; however, the specific new projects proposed for the next 5 years under the Proposed Action that would expand RMOTC's research and testing mission would not occur. Under the D&D Alternative, DOE would close uneconomical wells, remove buildings and other facilities lacking value for future operations, and reduce its future liabilities at the site. Additionally, depending upon the success of these actions and the residual value of the field, DOE could choose to sell or transfer ownership of NPR-3 and RMOTC to another entity under the D&D Alternative.

3.1 PROPOSED ACTION (PREFERRED ALTERNATIVE)

Under the Proposed Action, which is also DOE's preferred alternative, oil and gas extraction from the NPR-3 reserves would continue, and RMOTC's actions would focus on testing and evaluating energy-related technologies to extract oil and gas by methods that are more cost-efficient, safer, and less damaging to natural resources. These actions can be categorized as follows:

- **Oil and Gas Field Development Testing and Demonstration** would include conventional exploration methods, R&D of new drilling methods, testing logging tools, and special test facilities to address problems associated with oil and gas extraction and transmission. Specific projects proposed for the next 5 years include the FALF and the CWTTF.

- **Enhanced Techniques for Oil Recovery** would evaluate techniques aimed at increasing the yields within existing oil and gas fields. One specific project, the EOR Technology Project, is currently proposed for the next 5 years.

- **Application and Integration of Renewable Energy Sources** would demonstrate the feasibility of using renewable energy to extend the life of the field and increase the percentage of oil and gas extracted and to lower operating costs. Specific projects proposed for the next 5 years include Geothermal Energy Enhancement Facilities and the Wind Turbine Pilot Project.

The Proposed Action also includes the continued operation of NPR-3 (discussed further in Section 3.1.1). The specific projects that are planned for the next 5 years under the Proposed Action are described in Sections 3.1.2.1 through 3.1.2.6 and are shown on Figure 3-1. This expansion of activities is projected to lead to increased employment from the 2008 level of 98 (58 contractor and DOE personnel in the field, and an average of 40 in the Casper office) to 233 (145 field and 88 in Casper).

3.1.1 Continued Operations of NPR-3

Under the Proposed Action, extraction of oil and gas resources from the NPR-3 reserves would continue and would involve the following principal activities:

- **Installing and Operating an Estimated 6 to 10 New Wells** per year with the needed support infrastructure of roads, power, and pipelines for produced water, oil, and gas from each well.

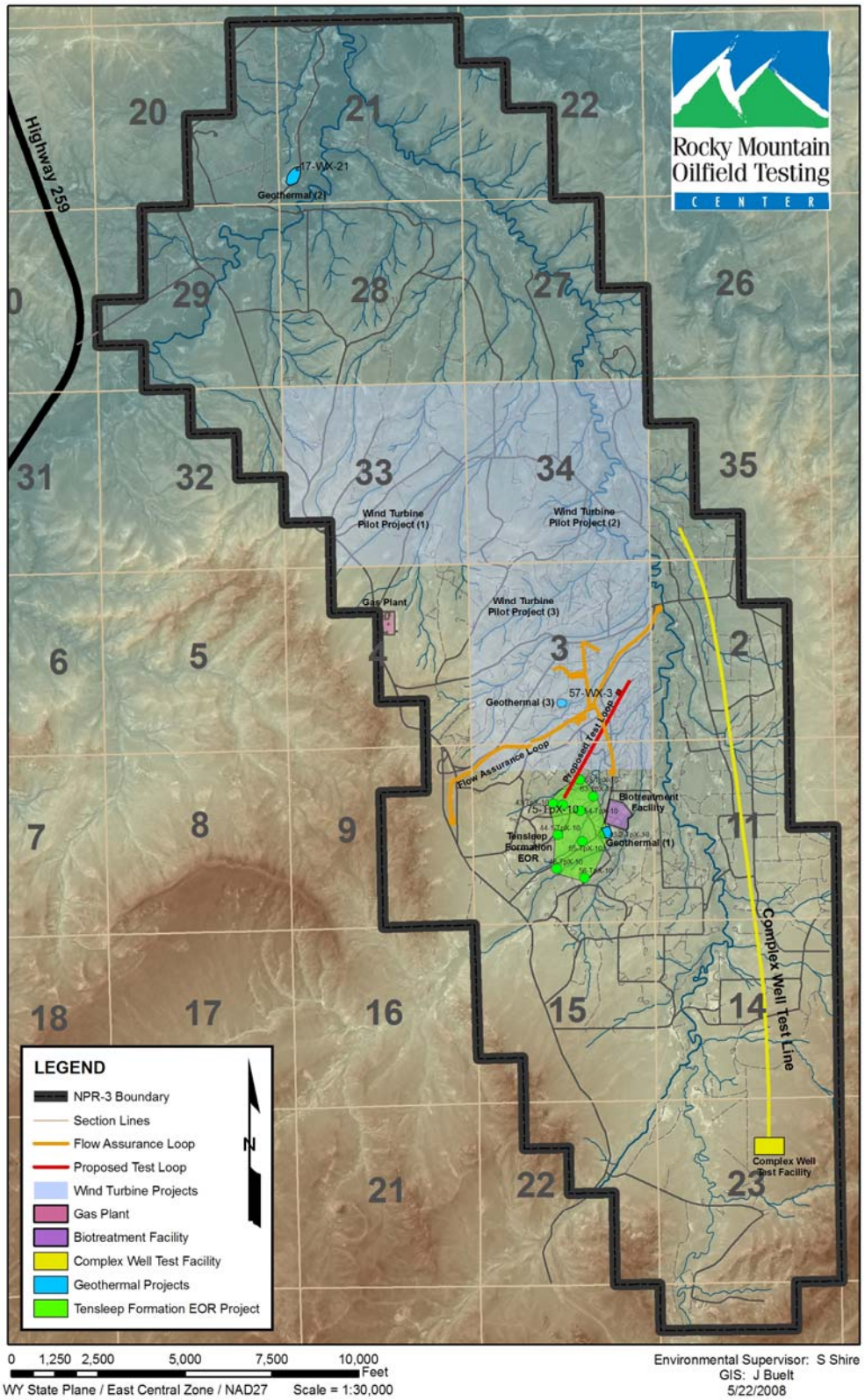

Figure 3-1. Projects under the Proposed Action

- **Plugging and Abandoning an Estimated 8 Wells** per year which are no longer economical to operate or useful for testing and demonstration purposes.

- **Maintaining and Replacing Infrastructure** to upgrade components of an aging system of buildings, roads, pipelines, transmission lines, pumps, storage tanks, flowlines, and treatment systems needed to support an operating oil and gas field. One specific project, the wastewater treatment facility upgrade, is currently proposed for the next 5 years.

These same actions would also occur under the No Action Alternative (discussed in Section 3.2.1).

3.1.2 RMOTC Project-Specific Actions

In addition to continuing the operations of NPR-3, under the Proposed Action DOE and RMOTC would implement six project-specific actions which would advance the site's mission as a test site for petroleum techniques and equipment both for the federal government and for private sector producers, service companies, and equipment manufacturers. These projects are described in detail in Sections 3.1.2.1 through 3.1.2.6.

3.1.2.1 Complex Well Technology Test Facility

The CWTTF would develop, test, and evaluate fit-for-purpose equipment, fluids, and processes for improved performance in extended-reach wells. In addition to testing and qualifying extended reach drilling (ERD) products, the facility would provide opportunities to test:

- horizontal, multi-lateral and deep water technologies,
- vibration and harmonic studies,
- buckling studies, and
- verification of drilling methods.

The ERD methods and technologies incorporate bit performance testing, wellbore cleaning, mud weight and properties, drilling fluid rates, drill string supports, rotational speed, and others to evaluate testing procedures. During drilling, the drill string can develop vibrations caused by a combination of several factors, including weight of the drill string, drag on the walls of the wellbore, cutting characteristics of the bit, and rotational movement of the drill string. Harmonics is part of the vibrational characteristics. Buckling is the actual deformation of the drill string caused by the load applied to the drill string to place weight on the bit for penetration. Several factors in the wellbore contribute to the buckling potential.

3.1.2.1.1 Proposed Action

The proposed CWTTF would involve the construction, operation, and maintenance of a pipeline approximately 20,000 linear feet (6,000 linear meters) long. The purpose of the pipeline would be to replicate a long, horizontal (inclined at times) synthetic wellbore for testing various drilling technologies and products. Most of the pipeline would be installed aboveground, but short segments may be underground because of field terrain. The pipeline would be supported by up to 100 footers along its entire length. The CWTTF pipeline system could vary between 14 and 24 inches (36 and 61 centimeters) in diameter. Actual design specifications would be developed upon funding approval.

The CWTTF pipeline system would be capable of simulating drilling mud systems and conditions, complete with drill cuttings. The systems would consist of fluid storage tanks, water and mud pumps, dry mud storage bins, mixing equipment, drill string running equipment, equipment to rotate the drilling string, and instrumentation to measure pressure, temperature, drill string load, and flows.

The project also proposes two metal, prefabricated control buildings to conduct the tests and demonstrations. New gravel access roads (temporary and permanent) approximately 20 feet (6 meters) wide and a gravel parking area are proposed within the property boundaries of the buildings. The temporary roads would generally follow the same route as the CWTTF pipeline system. The permanent road would extend approximately 2,600 feet (800 meters) from an existing gravel road to the control buildings. The specific locations of the temporary and permanent access roads would be determined upon selection of the locations of the facility buildings and the route for the simulated wellbore.

3.1.2.1.2 Project Location

The proposed location for the CWTTF control building is in Section 23, Township 38 North, and Range 78 West in Natrona County, Wyoming. Specific routes for the CWTTF pipeline system and locations of the line supports have not been determined at this time; however, likely route and building locations are presented on Figure 3-2.

3.1.2.1.3 Construction and Installation

Project planning (i.e., pipeline and equipment monitoring; corrosion control measures; emergency planning) would take approximately 6 months. The project construction would begin in the seventh month and take approximately 6 months to complete. The major construction activities involved in the CWTTF construction include clearing, stringing, bending, welding, joint coating, hydrostatic testing, building construction, and restoration.

Construction and installation of the new CWTTF system pipeline, other ancillary facilities, and the two control buildings would require approximately 24.7 acres (9.9 hectares). Table 3-1 shows the estimated land requirement for construction activities.

Table 3-1. Land required to construct the NPR-3 CWTTF project

Project facility	Area required	Number of acres required
Pipelines (Wellbore)		
14- to 24-inch pipeline (wellbore)	20,000 ft × 25 ft	11.40
Temporary access road	20,000 ft × 20 ft	11.40
Space for footers (100)	4 ft × 4 ft	0.04±
Proposed unload/stockpile site	100 ft× 100 ft	0.20
Control Buildings (2)		
Control building site (2)	60 ft × 100 ft	0.28
Additional space for interconnect/testing	25 ft × 300 ft	0.17
Permanent access road	2,640 ft × 20 ft	1.21
TOTAL ACREAGE REQUIRED FOR CONSTRUCTION		24.7

Note: To convert feet to meters, multiply by 0.3.
To convert acres to hectares, multiply by 0.4.
To convert inches to centimeters, multiply by 2.5.

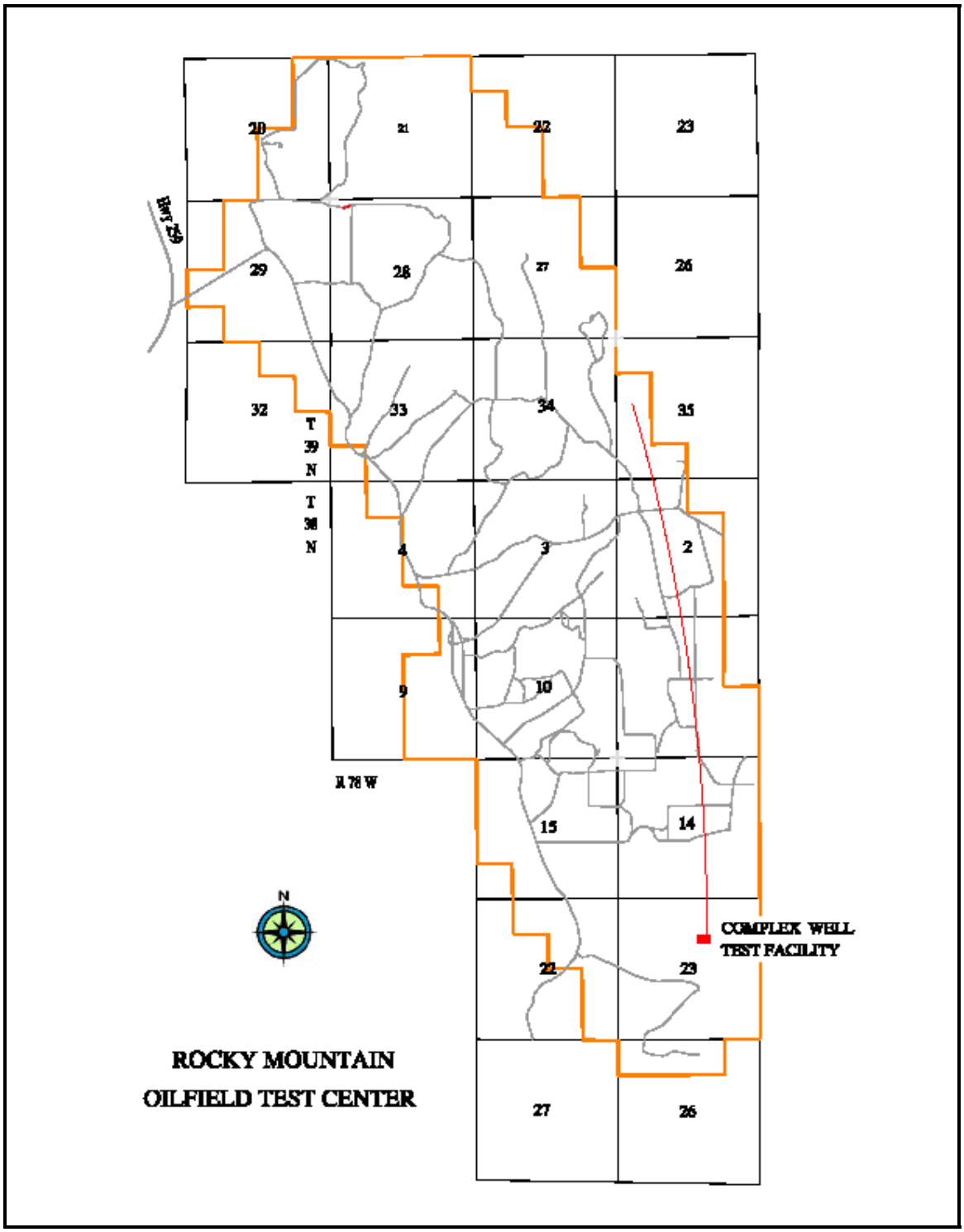

Figure 3-2. Potential layout for the conceptual CWTTF

Construction of the control buildings is expected to require 3 weeks and occur in two phases. The first phase would involve readying the site for the foundation and pouring the foundation. These activities would be accomplished before the prefabricated buildings arrived. Site preparation would require a minor amount of earthwork in the form of site grading. The second phase would involve construction of all buildings, equipment installation, and necessary cleanup and testing. Table 3-1 shows the estimated land requirement for construction activities.

The work force to complete the CWTTF project activities would peak at approximately seven workers working 10-hour days, 5 days per week. Estimated costs for the CWTTF project, including construction and material purchases, total approximately $13 million.

3.1.2.1.4 Operation and Maintenance

About 10 to 12 tests would be conducted at the CWTTF each year. On average, each test would take approximately 3 weeks to complete. Expected resources required during CWTTF operations would be water and electricity. Water for test purposes would be available from existing water wells on the site. Based on the expected facility needs (estimated at approximately 152,000 barrels of water per year), the on-site wells have the existing capacity to serve the proposed facility operations. The expected increase in electrical energy needs would be derived from existing on-site sources.

Based on the design of CWTTF and the associated testing activities, no discharges are expected as part of project operations. Operation of the CWTTF could require the use of drilling muds. Based on the types of activities expected at the facility, approximately 17,400 barrels per year of drilling muds could be used on the site. Drilling muds would either be reused on-site or disposed of at the existing landfarm.

Operations associated with the project would be supported by existing staff and would not require any additional workers or staff. Staff requirements would be limited to oil rig crews (two crews, each consisting of four workers), two maintenance workers, and two test engineers. Staffing requirements would be test-specific. The facility would also receive three to five visitors/observers and specialty workers during each test. No new support facilities, utilities, or public services would be required.

3.1.2.2 Flow Assurance Loop Facility

The purpose of the FALF would be to test problems associated with oil and gas flows in a deep-water environment by replicating flow problems in a “test-friendly” on-shore facility. The flow assurance problems of primary interest are hydrate formations and paraffin deposition in pipelines causing blockages, as well as mechanical problems difficult to evaluate in a deep-water environment.

The FALF was partially completed in 2001 under a previous Cooperative Research and Development Agreement with a number of industry partners. The proposed activities at the facility would complete the unfinished project and would be designed to meet the testing requirements of future industry partners.

The current facility has five underground flow loops (pipelines) approximately 20,000 feet (6,000 meters) long (Figure 3-3). Most of the buried flow loop pipelines are 6-inch (15-centimeter) diameter pipe within 10-inch (25-cemtimeter) diameter pipe (pipe-in-pipe). The loops converge at the wastewater treatment facility. Additional storage tanks, buildings, and supply lines associated with the existing facilities could be utilized or upgraded as part of the proposed project testing operations, and additional support buildings could be added.

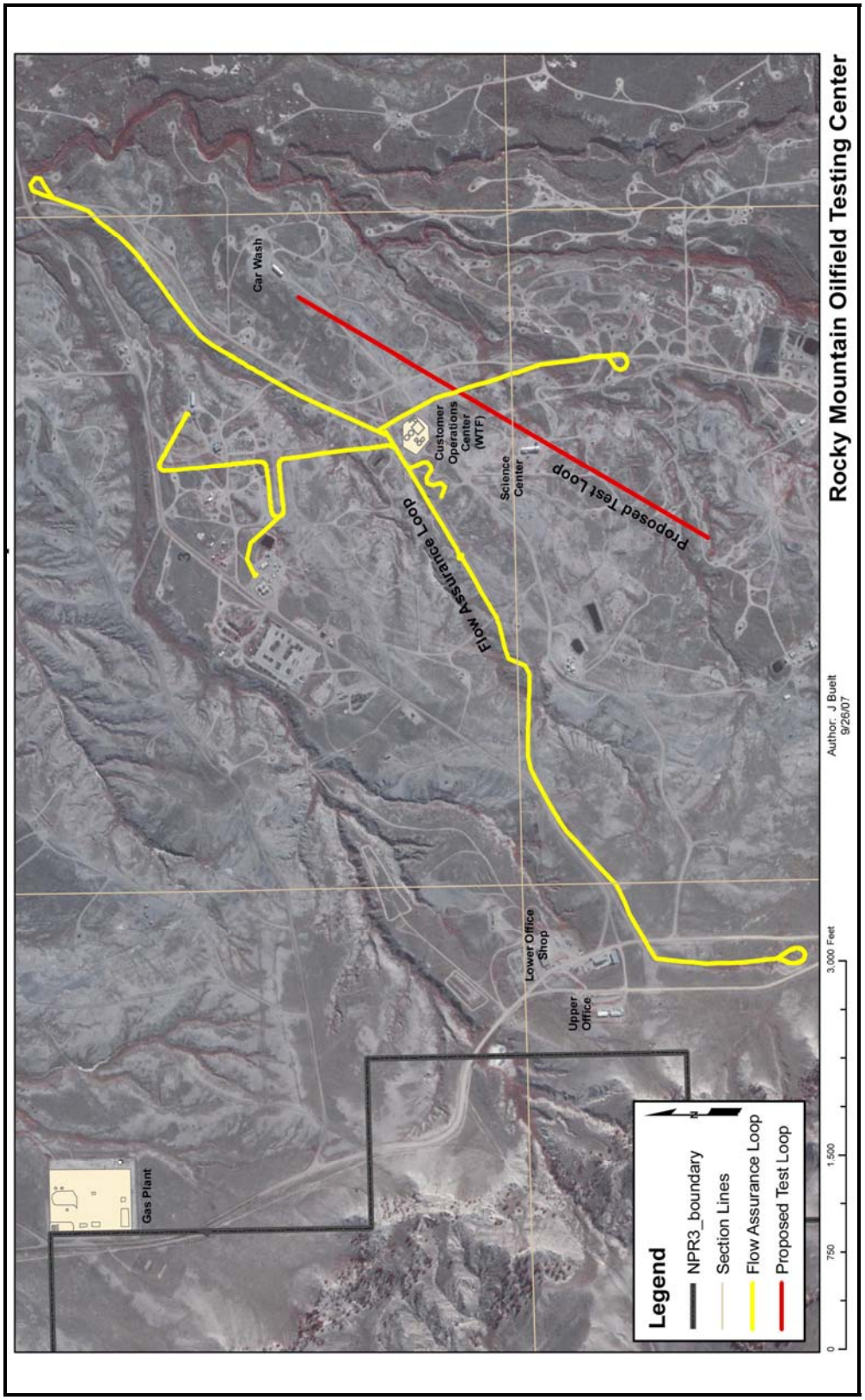

Figure 3-3. Proposed flow assurance loops and test loop

3.1.2.2.1 Proposed Action

The proposed FALF expansion would involve constructing, operating, and maintaining additional pipeline similar in size and character as the existing flow loops. The new pipeline (two lines totaling 3,750 feet [1,145 meters] in each direction) would be approximately 7,500 linear feet (2,290 linear meters) long. Most of the pipeline would be installed aboveground, but short segments may be placed belowground. Interconnecting pipelines between the major pipeline segments/equipment would be installed aboveground. The aboveground flow loop would be supported by approximately 150 piers along portions of the pipeline. The new FALF pipeline system would attempt to replicate various field conditions. The new flow loop would be installed on piers for a near-horizontal run. The new loop would tie into the existing northeast and south loops (see Figure 3-3). The existing loops would be utilized as pipe-in-pipe, double-jacketed heat exchangers.

The new flow loop or double-jacketed pipeline used for the project would be primarily made up of 4- and 5-inch (10- and 13-centimeter) diameter steel pipe inside an outer steel pipe with a diameter of approximately 8.6 inches (22 centimeters). Refrigerant or heating fluid would flow in the annulus between the inner pipe and outer pipe. All pipes would be coated to prevent corrosion.

The flow loop system would be capable of simulating the flow conditions in offshore pipelines, including pressure, temperature, and rates. The types of equipment utilized would include refrigeration systems, heating systems, multiphase pumps, separators, compressors, transfer pumps, and other auxiliary equipment. The types of fluids tested and used at the facility would include oil, water, and natural gas with various chemical additives. The pipeline would be designed for 3,200 pounds per square inch (psi).

The project also proposes a new control building to conduct various tests and demonstrations. A new process building to house various pieces of equipment is also proposed. New gravel access roads (temporary and permanent) approximately 20 feet (6 meters) wide and a gravel parking area are proposed within the property boundaries of the buildings. The temporary roads would generally follow the same route as the existing facility. The permanent road would extend approximately 500 feet (150 meters) from an existing gravel road to the control buildings. The specific locations of the temporary and permanent access roads are shown in Figure 3-3.

3.1.2.2.2 Project Location

The facility would be located in Section 3 and 10, Township 38 North, Range 78 West in Natrona County, Wyoming. Routes for the FALF flow system and control buildings have not been specifically determined at this time; however, possible routes are shown on Figure 3-3.

3.1.2.2.3 Construction and Installation

Project construction would begin in late 2008 and would last approximately 18 months. The major construction activities involved in the facility construction would include site preparation, foundation work, pier construction, flow loop construction (clearing, stringing, bending, joint coating, hydrostatic testing, and restoration) building erection, equipment placement and electrical tie-ins.

Construction and installation of the new flow system pipeline, control and process buildings, concrete piers, and other ancillary facilities would require approximately 15.6 acres (6.3 hectares). Table 3-2 shows the estimated land requirement for construction activities associated with the facility.

Table 3-2. Land required to construct the NPR-3 FALF expansion

Project facility	Area required	Number of acres required
Pipelines (FALF)		
8-inch pipeline	3,800 ft × 50 ft	4.4
Temporary access road	20,000 ft × 20 ft	9.2
Space for piers (150)	4 ft × 4 ft	0.1±
Proposed unload/stockpile site	100 ft × 100 ft	0.2
Control Buildings		
Control building site (2)	60 ft × 100 ft	0.3
Additional space for interconnect/testing	25 ft × 300 ft	0.2
Permanent access road	2,640 ft × 20 ft	1.21
TOTAL ACREAGE REQUIRED FOR CONSTRUCTION		15.61

Note: To convert feet to meters, multiply by 0.3
To convert acres to hectares, multiply by 0.4.
To convert inches to centimeters, multiply by 2.5.

Construction of the control and process buildings would require approximately 12 weeks and would occur in two phases. The first phase would involve preparing the foundation and readying the site for the foundation. These activities would be accomplished prior to the arrival of the prefabricated buildings. Site preparation would require a minor amount of earthwork in the form of site grading. The second phase would include construction of all buildings, equipment installation, and necessary cleanup and testing.

The work force to complete the project activities would peak at approximately 50 workers working 10 hour days, 7 days per week. Construction would require approximately 18 months. Estimated costs for the project, including construction and material purchases, total approximately $50 million.

3.1.2.2.4 Operation and Maintenance

With implementation of the facility, an expected three to twelve tests would be conducted each year. On the average, each test would average approximately 2 to 4 weeks to complete. Expected resources required during operation of the FALF would be limited to water, oil, natural gas supply, chemicals and electricity. Water for test purposes would be available from existing on-site water wells. Based on the expected facility needs (estimated at approximately 5,000 barrels of water per year), the on-site wells have the existing capacity to serve the proposed facility operations. The expected increase in electrical energy needs would be derived from existing on-site sources.

Based on the design of FALF and the associated testing activities, discharges are expected as part of project operations. Discharges may include emergency flaring of gases within the flow loop and emissions from natural gas-fired equipment including heaters, compressors and pumps. Pigging of the flow loops may result in wax, slop (oil and water), and other undetermined solids or liquids. This material would be land farmed or blended into the existing NPR-3 production system.

Based on the types of activities expected at the facility, approximately three dumpster-loads of waste would be generated per month during construction and one load per month during operations. This waste would include bags, rags, boxes, barrels, etc. The waste would be transferred off the site to an approved landfill.

Operations associated with the project would not require any additional workers or staff. Staff requirements would be limited to 2 to 10 workers, two maintenance workers and two test engineers. Staffing would be test-specific and would be accomplished with existing personnel. The facility would also receive up to five visitors/observers and specialty workers visiting the facility.

3.1.2.3 Enhanced Oil Recovery Technologies Project

DOE is currently conducting a pilot project to assess the viability and effectiveness of gravity-stable CO_2 injection for EOR in the fractured Tensleep reservoir in Section 10 of the RMOTC. Based on recent testing and modeling results, CO_2 injection has been shown to significantly reduce the viscosity of the Tensleep crude, which should result in significant incremental oil production. The pilot project has been designed for 6 weeks of continuous injection of approximately 1 million cubic feet per day (MMcfd) (approximately 58 tons per day) of pure CO_2. CO_2 would be supplied from the Anadarko facility located in Midwest, Wyoming. Dense-phase CO_2 would be delivered to the site by tanker truck, where it would be stored in two 50-ton (45-metric-ton) CO_2 storage vessels. The pilot project is designed to use one existing well to inject CO_2, while approximately six producing wells would be monitored for pressure and production effects.

3.1.2.3.1 Proposed EOR Action

Under the Proposed Action, and pending the outcome of the pilot project, DOE would conduct a more extensive EOR project at the Tensleep reservoir. The EOR project would modify and improve existing site wells as well and construct and operate a pipeline to transfer CO_2 for EOR efforts. The following discussion describes the proposed construction and operational activities of the EOR project.

Well Improvements and Modifications

The proposed EOR project would utilize up to three existing wells to inject CO_2 over a period of approximately 3 to 5 years. As part of the pilot project, reservoir modeling would be completed to determine the number and location of injection wells as well as optimum injection rates required for the proposed project (within CO_2 availability). Wells identified for CO_2 injection would be selected based on results from the pilot project and subsequent “tuning” of the reservoir model. Injection wells associated with the EOR project would likely be located high on the Tensleep structure (e.g., 54-Tpx-10, 46-Tpx-10 and 55-Tpx-10).

Depending upon the down-hole condition of existing wells and expected economics for converting them, it is possible one or more new wells may need to be drilled as part of the EOR project. If existing wells were used, each injection well would require moderate to extensive rework as well as installation of downhole monitoring instrumentation to collect pressure and temperature data. Detailed workover/completion plans would be developed for each well selected. Injection wells would be selected based on their location, predicted project contribution, current downhole condition, and potential conversion cost.

As part of the CO_2 injection activities, CO_2 would be heated and pressurized at the surface before being injected into the wells. An in-line heater located close to the injection wells would heat the CO_2.

The existing Tensleep wells are considered "stripper" wells, producing an average of 0.1 to 6 barrels of oil per day and up to 7,000 barrels of water per day per well. Thus, even minor oil cut, or percentage of oil in the total volume, increases would result in large percentage increases in production. Because CO_2 decreases the viscosity of the Tensleep oil and subsequently renders it more mobile, it is expected that increases in oil production (approximately 20 to 500 percent per well) would be realized in 6 to 16 wells in Section 10. Increases in production would be expected to occur between 3 months and 2 years after CO_2 injection began. Detailed predictive reservoir models have not been completed on the proposed project; however, based on preliminary results, the affected wells are expected to be: 43-Tpx-10, 43-2-Tpx-10, 46-Tpx-10, 52-1-Tpx-10, 53-Tpx-10, 54-Tpx-10, 55-Tpx-10, 56-Tpx-10, 62-Tpx-10, 63-Tpx-10, 64-Tpx-10, 67-1-Tpx-10, 72-Tpx-10, 73-Tpx-10, 75-Tpx-10, and 76-Tpx-10.

Figure 3-4 shows the injection and extraction wells that would be affected by the proposed project as well as the estimated areal extent under which the CO_2 would disperse below the ground.

Pipeline Lateral

To support the EOR project, DOE is proposing to construct and operate a CO_2 pipeline lateral from the existing Anadarko pipeline to the Tensleep reservoir. As shown in Figure 3-5, two pipeline corridors are under consideration. The following discussion describes the proposed construction activities for installing a new pipeline in either corridor, as well as metering and gathering facility improvements.

All pipelines and proposed facilities would be designed and constructed to meet all applicable federal, state, and local standards, including those specified by the American Petroleum Institute (API) and the U.S. Department of Transportation Office of Pipeline Safety (OPS). In addition, these facilities would be designed to -50° Fahrenheit (F) temperature specifications.

The proposed EOR CO_2 supply lateral would involve the construction and operation of a 4-inch (10-centimeter) diameter pipeline and one metering facility. The pipeline would transport CO_2 gas from Anadarko's nearby pipeline to RMOTC, a distance of approximately 7 miles (11 kilometers) for Alternative Corridor A (the easternmost route on Figure 3-5) and 19.4 miles (31.2 kilometers) for Alternative Corridor B (the westernmost route on Figure 3-5). The 4-inch (10-centimeter) lateral would be primarily made up of a low-tensile (e.g., API 5L X42) pipe with a wall thickness of 0.25 inch (0.6 centimeter). The pipeline system would be capable of transporting up to 10 MMcfd at 1,400 pounds per square inch gauge (psig). The pipeline would be designed for a maximum operating pressure of 1,440 psig to transport the CO_2 as a dense phase. Where necessary for stream, railroad, or road crossings, or crossing of foreign pipelines, pipe with a wall thickness of 0.315 inch (0.8 centimeter) would be used. All pipes would have a fusion-bonded epoxy coating to prevent corrosion. It is possible that the proposed pipeline lateral would be suspended in the air for some stream crossings if that approach were deemed the most reasonable for engineering, safety, and environmental purposes. The detailed pipeline design would address these issues.

A meter station would be located adjacent to Anadarko's pipeline to accurately account for the CO_2 delivered to RMOTC's EOR project. A control valve would allow only the specified delivery volume of gas to flow through the meter station. The meter station site would be approximately 0.06 acre (0.02 hectare) (50 feet by 50 feet). This property would be fenced to prevent unauthorized access to the buildings and other equipment. The buildings and above-grade piping colors would be uniform and non-contrasting to blend with the immediate natural environment. A new gravel access road approximately 16 feet (5 meters) wide and a gravel parking area are proposed within the meter station's property boundaries. The access road would extend from an existing gravel road.

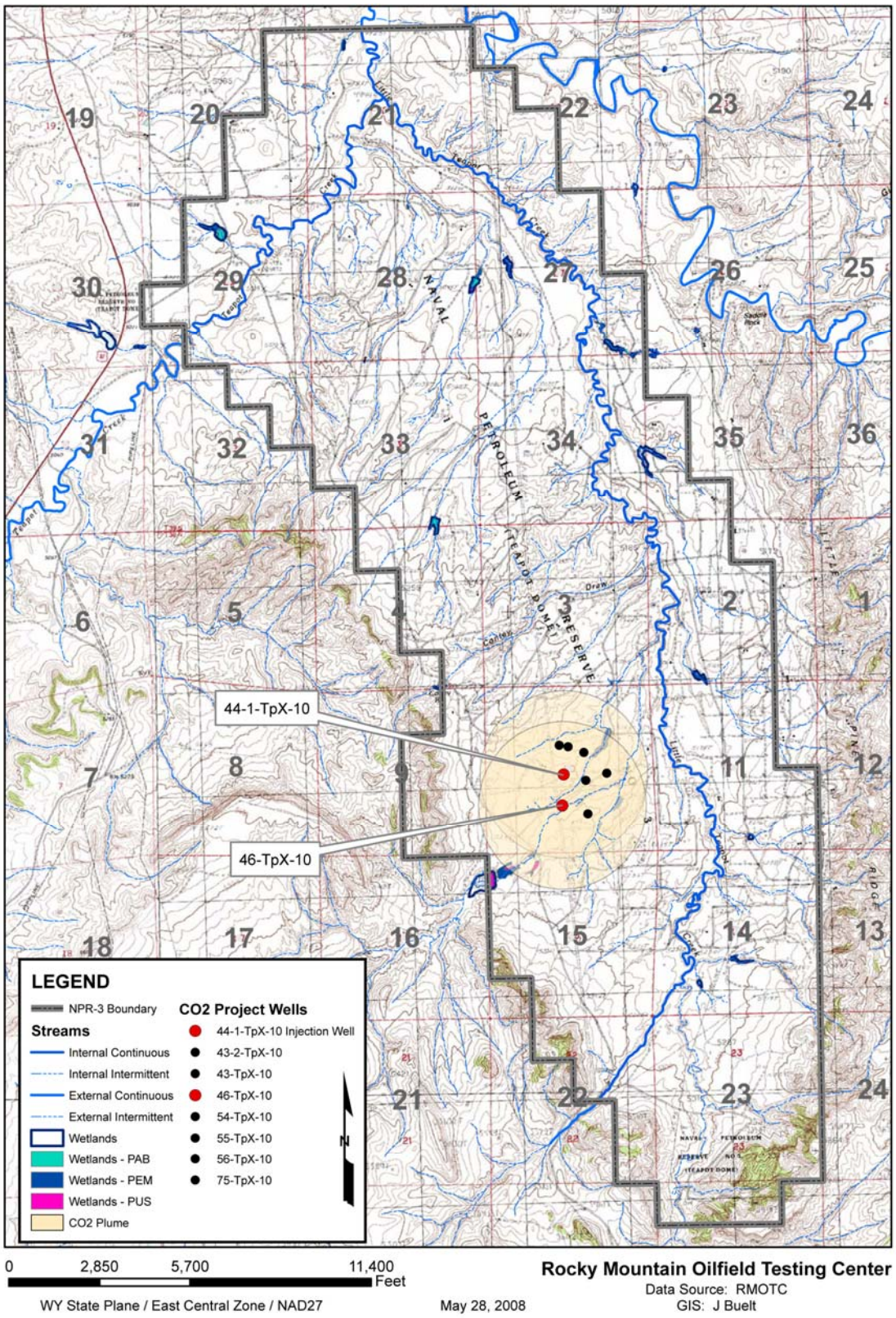

Figure 3-4. EOR injection and extraction wells and predicted CO_2 plume

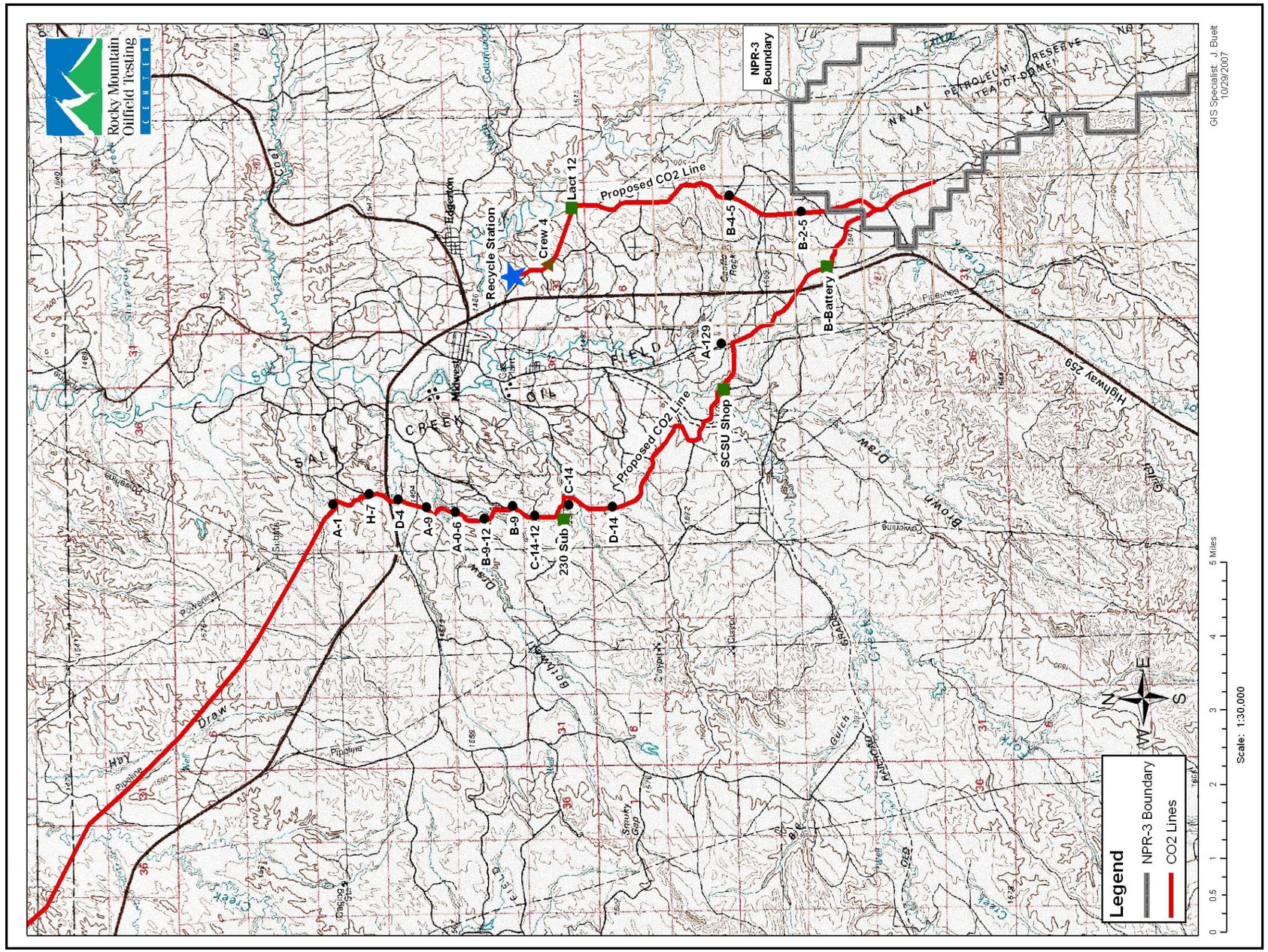

Figure 3-5 Proposed CO_2 route from Anadarko to NPR-3

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Construction of the proposed supply lateral would require a right-of-way (ROW) 25 feet (7.6 meters) wide, or approximately 3 acres (1.2 hectares) of land per mile. In addition, extra workspace would be required for pipeline and facility construction (Table 3-3).

An operational-phase ROW width of 25 feet (7.6 meters) would be required along the lateral, and the metering facilities would require approximately 0.06 acre (0.02 hectare). Total operation-phase land requirements for the two alternative corridors would be approximately 21 acres (8.5 hectares) for Corridor A and 59 acres (24 hectares) for Corridor B.

Table 3-3. Land required to construct the RMOTC lateral and associated facilities

Project facility	Area required	Number of acres required	
		Corridor A	Corridor B
4-inch pipeline	Length of corridor × 25 ft	21.2	58.8
Meter station	50 ft × 50 ft	0.06	0.06
Extra workspace for meter station	100 ft × 100 ft	0.23	0.23
Proposed unload/stockpile site	200 ft × 500 ft	2.3	2.3
TOTAL ACREAGE REQUIRED FOR CONSTRUCTION		23.8	61.4

Note: To convert feet to meters, multiply by 0.3.
To convert acres to hectares, multiply by 0.4.
To convert inches to centimeters, multiply by 2.5.

3.1.2.3.2 Construction and Installation

Preconstruction activities would include acquiring ROW easements, surveying the pipeline corridor and facility sites, and obtaining the necessary permits and approvals for construction.

Project construction would begin in late 2009 and last through 2010. The major construction activities involved in the pipeline construction would include clearing and grading, trenching, stringing, bending, joint coating, lowering-in and tie-ins, hydrostatic testing, backfilling, and clean-up and restoration.

Clearing and Grading: Clearing and grading would involve removing large rocks, brush, and other obstructions from the permanent easement and temporary construction work space, then partially grading and smoothing abrupt changes in ground contours. The permanent easement and temporary work space would be required to provide sufficient space for all construction activities and for the temporary storage of spoil (material excavated from the trench) and salvaged topsoil.

In relatively level terrain, the construction zone (ROW) could be narrowed for lengths of up to 500 feet (150 meters) in site-specific locations. Action would be taken, if necessary, to avoid sensitive features such as cultural resources. An alternate means of avoidance would be to incorporate minor realignments of the route around the sensitive area(s).

Under special construction circumstances, such as areas of steeper slopes, a nominal 25-foot (7.6-meter) wide construction ROW may not be sufficient. The project would be designed to minimize side-slope construction to reduce the need for wider workspaces. Working areas of up to 50 feet (15 meters) (wider than the typical construction corridor) would be needed for spoil areas from working on steep slopes.

Grading and cut-and-fill excavation would be performed to minimize effects on natural drainage and slope stability. These areas would be restored upon completion of construction to resemble original conditions. Excavation and grading would be undertaken where necessary to increase stability and decrease the gradient of unstable slopes.

After the pipeline ROW and temporary work space were cleared, and prior to trenching, the area would be graded as necessary to create a flat work surface for the passage of heavy equipment and vehicles for subsequent construction activities. Minimal grading would be required where the terrain is flat or where the ROW paralleled the fall line of the slope.

Trenching: A major portion of the work associated with the construction of an underground pipeline would be the excavation task. The majority of the pipeline would be buried in a continuous trench. In most areas, the trench would be excavated using a bucket-wheel ditching machine and conventional mechanical backhoes. Where rock or rocky formations were encountered, tractor-mounted mechanical rippers could be used for excavation.

The width and depth of the trench would vary slightly according to the soil type and minimum cover requirements. A minimum of 3 feet (1 meter) of cover would be used along most of the pipeline. At major washes or stream crossings and paved road bores, the minimum cover would be 5 feet (1.5 meters).

In areas where there would be a need to separate topsoils and subsoils, topsoil would be removed during clearing and grading operations and would be windrowed along the ROW. Trench spoils would be windrowed separately during excavation. This would allow for proper restoration of the soil during the backfilling. Spoil banks would contain gaps where necessary to prevent storm runoff water from being rechanneled and to allow landowners, livestock, and wildlife to cross the construction area.

Stringing and Bending: The stringing operation would involve trucking the pipe from designated stockpile areas into position along the ROW in preparation for subsequent bending and line-up. Stringing activities would be coordinated with the progress of the trenching and pipe laying crews to minimize the length of time that a specific tract of land was occupied by construction crews. After the joints of pipe were strung along the trench and before the sections of pipe were joined together, individual sections of the pipe would be bent so that the pipeline would conform with the varying contours of the trench bottom.

Lowering-in and Tie-ins: Side-boom tractors would lower the pipe into the trench. Before lowering-in, inspections would be performed to ensure that:

- the trench was of adequate depth to achieve the minimum cover required over the pipe;
- the bottom of the trench was free of animals, rocks, tree limbs, roots, debris, or water;
- the pipe was properly placed on the bottom of the trench;
- all bends conformed to the alignment of the trench; and,
- the external coating on the pipe was not damaged.

Lowered-in sections of the pipeline would be “tied-in” in the ditch. Tie-ins would be necessary at all crossings (bored paved roadway crossings, stream crossings) or special construction areas where the pipe could not be continuously welded aboveground.

Hydrostatic Testing: Before backfilling operations, contractors would hydrostatically test the pipelines in accordance with the Federal Safety Standards of the OPS (49 CFR, Section 615 Part 192). Hydrostatic testing would involve filling the completed pipeline with water and keeping it at the requisite pressure throughout the test. Testing would be conducted in segments; the length of each segment would depend on local topography. The hydrostatic test would be performed in sequence, where necessary, by

transferring the test water from one pipe section to another. Detailed hydrostatic testing plans and procedures would be finalized following the completion of detailed engineering and the confirmation of water sources and discharge points. Test water intake and discharge would be performed pursuant to all applicable state water regulations and federal and/or state discharge requirements. Test water would be discharged at a rate or in a manner that minimized erosion.

Backfilling, Cleanup, and Restoration: After the pipe was successfully hydrotested, the trench would be backfilled using a bulldozer, rotary auger backfiller, or other machine. In areas where topsoil was segregated, the backfilling operation would involve replacing subsoil in the trench, then replacing topsoil over the subsoil layer. Any excess excavated materials or materials unsuitable for backfill would be disposed of in accordance with applicable regulations and landowner requirements, and would usually consist of spreading the materials over the ROW. During or following backfilling, construction procedures would be implemented to minimize erosion, restore the natural contour of the ground, and allow normal surface drainage. On cultivated and improved lands where the topsoil is conserved, the topsoil would be returned to match the soil horizons on either side of the trench. Trench backfill would be compacted to approximate preconstruction conditions. Excess backfill material would be bermed over the ditch centerline to permit natural settling. To prevent erosion along the pipeline ROW in sloping terrain, water bars or breakers would be used across the filled trench to control erosion.

Estimated costs for the lateral, including ROW acquisition, material purchases, and facility installation, would total $1.1 million for Alternative Corridor A, and $3.1 million for Alternative Corridor B.

It is possible than some adjustments to water handling and oil treating operations and equipment could be required (such as change-out to a new treater). The need for and magnitude of these changes would be better understood after the pilot project was concluded. No major increases to the existing surface footprint of the facilities are anticipated.

3.1.2.3.3 Operation and Maintenance

With implementation of the EOR project, the Tensleep reservoir oil production facility would be operated in the same manner as the existing conditions. Expected CO_2 injection at the Tensleep reservoir has been estimated to be approximately 3 to 10 MMcfd over a course of 3 to 5 years. The expected increase in oil production would be derived from 6 to 16 producing wells. Increases in crude oil production from the Tensleep reservoir are expected to gradually ramp up by approximately 20 to 500 percent as a result of activities associated with EOR. Pending model tuning based on pilot results, the total incremental production from the EOR project could reach 2 million to 4 million barrels. It is expected that the produced natural gas and CO_2 would increase incrementally and would be subsequently dehydrated and reinjected into the reservoir. Pending pilot results, existing collection, transport, and storage facilities would be considered adequate for the proposed project.

Produced water from the increased oil production would be treated in a manner similar to existing operations. It is anticipated that the produced water as a result of increased oil production could be accommodated with the existing facilities currently employed on the site. This assumption is being evaluated by Operations and would be updated at the conclusion of the pilot.

The EOR project would require an additional three to five new full-time workers at the facility, with up to an additional six visitors/observers and maintenance workers visiting the facility on a routine or daily basis. No new support facilities, utilities, or public services would be required with the expected increase in oil production.

Pipeline operation and maintenance would consist of pipeline monitoring and emergency planning.

Pipeline Monitoring: Pipeline monitoring would involve a combination of mechanical devices, instrumental analysis, and physical inspections. A sophisticated pressure-sensitive monitoring device would be employed throughout the pipeline route so that leaks along the line could be detected and readily located and repaired. Pressure and flow rates would be monitored continuously. Over-pressure protection relief valves would be installed and would reseat promptly and automatically after any over-pressure condition ended. Anadarko would control the CO_2 supply to the proposed new pipeline lateral, and any over-pressure situation would originate on Anadarko's system. Operations of the two systems and emergency shut-down procedures would be coordinated to minimize both the volume of CO_2 released and the duration of any upset. Visual inspections of the pipeline would be performed according to specific operation and maintenance plans and schedules to ensure safe operation. The inspections would be performed using ground surveys and instrumental leak surveys. All valve actuators would be routinely operated, inspected, and lubricated.

Emergency Planning: An emergency response plan would be prepared for the lateral in order to provide the written procedures to minimize the hazard resulting from a gas pipeline emergency.

3.1.2.4 Wind Turbine Pilot Project

Part of RMOTC's mission is to demonstrate best practices and state-of-the-art technologies for extending the life of mature oil fields. A primary economic consideration for oil production is the cost of the electricity required to power on-site pumps used to extract oil from underground. In an effort to enhance the economic viability of oil production, RMOTC proposes to install up to 10 wind power generators adjacent to existing oil field operations. Depending upon their effectiveness, wind turbines could be moved periodically on the site to assess differing wind regimes or their effectiveness for powering different types of oil field operations.

3.1.2.4.1 Proposed Action

The Wind Turbine Pilot Project would consist of installing, operating, and maintaining up to 10 wind turbines and ancillary equipment at various locations within RMOTC. The goal of the pilot project is to provide wind-derived electricity to the RMOTC grid. The proposed turbines would most likely consist of a traditional three-bladed turbine and a vertical axis wind turbine (VAWT). Candidate turbines could include the Bergey BW Excel-S/60 and the VAWT unit, a PacWind Delta II. The power ratings for these turbines would be approximately 10 kilowatts (kW). Total wind turbine height would be approximately 92 feet (28 meters) above the ground surface. While the turbines could vary in size, power rating, and spacing requirements, they would have similar installation and operational activities and procedures.

Support and ancillary equipment would consist of storage sheds (control sheds) to house breaker panels, inverter systems, batteries, tools, and other equipment required to operate and maintain the wind turbines. Some units would require a separate 80-foot (24-meter) tower to house meteorological instruments (i.e., anemometer, air temperature/relative humidity instruments, and a supervisory control and data acquisition [SCADA] wave radio transceiver). The storage sheds would be preassembled, skid-mounted assemblies measuring approximately 8 feet (2.4 meters) wide by 8 feet (2.4 meters) high by 10 feet (3 meters) long.

The wind-generated power would be transferred into RMOTC's electrical grid via an existing electrical distribution line. These lines have the capacity to carry the wind-generated power and would not require upgrading as a result of the project.

3.1.2.4.2 Project Location

As shown on Figure 3-1, the proposed wind turbine sites could be located in Sections 3, 33 and 34 and the northern half of Section 10. The locations were chosen for their proximity to power transmission lines, accessibility, lack of obstructions, and the available land area. Candidate locations could be in Section 33, Township 39 North, Range 78 West; Section 34, Township 39 North, Range 78 West; Section 3, Township 38 North, Range 78 West; or in areas located in Section 10. The wind turbines would be located adjacent to active oil and gas production wells where electricity from conventional methods is currently used.

3.1.2.4.3 Construction and Installation

Preconstruction activities would include a simulation analysis to determine the exact configuration (e.g., spacing) and locations of the wind turbines. Other activities would include surveying the turbine locations and obtaining the necessary permits and approvals for construction.

Wind turbine construction and installation would occur in stages and would consist of installing pilings and assembling and raising the turbines and towers. The tilt-up tower foundations would consist of a 3-foot (1-meter) by 3-foot (1-meter) by 1-foot (0.3-meter) thick concrete base with four 3-foot by 3-foot by 1-foot thick concrete anchor pads with a steel anchor set in the pilings at a 45-degree angle. Each anchor pad would be buried approximately 4 feet (1.2 meters) below ground level. Each anchor would have four guy wires attached to the tower at 20-, 40-, 60-, and 75-foot levels on the wind turbine and meteorological towers; the guy wires would anchor the towers to the ground. Excavation would consist of using a backhoe for the base and the four holes for the tower guy wire anchors. After foundation preparation, the towers would be raised and the turbines and blades installed.

Construction of each wind turbine and each meteorological tower would require approximately 0.8 acre (0.3 hectare). Table 3-4 shows the estimated land requirement for construction activities associated with the development of 10 wind turbines.

Table 3-4. Land required to construct the NPR-3 Wind Turbine Pilot Project facilities

Project facility	Area required	Number of acres required for 10 turbines	Notes
Wind turbine site	80 ft × 80 ft (ea)	3.00	Assume each wind turbine area requires 0.30 acre
Additional space for powerline	50 ft × 300 ft	3.50	Assume each wind turbine area requires 0.35 acre
Proposed unload/stage site	100 ft × 100 ft	2.30	Assume each wind turbine area requires 0.23 acre
TOTAL ACREAGE REQUIRED FOR CONSTRUCTION		8.80	

Note: To convert feet to meters, multiply by 0.3.
To convert acres to hectares, multiply by 0.4.

Construction equipment needed to install the wind turbines would consist of tractor-trailers (low-boys) for transporting the turbine hardware, parts, and ancillary equipment to the site, boring the piling holes, and raising the tower and turbine assembly. Based on previous experience, it is estimated that the equipment required for installing each turbine would be operated intermittently over an average 2-week period.

Project construction is expected to require approximately 3 to 6 months. Estimated costs for each Wind Turbine Pilot Project would total approximately $75,000 (excluding labor). In addition to existing RMOTC employees, contract laborers would be needed for wind turbine construction and installation.

These laborers would be supplied by the local labor force; no workers would need to be relocated for this project. Based on the manufacturer's experience, a number of manufacturer's representatives would likely assist with initial installation and diagnostics as part of the pilot demonstration. This assistance is not expected to last for more than 2 weeks and would not require permanent relocation for those individuals.

3.1.2.4.4 Operation and Maintenance

Wind turbines, like gas and geothermal turbines, are designed to convert rotational energy into electricity through the use of a generator. Some design features for the pilot project turbines would include:

- solid tubular construction,
- wood epoxy blades,
- redundant brakes, and
- the ability to rotate with the prevailing wind direction.

The speed at which these turbines start spinning (the cut-in speed) would be approximately 9 to 11 miles per hour (mph) (14 to 17 kilometers per hour [kph]), while the maximum speed at which they shut down (the cut-out speed) would be between 50 and 70 mph (80 and 110 kph). The turbines would be designed to withstand a maximum wind speed of approximately 133 mph (214 kph).

Electricity from the wind turbines would be directed via insulated surface cable to the control sheds, to a battery pack, and then to the RMOTC grid. The units could supply power in sufficient wattage to run a typical pumping unit at NPR-3. The effective coordination of oil extraction and wind power is a complex process. A goal of the proposed project is to gain greater operational knowledge to effectively manage the energy contributions from the wind turbines and their effect on oil extraction activities.

Routine maintenance on the wind turbine equipment would be based on manufacturer-specific recommendations, but maintenance would likely occur every 3 to 6 months or after severe wind events. Turbines and towers would be inspected to ensure the integrity of the components and fasteners and gearbox oil would be changed. The frequency of oil changes would depend on the type of oil used during operations. Conventional oils require changing annually, while synthetic oils require changing once every 5 years. The turbines proposed for the project would have a 5- to 10-gallon (19- to 38-liter) oil capacity. RMOTC personnel would collect the oil in approved containers and dispose of it properly.

3.1.2.5 Biotreatment Facility Upgrade

The current RMOTC treatment facility, located in Section 10, consists of a mixing and skimming pit, cooling trench, aeration stair-step, and surface flow wetland. The process naturally cleans produced water from field production facilities by utilizing algae, bacteria, and plants. Water discharges from the existing BTP-10 pit (used as a skimming and mixing pond) through a canal designed to cool the produced water. Produced water then flows through a series of stair-steps for aeration and further cooling, finally reaching the treatment facility wetland. The water then discharges from the wetland into a lagoon and finally into an unnamed tributary to Little Teapot Creek. The treatment facility currently treats an average of 35,000 barrels per day of produced waters from oil and gas production at the Tensleep formation. The facility is designed to treat an average of up to 50,000 barrels per day of produced water averaging 190° F at its point of delivery to the current system.

The current treatment facility replaced subsurface injection, saving approximately $175,000 per year on utilities ($3.5 million over the 20-year life expectancy). The surface discharge of the treated produced water benefits wildlife by keeping a normally dry streambed wet year-round, thus providing an abundance of wetland plants for forage.

3.1.2.5.1 Proposed Action

Under the Proposed Action, the biotreatment facility would be upgraded to improve cooling capacity, solids handling/removal, skimming operations, flow control and water control structures, wetland revegetation (free-water surface and/or subsurface), future discharge limits, and water reuse.

3.1.2.5.2 Project Location

As shown on Figure 3-1, the upgraded biotreatment facility would be located adjacent to the current treatment facility and to the Tensleep formation, where oil and gas production wells are active and require treatment of produced waters.

3.1.2.5.3 Construction and Installation

Before construction began, a project design analysis would be conducted to determine the exact configurations and locations of the improvements. Other preconstruction activities would include surveying the new facility locations and obtaining the necessary permits and approvals for construction.

Project construction is expected to require approximately 1 year. Estimated construction costs for the treatment facility improvements total $500,000.

The treatment upgrades and improvements would consist of decommissioning the majority of the current treatment facility components, while maintaining the current wetland cell and oxidation lagoon. New components to the treatment facility would include four new treatment cells, a new cooling tower, new process pipe, and an access road along the perimeter of the new treatment cells. New treatment facility development would consist of excavating four 108-foot by 370-foot (33-meter by 113-meter) treatment cells, approximately 6 feet (2 meters) deep. A new 3,300-foot (1,000-meter) long gravel road would be constructed around the perimeter of the new cell area to provide access to the sides of the four new cells.

The new cooling tower would be installed on a 30-foot by 30-foot (9-meter by 9-meter) concrete pad. Chemicals required for tower maintenance would include scale inhibitors, polymers, and hydrochloric acid.

Approximately 4,000 linear feet (1,220 linear meters) of new process pipeline would be installed as part of the facility upgrade. The proposed pipeline would transport produced water and would vary between 8 and 16 inches (20 and 40 centimeters) in diameter. The process line would be made up primarily of a high-density polyethylene (HDPE) pipe, while other segments would be made up of steel. The pipeline system would be capable of transporting 50,000 gallons per day of produced water averaging 95° F at its point of delivery to the upgraded system.

Construction of the facility treatment upgrades would require approximately 9.3 acres (3.8 hectares). Table 3-5 shows the estimated land requirement for construction activities at the wastewater treatment facility.

Construction equipment needed to upgrade the biotreatment facility would consist of tractor-trailers (low-boys) for transporting the facility hardware, parts, and ancillary equipment to the site, excavating the cells, and raising the tower assembly. A blade and two backhoes would also be used intermittently to construct the access road and install the new piping. A temporary, 1,000-gallon (3,800-liter) diesel fuel storage tank would also be required during construction. A temporary berm and liner would be installed around the perimeter of the tank to preclude potential releases off-site. Based on previous experience, it is estimated that the equipment required for construction and installation of the proposed facilities would be operated intermittently over a 4-month period.

Table 3-5. Land required to construct the RMOTC biotreatment facility upgrades

Project facility	Area required	Number of acres required
Treatment Cells		
Four treatment sites	370 ft × 108 ft (ea)	3.6
Access road	20 ft × 3,300 ft	1.52
Proposed unload/stage site	100 ft × 100 ft	0.22
Cooling Tower		
Cooling tower site	30 ft × 30 ft	0.02
Proposed unload/stage site	100 ft × 100 ft	0.22
Process Pipe		
HDPE and steel pipe	20 ft × 4,000 ft	1.84
Proposed unload/stage site	200 ft × 200 ft	0.92
TOTAL ACREAGE REQUIRED FOR CONSTRUCTION		8.41

Note: To convert feet to meters, multiply by 0.3.
To convert acres to hectares, multiply by 0.4.

In addition to existing RMOTC employees, up to 12 contract laborers would be needed for the treatment facility construction and installation. These laborers would be supplied by the local labor force; no workers would need to be relocated for this project. A number of manufacturer's representatives would likely assist with initial installation and diagnostics as part of the upgrade process. This assistance is not expected to last for more than 2 weeks and would not require permanent relocation for those individuals.

3.1.2.5.4 Operation and Maintenance

The upgraded treatment facility would discharge to an unnamed tributary of the Little Teapot Creek at a new discharge location approximately 1,000 feet (300 meters) downstream from the current discharge point. The new discharge point would make use of the site topography to facilitate gravity flow. The receiving creek is fed primarily by the discharge from the treatment facility, which is approximately 30 feet (9 meters) higher in elevation than the creek bed.

3.1.2.6 Geothermal Energy Enhancement Facilities

The geothermal power generation project proposes to produce electrical power for RMOTC facilities by utilizing the waste brine from oil production operations. Currently, a large volume of hot brine is produced during the oil and gas extraction process. The hot brine is cooled, treated, and either discharged to a treatment facility or reinjected on-site, wasting the thermal energy of the produced hot brine. Utilizing the waste heat on-site to generate electrical power would likely reduce operating costs of on-site oil production facilities.

These projects would require the collection of the hot brine in a common area, where a binary geothermal generation system would be installed. The systems would be operated for a multi-year period to produce operational data while supplying electrical power to the on-site oil production facilities.

3.1.2.6.1 Proposed Action

The proposed geothermal power projects would consist of 450-kW (net) advanced binary, skid-mounted geothermal power plants, associated production and injection wells, and ancillary facilities such as on-site

access road(s) and interconnections to electric transmission lines. The proposed power plants would have an expected operational life of approximately 20 years.

The proposed power generation projects would utilize a conventional geothermal binary power plant process whereby heat from geothermal fluid is used to vaporize a working fluid, which is circulated within the power cycle and eventually expanded in a turbine/generator producing power (electric generation). The geothermal fluid would be made up of the waste brine from the current production operations. The binary geothermal power plants would use a hydrocarbon liquid (Isopentane) as the working fluid for the proposed units.

As shown on Figure 3-6, two new geothermal power plants (Geothermal 2 and 3) are proposed. (Geothermal 1 is an ongoing project reviewed separately under NEPA in 2007.) The two plants are referred to as the Madison 1 (Geothermal 2) and Madison 2 (Geothermal 3). Currently, only the Madison 1 location has a conceptual design for a water-cooled unit; Madison 2 has been considered for small-scale development projects.

Figure 3-7 is a conceptual simulation of the proposed power plants. Conceptually, the units would be either water-cooled or air-cooled systems. The air-cooled units would contain two banks of fans for the working-fluid condenser. The layout of an air-cooled facility for this unit is shown on Figure 3-8.

The conceptual layout for a water-cooled geothermal unit is shown on Figure 3-9. The power plant at the Madison 1 site would use brine from a well completed only in the Madison formation and produces no oil or gas. The existing facilities at this location include a large building and water storage tank that would be used in the system. The actual generation unit would be installed in the building and the brine would be supplied from the tank that is currently connected to the Madison well. The cooling water for the unit would be diverted from Little Teapot Creek. The majority of this water is discharged from the water treatment facility at the Tensleep Battery. The cooling water along with the spent brine would be returned to Little Teapot Creek immediately below the diversion point for the cooling water. The cooling water system would consist of parallel pipelines in the same ROW to minimize surface disturbance.

A conceptual process flow diagram for binary geothermal power generation systems is shown in Figure 3-10. The working fluid for the power generation system is recirculated within a “closed-loop” system through the following components: (1) the fluid is sent through a brine-heated vaporizer to produce a pressurized gas, (2) the pressurized gas is expanded through the turbine to rotate it, and then (3) the gas passes through a condenser to return to the liquid phase. Water or air can be used in the working-fluid condenser, depending on the project and individual unit requirements. The turbine is coupled with a generator, and the rotation of the components produces electrical power. The electrical power is conditioned, metered, and put into the electrical grid.

The proposed power plants would include the following major components and systems:

- site foundations, buildings, and structures (skid-mounted units),
- hot brine supply and return system,
- turbine generator(s),
- working fluid system,
- cooling water or air cooling system,
- electrical systems, and
- a fire protection system.

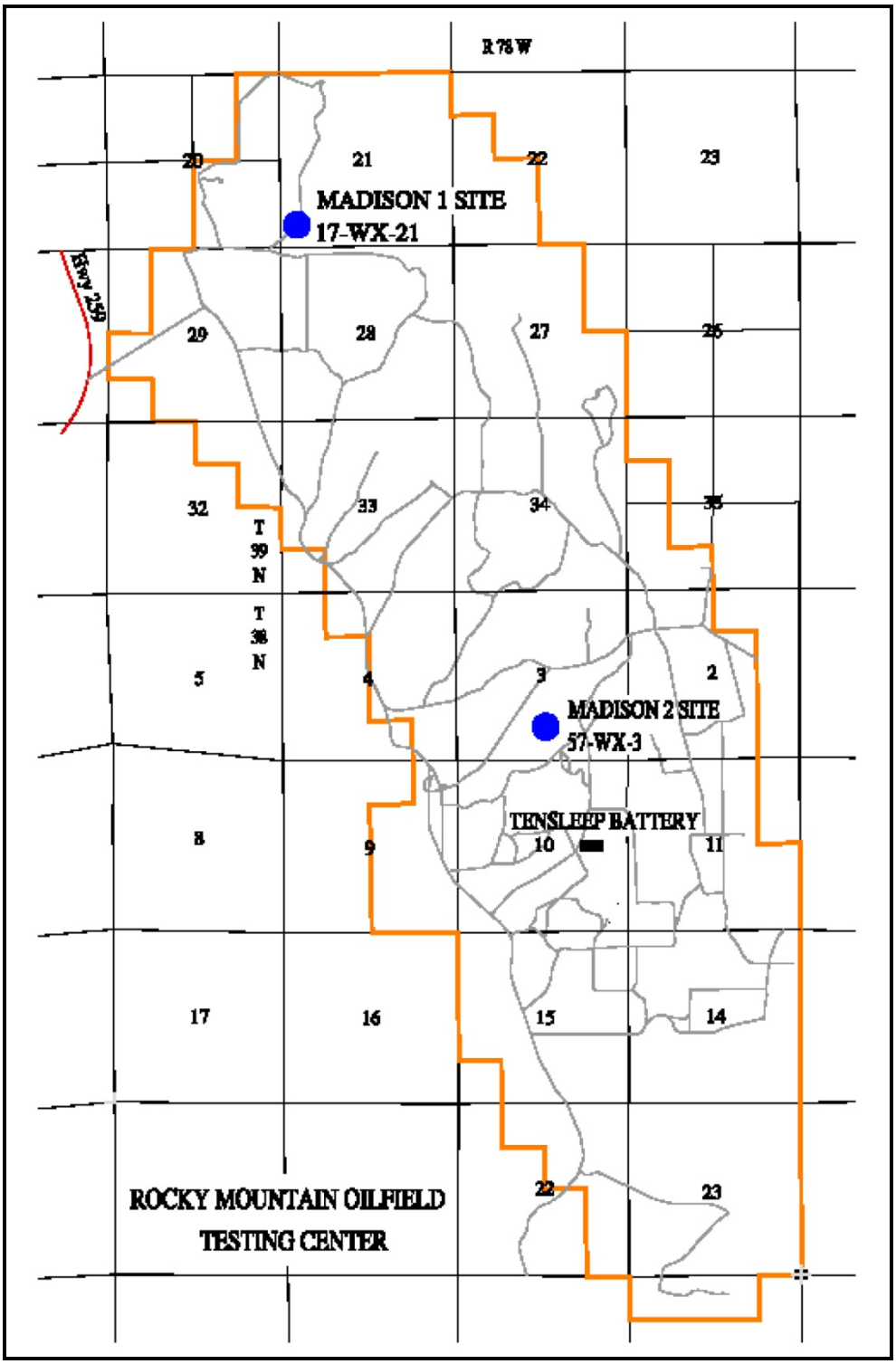

Figure 3-6. Location of potential geothermal projects

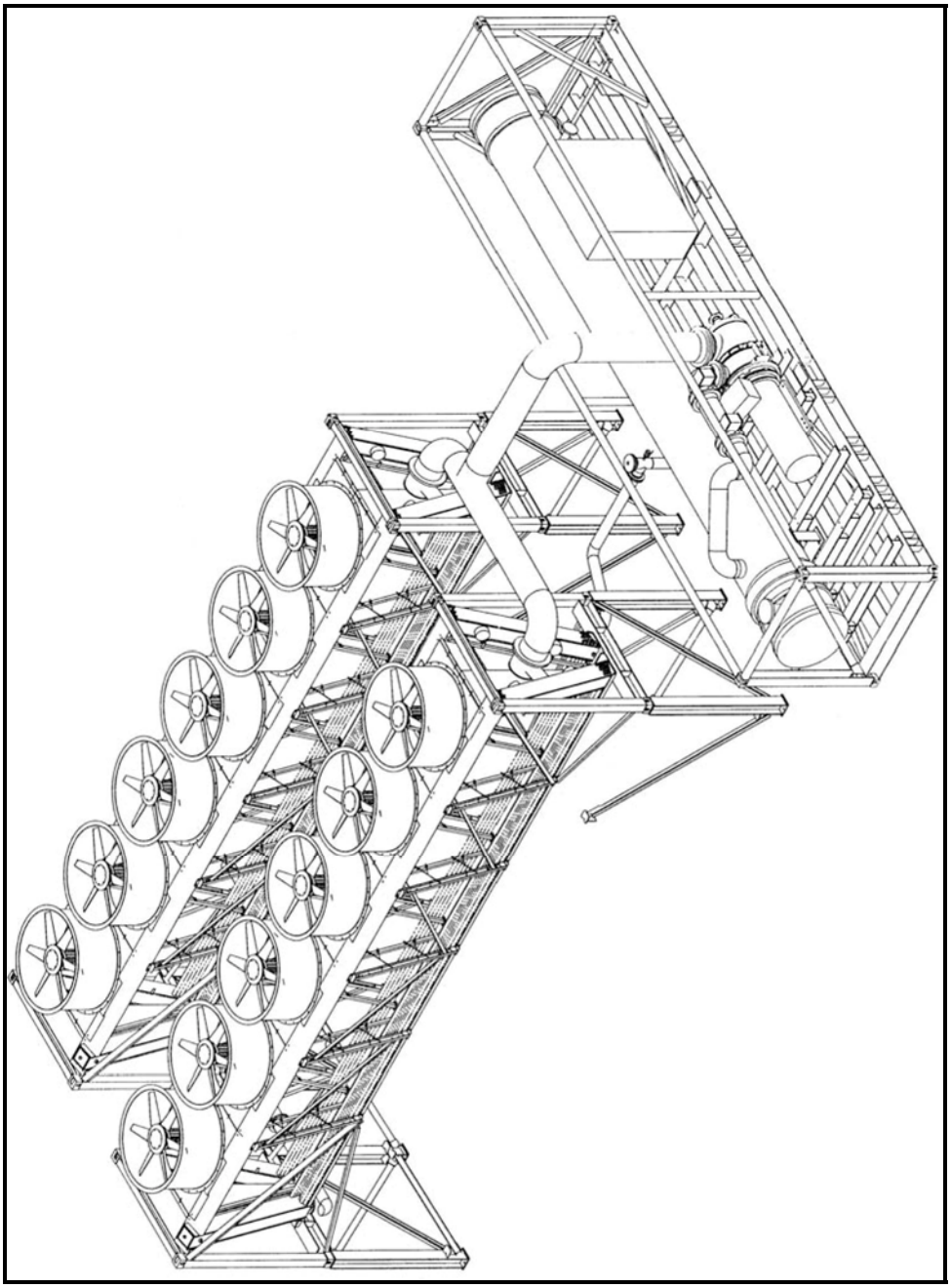

Figure 3-7. Conceptual drawing for power unit at Tensleep Battery.

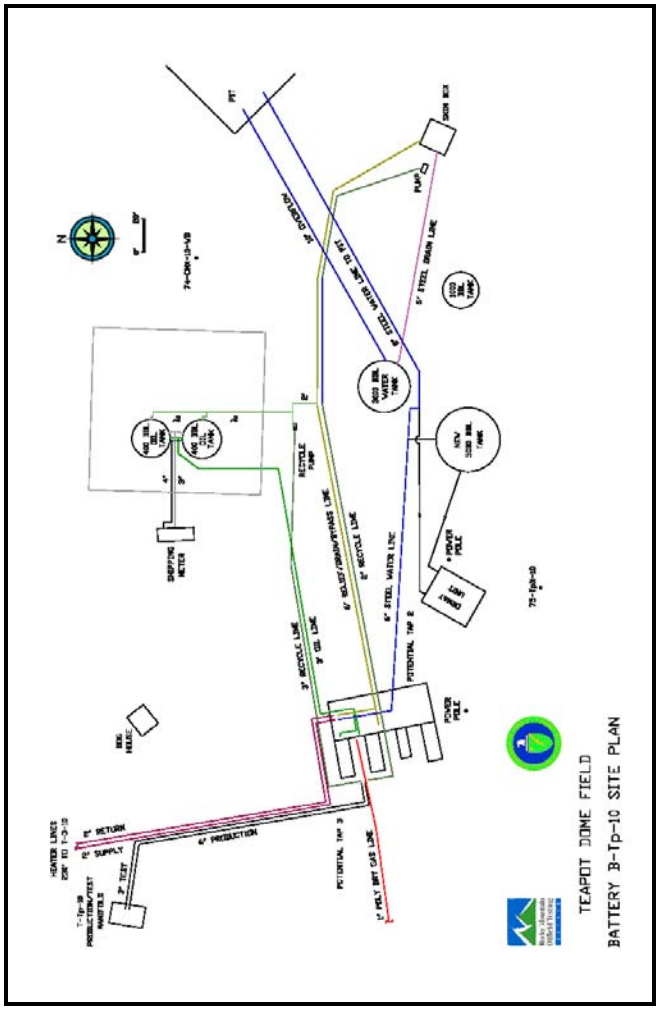

Figure 3-8. Site layout for Tensleep Battery geothermal site

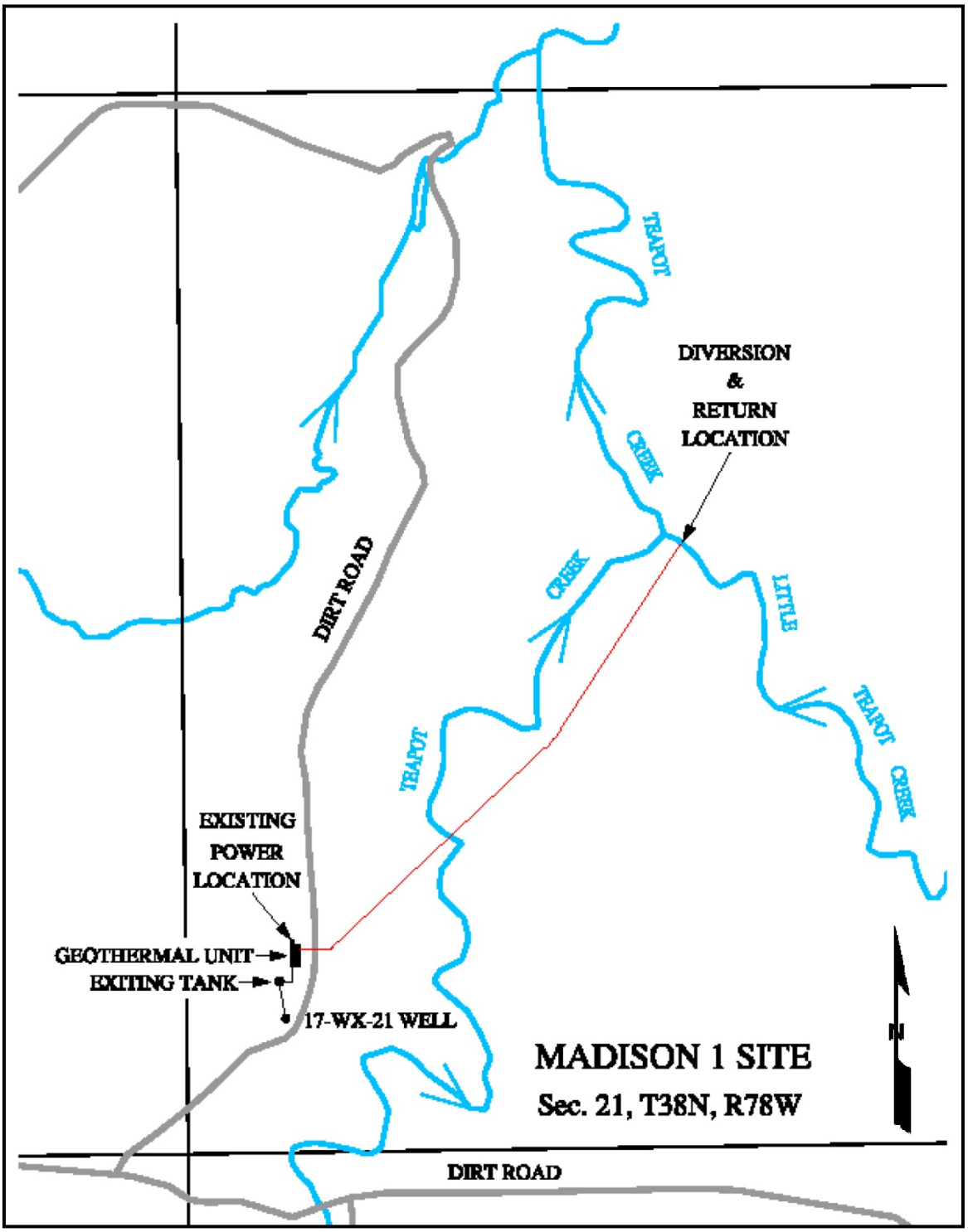

Figure 3-9. Conceptual site layout for Madison 1 area

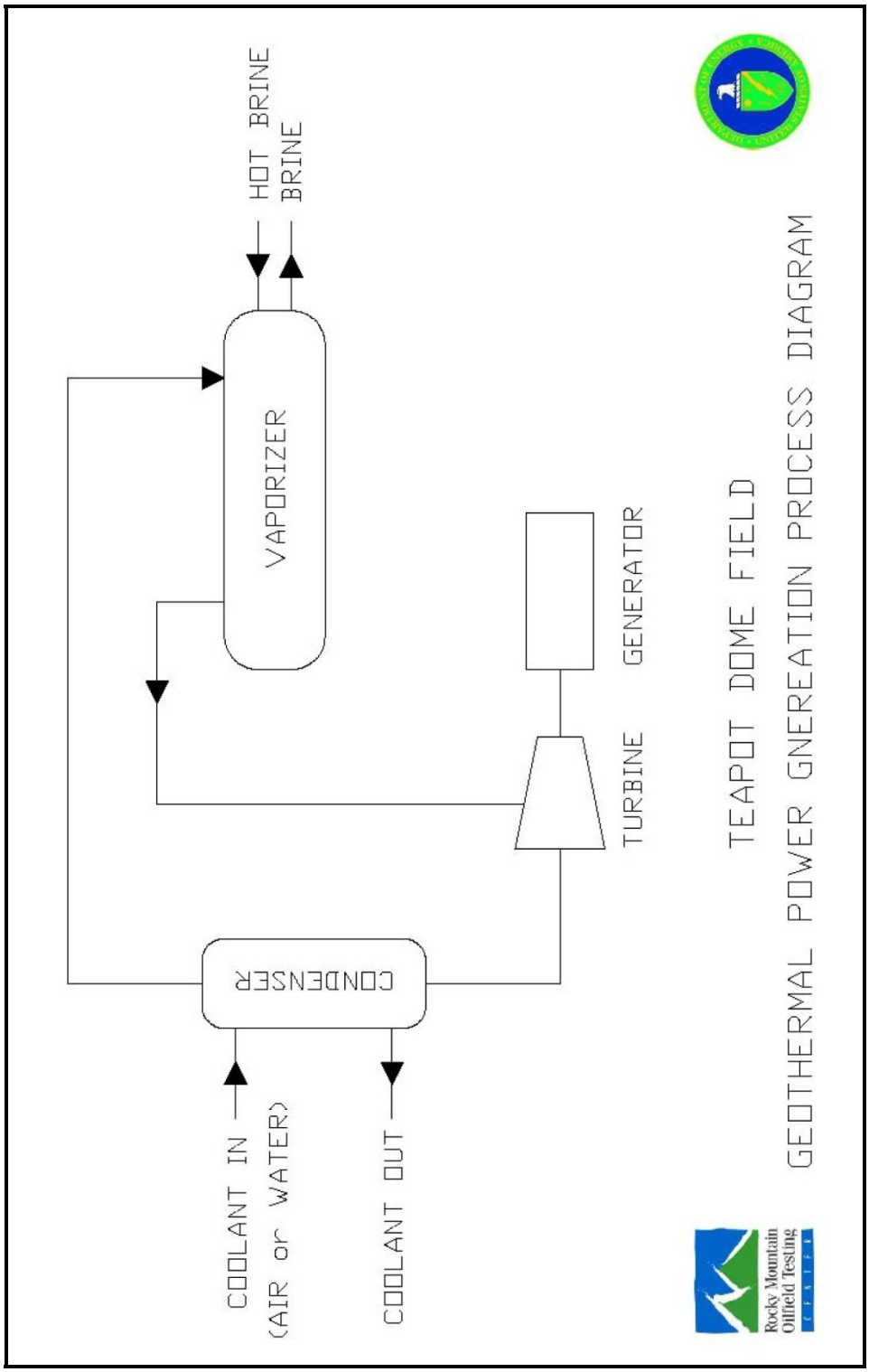

Figure 3-10. Geothermal power generation process flow diagram

3.1.2.6.2 Project Location

As shown on Figure 3-6, the proposed Madison 1 power plant would be located in Section 21, and the proposed Madison 2 power plant would be located in Section 3. As noted above, only the Madison 1 facility has a conceptual design for a water-cooled unit, while Madison 2 facility is a small site used only for small-scale development projects.

3.1.2.6.3 Construction and Installation

Conceptual project siting and engineering plans have been developed only for the proposed power plant at Madison 1. (In order to estimate environmental impacts in Chapter 5.0, the conceptual plan for Madison 1 was used to determine the potential impacts associated with Madison 2.) Power plant construction for either location would require a duration of no more than 6 months, beginning when all necessary permits were acquired. All construction activities, including site preparation, foundations, equipment installation, piping and tank erection, electrical, and instrumentation work and building erection, would be completed during the 6-month period. Many of these activities would likely be performed concurrently (at each location) by multiple contractors. An estimated 15 to 20 construction workers would be hired to complete the power plant facilities.

The proposed power plants would each occupy approximately 2 acres (0.8 hectare) of land. The power plants would be located adjacent to previously drilled production wells or production facilities. In addition, construction of the proposed power plants would require the installation of 6-inch (15-centimeter) pipelines and possibly supply tanks. Personnel would use existing gravel road to enter and exit the project sites. No new site access roads are proposed as part of the power plant projects.

Construction of the project sites would require approximately 3.97 acres (1.6 hectares). Table 3-6 shows the estimated land requirement for construction activities at each power plant location.

To support construction activities, temporary utility lines (water and electric) would be laid from existing lines to the construction areas. Provisions would be made for fuel storage (gasoline and diesel) during the construction period.

Heavy construction equipment required for installation of the proposed power plants would likely be limited and available from local civil contractors.

3.1.2.6.4 Operation and Maintenance

To operate the two power plants, RMOTC would retain a permanent on-site crew of operators and supervisors. A power plant supervisor, a maintenance supervisor, two operators, and a maintenance person would be assigned from current field staff. The power systems would be stand-alone, low-maintenance units.

Various chemicals would be stored and used to meet the operational requirements of the two power plants. The inventory of chemicals to be stored in various quantities on-site would consist of diesel fuel, flammable liquids such as paint and solvents, toxic liquids such as cable cleaner, degreasing liquids, lube/waste oils, and antifreeze. All chemicals would be stored aboveground in accordance with applicable regulations and with appropriate spill control features. In addition, once the geothermal fluid was used to produce electric generation in the power plants, the spent fluid would be treated and discharged according to the source of the fluid. Depending on the facility, geothermal fluid would be discharged to the existing water treatment facilities. The geothermal fluid for the Madison 1 and 2 sites would be discharged into

Table 3-6. Land required to construct the RMOTC geothermal power generation facilities

Project facility	Area required	Number of acres required	Notes
Madison 1 (Section 21)			
Skid-mounted power plant and building	Existing		Wyoming – R78W, T39N, S21, SW¼
6-inch pipeline	3,200 ft × 16 ft	1.20	Total cooling water feed and cooling water and brine discharge
6-inch pipeline	120 ft × 8 ft	0.02	Total brine feed, in previously disturbed location
Additional space for roads and powerline	Existing		No additional roads and power lines required
Additional space for tank	Existing		No additional space for tank is needed, tank is part of existing facility
Additional space for discharge	Existing		Discharge is immediately down stream of the point at which the cooling water is withdrawn
Proposed unload/stockpile site	50 ft × 50 ft	0.60	
Madison 2 (Section 3)			
Skid-mounted power plant and building	60 ft × 80 ft	0.09	Wyoming – R78 W, T38N, S3, SE¼
6-inch pipeline	4,600 ft × 16 ft	1.70	Cooling water feed and cooling water and brine discharge, if needed
6-inch pipeline	100 ft × 8 ft	0.20	Brine feed
Additional space for roads and powerline	16 ft × 300 ft	0.01	No new roads require; new power lines to be sited
Additional space for tank	50 ft × 75 ft	0.09	
Proposed unload/stockpile site	50 ft × 50 ft	0.06	
TOTAL ACREAGE REQUIRED FOR CONSTRUCTION		3.97	

Note: To convert feet to meters, multiply by 0.3.
To convert acres to hectares, multiply by 0.4.
To convert inches to centimeters, multiply by 2.5.

Little Teapot Creek. Appendix C identifies the quantities and analysis for all the projected brines and cooling waters for the proposed power plants. Discharge rates from the power plants are expected to range between 6,000 and 40,000 barrels per day.

Solid wastes generated during routine operations and maintenance would include dirty/oily rags, used air and lube filters, miscellaneous maintenance materials, and daily trash. Solid waste would be collected in the appropriate containers and hauled away weekly by licensed haulers, for disposal at an appropriate local landfill. Liquid waste would be predominantly spent solvents, spent oils, periodic equipment cleaners, and sanitary waste. Aqua-ammonia waste would be collected, transported off-site, treated, and

either disposed of or recycled by a licensed operator in accordance with applicable regulations. Other liquid waste would be collected and stored on the site and recycled if possible; the remainder would be transported and disposed of as prescribed by law.

An existing gravel road would provide access to and from the two sites. There is no plan for developing other roads or access to the site.

3.2 ALTERNATIVES TO THE PROPOSED ACTION

DOE is considering two alternatives to the proposed action in this SWEA: the No Action Alternative and the D&D Alternative. Under the No Action Alternative, DOE would continue the ongoing oil and gas production activities of NPR-3, routine maintenance, and the ongoing test and evaluation activities of RMOTC, but the expansion of these activities planned under the Proposed Action would not occur. Under the D&D Alternative, DOE would close and abandon uneconomical wells and other facilities that would reduce the Department's future liability, and would possibly sell or transfer the NPR field to another entity. These alternatives are discussed further in the following sections.

3.2.1 No Action Alternative

Under the No Action Alternative, production and operation of NPR-3 would continue using conventional technologies together with the limited test and evaluation of energy-related technologies. The new projects described for the Proposed Action would not be undertaken under this alternative; however, existing experimental systems, such as the flow test loop, might be used under this alternative.

Based on the production activities of the last few years, it is estimated that under the No Action Alternative, between 6 and 10 new wells would be installed annually and approximately 8 to 10 wells would be plugged and abandoned each year. In addition, because the NPR-3 field has been in production for many decades, its infrastructure systems of roads, pipelines, storage tanks, treatment systems, and electrical distribution would need to be constantly maintained and often replaced as equipment became antiquated or simply wore out. Due to the size of the NPR-3 site, the annual maintenance activities could require the replacement of several miles of pipelines, electrical distribution lines, and roads each year to keep up with the demands of new production wells.

As production has decreased, there has been an increase in use of the same facilities and personnel in support of the RMOTC. RMOTC supports government and private industry for the testing, demonstration, and evaluation of new oil field and environmental technologies. In parallel with these activities has been a continued effort toward restoration of the field. These activities include plugging and abandoning uneconomical wells and reclaiming and restoring abandoned wells and sites (including dismantling surface facilities, batteries, roads, test satellites, and associated electrical distribution systems) when they are no longer needed for production or RMOTC operations. All of these activities are expected to continue through the next 5 years. Table 3-7 shows the estimated land requirements under the No Action Alternative.

3.2.2 Decommissioning and Divestiture Alternative

Under the D&D Alternative, DOE would stop testing and production activities and would reduce environmental liabilities to a point at which the field could be sold or transferred to another entity.

Table 3-7. Land required to implement the No Action Alternative (acres/year)

Continued operations	Acres required	Acres reclaimed	Notes
New well development	10 acres/year		Assuming 10 wells (each approximately 1 acre) per year would be developed. New well development could range between 6 and 10 wells annually.
Plug/abandon wells		10 acres/year	Assuming an average of 10 wells (each approximately 1 acre) per year would be plugged/abandoned. Well abandonment could range between 8 and 10 wells annually.
Remove/repair/replace pipelines	15 acres/year		Assuming an average 5 miles per year averaging 3 acres per mile.

Note: To convert acres to hectares, multiply by 0.4.
To convert miles to kilometers, multiply by 1.6.

DOE would accelerate the plugging and abandoning of uneconomical wells over the next 5 years in accordance with Wyoming Oil and Gas Conservation Commission rules and regulations. Uneconomical wells are operating wells that can no longer cover their direct and indirect costs. DOE estimates that there are 900 wells to be plugged and abandoned, leaving approximately 200 wells for transfer by 2013. The actual number of wells and facilities to remain through year 2013 would depend upon project economics and the potential for facilities to benefit future site landlords.

Reclamation activities would occur concurrent with the plug and abandonment program. These activities would include dismantling an estimated 30 surface facilities, such as treater batteries, test satellites, tanks, and buildings no longer required for production operations; closing and reclaiming approximately 266 acres (108 hectares) of roads and abandoned pits; dismantling an estimated 540,000 feet (165,000 meters) of electrical distribution systems and 1,200 associated electrical poles; and performing prescribed soil sampling and soil remediation. Soil contaminated by hydrocarbons would be treated on-site by land farming, by using biodegradable chemicals, or both. Roads, facilities, batteries, and well sites would be ripped up, recontoured, disked, and seeded with native vegetation. The existing landfarm/landfill would be closed in accordance with Wyoming Department of Environmental Quality (WDEQ) standards. Underground pipes would be flushed with hot water, cut at a depth of 3 to 5 feet (1 to 1.5 meters) below surface level, and welded shut. Grazing activities would be suspended during the spring and summer months due to reseeding of large portions of NPR-3.

While the future environmental liabilities to the United States Government would be minimized by this approach, a decision on the sale or transfer of NPR-3 would be made only when the remaining liabilities of the site and the residual value of the reserve could be quantified.

Table 3-8 shows the estimated land requirements under the D&D Alternative.

Table 3-8. Land required to implement the D&D Alternative (acres/year)

Continued operations	Acres disturbed	Acres reclaimed	Notes
Decommission existing facilities	10 acres/year	10 acres/year	Assuming an average of five facilities (each approximately 2 acres in area) per year would be decommissioned.
Plug/abandon wells		10 acres/year	Assuming an average of 10 wells (each approximately 1 acre) per year would be plugged/abandoned.
Remove/abandon in-place linear facilities	75 acres/year	75 acres/year	Assuming an average 25 miles per year averaging 3 acres per mile.

Note: To convert acres to hectares, multiply by 0.4.
To convert miles to kilometers, multiply by 1.6.

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4.0 AFFECTED ENVIRONMENT

This chapter describes the existing environmental resources and existing conditions of the physical and social environments.

4.1 LAND RESOURCES

The following discussion provides an overview of the existing local and regional human environments.

4.1.1 Land Uses

The project is located in an unincorporated area of Natrona County, Wyoming, south of the towns of Midwest and Edgerton. Natrona County has established the area around RMOTC as a Ranching and Farming District (RF). Under Natrona County land use policy, all unincorporated lands in the county area are given a general designation until an application is filed for specific zoning designation (May 2007). Within a RF district, oil and gas development is considered to be an allowable use by right, upon issuance of a Use Certificate (May 2007). Generally, the land in the area is currently used for oil and gas production intermingled with agricultural uses, primarily sheep and cattle grazing. The area is also used for hunting primarily big game, typically from September through November; however, hunting is prohibited within RMOTC boundaries. Recreational use of off-road vehicles may also occur; however, there are no trails defined for this use in the project vicinity.

Land use activities at the project site associated with oil and gas development include exploration, pumping, processing, and transport. In addition, activities associated with commercial oil production and R&D occurs; these activities are related to stimulating and increasing oil production. Adjacent ranches graze sheep on the entire site for 2 to 3 months during the year. Sheep may be on the site between February/March through April. The proposed project site overlies an existing gas/oil field, and RMOTC operates existing oil and gas production facilities at the site.

Within the NPR-3 site, developed features include gravel and dirt roads, wellheads and pumping units, oil and gas production facilities and equipment, storage areas, and an office complex. The office is headquarters to approximately 60 staff members who provide field and administrative support to the site. Existing well locations are concentrated in a 2,500-acre (1,000-hectare) area located in the center of the site, with substantially less development taking place in the northern and southern portions of the site. Most wells are located within the central basin area and at a considerable distance from the surrounding bluffs, although there are several wells in the extreme southern portion of the site near the steeper slopes. There are currently approximately 400 active wells and 200 to 300 reclaimed wells on the property.

4.1.2 Land Ownership

Natrona County contains an estimated 3,436,160 acres (1,390,567 hectares). Of this total, approximately one-half is under federal administration; the remainder consists largely of privately owned ranches or state-owned lands.

The project site is surrounded primarily by BLM, state, and private lands. The state-owned land adjacent to the site is located along the southwest boundary and northern boundaries of NPR-3. The BLM lands are adjacent to the northwest boundary of the site. Private land ownership surrounding NPR-3 is registered by five cattle ranchers. One of the ranchers currently leases land on NPR-3 to graze sheep.

The proposed pipeline routes cross federally administered and private lands that are largely used for ranching and energy development. Once final corridors have been selected, specific land use along the corridor would need to be evaluated in a separate NEPA document; however, it is not anticipated that any protected lands such as wilderness study areas or areas of critical environmental concern would be crossed by the pipeline. The area under consideration has a history of energy development and related disturbances.

4.1.3 Recreation

There are no public recreation facilities in the immediate vicinity of NPR-3, and no areas within NPR-3 are open to the public for recreational purposes. However, hunting does occur in nearby areas. The nearest public recreational facilities are located in and near Midwest, Wyoming, approximately 7 miles (11 kilometers) northwest of NPR-3. These facilities include ball fields, the Salt Creek Museum, developed parks, a recreation center, rodeo grounds, and a golf course. Other recreational facilities maintained within Natrona County include county parks, reservoirs, and recreation areas. These offer a variety of activities such as picnicking, camping, fishing, boating, swimming, and hiking.

A nationally noted historic trail that was first used by gold miners seeking a short cut to the Montana gold fields is located north and east of NPR-3. The trail subsequently became a military and freight route through the area. It is called the Bozeman Trail; portions of the trail are on the National Register of Historic Trails (BLM 2007).

There are no Wild or Scenic rivers within NPR-3. The Teapot and Little Teapot Creeks do not meet minimum qualifications for Wild or Scenic status based on their low flow and seasonally dry creek beds. No areas within NPR-3 have been designated for protection status (e.g., wilderness study areas or areas of critical environmental concern) due to the valuable resources present.

As described above, no recreational facilities, nationally designated recreational resources, or dispersed recreational activities are found within the NPR-3; therefore, this resource is not considered further in this SWEA.

With one exception, no recreational resources would be affected by construction of either identified CO_2 pipeline route. The eastern CO_2 pipeline corridor may cross the Bozeman Trail. However, until a final route determination has been made, it is unknown if the trail would be affected. It is likely that the future pipeline construction schedule would affect various off-road dispersed recreational activities, such as hunting large or small game; however, this impact would be considered negligible and accepted by area residents as part of the energy development impacts. For these reasons, this resource is not considered further in this SWEA.

4.1.4 Visual Resources

Natural Character

The natural setting of the NPR-3 site is typical of much of the central portion of Wyoming. It consists of rolling terrain covered with grasses and sagebrush and fragmented by numerous small gullies and deeply incised drainages. In the winter, vegetation (predominantly grass and scrub communities) is sparse. The region is generally covered in deep snow in winter. Grassy terrain predominates in the summer. Along the east, south, and west fringes of the NPR-3 property are rocky cliffs and sandstone bluffs covered with Ponderosa pine and juniper. Figure 4-1 provides a general view of the natural terrain that characterizes the site setting.

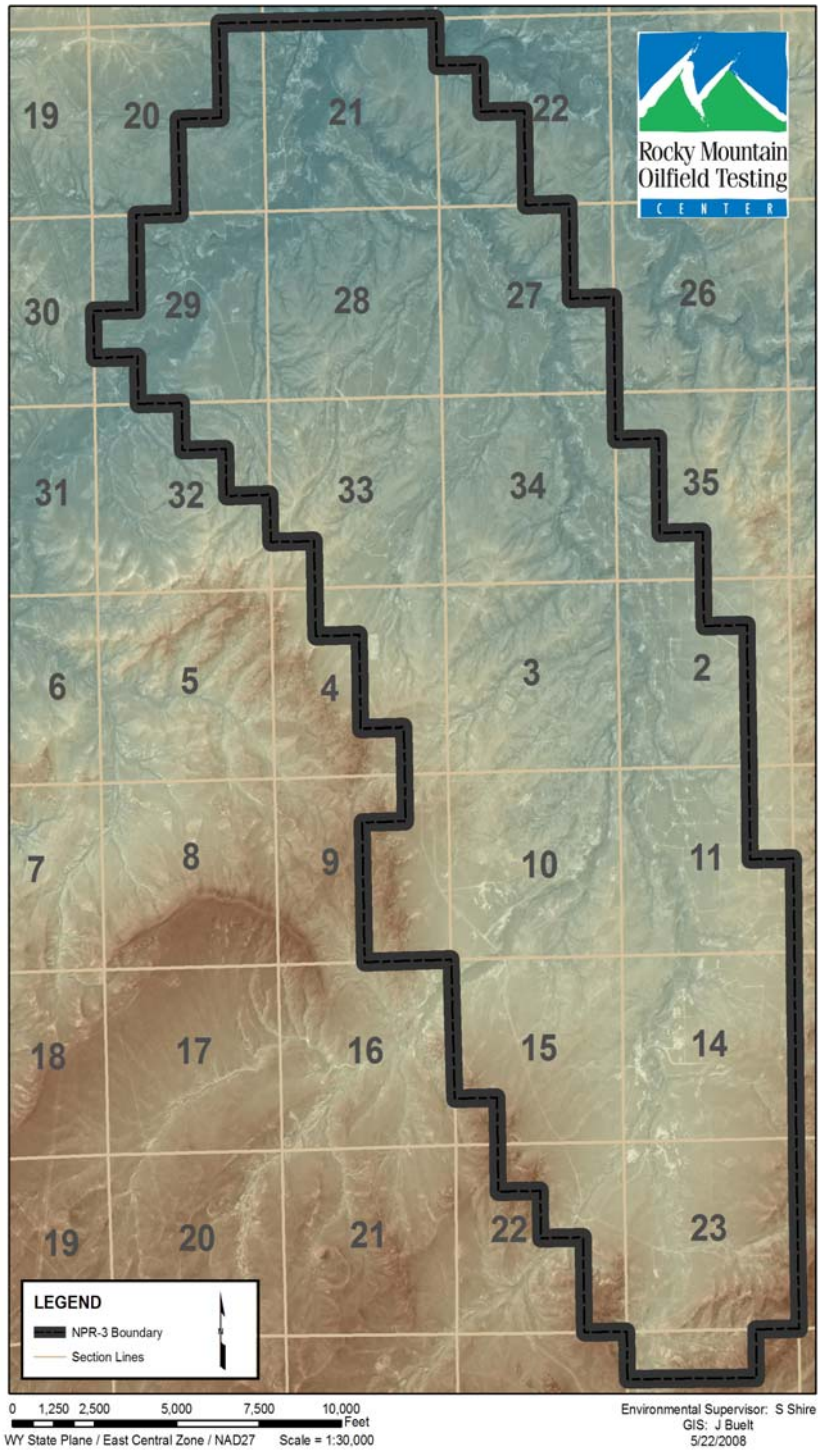


Figure 4-1. RMOTC site terrain

Small portions of the NPR-3 site are briefly visible from Wyoming Route 259 from the north, but bluffs to the south, east, and west of the site generally isolate it visually from the public. The sandstone rims along the southernmost end of the property provide observers with a panoramic view of the entire NPR-3 site, but this viewpoint is limited to NPR-3 employees and adjacent landowners.

Man-made Features

The natural setting of the NPR-3 landscape has been dramatically affected and interrupted by the installation of facilities, structures, and roads associated with oil and gas development (pump jacks, pipeline ROWs, compressor stations), ranching activities (fences, homesteads, and unimproved roads), transportation facilities, and electrical power transmission lines. The linear forms created by access roads, drill rigs, and power poles contrast sharply with the non-linear aspects of the natural rolling terrain, interrupting natural views. Likewise, man-made structures such as office buildings, sheds, warehouses, and pump jacks throughout the site contrast sharply in texture, color, and form with the natural landscape. The altered landscape on NPR-3, however, is aesthetically consistent with the surrounding privately owned and BLM-managed lands, which contain the same types of features and structures.

No scenic routes or corridors occur in the project area.

Visual Resource Management

The BLM has inventoried visual resources for all BLM, state, and private land in the NPR-3 area according to the *Visual Resource Inventory* handbook (BLM 1986) and established visual resource management (VRM) classes. The VRM system is the basic tool used by the BLM to inventory and manage visual resources on public lands. The VRM classes are objectives that outline the amount of disturbance an area can tolerate before it no longer meets the objectives of the class. There are four VRM classes, each of which combine and evaluate visual quality, visual sensitivity of the area, and view distances. The inventory includes state and private lands as well as BLM lands. However, the BLM manages visual resources only on BLM lands.

Many private and public lands in the area have increased in sensitivity since the last inventory conducted in the 1970s as a result of increases in population and lifestyle shifts that emphasize outdoor recreation. Four VRM classes have been inventoried within the NPR-3 area. The objectives of VRM classes applied to lands within the area are:

- Class II — Class II provides for activities that would not be evident in the characteristic landscape. Contrasts are seen, but must not attract attention. These lands are sensitive to public view.

- Class III — the objective is to provide for management activities that may contrast with the basic landscape elements, but remain subordinate to the existing landscape character. Activities may be visually evident, but should not be dominant. Class III areas occur primarily along major highway corridors.

- Class IV — the objective is to provide for management activities that may require major modifications to the existing landscape. The level of change to the landscape can be high and may be visually dominant. Most of the NPR-3 area is managed with Class IV objectives.

- Class V — this class is applied to areas where the landscape character has been so disturbed that rehabilitation is needed. It should be considered an interim short-term classification until one of the other classes can be reached through rehabilitation or enhancement. Lands currently managed with Class V objectives occur near urban areas and at oil and gas areas in portions of the NPR-3 area.

In its recent draft *Resource Management Plan* (BLM 2007), BLM has classified all public lands surrounding NPR-3 as "Class IV." This classification allows BLM to permit activities that would result in major modifications to the existing character of the landscape, such as oil and gas development.

4.2 AIR QUALITY AND METEOROLOGY

This section provides an overview of the meteorology and air quality in the local and regional environment. Information in this section was obtained from the *Final Environmental Assessment for Preparation for Production of Crude Oil from a Subterranean Facility* (DOE 2001).

4.2.1 Meteorology and Climate

The NPR-3/RMOTC is located in central Wyoming, Natrona County. The climate of the project area and central Wyoming is typically cool, dry, and windy. The projects associated with the Proposed Action are located in areas that are generally characterized by rolling plains interspersed with ridges and bluffs, with elevations averaging over 7,000 feet (2,100 meters).

RMOTC operates two meteorological stations on the NPR site. In addition, the Midwest meteorological monitoring station is located approximately 7 miles (11 kilometers) north of the project site. Several other monitoring stations operated by the private petroleum companies, the U.S. Environmental Protection Agency (EPA), and the state also provide background information necessary to assess the meteorology and air quality in the project area.

4.2.2 Precipitation

Precipitation averages 7 to 12 inches (18 to 30 centimeters) annually in central Wyoming. The Midwest monitoring station recorded approximately 12 inches (30 centimeters) of total precipitation (water equivalent). The maximum period for precipitation occurs in the spring and early summer. Mountain ranges influence local precipitation; the western portions are wettest as air currents from the Pacific Ocean drop moisture during orographic uplift. Snow falls frequently from November through May. Snow levels in the project area can reach annual amounts over 50 inches (130 centimeters). The maximum monthly total of snow, ice pellets, and hail at Casper was 62.8 inches (159.5 centimeters) in December 1982. Blizzard conditions of high winds, low temperatures, and snow commonly last from 1 to 3 days.

4.2.3 Temperature

Large variations in diurnal and seasonal temperatures occur, with temperature extremes for the project area ranging from summer maximum of 96° F to a winter minimum of -38° F. Rapid and frequent temperature changes occur during the winter. The annual average maximum temperature is approximately 58° F, and the annual average minimum temperature is approximately 30° F. The record high temperature at Casper was 104° F in July 1954, while the record low at Casper was -41° F in December 1990. Chinook winds, warm downslope winds, are common along the central Wyoming slopes. Numerous valleys provide pockets for cold air to collect and drain into at night. The higher terrain of the ridges and bluffs prevents wind from stirring the air and the heavier cold air settles in the valleys. It is common for temperatures in the valleys to be lower than temperatures on nearby mountainsides.

Data recorded at the monitoring station show the predominant wind direction to be from the southwest. The wind is locally influenced by the general north-to-south-running mountain ranges. Wind speed is also a function of the area's topography. Mean wind speeds vary from approximately 10 to 15 mph (16 to 24 kph). Strong winds with speeds averaging 30 to 40 mph (48 to 64 kph) and gusts up to 65 mph (104 kph) are common in central Wyoming.

4.2.4 Air Pollutants

Existing regional ambient air quality is good due to strong winds and the low density of emission sources and population centers. The EPA and WDEQ have established air quality standards at the federal and state levels, respectively. The EPA implemented National Ambient Air Quality Standards (NAAQS) to specify acceptable pollutant concentrations which may be equaled, but are not to be exceeded, more than once per year. The Wyoming Ambient Air Quality Standards (WAAQS) are generally not to be exceeded more than once per year. Federal and state standards are listed in Table 4-1.

Natrona County is designated to be in attainment of all state and federal ambient air quality standards. The primary and secondary NAAQS for inhalable particulate matter 10 microns or less (PM_{10}) are 150 micrograms per cubic meter ($\mu g/m^3$) over a 24-hour period and 50 $\mu g/m^3$ over a year, respectively. Ambient air quality data taken from monitoring stations in the area are shown in Table 4-1. Concentrations of nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) are low in relation to the ambient standards. Annual average PM_{10} concentrations in the area are relatively low when compared to the annual standard of 50 $\mu g/m^3$. Total suspended particulate values are high due to the effects of barren land and strong winds common to the region. Pollutant levels in the immediate area of the NPR-3 site are higher due to the existing sources located there.

4.3 WATER RESOURCES

This section provides an overview of the local and regional surface water and groundwater resources.

4.3.1 Surface Water

Local Surface Hydrology

The NPR-3 area is tributary to two major drainage areas (see Figure 3-4, which shows the major streams in the area). The southern portion of NPR-3 is tributary to Little Teapot Creek, while the northern portion is tributary to Teapot Creek. The approximate drainage boundaries and directions of on-site runoff flows are shown on Figure 3-4.

Table 4-1. Wyoming and National Ambient Air Quality Standards

Pollutant	Averaging time[a]	Primary NAAQS[b] ($\mu g/m^3$)	Secondary NAAQS[b] ($\mu g/m^3$)	Wyoming Standards ($\mu g/m^3$)
Carbon Monoxide	1-Hour	40,000	40,000	40,000
	8-Hour	10,000	10,000	10,000
Nitrogen Dioxide	Annual	100	100	100
Ozone	8-Hour	157	157	157
PM_{10}	24-Hour	150	150	150
	Annual	----	**50**	50
$PM_{2.5}$	24-Hour	35	35	65
	Annual	15	15	15
Sulfur Dioxide	3-Hour	----	1,300	1,300
	24-Hour	365	----	260
	Annual	80	----	60

a. Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.
b. Primary standards are designed to protect public health; secondary standards are designed to protect public welfare.
Source: http://www.epa.gov/air/criteria.html

As shown on Figure 3-4, Little Teapot Creek enters the site on the southern boundary as a dry ephemeral wash. It transitions to an intermittent stream in places before becoming perennial below a National Pollutant Discharge Elimination System (NPDES) discharge point for produced water. From that point, it flows northwest into Teapot Creek at the northern end of the site.

Teapot Creek originates approximately 15 miles (24 kilometers) southwest of NPR-3, and some upstream portions have been designated by the BLM Casper Field Office as sensitive. Teapot Creek enters the site as a perennial stream, flows to the northeast across the northwest portion of the site, joins with Little Teapot Creek with a combined flow of approximately 5 cubic feet per second, and leaves the site on the northern boundary. Approximately 1 mile (1.6 kilometers) downstream from the site, Teapot Creek flows into Salt Creek (designated by BLM as sensitive), then into the Powder River approximately 25 miles (40 kilometers) north. NPR-3 contains a large number of dry ephemeral washes and intermittent streams, all of which drain into Teapot Creek or Little Teapot Creek. Over 25 impoundments, constructed in the 1920s, exist on the site, and at least 18 contain enough surface water to qualify as wetlands.

The WDEQ identifies four classes of streams, from Class 1 (highest level of protection) to Class 4 (lowest level of protection). Streams and washes on NPR-3 are classified by WDEQ as Class 3B streams (WDEQ 2001a). Class 3B waters are intermittent and ephemeral streams that do not, or do not have the potential to, support fish populations or drinking water supplies. However, the presence of frequent linear wetlands indicates that they provide habitat for invertebrates, amphibians, or other flora and fauna that inhabit waters of the state at some stage in their life cycles (WDEQ 2007). Class 4 designations are based upon knowledge that a water body is an artificial, man-made conveyance (i.e., canals), or has been determined not to support aquatic life uses through an approved Use Attainability Analysis. Based on this designation, no waters on NPR-3 are currently Class 4.

Water Quality Permits

Wyoming is an NPDES authorized state (referred to in Wyoming as WYPDES). Wastewater discharges are regulated under the Clean Water Act (33 USC 1251–1387) and its associated EPA regulations (40 CFR Parts 122, 136, 403, and 405–471). Wyoming regulations are codified under the Wyoming Water Quality Rules and Regulations, Chapter 7.

NPR-3 currently holds three active WYPDES permits, issued by WDEQ (DOE is the permit holder). These permits are for discharges at the water treatment facility, the B-1-3 main collection area, and the water disposal facility. These permits are listed in Table 4-2.

Table 4-2. On-site discharge permits

WDEQ permit number	Facility name	Status/expiration date	Number of outfalls permitted for discharge	Number of outfalls discharging
WY-0028274 (Outfall #1)	B-TP-10 Tank Battery	Active/June 30, 2010	One	One
WY-0028274 (Outfall #2)	B-TP-10 Tank Battery	Active/June 30, 2010	One	None
WY-0028894	B-1-3 Tank Battery	Active/December 31, 2010	One	None
WY-0032115	Water Disposal Facility	Active/December 31, 2010	One	None

Produced water from wells in the Tensleep Battery, located in the central portion of the site, is cooled in a series of treatment ponds and discharged under NPDES permit #WY-0028274 into an unnamed tributary of Little Teapot Creek. The treatment ponds were constructed in 1996. In the ponds, oil is skimmed from the surface, and the water is cooled to approximately 100° F from 180° F before discharge. The oil-skimming pond is netted to prevent waterfowl from landing; other ponds are flagged. The facility is also fenced to prevent access by grazing animals. Surface water is not withdrawn at any time on the site for current operations.

The WYPDES permits contain discharge limits and sampling requirements for oil and grease, conductivity, total dissolved solids (TDS), pH, chlorides, chemical oxygen demand (COD) and radium-226. The Tensleep Battery discharges up to 1,470,000 gallons (5,565,000 liters) of water per day; it is the only major discharge point on NPR-3. Sampling is required twice a month at the discharge points for pH, conductivity, oil and grease, TDS, and chlorides. Radium-226 is sampled once per year at the outfall point; this voluntary sampling is done at the request of WDEQ for produced waters. Discharge monitoring reports are filed with WDEQ in January and June of each year. Monitoring reports indicate compliance with all of the WYPDES permit limits over the last 3 years, with the exception of a single exceedance reported for B-TP–10 (Outfall #2) in 2004.

Surface water is also sampled as it enters the site from adjacent properties, as it can contain elevated chlorides and sulfates. In late 2006, off-site well operations began to inject produced water in some areas rather than discharging, and in these areas, surface water sampling was discontinued.

The western proposed pipeline route would cross perennial sections of Salt Creek and Teapot Creek, up to 11 ephemeral or intermittent tributaries of Castle Creek (a stream running north to Salt Creek outside the western boundary of NPR-3), and up to 4 ephemeral or intermittent tributaries of Teapot Creek. The eastern proposed pipeline route would cross a perennial section of Salt Creek, up to 3 ephemeral or intermittent tributaries of Salt Creek, up to 3 tributaries of Castle Creek, and up to 2 tributaries of Teapot Creek. Castle Creek is a Class 3B stream similar to Teapot Creek, and Salt Creek is a Class 2B stream containing non-game and warm water game fish.

4.3.2 Groundwater

Regional Groundwater Resources

Groundwater resources within the planning area occur in geologic formations (ranging from the Precambrian to the Holocene in age) exposed at points; most are known to yield some water to wells and springs. The major regional aquifer of the planning area is the High Plains. The High Plains aquifer is mostly alluvial, relatively shallow and thick, permeable, and generally productive for wells. Discharges to small streams or springs at outcrops occur in some areas (USGS 1996).

Groundwater recharge occurs primarily from direct infiltration of precipitation into the shallower aquifers, infiltration into the rock outcrop areas of the deeper aquifers, and leakage between aquifers. Groundwater quality depends primarily on the source geologic formation or aquifer.

Groundwater is used to meet the demand of current uses on public land, such as livestock, wildlife, mineral development, and recreation. Groundwater sources are adequate to meet the demands of all current uses on public land. New development and increased water use by resources, such as minerals, range, forestry, and recreation, may affect groundwater quality. Baseline water quality data can be found in the U.S. Geological Survey (USGS) *Groundwater Resources of Natrona County, Wyoming* (USGS 1972).

Local Groundwater Conditions

No high-quality fresh water aquifers occur in the strata underlying NPR-3. Those strata that produce fluids produce water with either excessive levels of TDS or a mixture of hydrocarbons and water. Throughout the majority of NPR-3, the Steele Shale formation occupies the interval from the surface to an approximate depth of 2,000 feet (600 meters). Two porous and permeable sandstone formations occur within the upper reaches of the Steele Shale. The upper formation, the Sussex sandstone, outcrops in a ring near the center of the Teapot Dome anticlinal structure and does not appear to contain an aquifer (DOE 1998). The second sandstone body, the Shannon sandstone, is an oil reservoir in much of the NPR-3 field. A fault separates the oil reservoir from the Shannon sandstone outcrop at Salt Creek to the north. Groundwater is encountered in the Shannon sandstone in some areas north of the fault, but the concentration of TDS exceeds 10,000 milligrams per liter (mg/l) (water quality standards in Wyoming are 500 mg/l for human consumption and 5,000 mg/l for livestock use). No underground sources of drinking water or other shallow fresh water aquifers have been detected in the more than 790 wells drilled since 1976 (DOE 2001).

Along the southern boundary of NPR-3, the Mesa Verde Sandstone outcrops as high ridges. This geologic unit overlies the Steele Shale along the eastern, western, and southern flanks of the Teapot Dome structure. No water wells have been completed within this geologic unit on NPR-3. Approximately 0.5 mile (0.8 kilometer) east of NPR-3 in Section 24, Township 38 North, Range 78 West, a water well is completed at a depth of 740 feet (225 meters) in the Mesa Verde Sandstone. In 1972 (Crist and Lowry 1972), the water level within the well was 400 feet (122 meters) below ground surface. The quality and quantity of the groundwater are unknown.

The Madison formation, which in some areas of Wyoming can be a high-yielding freshwater aquifer, lies below the deepest producing geologic unit at NPR-3 at a depth of more than 6,000 feet (1,800 meters). This formation yields water of only fair quality, having a TDS concentration of approximately 3,000 mg/l (DOE 1998). Current water quality standards would make this water appropriate for livestock but not for agricultural or domestic uses. It is occasionally used for site activities. A freshwater aquifer also exists in the Tensleep formation (approximately 5,400 feet.[1,600 meters] below the surface); the quality of its water is similar to the quality of water from the Madison formation.

Groundwater produced with crude oil and natural gas is disposed of through the on-site water treatment facility or by underground injection into the Crow Mountain formation. At the water treatment facility, produced water is allowed to cool in a series of three ponds, and petroleum-based contaminants are removed from the surface. The water is then discharged into Little Teapot Creek, providing a freshwater drinking source for local wildlife. The underground injection wells are permitted through EPA's Underground Injection Control program, which is managed by the Wyoming Oil and Gas Conservation Commission (DOE 1998). In addition to produced water injection, softener regeneration water from the site's water treatment plant is also injected into a disposal well. Groundwater appropriation and injection permits are summarized in Table 4-3.

Because there are no potable water wells in the vicinity of NPR-3, all potable water (as of December 2007) is trucked to the site from either the city of Casper or the town of Midwest. Both supplies are community water systems and have been approved by EPA as drinking water sources. To prevent fluid migration and cross-contamination between subsurface formations, production wells are cased and cemented according to Wyoming Oil and Gas Conservation Commission regulations. Abandoned wells are permanently plugged, and injection wells are tested regularly for casing integrity.

Groundwater resources north and northwest of NPR-3 along the proposed CO_2 pipeline routes are similar to those encountered on NPR-3. As with the majority of NPR-3, the geologic unit comprising the surface is the Steele Shale formation. No water wells containing high-quality water are known to be completed

Table 4-3. Groundwater permits at NPR-3

Type of permit	Permit number	Facility
Groundwater Appropriation	UW-60713	B-1-3 Tank Battery
	UW-60714	B-1-10 Tank Battery
	UW-60715	B-2-10 Tank Battery
	UW-60716	B-TP-10 Tank Battery
	UW-60717	B-1-14 Tank Battery
	UW-60718	B-1-20 Tank Battery
	UW-60721	B-1-33 Tank Battery
	UW-43810	17-WX-21 Madison Water Well
	UW-85156	57-WX-3 Madison Water Well
Underground Injection Control	049-025-10929	34-CMX-10-WD for Brine Disposal
	049-025-11123	51-CMX-10-WD for Brine Disposal
	049-025-06338	74-CMX-10-WD for Brine Disposal
	049-025-10212	302-A-3 Gas Injector
	049-025-10880	401-A-10 Gas Injector
	049-025-10431	44-MX-10 Gas Injector
	049-025-10025	27-AX-34 Gas Injector
	049-025-10218	103-A-33 Gas Injector
	049-025-10799	85-AX-33 Gas Injector

within this formation near the pipeline routes. One known water well, completed in the Steele Shale formation (at a depth of 495 feet [150 meters]) near the town of Edgerton, has water containing a TDS concentration of greater than 8,000 mg/l. Other water wells near the western pipeline route have been completed in the Madison Formation at depths ranging from 4,400 to 5,600 feet (1,340 to 1,700 meters). TDS concentrations have been measured at approximately 4,000 mg/l (Crist and Lowry 1972). Shallow alluvial groundwater is to be expected near pipeline crossings of Salt Creek and Teapot Creek.

4.3.3 Potable Water

There are no potable water wells in the vicinity of NPR-3; potable water must be transported by truck to NPR-3 from either the City of Casper or the Town of Midwest. Both supplies are community water systems and have been approved by the EPA as drinking water systems. RMOTC's current on-site water system consists of an 8,000-gallon underground water storage tank located at the Lower Office, a pressure pump, and distribution lines to the Upper Office, the Technical Assurance Building, and the warehouse.

During delivery and storage, the water is batch-treated with sodium hypochlorite as the tank is filled. Bottled drinking water is also provided for those who prefer it. The water system supports the on-site RMOTC administrative operations but does not have the capacity to support the associated support buildings or future operations under consideration for RMOTC's site-wide improvements.

Drinking water samples are taken quarterly at NPR-3 to monitor for chloroform and confluent bacteria. Samples are analyzed by the Natrona County Health Department. A copy of the analytical results is retained, and a copy is sent to the EPA Region VIII by the Natrona County Health Department (DOE 1998). Sampling is also conducted for lead and copper levels.

4.4 GEOLOGY, SOILS, AND PRIME AND UNIQUE FARMLANDS

The following discussion provides an overview of the local and regional geological, soil, and farmland resources.

4.4.1 Geology

The topography of the region surrounding NPR-3 is characterized by rolling plains interspersed with ridges and isolated bluffs. The central part of NPR-3 consists of a large plain, dissected by ravines (draws), that is encircled to the east, west, and south by a rim of sandstone (DOE 1998). The area surrounding NPR-3 is not known to be seismically active (DOE 1998).

NPR-3 is centered over the crestal axis of an asymmetrical doubly-plunging anticline called the Teapot Dome, which is the southern extension of the much larger Salt Creek anticline. The Salt Creek anticline underlies the prolific Salt Creek Oilfield, located to the north of NPR-3 (DOE 1998).

The geologic column for the Teapot Dome is shown on Figure 4-2. The oil-productive horizons are the Shannon, Steele Shale, Niobrara Shale, Second Wall Creek, Third Wall Creek, Muddy, Dakota, Lakota, and Tensleep formations.

Since inception, over 1,300 wells have been drilled into the structure which consists of a doubly plunging anticline cored by a basement high-angle reverse fault. Peak production (during the early 1920s) of the structure yielded an average of 4,460 barrels per day and average production during the period was 3,790 barrels per day. These wells were predominantly completed in the Second Wall Creek sand at depths from 2,900 to 3,100 feet (880 to 940 meters). Today at NPR-3, approximately 600 active wells produce oil and gas from several different geologic formations ranging in depth from 500 to 5,000 feet (150 to 1,500 meters).

4.4.2 Soils

Soils and residual material and alluvium within NPR-3 have developed in a climatic regime characterized by cold winters, warm summers, and low to moderate precipitation. The upland soils are derived from both the residual material (derived from flat-lying, interbedded sandstone, siltstone, and shale) and stream alluvium. Valley soils have developed in unconsolidated stream sediments, including silt, sand and gravel. Soils are generally low in organic matter and are highly alkaline and saline. Textures range from clay loams to sandy loams with varying amounts of gravel or coarser materials. Slopes range from nearly level to very steep, with deeper soils found in the less steeply sloping areas. These soils support little vegetation except in perennial streams. The predominant land use on-site is dedicated to oil and gas collection as well as small amounts of rangeland. Vegetation is predominantly grass-shrub that is used for grazing and wildlife habitat.

The U.S. Department of Agriculture (USDA) NRCS (formerly known as the Soil Conservation Service) has completed a soil survey of the NPR-3 site and surrounding lands (NRCS 1997). Although the NRCS mapping is adequate for this level of analysis, it is insufficient for use in locating specific facilities associated with the proposed action. RMOTC would select the specific locations of the proposed facilities and activities (access roads, pads, pipelines, and other ancillary facilities) during the final design process.

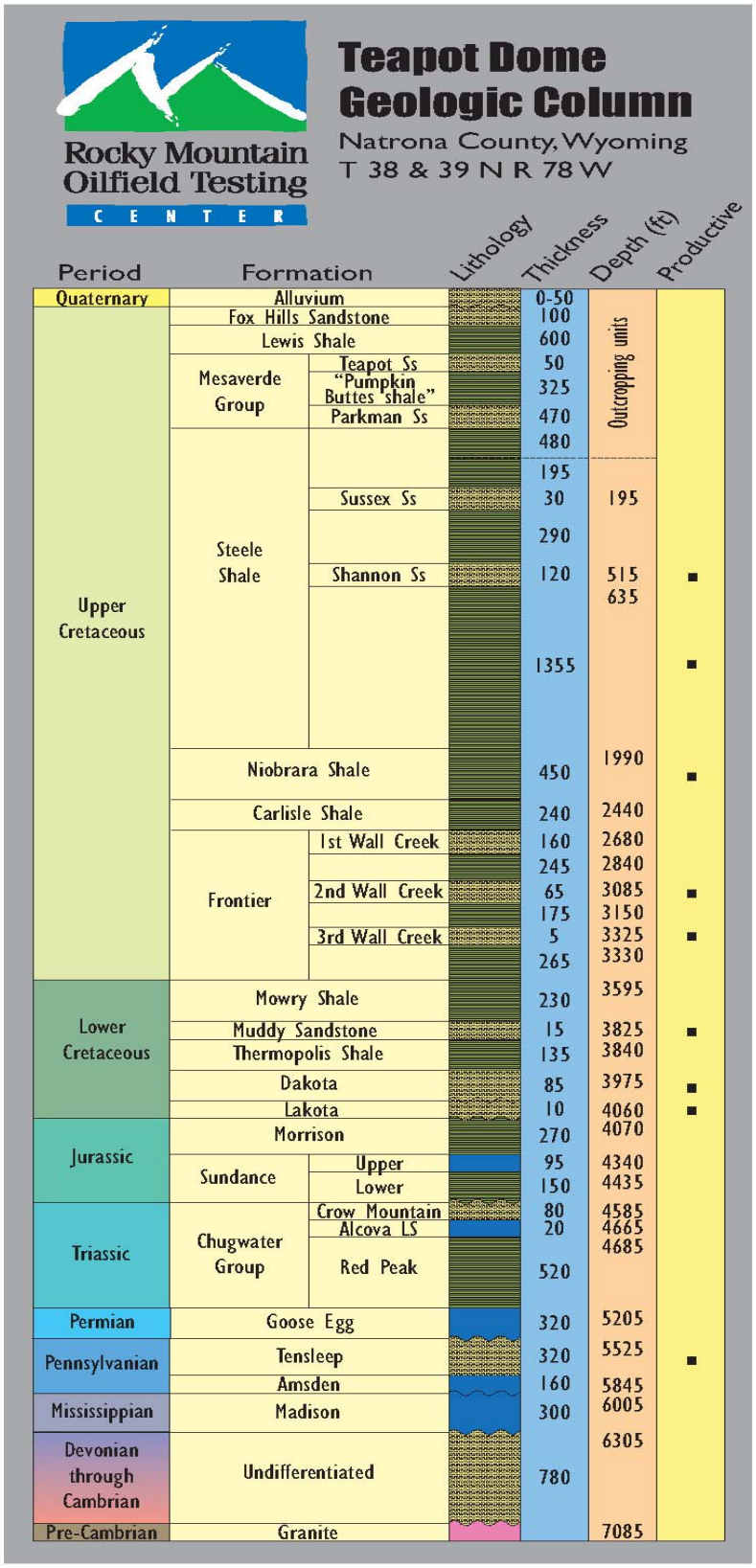


Figure 4-2. Geologic column for the Teapot Dome

Therefore, because exact locations are unknown at this point, the analysis of soils is all-inclusive of the project area and is not based on site-specific information.

Table 4-4 lists the dominant soil series for all the associations on NPR-3. The general characteristics of the soil are listed for each series. The series with severe wind and water erosion hazards, high compaction potential (based on clay content and type in high shrink-swell capacity), high salinity and sodicity, and soils with a poor potential for revegetation are listed in the table.

Soil Descriptions

Soils in the major draws on NPR-3 (Little Teapot Creek, Teapot Creek) are mapped as the Haverdad-Clarkelen complex (saline), which includes a mosaic of soils in the Haverdad loam series and the Clarkelen sandy loam series. Properties and characteristics of these soils are listed in Table 4-4.

The majority of the upland areas throughout NPR-3, other than the peripheral bluffs and ridges, are mapped as the Arvada-Absted-Slickspots complex, the Cadoma-Renohill-Samday clay loams, and the Keyner sandy clay loam. Soils on and immediately at the base of the bluffs are mapped in the Rock Outcrop-Ustic Torriorthents, shallow-Rubble Land complex (Table 4-4).

Along the eastern CO_2 pipeline route, the primary soil map units include the Bowbac-Taluce-Terro complex, Shingle-Taluce-Rock Outcrop complex, Theedle-Shingle-Kishona complex (gullied), and Blackdraw-Lolite-Gullied Land complex (Table 4-4). The route generally is composed of highly dissected hills and upland areas containing rock outcrops and a dense network of gullies.

The western CO_2 pipeline route encompasses numerous soil map units along its 19.4-mile (31.2-kilometer) length, primarily the Blackdraw-Lolite-Gullied Land complex, Cadoma-Renohill-Samday clay loams, Bowbac-Taluce-Terro complex, Arvada-Absted-Slickspots complex, and Amodac-Keyner complex (Table 4-4). This route also is composed of highly dissected hills and upland areas containing rock outcrops and a dense network of gullies. The route crosses Brown Draw, Castle Creek, and Bothwell Draw, which are composed of soils in the Haverdad-Clarkelen complex (saline).

4.4.3 Prime and Unique Farmlands

Prime and unique farmlands are regulated under the jurisdiction of the USDA Farmlands Protection Policy Act (FPPA) of 1981 and administered by the NRCS. Prime farmland is defined in the FPPA as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary of the USDA (USDA 1981).

Unique farmland is land not recognized as prime farmland that is used for the production of specific high-value food and fiber crops, as determined by the Secretary of the USDA. It has a combination of soil quality, location, growing season, and moisture availability necessary to produce economically sustainable high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods (USDA 1981).

Farmland of statewide or local importance is land not considered prime or unique farmland that is believed to be of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops, as determined by the State of Wyoming.

There are no prime or unique farmlands of local or statewide importance present within or in proximity to the NPR-3 (Davis 1993).

Table 4-4. Properties and characteristics of soils on NPR-3 and CO_2 pipeline routes

Soil series	Slope (%)	Landform	Parent material	Primary soil texture	Soil depth	Drainage	Water erosion hazard	Wind erosion hazard
Absted	0-6	Alluvial fans and low terraces	Alluvium from sodic shale	Clay loam	Very deep	Well	Slight	Moderate
Amodac	2-12	Hill slopes	Slopewash alluvium and residuum derived from sodic shale	Fine sandy loam	Very deep	Well	Moderate	Severe
Arvada	0-6	Alluvial fans and low terraces	Alluvium derived from sodic shale	Clay loam	Deep	Well	Slight	Moderate
Blackdraw	3-15	Hillsides	Slopewash alluvium and residuum derived from sodic shale	Clay loam	Very deep	Well	Severe	Moderate
Bowbac	6-10	Foot slopes	Slopewash alluvium and residuum derived from sandstone	Sandy loam	Moderately deep	Well	Moderate	Severe
Cadoma	3-12	Hillsides	Slopewash alluvium and residuum derived from sodic shale	Clay loam	Moderately deep	Well	Moderate	Moderate
Clarkelen	0-3	Floodplains	Alluvium derived from various sources	Sandy loam	Very deep	Somewhat excessive	Slight	Severe
Gullied Land	Areas on hills where severe erosion has cut a dense network of many, small, steep-sided gullies; the gullies are 2-3 feet deep and 1-2 feet wide							
Haverdad	0-3	Floodplains	Alluvium derived from various sources	Loam	Very deep	Well	Slight	Moderate
Keyner	3-10	Alluvial fans and terraces	Alluvium derived from sodic sandstone and shale	Sandy clay loam	Very deep	Well	Moderate	Moderate
Kishona	6-20	Hills dissected by gullies	Slopewash alluvium derived from siltstone, sandstone, and shale	Clay loam	Very deep	Well	Severe	Moderate
Lolite	6-20	Hill crests	Residuum derived from sodic shale	Clay loam	Very shallow or shallow	Well	Severe	Moderate

Table 4-4. Properties and characteristics of soils on NPR-3 and CO_2 pipeline routes (continued)

Soil series	Slope (%)	Landform	Parent material	Primary soil texture	Soil depth	Drainage	Water erosion hazard	Wind erosion hazard
Renohill	3-6	Swales	Slopewash alluvium and residuum derived from shale	Clay loam	Moderately deep	Well	Slight	Moderate
Rock Outcrop	Consists of exposures of sandstone, siltstone, and shale							
Rubble Land	Consists of areas where colluvial boulders and stones have accumulated below sandstone ledges and escarpments; the voids between the boulders and stones are virtually free of soil material; these areas support no vegetation							
Samday	3-12	Hill crests	Residuum derived from shale	Clay loam	Very shallow to shallow	Well	Moderate	Moderate
Shingle	10-40	Escarpments and hills	Residuum and slopewash alluvium derived from siltstone and shale	Loam	Shallow	Well	Severe	Moderate
Slickspots	Areas of clayey soils that are very strongly alkaline and support little or no vegetation							
Taluse	6-20	Hill crests	Residuum derived from sandstone	Sandy loam	Very shallow to shallow	Well	Severe	Severe
Terro	6-15	Hill slopes	Slopewash alluvium derived from sandstone	Fine sandy loam	Moderately deep	Well	Moderate	Severe
Theedle	10-30	Hills dissected by gullies	Slopewash alluvium and residuum derived from siltstone, sandstone, and shale	Clay loam	Moderately deep	Well	Severe	Moderate
Ustic Torriorthents	30-100	Steep slopes	Residuum or colluvium derived from sedimentary rock	Varies	Very shallow or shallow	Well or excessively well	Severe	Varies

Note: To convert feet to meters, multiply by 0.3.

4.5 BIOLOGICAL RESOURCES

The following discussion provides an overview of the local and regional biological resources and environments. A review of literature and existing data and the results of field observations in 2007 were used to characterize the existing biological resources of the NPR-3 site. BLM maps, which included locations and boundaries of critical big-game winter range, raptor nest sites (see Appendix B), and prairie dog towns, and the WGFD database were obtained and reviewed before conducting an aerial reconnaissance.

Additional information on wildlife species was obtained from personal communications with biologists from the WGFD (Emmerich 2007) and USFWS (Kelly 2007a, 2007b).

4.5.1 Aquatic Biology

Aquatic habitats at NPR-3 are limited to intermittent streams within the draws, shallow perennial streams fed primarily by produced water discharged under NPDES permits, and man-made ponds. The intermittent and perennial streams on the site are not known to support any species of fish, but warmwater game fish and non-game fish are found downstream in Salt Creek (RETEC 2004, Appendix E). Fish have not previously been reported in the draws on NPR-3 (DOE 1998). Water in one of the impoundments consists of runoff from snowmelt and rain, and water in the other consists of produced water originating from the Madison formation on an adjoining, privately owned oilfield. A fish survey of the surface waters on NPR-3 has not been conducted. NPR-3 lies within the geographic range of approximately 17 fish species. Although only a few of these species (such as creek chub or killifish) would be expected in on-site streams, NPR-3 is within the watershed of the Powder River, which may contain most of these species (Page and Burr 1991).

The presence of wetland vegetation along portions of intermittent and perennial streams (Teapot and Little Teapot Creeks) at NPR indicates that populations of aquatic macroinvertebrates and other aquatic flora and fauna potentially inhabit these areas. However, because the main water supply is produced water, species diversity is expected to be relatively low, as it is in stretches of Salt Creek below its confluence with Teapot Creek, approximately 1 mile (1.6 kilometers) north of NPR-3 (RETEC 2004, Appendix D). Most of the habitat for aquatic species exists because of on-site and off-site discharges of produced water to these streams. It is estimated that more than 75 percent of the wetlands along Salt Creek would not exist without the discharge of produced water (RETEC 2004, Appendix C).

Aquatic macroinvertebrates would be expected to occur in impoundments with seasonal or perennial water supply. Over 25 such impoundments exist on the site, and at least 18 of these impoundments contain wetland vegetation. The remainder of the impoundments are normally dry and would not support aquatic organisms. Other than Teapot and Little Teapot Creeks, the majority of drainages on NPR-3 are ephemeral and do not support aquatic organisms.

Both the eastern and western proposed pipeline routes would cross Salt Creek. Salt Creek is a BLM-designated sensitive stream containing macroinvertebrates, warmwater game fish, and non-game fish. Other aquatic or semi-aquatic organisms such as amphibians are expected to occur in Salt Creek as well. Dry and intermittent tributaries to Salt Creek, Teapot Creek, and Castle Creek would not be expected to support aquatic organisms.

4.5.2 Terrestrial Vegetation

The majority of NPR-3 supports two vegetation types: mixed grass prairie and desert shrub (Wyoming Geographic Information Science Center 2007). The mixed grass prairie at NPR-3 contains a substantial

proportion of weedy annual grasses and forbs, including cheatgrass (*Bromus tectorum*), Japanese brome (*Bromus japonicus*), tansymustard (*Descurainia pinnata*), and kochia (*Bassia scoparia*). However, many species of desirable perennial grasses also occur, including western wheatgrass (*Pascopyrum smithii*), needle and thread (*Hesperostipa comata*), bluebunch wheatgrass (*Pseudoroegneria spicata*), wildrye (*Elymus* spp.), crested wheatgrass (*Agropyron cristatum*), and Indian rice grass (*Achnatherum hymenoides*).

The desert shrub areas are composed of drought-tolerant shrubs with an understory of grasses similar to those in the mixed grass prairie. Shrubs and subshrubs in these portions of NPR-3 include silver sagebrush (*Artemisia cana*), greasewood (*Sarcobatus vermiculatus*), rabbitbrush (*Ericameria nauseosa*), saltbush (*Atriplex* spp.), and broom snakeweed (*Gutierrezia sarothrae*).

Patches of two other vegetation types—ponderosa pine and Wyoming big sagebrush—also occur at NPR-3 (Wyoming Geographic Information Science Center 2007). Ponderosa pine (*Pinus ponderosa*) stands are found on the peripheral ridge at the southeastern portion of the site and include a wider diversity of understory species such as silver sagebrush, bluebunch wheatgrass, Sandberg bluegrass (*Poa secunda*), threadleaf sedge (*Carex filifolia*), and a diversity of wildflowers.

The Wyoming big sagebrush vegetation type, dominated by several species of sagebrush (*Artemisia* spp.) with a grass understory, occurs in some locations along the southern and western periphery of the site.

Riparian areas exist along draws, impoundments, and perennial and intermittent streams at NPR-3. With the exception of saltcedar (*Tamarix* spp.) and scattered cottonwood (*Populus* sp.) and willow (*Salix* sp.) individuals, most riparian areas at the site are dominated by grasses. Wetland areas are described in Section 4.5.5.

The vegetation at NPR-3 has been strongly influenced by human activities over time. Livestock grazing has occurred for many decades across the site, and DOE continues to lease rangeland within portions of NPR-3. Prior to 1986, the area was reported to have been overgrazed (DOE 1998); this resulted in lower species diversity and increased weedy species. Historic disturbances associated with wellfield operations have changed the vegetation at NPR-3; historically, work areas, wells, roads, pipelines, houses, ponds, and other structures have been constructed, abandoned, and/or removed. Recent reclamation efforts using native species have resulted in the successful reestablishment of desirable shrubs, grasses, and forbs in many portions of NPR-3; consequently, the species diversity has also increased. Wellfield activities have generally not disturbed vegetation on the peripheral ridges and in riparian/wetland areas of the site. However, grazing has affected all areas, and some wetlands have also been affected by discharges of produced water (see Section 4.5.5).

Noxious weed species can be expected to occur in riparian and wetland areas, in historically overgrazed areas, along roads, and in disturbed soils. With the exception of cheatgrass, noxious weed infestations at NPR-3 are not large, and they are currently mapped and controlled by on-site staff. At present, the most common noxious weed at the site is Canada thistle (*Cirsium arvense*), but other weeds have been observed, including common burdock (*Arctium minus*) and saltcedar (*Tamarix* spp.). Table 4-5 lists all species of weeds considered noxious in the State of Wyoming.

The eastern and western proposed pipeline routes would cross similar mixed grass prairie and desert shrub vegetation types described for the NPR-3 site. Because the majority of each pipeline route would follow existing roads, populations of noxious weeds would also be expected to occur along both pipeline routes.

Table 4-5. Noxious weed species in the State of Wyoming

Common name	Scientific name
Field bindweed	*Convolvulus arvensis*
Canada thistle	*Cirsium arvense*
Leafy spurge	*Euphorbia esula*
Perennial sowthistle	*Sonchus arvensis*
Quackgrass	*Agropyron repens*
Hoary cress / Whitetop	*Cardaria draba* and *Cardaria pubescens*
Perennial pepperweed / Giant whitetop	*Lepidium latifolium*
Ox-eye daisy	*Chrysanthemum leucanthemum*
Skeletonleaf bursage	*Fransera discolor*
Russian knapweed	*Acroptilon repens*
Yellow toadflax	*Linaria vulgaris*
Dalmatian toadflax	*Linaria dalmatica*
Scotch thistle	*Onopordum acanthium*
Musk thistle	*Carduus nutans*
Common burdock	*Arctium minus*
Plumeless thistle	*Carduus acanthoides*
Dyers woad	*Isatis tinctoria*
Houndstongue	*Cynoglossum officinale*
Spotted knapweed	*Centaurea maculosa*
Diffuse knapweed	*Centaurea diffusa*
Purple loosestrife	*Lythrum salicaria*
Saltcedar	*Tamarix* spp.
Common St. Johnswort	*Hypericum perforatum*
Common tansy	*Tanacetum vulgare*
Russian olive	*Elaeagnus angustifolia*

4.5.3 Terrestrial Wildlife

The WGFD maintains a database (Wildlife Observation System) of wildlife sightings throughout the state by township, range, and section. This list includes some species that have been observed historically on the NPR-3 site by staff and contractors. The following information is both general and site-specific but may not reflect the complexity of wildlife actually present on the site. Additional site-specific surveys would need to be conducted once specific project site locations were identified.

Several surveys, including raptor surveys that were conducted for energy development in the area, included portions of NPR-3. The most recent raptor survey was conducted May 2007 in the general area. Other wildlife surveys were conducted in 1999, 2001, and 2005. In addition, the results of consultations with the WGFD and USFWS are provided with copies of all letters in Appendix B.

According to a bird and mammal distributive study for Wyoming, approximately 222 avian species and 49 mammal species have been observed in the region containing the NPR-3 site, which also lies within the geographic range with at least 6 amphibian species and 9 reptile species. DOE provides a list of

amphibians, reptiles, fish, birds, and mammals known to inhabit NPR-3 in its *Final Environmental Assessment for Preparation for Production of Crude Oil from a Subterranean Facility* (DOE 2001).

Approximately 70 percent of the world's pronghorn antelope are found in the State of Wyoming. Pronghorn and mule deer are the principal big-game mammals seen on the site. No hunting is allowed by DOE within NPR-3. Critical winter range for either antelope or mule deer is not found within NPR-3. However, range within the NPR-3 is classified by the WGFD as Winter Year-Long Range for both species. The range is utilized by both species throughout the year but is not depended upon during the winter by transient deer or antelope populations (DOE 2001).

Other characteristic mammal populations include raccoons, striped skunk, porcupine, badger, fox, bobcat, prairie dogs (two known colonies), cottontail rabbit, and deer mouse (DOE 2001). During 2007, a tularemia epidemic appeared to be decimating the prairie dog towns, and it is unknown at the time of this writing if prairie dog populations are sustaining or will need to rebuild over time (Wildlife Consulting Services 2007).

Avian species include raptors such as the American kestrel, red-tailed hawk, golden eagles, and northern harrier. Other species include horned lark, western meadowlark, Brewer's blackbird, mountain plover, vesper sparrow, Brewer's sparrow, lark bunting, and sage thrasher. These species would be considered common to any open prairie area. In addition, dabbling ducks such as teals, wigeons, mallards, snipe, gadwalls, etc., may be present in ponded and slow water areas. Past surveys indicate the presence of burrowing owl in association with prairie dog towns (DOE 2001).

Other species potentially found on the site include various toad species, sagebrush lizard, short-horned lizard, garter snake, gopher snake, and western rattlesnake.

Several surveys have been conducted for raptor presence on NPR-3. The bluffs near the site perimeter provide excellent nesting habitat for raptors. The following compilation includes the results of surveys conducted in 1996, 1999, 2005, and 2007. The results of the 1996 and 1999 surveys identified golden eagles (*Aquila chrysaetos*), short-eared owls (*Asio flammeus*), red-tail hawks *(Buteo jamaicensis*), northern harrier hawks (*Circus cyaneus*), bald eagle (*Haliaeetus leucocephalus*), burrowing owls (*Athene cunicularia*), mountain plover (*Charadrius montanus*), and loggerhead shrike (*Lanius ludovicianus*). Two occupied nests were found, a golden eagle nest containing one eaglet and a red-tail hawk nest containing three fledglings. Although a bald eagle was sighted during these surveys, the sighting was outside of the site boundaries.

Ten burrowing owls were observed during a survey of one of the prairie dog towns in August 2000.

The most recent raptor survey, which was conducted in May 2007, evaluated portions of the NPR-3 site as well as adjacent areas for a larger project. The aerial survey confirmed occupied nests for prairie falcons (three nests), golden eagle (one nest), red-tailed hawk (one nest), and great-horned owl (one nest). Additional nests were located during the survey, but they were dilapidated and the associated species could not be identified. These were located primarily in Township 38 North, Range 78 West, Section 22, which includes the bluffs along the southwestern site area. The surveyors were not allowed within certain areas of the site, which remained unsurveyed. No sage grouse leeks were identified within NPR-3 during the survey (Wildlife Consulting Services 2007). Sage grouse depend on the presence of sagebrush communities.

The results of a 2005 ground survey that included the northern portion of the NPR-3 site resulted in the identification of an active northern harrier hawk nest northwest of Teapot Creek but within the NPR-3 boundary. Little potential raptor nesting habitat was present in this area (Veritas DGC Land, Inc 2005).

The Veritas survey (2005) also included a field inventory for prairie dog colonies within NPR-3. All prairie dog colonies on NPR-3 within the project area were mapped. Low density was identified as less than five burrows per acre. One black-tailed prairie dog (*Cynomys ludovicianus*) colony was documented and located on the western border of the site. The colony covered 3.4 acres (1.4 hectares) and was considered low-density. No white-tailed prairie dogs (*Cynomys leucurus*) were documented on the site during this survey (Veritas DGC Land, Inc 2005).

The presence of prairie dog colonies was also evaluated in a May 2007 survey. Less than 6 acres (2.4 hectares) of active mounds were identified. None of the areas appeared to provide suitable mountain plover habitat. As mentioned earlier, site staff have observed a lot of die off from tularemia, which may be affecting burrow active use (Wildlife Consulting Services 2007). In a 2008 site survey, a Range Manager observed no actively inhabited prairie dog colonies.

Mountain plover habitat suitable for nesting on NPR-3 lands within the survey area were mapped. Habitat indicators include level terrain, prairie dogs, bare ground (minimum 30 percent), prickly pear cactus pads (*Opuntia sp.*), heavily grazed pastures, widely spaced plants, and grass height typically less than 4 inches (10 centimeters). No suitable mountain plover habitat was located on the area surveyed within NPR-3. Potential habitat on a bench west of Little Teapot Creek is being encroached by dense stands of cheatgrass, which makes the area unsuitable. Although the mountain plover was originally proposed for listing as a threatened species in 1999, the Service withdrew listing in 2003.

No site-specific surveys have been conducted along either proposed CO_2 pipeline corridor. It is expected that the majority of the species listed above would be found along either route. Prior to any ground disturbance, site-specific surveys would be conducted along potentially disturbed areas.

4.5.4 Threatened, Endangered, and Rare Species

Threatened, Endangered, and Rare Plants

Because NPR-3 was overgrazed prior to 1986, it is unlikely that any threatened, endangered, or rare plant species occur on the site. Although formal vegetation surveys have not been done on NPR-3 since 1978 (DOE 1998), recent observations indicate that plant species diversity remains low, particularly in the basin area. With the exception of the Teapot Creek drainage, vertebrate species diversity is known to be low across the site (Wyoming Geographic Information Science Center 2007), and low vertebrate diversity is highly correlated with low plant diversity (Hong Quian 2006). Moderate vertebrate species diversity occurs along Teapot and Little Teapot Creeks and along Salt Creek to the north. High vertebrate species diversity exists in downstream sections of Salt Creek, north of the town of Midwest.

No federally listed endangered or threatened plant species are known to occur at NPR-3. In 1997, surveys were performed at NPR-3 for Ute Ladies' Tresses (*Spiranthes diluvialis*), a threatened species. No plants were found; additionally, no plants of this species have yet been found in Natrona County (Fertig et al. 2005). Because it is an early successional plant, it is possible, though highly unlikely, that this species may occur on the site along the edges of wetlands at NPR-3.

The riparian areas and peripheral ridges on NPR-3 have been less affected by well-related activities than the basin area. Therefore, rare plant species could potentially be found in these areas, particularly in portions of the ridges with topography that would discourage grazing animals. Table 4-6 lists rare plants that are known to occur in the vicinity of NPR-3 and assesses the likelihood of their occurrence.

Table 4-6. Rare plants in the vicinity of NPR-3

Common name	Botanical name	Listed	Could occur at NPR-3?
Porter's sagebrush	*Artemisia porteri*	a,b	Possible
Nelson's milkvetch	*Astragalus nelsonianus* syn. *A. pectinatus* var. *platyphyllus*	a	Possible
Many-stemmed spider-flower	*Cleome multicaulis*	a, b, c	No; habitat (saline lake shores) not present on NPR-3
Williams wafer parsnip	*Cymopteris williamsii*	a, b	No; elevation and soil type not present on NPR-3
Laramie false sagebrush	*Sphaeromeria simplex*	a, c, d	No; elevation, soil type, and habitat not present on NPR-3
Hapeman's sullivantia	*Sullivantia hapemanii* var. *hapemanii*	b, c, d	No; habitat (moist calcareous outcrops) not present on NPR-3
Contracted Indian rice grass	*Achnatherum contractum*	b, c	Possible
Devil's Gate twinpod	*Physaria eburniflora*	c	No; elevation and habitat not present on NPR-3
Alpine feverfew	*Parthenium alpinum*	d	Possible
Soft aster	*Aster mollis*	b, c, d, e	No; elevation and habitat (deep calcareous soils) not present on NPR-3

a. BLM sensitive species, Casper Field Office.
b. Wyoming Rare Plant Guide lists this plant in Natrona County.
c. USFWS Category C2 (taxed for which current information indicates that proposing to list as threatened or endangered is possible, but appropriate or substantial biological information is not on file to support an immediate rulemaking).
d. Designated as sensitive in U.S. Forest Service Region 2 (Rocky Mountain).
e. Designated as sensitive in U.S. Forest Service Region 4 (Intermountain).

Porter's sagebrush is endemic to the Wind River Basin. It occurs on sparsely vegetated clay slopes. Alpine feverfew and Nelson's milkvetch grow in sparsely vegetated cushion plant communities. It is possible that any of these species may occur in isolated portions of the peripheral ridges at NPR-3 or in similar areas along the pipeline route. Contracted Indian rice grass is found on dry, sandy soils between 4,800 and 7,500 feet (1,460 and 2,290 meters). Because it can occur on disturbed sites, it is possible that this species may occur anywhere on NPR-3 or along the proposed pipeline routes.

Threatened, Endangered, and Rare Wildlife

As a part of scoping activities, the DOE contacted the WGFD. Its response is provided in Appendix B. In general, it commented on the lack of specific locations for its review. In its general comments, the WGFD recommended seeking improved reclamation practices that would restore and enhance wildlife habitats impacted from oil and gas development, especially as related to the greater sage-grouse.

The USFWS was also contacted in 2007; it provided two letter responses, which are included in Appendix B. The black-footed ferret, the mountain plover, and the greater sage-grouse were addressed and are discussed in the following paragraphs.

Black-footed ferret (endangered): this species may be affected if prairie dog towns are impacted. Black-footed ferret surveys are no longer required. However, the Service recommends protection of all prairie dog towns for their value to prairie ecosystems and associated species. As of the summer of 2008, there were no actively inhabited prairie dog towns present on NPR-3 due to die off from tularemia.

Mountain plover: this species is no longer listed and the Service is not reviewing project impacts to this species under the Endangered Species Act (ESA). However, as a migratory bird species, it is protected under the Migratory Bird Treaty Act (MBTA).

Greater sage-grouse: this species is not listed; however, the Service is concerned over potential habitat loss and degradation. It recommended that DOE evaluate any activities that would result in loss or degradation of the sagebrush habitat. If loss of sagebrush habitat or the species cannot be avoided, then it recommends the development and implementation of appropriate mitigation in concert with the WGFD.

If any of the proposed activities would lead to water depletions in the Powder River System, impacts to threatened and endangered species inhabiting downstream reaches should be evaluated. Powder River system depletions may affect the whooping crane (*Grus americana*), interior least tern (*Sterna antillarum*), piping plover (*Charadrius melodus*), pallid sturgeon (*Scaphirhynchus albus*), and western prairie fringed orchid (*Platanthera praeclara*). In addition, depletions may contribute to the destruction or modification of habitat for the whooping crane and proposed critical habitat for the northern Great Plains breeding population of the piping plover.

4.5.5 Floodplains and Wetlands

In 2004, BKS Environmental Associates, Inc. (BKS) conducted formal wetland delineations at NPR-3 (BKS Environmental Associates 2005). Approximately 61 acres (25 hectares) of wetlands exist at the site. The majority of these wetlands (50.94 acres [20.61 hectares]) are classified as Palustrine Emergent and support hydrophytic vegetation. An additional 9.90 acres (4.0 hectares) of Palustrine Aquatic Bed wetlands are unvegetated. BKS also identified 12.02 acres (4.86 hectares) of “other waters of the U.S.” (4.79 acres [1.94 hectares] of Palustrine Unconsolidated Shore and 7.23 acres [2.93 hectares] of Riverine, Intermittent, Streambed), and 55.57 miles (89.43 kilometers) of dry ephemeral drainages at NPR-3. “Other waters of the U.S.” may be jurisdictional, subject to regulation under Section 404 of the Clean Water Act. The U.S. Army Corps of Engineers determines whether a particular feature is jurisdictional. Wetland-non wetland boundaries are gradual to abrupt based on changes in topography.

Wetlands at the site are associated with two streams, Teapot Creek and Little Teapot Creek, and over 25 impoundments located across the site. Most of the impoundments were constructed in unnamed tributary drainages that lead to the creeks; some support wetlands (approximately 18); others do not.

The predominant plant species in NPR-3 wetlands include inland salt grass (*Distichlis spicata*), alkali bulrush (*Schoenoplectus maritimus*), American bulrush (*Schoenoplectus americanus*), and foxtail barley (*Hordeum jubatum*). Less common species include summer cypress (*Bassia scoparia*), seepweed (*Suaeda calceoliformis*), Baltic rush (*Juncus arcticus*), alkali cordgrass (*Spartina gracilis*), Canada thistle (*Cirsium arvense*), saltcedar (*Tamarix* spp.), cattail (*Typha latifolia*), creeping bentgrass (*Agrostis stolonifera*), Sandberg bluegrass (*Poa secunda*), creeping spike rush (*Eleocharis palustris*), and seaside arrowgrass (*Triglochin maritima*).

Wetland areas at NPR-3 are sustained by a combination of natural seeps and springs, runoff, and produced water from oil well operations. Some of the produced water enters from adjacent properties as surface and subsurface flow. On-site, produced water is cooled and discharged into an unnamed tributary

of Little Teapot Creek. This NPDES-permitted discharge results in higher temperatures, increased flow, and the introduction of small quantities of petroleum-related substances into the downstream wetlands.

Floodplain maps do not exist for NPR-3 because there are no large population centers in the vicinity. Flood-prone areas are generally low-lying areas adjacent to wetlands and drainages. The majority of Little Teapot Creek is bounded by high cutbanks. Vegetation in the floodplains/riparian zones include desirable, perennial grasses (inland salt grass, many species of wheatgrass [*Elymus* sp.], prairie junegrass [*Koeleria macrantha*], alkaligrass [*Puccinellia nuttalliana*], and green needlegrass [*Nassella viridula*]), and annual weeds. Scattered woody plants, including saltcedar, cottonwood (*Populus* sp.), willow (*Salix* sp.), Douglas rabbitbrush (*Chrysothamnus viscidiflorus*), and sagebrush (*Artemisia* sp.), also occur. Structures at NPR-3 are located away from flood-prone areas.

Although the proposed pipeline route could cross tributaries to Castle Creek, no wetlands were found in this creek or its tributaries during a recent survey (RETEC 2004, Appendix C). Linear wetlands occur along the shores of Salt Creek, which would be crossed by either pipeline route. Teapot Creek, which may be crossed by the western pipeline route, also contains wetlands. Small pocket wetlands exist in some of the tributaries to Salt and Teapot Creeks; these areas could easily be avoided by minor changes in pipeline routes.

4.6 CULTURAL RESOURCES

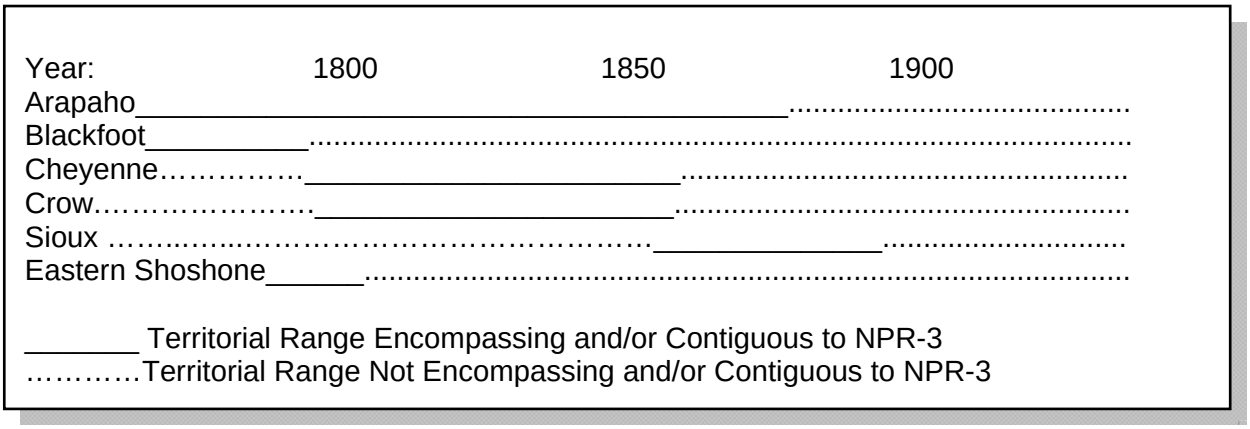
State and Federal Regulations

Cultural resources include archaeological, historical, and ethnographic sites. These resources are protected by a variety of state and federal laws and regulations; the most significant regulations pertain to the NEPA, the National Historic Preservation Act, the Archaeological Resources Protection Act, and the American Indian Religious Freedom Act. Compliance with these regulations requires (1) the assessment and comparison of the impacts of the project; (2) a cultural resource inventory (including fieldwork and archival research) of the ROW; (3) the evaluation of the significance of the sites that could be impacted; (4) the determination of project effects on significant sites; and (5) the implementation of prudent and feasible measures to avoid or mitigate adverse effects to significant sites. During the course of conducting these project-related activities, the State Historic Preservation Officer would be consulted.

Cultural Resource Sensitivity

The cultural history of the NPR-3 site dates back to 12,000 B.P., when Native American people lived and hunted in this area. During cultural resource inventories of the NPR-3 site, artifacts and features dating to the Paleo-Indian period (12,000+ to 7,500 B.P) through the Historic period have been discovered (Goss et al. 2002, Hatcher and Goss 1995, Slensker and Goss 2005, Goss and Knesel 2007). Cultural resource surveys conducted throughout the central Wyoming area indicate that most archaeological resources are dated to the Late Archaic and Late Prehistoric periods (about the last 5,000 years) (BLM 2007). Typical cultural resource discoveries in central Wyoming include open and sheltered camps, hearths, lithic scatters and workshops, stone circles, rock cairns, and petroglyphs. Numerous cultural artifacts have been recovered from the NPR-3 site (Slensker and Goss 2005, Goss and Knesel 2007) and will be curated at the University of Wyoming in Laramie.

Published and unpublished sources of ethnographic literature also indicate that Native American tribes have lived and hunted on and near the NPR-3 site since prehistoric times (Fritz 2007). The colonization of the West by Euro-Americans in the late 1700s and 1800s created a dynamic situation, in which numerous tribes were displaced back and forth across the central Wyoming area. Figure 4-3 shows the specific Native American tribes that were believed to have occupied the NPR-3 area and the time periods during which they were believed to be present.



From Wissler (1917); Kroeber (1939); Driver and Massey (1957), as cited in Fritz 2007.

Figure 4-3. Chronology and territorial range of Native American tribes in NPR-3 area

Since the early 1900s, petroleum development has shaped the history of NPR-3 and its immediate surroundings. NPR-3 was established in 1915, but public versus private use of petroleum resources on the site became a hotly contested political issue that culminated in the "Teapot Dome Scandal" of 1924. Oil production at NPR-3 was discontinued in 1927 and did not resume again until 1959. From 1959 until 1976, oil production operations were established at NPR-3 to prevent the loss of oil to adjacent lands. In response to the oil shortages of the mid-1970s, President Carter authorized the production of NPR-3 at the maximum efficient rate. Since that time, oil has been continuously pumped from NPR-3 (DOE 1998).

Cultural Resources Inventory

A Class III cultural resource inventory was conducted throughout the NPR-3 site in 1994 and 1995 (Hatcher and Goss 1995). The inventory identified 17 prehistoric sites, 13 isolated artifacts, and one historic site (Teapot Dome Oil Field). Two of the 17 prehistoric sites were recommended for additional survey work and were considered eligible for inclusion in the National Register of Historic Places.

Since 2002, numerous additional cultural sites on NPR-3 have been discovered and considered eligible for inclusion in the National Register of Historic Places (Slensker and Goss 2002, Goss and Knesel 2007).

Cultural resources inventory coverage has occurred on approximately 876.4 acres (354.666 hectares), or about 11 percent of the site. The cultural resource inventory coverage is evenly distributed across the site. Heavy concentrations of surveys have occurred in areas currently proposed for projects associated with the Proposed Action.

Cultural resources along the two proposed CO_2 pipelines are similar in type, age, and density to those found on the NPR-3 site. A Class III cultural resource inventory of much of the pipeline corridors was completed in the late 1980s (Pronghorn Archaeological Services 1995). The corridors have been extensively disturbed by activities associated with historical and modern oil and gas development.

Native American Consultation

In accordance with Section 106 of the National Historic Preservation Act, DOE is required to notify Native American tribes if eligible cultural resources may be affected by DOE's proposed actions. In July

2007, DOE formally initiated the Section 106 consultation process by notifying potentially interested Native American tribes that previously had resided in or had cultural ties to the project area to inform them of DOE's proposed actions and to solicit their concerns or comments. A total of 16 representatives from eight Native American tribes—the Arapaho, Northern Cheyenne, Shoshone-Bannock, Eastern Shoshone, Cheyenne River Sioux, Rosebud Sioux, Blackfoot, and Crow Tribes—were contacted by mail, telephone, and e-mail and invited to participate in a site visit. Representatives from the Arapaho, Northern Cheyenne, and Eastern Shoshone Tribes responded with an interest in a site visit. DOE hosted a site visit with two representatives of the Eastern Shoshone Tribe on November 7-8, 2007, and the Arapaho and Northern Cheyenne on May 14-18, 2008.

The Eastern Shoshone representatives provided several comments to DOE concerning the protection of cultural sites. Primarily, they recommended that DOE avoid cultural sites entirely and not draw attention to them by refraining from (1) posting "No Trespassing" signs near the cultural sites, (2) erecting fences (temporary or permanent) around cultural sites to "protect" them, (3) walking to the sites and inadvertently forming trails, and (4) temporarily marking cultural sites with flagging. Additionally, they recommended that hunting not be allowed on the NPR-3 site, as hunting tends to draw more people into areas containing cultural sites. The Northern Arapaho and Northern Cheyenne recommended an ethnographic overview (which has been completed) and cautioned against purely archaeological interpretations. They proposed that a site-wide cultural landscapes study be undertaken that would include elders of their respective tribes. They also offered positive support for the management of on-site security and suggested that a cultural resource advisory group might be formed. They further recommended that all site personnel and site visitors be briefed about the importance of cultural resources, with an emphasis on tribal points of view, and that all personnel and visitors be instructed to refrain from removing any items from the sites. All tribes asked to be kept informed. No traditional cultural properties were identified as a result of the site visits.

Cultural Resource Management and Protection

Section 110 of the National Historic Preservation Act requires federal agencies to assume responsibility for the preservation of historic properties by locating, inventorying, and nominating to the National Register of Historic Places all historic properties under their ownership or control. In accordance with these requirements, DOE has developed a procedure for inventorying and protecting cultural resources on the NPR-3 site. These requirements are outlined in two DOE NPR standard operating procedures—DOE 5407 - *Protection of Cultural Resources,* and DOE 5403.01 - *Environmental Policy*—and reflect requirements in DOE Order 5480.4 - *Environment, Safety and Health Protection Standards.*

Section 106 of the National Historic Preservation Act compels federal agencies to "take into account" the effect of their projects on historical and archaeological resources. If DOE's actions would have an adverse effect on an eligible cultural resource, DOE would be required to implement a process called the Section 106 consultation process. This process would require DOE to consult with the State Historic Preservation Officer, Native American tribes, and others in an effort to find ways to make the action less harmful.

4.7 SOCIOECONOMICS

The following discussion provides an overview on the local and regional human environments.

4.7.1 Population and Housing

The project lies in an unincorporated area on Natrona County. The nearest major population center is the Midwest/Edgerton area. The latest census shows that Natrona County has a population of approximately 65,000 (Natrona County 2007).

Casper is the county seat of Natrona County and the second largest city in Wyoming. The most recent census data from 2000 recorded a population of 49,644; however, due to the continuing energy development in the area, the Casper Area Economic Development Alliance has identified a more recent (2005) population of 51,738 for Casper (CAEDA 2007). Natrona County had a 2005 population of 69,799. After Casper, the majority of the remaining population lives in unincorporated areas. The closest towns to NPR-3 are Midwest and Edgerton; they are located approximately 7 miles (11 kilometers) north of the northern boundary of NPR-3 and along State Highway 387.

Casper has been important to area commerce since the mid-nineteenth century. It began as a ferry crossing in 1847; soon afterward, a military fort was constructed to protect the Platte River Bridge. After the Salt Creek Oil Field (north of NPR-3) was discovered in the 1880s and the Teapot Dome Oil Field several decades later, oil and gas drilling began to dominate Natrona County's economy. At the time of this writing, the majority of employment and economic growth is related to the energy sector. Energy-related employment provides higher wages than other employment opportunities. Casper serves as a service center for the oil and gas industry, as well as a center for coal mining, uranium, and medical and financial services (BLM 2007).

The town of Midwest has a population of approximately 408; the town of Edgerton has a population of 169. The towns of Midwest and Edgerton, immediately adjacent to each other, have approximately 347 permanent housing units, both owned and rented (Wyoming Gazetteer 2008). The population has decreased since 1980 when it had more inhabitants, and during the oil and gas development boom in 1983-4.

Approximately three hotel and motel units and recreational vehicle/camper units are available in Midwest/Edgerton. Site visits to the area in November 2007 identified approximately 10 apartment and permanent dwellings available for rent in the Midwest/Edgerton area.

4.7.2 Employment

The towns of Midwest and Edgerton are primarily a bedroom community for the mineral industry. The economy is based primarily on oil and gas operations and is inhabited mostly by operating crews for facilities in the area. It is likely that construction personnel reside in the towns. A small retail trade occurs in both towns to support the oil and gas industry in the project area.

4.7.3 Transportation

Interstate 25 (I-25) is a four-lane interstate highway that enters Wyoming near Cheyenne, north of the Colorado state line, and continues north to Douglas. It continues west to Casper, then north to Montana. It provides the primary north-south highway access in Natrona County. An estimated 31 miles (50 kilometers) north of Casper, State Route 259 (SR-259) splits off from I-25, providing direct highway access to the western edge of the site for NPR-3 workers, and continues north to Midwest and Edgerton for oil field workers in surrounding areas. Actual site access off of SR-259, however, is by a restricted internal road within NPR-3.

Current use of I-25 and SR-259 has historically been and continues to be light; both routes operate below capacity at a Level of Service A, which indicates a lack of congestion. In 2006, recorded highway counts on I-25 between Casper and Midwest, Wyoming, showed an average daily vehicle count of 5,470 vehicles. SR-259 is a two-lane paved state road that similarly receives light use and is carrying traffic below highway design levels. In 2006, an average daily traffic count of 2,000 vehicles was recorded on this road (Wiseman 2007).

Injury and fatal accident data were reported for the period of 2002-2006 on I-25 between Casper and the Natrona-Johnson County lines. On I-25, there were 324 total crashes; of these, 97 were injury crashes and 4 were fatal crashes. For SR-259 during the same reporting period, there were 30 total crashes; of these, 9 were injury crashes and 1 was a fatal crash. In comparison, there were a total of 10 fatal crashes on all roads in Natrona County in 2006. A crash is reported if there is over $1,000 damage, injury, or death (Carpenter 2007; WDOT 2007).

There are no scenic byways along the above-described highways.

Air transportation services in Natrona are provided by the Natrona County International Airport in Casper. The airport offers both freight and passenger services.

4.7.4 Community Services

The Wyoming Medical Center hospital in Casper has a 225-bed capacity. Ambulance service is also available.

Electricity for the project area is supplied by Pacific Power and Light. Natural gas is supplied by the field for use in heating, air conditioning, and running equipment. Potable water is available from an on-site storage and distribution system that stores water transported from Midwest to the site. Sewage disposal facilities are available from on-site septic tanks with a large excess capacity. All utilities are currently operating with peak load demands well below the maximum supply capacity. A county-owned landfill is available for solid waste disposal in the town of Casper.

Natrona County fire departments would be the first to respond to a fire or emergency in the project area. The county and town provide volunteer fire protection stations in the vicinity of NPR. On-site personnel have also been trained as firefighters and would be available to respond. NPR-3 has mutual aid agreements with the adjacent towns to provide firefighting services to the site. Additional back-up units could be provided, as needed, from the Casper region located south of the project.

4.8 WASTE MANAGEMENT

The following discussion addresses current operations associated with managing operational wastes from the various activities currently taking place on-site.

4.8.1 Hazardous Waste

The NPR-3 site has a waste management policy that provides direction for the appropriate disposition of hazardous waste materials generated during site operations. Hazardous and non-hazardous waste treatment, storage, and disposal of solid matter is regulated under the Resource Conservation and Recovery Act (RCRA) (42 USC 9601-9675 et seq.). Much of the waste generated at the site is exempt under 40 CFR 261.4 (b) (5), which defines the following solid wastes as exempt from the designation of hazardous: "*drilling fluids, produced waters, and other wastes associated with the exploration,*

development, or production of crude oil, natural gas, or geothermal energy". Crude oil, natural gas, and associated liquid petroleum gases are produced at NPR-3 (DOE 2001).

NPR-3 is listed as a conditionally exempt small-quantity generator under RCRA. As such, NPR-3 could generate no more than 220 pounds (100 kilograms) of hazardous waste per month, and total on-site accumulation could not exceed 2,205 pounds (1,000 kilograms) of hazardous waste or 2.2 pounds (1 kilogram) of acutely hazardous waste at one time (DOE 2001).

The existing drilling and production wastes at NPR-3 include oil, water, drilling mud, cuttings, well cement, produced waters, and sediments and sludges from produced water pits. Oil from wells is routed to test satellites and tank batteries, and water from the tank batteries is discharged into pits or injected into a permitted well. This water contains residual oil. Other RCRA-exempt wastes generated at NPR-3 include sediment and tank bottoms from pits and storage tanks, pigging wastes, soil contaminated with crude oil, and spent filters (DOE 2001).

In accordance with the Superfund Amendment Reauthorization Act Title III, chemicals are evaluated to determine if any are listed as extremely hazardous substances. If any of these are utilized at NPR-3 in reportable threshold planning quantities, NPR-3 submits annual tier II reports for items such as treating chemicals, hydrochloric acid, gasoline, diesel fuel, ethylene glycol, propane, and butane-gasoline mixture. The current minimum quantity of all chemicals stored at NPR-3 at any given time is 25,000 gallons (95,000 liters) (DOE 2001).

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601-9675 et seq.) establishes liability, compensation, clean-up, and emergency response by the federal government for hazardous substances released to the environment and for the clean-up of inactive hazardous waste disposal sites. Historically, a variety of CERCLA-regulated substances have been used at NPR-3; these substances have included caustic soda, chrome lignosulfonate (1960s), hydrochloric acid (1950s to present), sodium chromate (late 1970s), sodium bichromate (late 1970s), xylene, ethylene glycol, methanol, and n-butyl alcohol (unknown date to 1997) (DOE 2001).

4.8.2 Pesticides

For parking lots, fence lines, and areas around production equipment and buildings, NPR-3 staff have used pesticides such as Roundup, Banvil, and Karmex. Herbicides are stored in a shed at the chemical dock. They are purchased in small quantities and with return agreements with vendors whenever possible to limit the amount stored on-site (DOE 2001).

4.8.3 Radioactive Wastes

Radioactive waste is generated as a by-product of oil and gas production in an area with naturally high radioactivity in the subsurface, which is classified as "naturally occurring radioactive material" (NORM).

There are two sources of NORM/radium-226 at the NPR-3 facility: groundwater drawn from wells in the Madison formation and the build-up and storage of scale on equipment and pipelines. Wells drilled in the Madison formation produce water at high temperatures and contain radium-226. Oil field equipment can contain radiological scale and scale-bearing sludge, both of which can form as coatings or sediments. Scale precipitates from produced water in response to changes in temperature, pressure, and salinity as the water is brought to the surface and is processed to separate coexisting crude oil (USGS 1999).

No federal regulations specifically address the handling and disposal of oil-filled NORM wastes. While several states have enacted NORM regulations, Wyoming has not (Shire 2007a). NPR-3's WYPDES

permits include monitoring for radium-226 annually. The maximum discharge amount is 60 picocuries per liter (pCi/l). Wyoming has regulations for the disposal of radioactive waste. According to staff members of the WDEQ, in accordance with state regulations for solid waste disposal, radioactive materials below 5 pCi/l can be disposed of in a solid waste disposal facility without special action; however, if the waste is in excess of the criteria limit, then it requires 4 feet (1.2 meters) of soil cover following disposal at a solid waste facility. In the past, equipment and pipelines affected by radium-226 has been placed in the facility's hazardous waste accumulation area on the site. Furthermore, there are no Wyoming regulations for NORM or radium-226 in soil. All sites with a potential radioactive issue receive review on a case-by-case basis. For purposes of assessing impacts, the API bulletin E2 on management of NORM in oil and gas production (1992) is used as a guidance document.

4.8.4 Waste Disposal

NPR-3 has waste disposal sites that include an industrial solid waste landfill and landfarm, reserve pits, and, injection wells. NPR-3 contracts for solid waste collection and disposal.

Wyoming is an NPDES authorized state, and wastewater discharges are regulated under the Clean Water Act and its associated EPA regulations. Wyoming regulations are codified under the Wyoming Water Quality Rules and Regulations. A water treatment facility uses an organic process to clean produced water of hydrocarbons and reduce COD. This process allows produced water to be discharged rather than injected into underground reservoirs (Navarro 2005).

Petroleum discharges are regulated under the Clean Water Act. Petroleum management at NPR-3 consists of management of oil and associated wasted (e.g., produced water, sludge) to prevent oil from being discharged into surface water. Oil spill prevention measures are outlined in the NPR-3 Spill Prevention Control and Countermeasure (SPCC) Plan (Navarro 2005).

4.9 ENVIRONMENTAL JUSTICE

Environmental justice is related to the fair treatment and meaningful involvement of minority and low-income populations in proposed projects on federal land or using federal funding. When the impacts of a proposed federal action may involve such populations, an analysis of the potential for disproportionate and adverse impacts to these populations, combined with meaningful community outreach and public involvement, is required.

NPR-3 is on land that was withdrawn from other purposes for the production of oil. It is remote from urban centers and surrounded by large ranches and public land. The proposed activities evaluated in this SWEA are construction and research in nature and would be completed with limited outside labor. As a federal agency, DOE complies with all federal hiring and contracting requirements. Minority and low-income populations would not be affected by any of the proposed activities described in this SWEA because the projects would be conducted on land withdrawn for the NPR-3; therefore, this resource is not considered further in this SWEA.

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5.0 ENVIRONMENTAL CONSEQUENCES

This chapter describes and assesses the environmental effects associated with each of the three alternatives (see Chapter 3.0), including the No Action Alternative.

5.1 IMPACTS OF THE PROPOSED ACTION

5.1.1 Land Resources

Criteria used to assess land use impacts are based on potential conflicts between the Proposed Action and existing land uses, conformance with land use regulations of governing agencies with jurisdiction on the project site, and duration of potential impacts.

5.1.1.1 Land Use

The projects associated with the Proposed Action are consistent and compatible with the current and past oil and gas industrial uses and research uses at the NPR-3 site. The facility is remote from human activities, and the land has been withdrawn for use as a dedicated oil production and research facility. The proposed projects are experimental research activities designed to stimulate additional oil recovery and are refinements of past and current technologies that have been used on the site. In addition, the use of wind power to provide a renewable source of energy is in alignment with Executive Order (E.O.) 13423 signed by President Bush in 2006. Land use impacts associated with the Proposed Action as it relates to land use conflicts are not expected. The Proposed Action does not represent a change from existing land uses at the NPR-3 site. As described in Chapter 3.0, if all the proposed projects described in Section 3.1.2 were implemented, an estimated 85 to 123 acres (34 to 50 hectares) of land would be disturbed under the Proposed Action (the number of disturbed acres would depend on which alternative corridor of the EOR project was selected). An estimated 25 acres (10 hectares) would be disturbed annually for ongoing operations associated with the Proposed Action.

Natrona County would consider the Proposed Action to be consistent with governing land use policies located in a known oil and gas resource area. The project therefore would comply with county land use requirements, which specify locating heavy resource-related land-based activities near the resource to be extracted.

Impacts would occur during the construction phase of each proposed activity, mainly due to ground disturbance. Domestic grazing could be precluded during construction activities (the construction schedule coincides with the grazing season); however, the majority of the site would remain available for this use. After construction of the facilities, however, grazing activity would return to approximate existing conditions. Construction impacts on land use would affect a relatively small portion of the overall grazeland and would be short-term; therefore, they are not considered adverse.

5.1.1.2 Land Ownership

As described in Chapter 3.0, with the exception of the proposed CO_2 pipeline, project-related activities would occur on the NPR-3 site. Because the proposed activities are similar in nature to the activities that have occurred over the last 50 years, potential conflicts with adjacent property or land activities operated by private landowners or state and federal land managers are not expected.

With respect to potential impacts of the proposed CO_2 pipeline, pipeline construction impacts would largely consist of surface disturbances. Under the Proposed Action, an estimated 23.8 acres (9.6 hectares) would be disturbed if Alternative Corridor A were selected, and an estimated 61.4 acres (24.8 hectares) would be disturbed if Alternative Corridor B were selected. Once the pipeline was completed, disturbed surface areas would be reclaimed. The CO_2 pipeline could traverse federal lands. To the extent practical, the pipeline would be located within an established pipeline corridor approved by the BLM. Based on discussions with the local BLM office, the subject EA would be reviewed and used to assess potential land use impacts associated with construction and operation of the proposed CO_2 pipeline (Shire 2007).

5.1.1.3 Recreation

As described in Section 4.1.3, no recreational facilities or resources currently exist at the NPR-3 site. No significant increases in the full-time work force would occur, so there would be no increased demand for regional recreational facilities. Because there are no recreational facilities, nationally designated recreational resources, or dispersed recreational activities found within the NPR-3, adverse effects are not expected under the Proposed Action.

5.1.1.4 Aesthetics

Under the Proposed Action, construction-related visual impacts would be limited to earthwork and grading scars, heavy equipment tracks, support machinery and tool temporary storage, and related waste materials and cuttings.

The NPR-3 site is located in an area characterized as having a low level of visual sensitivity based on prior modifications of the natural setting in the area. Under the Proposed Action, visual impacts would be minimized by constructing and generally locating proposed facilities adjacent to existing oil and gas facilities. According to BLM Resource Area Management Plan maps, the project area is not in a visually sensitive area; therefore, the Proposed Action would not affect adjacent areas managed by the federal agency.

Any visual impacts would be reduced by implementing standard revegetation efforts currently undertaken by RMOTC, restoring pre-existing areas, and minimizing the construction duration at the site (project construction is currently scheduled to begin in late 2009 and last through 2010). Residual impacts would be short-term. With mitigation, landscape changes following revegetation of disturbed areas would not be obvious or attract attention and are not expected to be adverse. In summary, the proposed activities would not represent a change in the visual character of the area.

There are no residences adjacent to, or in view of, the pipeline corridor or associated facilities. Travelers on U.S. Highway 259 would be able to view pipeline construction. With the above mitigation, construction-related visual impacts would be short-term and are not expected to be significant.

Sporadic recreational travelers, hunters, and sheep or cattle herders could enter the project area during construction and view construction activities. Due to the low visual sensitivity of the project area as a result of previous disturbance under the same long-term recovery conditions, impacts in this area are not considered adverse.

5.1.2 Air Quality and Noise

5.1.2.1 Air Pollutants

Air quality regulations stipulate that the project would be considered to have an adverse impact on air quality if the project violates any ambient air quality standard, contributes measurably to an existing air quality violation, or exposes sensitive receptors to substantial levels of pollutants.

The potential air quality impacts resulting from the Proposed Action can be divided into two major categories:

- Short-term construction emissions: airborne dust in emissions from heavy equipment during the construction phases of the proposed action.
- Long-term stationary emissions: emissions resulting from operations.

Short-Term Construction Emissions

Under the Proposed Action, the construction of new facilities and the installation and use of equipment within the project area would produce two types of air contaminants: exhaust emissions from construction equipment and fugitive dust generated as a result of soil movement. These construction impacts could be expected during each phase (i.e., new project development) of the Proposed Action. The emissions produced during grading activities, although of short duration, could result in adverse impacts even when prescribed procedures were followed.

Exhaust Emissions from Construction Equipment

Under the Proposed Action, construction-related primary emission sources would include diesel- or gasoline-fired internal combustion (IC) engines operating heavy-duty equipment. There would be no construction equipment-related emission sources on the site that would require permits from the state or EPA. Although the emissions from the IC engines would include volatile organic compounds (VOC), nitrogen oxides (NO_X), sulfur dioxide (SO_2), carbon monoxide (CO), and particulate matter (PM), emissions of these pollutants would be limited and intermittent. Typical equipment to be utilized at the site would include track-type dozers, pickup trucks, and a fuel truck. Secondary emission impacts from construction personnel automobiles would also be limited. Due to the remote location of the proposed site, the short-term increase in emissions is not expected to result in an adverse impact.

Fugitive Dust Emissions

Construction activities associated with the Proposed Action would emit fugitive dust; these emissions could have substantial temporary impacts on local air quality. Building and road construction are the construction categories with the highest emission potential. Specific activities that would emit fugitive dust are land clearing, ground excavation, grading operations, and construction of the structures.

Dust emissions would vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing weather. A large portion of the emissions would result from equipment traffic over temporary roads at the site. The quantity of fugitive dust generated would be proportional to the area of land being worked and the level of construction activity. Emissions from heavy construction would be directly proportional to the silt content of the soil (that is, particles smaller than 75 microns in diameter) and inversely proportional to the square of the soil moisture. At this general level of analysis, the timeframe/schedule, amount, and exact nature of grading required for complete development of the site is not known.

A general estimate of dust generation can be illustrated by applying the EPA dust generation factor of 1.2 tons of fugitive dust per acre of disturbance per month of grading activity to an estimate of grading activity for the Proposed Action. As outlined in Chapter 3.0, approximately 98 acres (40 hectares)[1] within the project area could be subject to development grading (calculated from Tables 3-1 through 3-6). Assuming an estimated 5-year development phase (new construction is projected to occur over a 5-year period), an average of approximately 1.6 acres (0.6 hectare) would be graded per month (98 acres [40 hectares] divided by 60 months). Based on the EPA dust-generation factor of 1.2 tons per acre per month, grading activities could generate approximately 1.9 tons (1.7 metric tons) of dust per month. This estimate is highly conservative (worst-case) and does not account for dust control measures (e.g., watering, soil fixative).

While construction activities would be a significant source of fugitive dust emissions that could have a substantial temporary impact on local air quality, the duration of this impact would be short. Dust control measures, if correctly implemented, have been shown to control up to 95 percent of construction-related dust at a construction site. DOE would implement dust control measures under the Proposed Action.

Long-Term Stationary Emissions

The WDEQ has reviewed the emissions from ongoing operations of the NPR-3 stripper field and has determined that at production rates of 730 barrels of oil per day and 2.5 million standard cubic feet of gas per day, there would be no emission sources throughout the production field that would require controls. The WDEQ also has determined that the emissions from NPR-3 production are considered "insignificant in terms of ambient impact and rate," based on the Wyoming Air Quality Standards (WDEQ 2001b). Production under the Proposed Action would not likely exceed 500 barrels per day and thus would be well below the limits assessed by WDEQ, even if the proposed EOR project were successful in increasing yields. Other projects such as the FALF or the CWTTF would not generate routine air emissions that would increase the overall site emission inventory.

5.1.2.2 Noise

Potential noise impacts associated with the Proposed Action can be divided into short-term and long-term impacts. Short-term impacts would occur from noise generated by stationary and mobile construction equipment. Long-term impacts would occur from new equipment and from operations associated with the Proposed Action.

Short-Term (Construction) Noise Impacts

Construction noise would result in a short-term impact on ambient noise levels. Noise from earth movers, material handlers, and portable generators can reach high levels. All trucks and equipment carriers accessing the NPR-3 site could generate annoying noise levels while passing through noise-sensitive areas. No noise-sensitive land uses exist in the project area. Impacts from construction noise would depend on the phase of the various projects and improvements associated with the Proposed Action.

The noise associated with the construction of the various projects and associated facilities would result from operation of heavy construction equipment. Average noise levels from typical construction equipment at 50 feet (15 meters), measured in A-weighted decibels (dBA), are as follows: 88 dBA (trucks), 85 dBA (backhoes), and 85 dBA (graders). Where hard rock formations are encountered,

[1] The estimated amount of total disturbed land uses an average of the estimated acreage required to construct each of the two proposed CO_2 laterals under consideration (see Table 3-3). For Corridor A, 23.8 acres (9.6 hectares) are estimated; for Corridor B, 61.4 acres (24.8 hectares) are estimated. The estimated average amount of this disturbed land is 42.6 acres (17.2 hectares).

controlled blasting could be required (possibly for the proposed EOR pipeline). This would increase sound levels temporarily. Blasting would be conducted during daylight hours to avoid night-time disturbances.

There are no state regulations governing noise levels during construction or operation of the proposed project. Guidelines often used in assessing and abating noise impacts are contained in the *Federal Highway Administration (FHWA) Federal-Aid Highway Program Manual* and the *Protective Noise Levels* document published by the EPA. However, there are no FHWA noise abatement criteria for undeveloped lands.

EPA has established maximum allowable noise exposure levels. The EPA maximum allowable 24-hour L_{eq} (equivalent sound levels) for continuous noise is 66.4 dBA. The EPA maximum allowable 8-hour L_{eq} for intermittent sounds (such as those from construction) is 78 dBA. Persons exposed daily to continuous sound levels of up to 66.4 dBA or intermittent sounds of up to 78 dBA would not experience hearing losses (EPA 1978).

Construction-related noise impacts on workers would represent a short-term nuisance. Because the duration of construction activities would be short and there are no other sensitive noise receptors in the project area, noise impacts are not expected.

Noise generated from trucks traveling to and from the town of Midwest and Edgerton could have a potential impact on residents if residential roads were used to transport construction materials. Such impacts could be reduced by routing the trucks away from residential streets where possible and limiting truck travel through the town to normal workday hours.

Long-Term (Operational) Noise Impacts

Implementation of the Proposed Action would introduce new noise sources to the project area (e.g., new technology and demonstration activities) and would increase noise levels from vehicles and heavy equipment required for operations. Project implementation would result in a gradual overall increase in the ambient noise levels of the project area. As described earlier, the project vicinity is largely undeveloped; therefore, existing ambient noise levels are relatively low. Given this acoustic environment, even small increases in ambient noise levels could be notable. As the phase development of the Proposed Action occurred, incremental increases in ambient noise levels would likely become less discernible because when the ambient noise levels in a setting become louder, the setting becomes less sensitive to new sounds.

The assessment of noise impacts at the NPR-3 site considers that changes in noise levels greater than 3 dB are often identified as an adverse impact, while changes less than 1 dB would not be discernible to most people. In the range of 1 to 3 dB, people who are very sensitive to noise may perceive a slight change. No scientific evidence is available to support the use of 3 dB as an adverse impact threshold. Under laboratory testing situations, humans are able to detect noise level changes slightly less than 1 dB. However, under general noise situations, noise exposure occurs over a long time period, and changes in noise levels occur over the years, rather the immediate comparison in a laboratory situation. Therefore, the threshold at which a change in general noise levels becomes discernible is likely to be some value greater than 1 dB; 3 dB appears to be an appropriate threshold for most people.

With respect to stationary noise sources associated with new facilities and equipment, no noise impacts are expected to occur during operations. Equipment and operations (refer to Chapter 3.0) are characterized as relatively low-intensity activities. Based on the existing acoustical environment, the absence of sensitive noise receptors on the site, and the low level of intensity associated with operations under the Proposed Action, noise level increases of 3 dB from current levels would not be expected.

5.1.3 Water Resources

5.1.3.1 Surface Water

Rechanneling of runoff during construction, drainage restrictions, and erosion control could impact drainage patterns, rates, and the amount of surface water runoff at the project site. Impacts to drainage patterns and runoff would be restricted to the new facility locations, and construction impacts would be short-term, limited to 6 to 12 months during construction. Moreover, construction activities are not proposed through flowing or standing water. No impacts to surface water quality from construction runoff or construction activities are expected during the construction period of the Proposed Action.

The discharging of test water from the pipeline-related projects during construction would require an NPDES permit. The NPDES permit would require that discharges not be allowed into live streams or adjacent to any water bodies and that erosion control devices and methods be implemented. Implementation of these measures would reduce impacts to water quality from hydrostatic testing.

Drainage patterns and rates originating from areas where new facilities would be constructed would differ from current drainage conditions. However, because the size of the new facilities would be relatively small, and because any discharges associated with the operation of the new facilities would not affect any live streams or adjacent water bodies, final collection and discharge systems would not change under the Proposed Action.

Operation of the wastewater treatment facility would result in continued discharges of treated produced waters into the Little Teapot Creek. As discussed in Section 4.3.1, all produced water is currently discharged under an NPDES permit. Operations under the Proposed Action would continue to meet current water quality criteria and regulatory limits imposed as part of the NPDES permit.

With respect to potential effects of produced water discharges, permitted and expected produced water discharges resulting from operations would continue to flow to the Salt Creek basin. Operational discharges have contributed to the basic flow conditions in the lower reaches of Salt Creek, resulting in a perennial stream. Based upon this contribution, continued beneficial impacts are expected for livestock watering, as well as wetland habitats that currently exist in the receiving waters.

Minor quantities of surface water runoff could reach streams bisecting the NPR-3 site. Both the water quantity and quality of this runoff would likely be similar to existing water quantity and quality conditions currently experienced on the site. Engineering controls would be implemented to ensure that surface water runoff during operations did not result in sedimentation or pollutants reaching either of the two streams draining the site.

5.1.3.2 Groundwater

Potential impacts to groundwater resources associated with the construction phase include disruption of shallow or perched aquifers during excavation and localized dewatering. Those impacts would be confined to a small area and would be of short duration and therefore would not be significant.

The potential impact of groundwater contamination due to accidental spills of petroleum from construction equipment or of other chemicals used during construction would likely be limited to areas in the vicinity of the construction. Because the water table in the project area is generally fairly deep and groundwater resources occur in localized areas, this impact is not considered adverse. Furthermore, because it is not certain that spills would occur, this impact is judged to have a low potential for occurrence.

As described in Chapter 3.0, with the exception of the geothermal energy enhancement project, the Proposed Action would not affect groundwater resources underlying the NPR-3 site. Moreover, based on the relatively shallow depth of pipeline installation in relation to the expected depth of groundwater in the project area, potential effects of the EOR project to local or regional groundwater resources are not likely. The proposed geothermal power plant projects would involve withdrawing water from oil-bearing formations. However, the water used for operations would come from existing oil extraction operations, not from groundwater resources.

With respect to groundwater quantity and drawdown, groundwater resources withdrawn from the underlying formations is high in TDS and hydrocarbons and is not suitable for drinking. In particular, the salinity of the Madison formation water renders it unsuitable for drinking; therefore, no adverse competition with regional demands for potable water is possible. Because the Madison formation is deep and overlain by rigid strata not susceptible to compression, there is no potential for land subsidence due to groundwater withdrawals resulting from RMOTC test projects.

5.1.3.3 Potable Water

Under the Proposed Action, potable water demands would be met by adding a new potable water line (assessed in a separate EA [DOE 2008]). During construction, workers associated with new construction would provide their own drinking water supply. Adverse impacts to potable water resources are not expected as a result of the Proposed Action.

5.1.4 Geology, Soils, and Prime and Unique Farmlands

5.1.4.1 Geology

The project region has been undergoing similar development for over a century, and most of the projects associated with the Proposed Action would be located at existing facility sites. Overall, the proposed facilities (either during development, during construction, or during operations) would avoid steep or unstable slopes. As a result, no impacts associated with reduced slope stability would be anticipated. Some minor changes in topography from cut-and-fill activities would be anticipated during construction of new roads and project facilities. However, impacts from these activities would be minimal.

5.1.4.2 Soils

Construction activities would require soil excavation and stockpiling. These soils could be susceptible to erosion until they were replaced. Soil erosion could also occur after the soil was replaced and before sufficient ground cover developed. Erosion impacts associated with stockpiled and with recently replaced soils would be considered adverse. As part of the current procedures implemented at the site, areas affected by construction activities would be reclaimed, reseeded, and restored to preconstruction conditions. Implementing the revegetation program should reduce the potential for significant erosion of spoil piles. Soil stabilization and the use of native seed mixes recommended by the U. S. Bureau of Land Management are standard reclamation practices for reclamation of surface disturbances caused by human activities at RMOTC/NPR-3.

5.1.5 Biological Resources

The following analysis of potential biological impacts under the Proposed Action is divided into two discussions. The first discussion focuses on the potential impacts to specific plant communities and wildlife habitats as a result of the projects associated with the Proposed Action. The second discussion examines the broad, area-wide constraints and opportunities of future development (within a 5-year

period) might have on the ecological functioning of the project area. Following the discussion of area-wide opportunities and constraints, resource mapping depicts specific sensitive biological areas as well as areas devoid of sensitive biological resources on the NPR–3 site.

5.1.5.1 Aquatic Biology

The NPR-3 site is bisected and drained by Teapot and Little Teapot Creeks. These drainages are intermittent and are not considered to provide well-established aquatic habitat at the NPR-3 site. Because no perennial water bodies occur on or in close proximity to the site, well-established aquatic habitats do not exist. Adverse impacts to species associated with aquatic habitat or impacts to area fisheries would be unlikely. Moreover, the continued discharge of produced water from the NPR-3 during operations would be considered a beneficial impact to the aquatic habitat that occurs in the Sand Creek watershed.

5.1.5.2 Terrestrial Vegetation

Construction activities such as excavation, the removal and stockpiling of topsoil, and the construction of new vehicle access roads would disturb vegetation at the project site. Other potential impacts that could occur include soil compaction and the removal and/or crushing of individual plants. As described in Chapter 3.0, if all the proposed projects described in Section 3.1.2 were implemented, an estimated 85 to 123 acres (34 to 50 hectares) of land would be disturbed under the Proposed Action (the number of disturbed acres would depend on which alternative corridor of the EOR project was selected). An estimated 25 acres (10 hectares) would be disturbed annually for ongoing operations associated with the Proposed Action.

Because the vegetation potentially affected under the Proposed Action is not unique in the area and is generally poorly developed compared to similar habitats elsewhere in the region, these temporary impacts are not considered to be significant for widespread habitats such as the mixed grass prairie, desert shrub and Wyoming big sagebrush. Moreover, specific revegetation efforts should mitigate potential construction-related impacts on vegetation. Such efforts include salvaging and replacing topsoil; loosening compacted soils to enhance water absorption; recontouring disturbed areas to blend with surrounding topography and restoring natural drainage patterns; stabilizing soils and minimizing erosion; and seeding, fertilizing, and mulching disturbed areas with a mixture, rate, and method conducive to rapid revegetation of the disturbed areas.

With respect to operational impacts of the Proposed Action, the amount of disturbance due to operational and maintenance activities would be minimal. Implementing the proposed projects would result in the permanent disturbance of approximately 85 acres (34 hectares) if Alternative Corridor A of the EOR project were selected and approximately 123 acres (50 hectares) ifAlternative Corridor B of the EOR project were selected. Access roads required for operation and maintenance activities are mostly in place, while new access roads would be developed in areas that are currently disturbed or devoid of unique vegetation. Impacts to vegetation would be reduced in magnitude by reclamation measures currently in place at NPR-3. No rare plants are likely to be affected by operation and maintenance of the Proposed Action.

Current operational activities and operations associated with the Proposed Action would not be expected to disturb ponderosa pine vegetation on the peripheral ridges or existing riparian/wetland areas of the site. These areas are considered unique to the site and may provide important habitat for wildlife species, such as raptors, that require extensive area for foraging.

5.1.5.3 Terrestrial Wildlife

Raptors

Due to the apparent absence of nest sites in and around the areas that would be affected by the Proposed Action, construction-related activities are not expected to impact raptor populations. Impacts to foraging habitat are expected to be minimal. Overall, adverse effects to raptor populations due to construction are expected to be temporary and negligible.

With respect to operational impacts of the proposed projects, the potential exists for birds to collide with wind turbine blades or towers; such collisions often result in the death of the bird. Studies have indicated a great deal of variability among sites with respect to bird strikes, but several factors contribute to the rate of collision. These factors include the number of birds flying through the site, the flight altitude of the birds, the probability of a bird entering the area swept by the turbine blades, and the number and height of operating turbines. Most of the studies have indicated that raptors are the species most affected by such collisions, possibly because the raptors focus their attention on hunting for rodents in areas around the turbines. Raptors also would be at risk during periods of poor visibility or inclement weather. Raptors are relatively uncommon in the NPR-3 area. Overall, the potential impacts to the local raptor would most likely be limited to the occasional individual colliding with the turbine. Due to the small size of the proposed turbines, both in swept area and tower heights, and the relatively small numbers of turbines that may be operating (no more than 10 scattered over three to four sections), the likelihood of avian collisions with turbines is small. These isolated collisions would not be expected to affect the local population of these birds.

Because there are no major migratory staging areas for waterfowl or other avian species in the immediate area of the site, and no major geographic features that attract birds to the proposed wind turbine locations, adverse effects on migratory species are not anticipated. Additionally, due to the poorly developed habitat in the project area, no avian species of concern are expected to nest within the project area.

Based on the proposed locations where wind turbines would operate, as well as the ability to relocate the turbines if necessary, adverse impacts to raptors and migratory species are not expected.

Big Game

Impacts to big-game species on the NPR-3 site during construction would likely be localized and minimal (see Appendix B). Because construction activities would largely be confined to summer and fall, animals would not be affected while occupying winter range. As such, impacts would be limited to relatively small areas of temporary habitat loss. Impacts to sensitive wildlife species (i.e., big game) due to operation and maintenance of the proposed projects are expected to be minimal. Interaction between wildlife and site workers would be negligible and temporary, and operation of the proposed projects would likely result in minimal impacts to these species.

5.1.5.4 Threatened, Endangered and Rare Species

Biological resources that are considered sensitive must be given particular careful attention when analyzing the potential impacts of the Proposed Action. Loss of a population of state-or federally listed threatened, endangered, or rare plant or wildlife species would be considered an adverse impact. Impacts on other sensitive plant or wildlife species would be considered an adverse impact if they resulted in a threat to the continued existence of the resource.

Of the sensitive species possibly occurring on the site, only those with the potential for experiencing impacts as result of project implementation are discussed in this section. Species that are not likely to

occur on the NPR-3 site, have a very low possibility of occurrence, or are expected to occur (or have been recorded as occurring) in areas of the NPR-3 site that would not be affected under the Proposed Action are not discussed, because no impacts would be likely to affect these species.

Vegetation

Federally listed threatened or endangered plant species are not expected to inhabit the NPR-3 site based on the following considerations:

- Prior to 1986, the NPR-3 site had been overgrazed, which likely resulted in the destruction of any potential threatened, endangered, or rare plant species.

- Based on indications from recent observations, plant species diversity is considered low, particularly in areas proposed for future development. As discussed in Section 4.5.4, ridges located on the periphery of the site and riparian areas associated with drainages that bisect the project site have been less affected by site operations compared to the basin area. Therefore, rare plant species may occur in these areas. However, as described in Chapter 3.0 (Proposed Action and Alternatives), these two areas would be avoided during project development. Moreover, these areas would be protected from future development, thereby preserving any rare plants that might occur.

Based on these considerations, threatened, endangered, and rare plant species are not expected to be affected by the various projects that are part of the Proposed Action or by existing operational activities.

Wildlife

Potential impacts to federally listed threatened or endangered wildlife species are not expected to occur under the Proposed Action based on the following considerations:

- The findings of the USFWS consultation did not indicate that any currently listed species were likely present on the NPR-3 site (see Appendix B and Section 4.5).

- The absence of active prairie dog towns contributes to the lack of black-footed ferrets in the project area; therefore, construction- and operation-related activities would not impact this protected species.

- The USFWS is concerned with the loss of sagebrush that provides needed habitat for the Greater-sage grouse (*Centocercus urophasianus*). However, the habitat type on the site that is generally associated with the Greater-sage grouse is limited and poorly developed; therefore, it is unlikely that the Greater-sage grouse occupies habitat where the proposed projects are planned for development. Potential adverse impacts to the Greater-sage grouse are not expected.

Based on these considerations, threatened, endangered, and rare wildlife species would not be expected to be affected by the various projects that make up the Proposed Action or by existing operational activities.

5.1.6 Cultural Resources

There are no known cultural, archaeological, or historical resources that would be disturbed by construction of projects that are part of the Proposed Action. However, based on many decades of site-disturbing activities and numerous recent cultural resource surveys, DOE recognizes that there is the potential for impacts to occur to surface and subsurface cultural resources during construction of the proposed facilities and associated access roads. Cultural resources could be physically damaged or

destroyed by heavy equipment during construction and could be removed from meaningful context. However, based on recent surveys, DOE does not anticipate encountering cultural resources that are unique at the site or in the region.

DOE would monitor construction activities to ensure that personnel complied with existing policies and procedures relative to mitigation of impacts to cultural resources during construction of the proposed projects. Adherence to the site's procedures would ensure that impacts on cultural resources would be avoided or mitigated.

Current operational activities and activities associated with the Proposed Action would not disturb those areas that are considered sensitive. DOE has worked with tribal consultants, has reviewed the results of field surveys of the site, and has identified areas that are considered unique to the site and may provide important archaeological and historical resources. These areas are known to DOE and tribal representatives but have not been identified in this SWEA to aid in their protection. DOE has reviewed its proposed activities and has determined that none would occur within these protected areas.

5.1.7 Socioeconomics

5.1.7.1 Population and Housing

Because the majority of the workforce is anticipated to be available locally, no impacts to the housing supply, schools, or other infrastructure would be anticipated. The NPR-3 site has historically conducted a variety of research and projects similar to the ones currently proposed, and such projects have not negatively impacted area socioeconomic resources. Positive impacts would be related to employment opportunities and revenues paid to federal, state, and local governments.

5.1.7.2 Employment

The proposed construction actions and pilot projects on site would be of short duration, with most estimated to occur over a 6-month time period. Labor requirements would vary with the projects, particularly during construction. Most of the projects would require an estimated 15 to 50 contract workers during the peak construction period. These workers would likely be available in the general area, which would include Casper. It is anticipated that construction workers with the appropriate skills would be available and would be willing to travel from other areas to obtain work. The continuing energy development throughout the west continues to attract workers from all geographic areas.

Pipeline construction would require a variety of construction skills that would be needed for varying periods of time. It is estimated that the construction would take approximately 3 years (intermittently), during which a relatively small labor force would be required. While several specialized skills could be required, the large historical presence of the energy industry suggests that skilled workers would be available in the general area. Positive impacts would be related to employment opportunities and revenues paid to federal, state, and local governments.

Assuming the near-term success in expanding RMOTC's mission, DOE projects that staffing may more than double from the current 98 to approximately 233 full-time staff over the next 5 years. This employee increase would have a positive economic impact in the area but would not negatively impact housing, schools, or the demand on existing infrastructure of local communities.

5.1.7.3 Transportation

The proposed construction projects at the NPR-3 likely would not occur simultaneously, nor would they require large work forces. It is estimated that most of the proposed projects would take 6 months to complete and require as many as 50 workers during construction. As discussed in Section 4.7.1, (Population and Housing), it is assumed that workers would be available in the general area of Midwest and Edgerton, as well as Casper. However, as a worst-case analysis, if all workers lived in Casper, Wyoming, and each worker drove alone to NPR-3 each day for the duration of a project, the resulting 100 trips per day would increase existing traffic on I-25 by less than 2 percent. Even if two projects were scheduled to occur concurrently and resulted in 100 new workers (or 200 trips per day) from Casper, the resulting estimated 4 percent increase in traffic on I-25 would be negligible. It is more realistic to assume that area towns (e.g., Midwest or Edgerton) or ranches could supply temporary workers that would use back roads or segments of highways to access the site, reducing any potential transportation impact even further.

Similarly, if the permanent employment levels in the field reached the projected 145, from the current 58, and all of those employees commuted individually from Casper, an estimated 4 percent increase in I-25 traffic could occur. More likely, some commuting employees would carpool and not all would come from Casper, thus reducing the estimated increase in I-25 traffic.

5.1.7.4 Community Services

Based on the analyses in Sections 5.1.7.1 through 5.1.7.3, community services within the project area are not expected to be affected by the Proposed Action. Because the projected increases of the permanent work force under the Proposed Action would be small relative to the population of the region, community services (fire and police protection, communication systems, solid waste disposal, hospital services, schools, and other governmental services) would likely continue without experiencing additional demand.

5.1.8 Waste Management

As described in Section 4.8, management of hazardous and nonhazardous materials on the site would apply as appropriate to similar materials used during construction and operation of the various proposed projects. These projects would largely require the use of fuels (gasoline and diesel) and various chemicals such as paints, solvents, and antifreeze while generating waste oils and waters along with typical solid waste materials associated with construction projects. As needed, based on actual quantities of fuels stored on-site, an SPCC plan would be prepared and appropriate berming and other considerations related to fuel storage would be followed. NPR-3 would comply with all applicable permits, plans, and other federal and state requirements related to waste management. These requirements would be detailed as specific contract elements

5.1.9 Accidents and Intentional Destructive Acts

As an operating oil field, NPR-3 may experience the same types of accidents that any commercial oil field might encounter, such as oil spills, pipeline breaks, equipment failures, and fires. As assessed in this SWEA, the experimental activities planned by RMOTC could result in similar accidents. Whether an accident was the result of an operation failure or an intentional destructive act, its consequences at the site would be minimized by isolating the site from any nearby off-site population and isolation most of the on-site workers from hazardous areas. Consequently (and consistent with the principle that impacts be discussed in proportion to their significance (40 CFR 1502.2(b)), a sliding-scale approach has been used to analyze both accidents and intentional acts of destruction. Therefore, the following discussions only

qualitatively assess impacts. Additionally, it should be noted that in many decades of operations, there has never been an on-site accident at NPR-3 that has resulted in off-site consequences.

5.1.9.1 Accidents

An accident is an unplanned event or sequence of events that results in undesirable consequences. Accidents may be caused by equipment malfunction, human error, or natural phenomena. The more typical or frequent types of industrial accidents, such as trips and falls, occur no more frequently at the NPR-3 site than at a commercial oil field. RMOTC just recently went 245 days without a lost time accident. The accident was a minor accident that caused 1 days lost time. The accident was reviewed and it was caused by poor weather conditions from extreme wind. Generally, accidents at NPR-3/RMOTC that could cause more serious impacts to workers or the environment would result from either spills of oil or oily brines or fires involving produced oil or natural gas.

All well sites, pads, storage tanks, and other locations where oil is accumulated or stored are bermed to limit the extent of damage from any spill. However, a leak or rupture in the pipelines that gather oil from individual wells and transport it to the south terminal for off-site shipment would result in surface contamination that would have to be remediated. The extent of damages would be directly proportional to the size of the pipeline and its operating pressure, the magnitude of the leak or rupture, and the duration of the spill. Failure of a large pipeline during an unmonitored holiday weekend could result in the contamination of many acres of the site; if such a spill reached the drainages receiving discharge waters, a spill could spread off-site with the normal discharge flows. For RMOTC's proposed projects, the experimental nature of the proposed flow test loop and the CWTTF, which could be charged with oils or drilling muds, may present additional opportunities for spills during the filling or draining of those systems.

The produced oil and natural gas present an additional concern for explosions and fires. If worker activities provided the ignition source for such an event, the consequences to the involved worker could be serious or even fatal. Due to the large size of the site and its remoteness, uninvolved workers and the off-site public would likely not be affected by a fire or explosion unless such an event ignited site grasslands and spread to off-site rangeland.

5.1.9.2 Acts of Sabotage or Terrorism

The DOE Office of General Counsel has issued interim guidance stipulating that each DOE EIS and EA should explicitly consider intentional destructive acts (i.e., acts of sabotage or terrorism). DOE applied a sliding scale in considering the potential impacts of intentional destructive acts within the context of the Proposed Action. Neither ongoing operations nor the proposed projects that are the subject of this SWEA would involve the transportation, storage, or use of radioactive (other than small-quantity sealed sources and tracers) or explosive materials; however, under routine site operations, oil is stored before being exported via pipeline from the site. The site is remote from population and economic centers and is not a major oil production source in the region. Consequently, it is highly unlikely that the Proposed Action would be viewed as a potential target by saboteurs or terrorists. The Proposed Action would not offer any credible targets of opportunity for terrorists or saboteurs to inflict significant adverse impacts to human life, heath, or safety, nor would the Proposed Action render the site as a whole any more susceptible to such acts. However, the consequences of an operational accident as defined in Section 5.1.9.1 could occur if initiated by an act of terrorism or sabotage.

5.2 IMPACTS OF THE NO ACTION ALTERNATIVE

As described in Section 3.2.1, under the No Action Alternative, routine operations at the site (such as new well installation, plugging and abandonment of old wells, and routine maintenance and replacement of site infrastructure such as roads and pipelines) would continue. As such, the types of impacts that would occur annually would be similar to those that have been occurring for many decades. More specific characterization of the impacts that would occur under the No Action Alternative are discussed in Sections 5.2.1 through 5.2.9.

5.2.1 Land Resources

Under the No Action Alternative, RMOTC would continue to operate as a stripper oil field, meeting the production and revenue goals identified in Section 3.2.1. No impacts to existing or proposed land uses would occur from continuation of existing operations.

Currently, the facility is devoid of any recreational resources. Under the No Action Alternative, access to the site for recreational purposes would continue to be prohibited; therefore, no impacts would occur.

The No Action Alternative would maintain existing operations without the need for new facilities or land disturbance. As described in Chapter 3.0, under the No Action Alternative, approximately 25 acres (10 hectares) per year of disturbance related to ongoing operations is expected, while approximately 10 acres (4 hectares) per year of disturbance related to reclamation and rehabilitation from abandoning and plugging non-productive wells is expected. For these reasons, changes to the current landscape would not occur. Moreover, the site is not considered to be visually sensitive or unique and is without significant visual classification from the BLM.

5.2.2 Air Quality and Noise

Under the No Action Alternative, RMOTC would continue to operate the facilities at the site in accordance with current operations, generating air emissions from existing crude oil and natural gas operations as described in Chapter 3.0. Because this alternative proposes that new wells continue to be installed and operated while abandoning and plugging unproductive wells at a similar rate, air emissions from ground disturbance in general maintenance/construction areas would be considered short-term and minimal. By restoring and reclaiming unproductive well areas, fugitive dust generated by wind erosion would be reduced significantly. As determined by WDEQ, air quality impacts under this alternative would not be expected (WDEQ 2001b).

The No Action Alternative does not propose that new equipment be installed and operated or that existing equipment be modified in a manner that could generate new levels of noise that could be considered a health effect or nuisance. Adverse impacts to the existing sound environment are not expected under this alternative.

5.2.3 Water Resources

The No Action Alternative would not adversely impact hydrology or potable water resources at the NPR-3 site. If this alternative were implemented, no adverse impacts would result from normal operations at the facility. The continued operations would likely meet existing water quality permit levels and meet the term of the site's existing NPDES requirements.

5.2.4 Geology, Soils, and Prime and Unique Farmlands

Geologic impacts associated with this alternative would be the same as the impacts associated with the Proposed Action.

Because no new construction or surface disturbance (other than small disturbed areas for new oil production, whose effects would be countered by areas reclaimed as a result of abandoned and plugged well areas) is proposed under this alternative, soil impacts would not be expected. The site is devoid of prime and unique farmlands; therefore, impacts could not occur to this resource.

5.2.5 Biological Resources

Neither the Proposed Action nor the No Action Alternative would adversely affect biological resources at the NPR-3 site. Under both the Proposed Action and the No Action Alternative, produced water would contribute to the regional aquatic habitat, thereby benefiting biological resources at the site. With respect to terrestrial vegetation and wildlife resources, the additional surface disturbances associated with new well development would be approximately 25 acres (10 hectares) per year, with approximately 10 acres (4 hectares) reclaimed per year from abandoned and plugged wells. Finally, the site is devoid of any threatened, endangered, or special species and would not be affected by continued operations associated with the No Action Alternative.

5.2.6 Cultural Resources

The No Action Alternative would not be expected to result in any adverse impacts to cultural resources. While specific areas have not been identified for future oil well development, the areas expected to be developed are devoid of any cultural resources. Moreover, RMOTC currently employs procedures in the event that cultural resources are unearthed during construction activities and prescribes protective measures to avoid adverse impacts.

5.2.7 Socioeconomics

The No Action Alternative proposes continued operations at the NPR-3 site. This alternative would not require additional workers and therefore would not have an effect on the area's community services, housing stock, utilities, or transportation services. Continued operations would maintain the current beneficial effect on the economy of the immediate area and the region.

5.2.8 Waste Management

Because there would be no change in operations at the NPR-3 site under the No Action Alternative, generation of wastes or hazardous materials would not be expected. Therefore, no adverse impacts would occur.

5.2.9 Accidents and Intentional Destructive Acts

Because operations at NPR-3 would continue under the No Action Alternative at a scale similar to that described for the Proposed Action, the same types of accidents that could occur the Proposed Action (refer to Section 5.1.9) could occur under the No Action Alternative. Additionally, the likelihood and consequences of an intentional destructive act would be similar to the Proposed Action.

5.3 IMPACTS OF THE D&D ALTERNATIVE

The analysis of impacts under the D&D Alternative provided in this SWEA addresses only those impacts resulting from DOE's actions that would be required to terminate ongoing development actions and sufficiently remediate the site to allow DOE to eliminate future environmental liabilities and divest itself from site ownership. Because the post-D&D ownership and site use are highly speculative at this time and would not be under DOE's control, detailed assessment of such actions is not included in this SWEA.

If one assumes that the viable resources beneath NPR-3 have been sufficiently depleted to make further exploration uneconomical, a transfer of ownership to the BLM would seem a likely post-D&D future. Under such a future, grazing and perhaps hunting may become the most prevalent use of the site; however, BLM, as a Federal agency, would remain responsible for protection of resources such as wetlands and other important habitats, as well as cultural and historical resources.

At the other end of the spectrum, if one assumes that the site has residual economic resources worthy of recovery after D&D and is sold for private development, then impacts similar to those that have occurred for decades at NPR-3 would likely occur. The magnitude of impacts would be commensurate with the level of development and could be greater or less than those from current NPR-3 operations. However, under private ownership, without some enforceable stipulations established prior to land transfer, some resource protection afforded under federal statutes (such as cultural and historic resources) could be lost and those resources impacted.

Prior to the implementation of a D&D Alternative and the divestiture of ownership, DOE would take a more detailed look under NEPA at all reasonable alternatives for future ownership.

As stated above, the remainder of this section discusses only those impacts associated with DOE's actions related to D&D of the site and not post-D&D ownership actions.

5.3.1 Land Resources

Under the D&D Alternative, the existing land uses at the project site would be discontinued, and most of the facilities (e.g., uneconomical wells, surface structures, roads, abandoned pits, utilities) related to current operations would be decommissioned. Crude oil extraction and storage along with natural gas development are the planned and designated uses of the site. Moreover, major land use changes are not anticipated in the long-range development of the site. If the D&D Alternative were implemented, DOE's stated goals for the site would not be met.

Currently, the facility is devoid of any recreational resources. Under the D&D Alternative, the NPR-3 site could become available for recreational purposes; however, the site, either as a whole or in part, could be used for purposes similar to those currently ongoing, which likely limit or preclude recreational uses. Because the site is not a designated resource and the surrounding area already possesses recreational areas similar to the NPR-3 site, recreation impacts would not be expected under the D&D Alternative.

Under the D&D Alternative, most of the existing facilities and support structures would be eliminated and operations would cease. Cessation of operations could improve the visual quality of the immediate area. However, because the areas surrounding the NPR-3 site are not classified by the BLM as visually sensitive or unique and are without significant visual classification from the BLM, no beneficial impacts to the visual resources of the area would be expected under this alternative.

5.3.2 Air Quality and Noise

Under the D&D Alternative, the on-site facilities, which are currently generating air emissions from extracting crude oil and natural gas, would cease to generate such emissions. Because this alternative proposes dismantling and decommissioning existing facilities while at the same time abandoning and plugging wells, air emissions from general ground disturbance /construction would be considered short-term and minimal. Because unproductive well areas would be restored and reclaimed, fugitive dust caused by wind erosion would be reduced significantly. The site is currently in compliance with applicable air quality rules and regulations; therefore, under the D&D Alternative, any changes in air quality would likely be negligible and would not affect the status of the site with regard to regulatory compliance.

Because the D&D Alternative proposes the dismantling and decommissioning of existing facilities, existing ambient sound levels in the immediate area of current operations would likely be reduced. Therefore, impacts to the existing sound environment under this alternative would be considered beneficial .

5.3.3 Water Resources

The D&D Alternative would not adversely impact hydrology or potable water resources at the NPR-3 site. Discontinued operations would eliminate current discharges of produced water and would likely result in upset conditions of the aquatic environment and habitats downstream of the NPR-3 site. Because the site is currently in compliance with applicable water quality rules and regulations, any changes in water quality would likely be negligible and would not affect the status of the site with regard to regulatory compliance.

5.3.4 Geology, Soils, and Prime and Unique Farmlands

Under the D&D Alternative, the NPR-3 site would eventually be vacated. Project facilities would be decommissioned and operations would cease. The potential for geologic impacts is considered to be remote under this alternative.

Because no new construction or surface disturbance is proposed under this alternative, and soils would be reclaimed after decommissioning activities were completed, beneficial soil impacts would be expected. The site is devoid of prime and unique farmlands; therefore, impacts to these resources would not occur.

5.3.5 Biological Resources

Implementation of the D&D Alternative would not affect sensitive terrestrial biological resources at the NPR-3 site. However, treated produced water currently flows from the wastewater treatment plant, contributing to the regional aquatic habitat downstream of the site. This flow results in a beneficial impact by providing an abundance of wetland plants for forage and a water source for livestock and wildlife. Implementation of the D&D Alternative would eliminate these flows and, as a result, reduce or eliminate wetland and aquatic habitats, and a wildlife water source, both on the site and potentially miles downstream of the NPR-3 site.

With respect to terrestrial vegetation and wildlife resources, beneficial effects could be expected under the D&D Alternative because decommissioned areas and abandoned and plugged wells would be reclaimed; after reclamation, such areas could provide new habitat. Finally, the site is devoid of any threatened, endangered, or special species, so these resources would not be affected under the D&D Alternative.

5.3.6 Cultural Resources

The D&D Alternative would not be expected to result in any adverse impacts to cultural resources. Activities associated with this alternative include decommissioning facilities at locations that have been previously disturbed. The possibility exists that some facilities could be considered a historic resource based upon the age of existing equipment and the past use of the site. RMOTC currently employs procedures in the event that cultural resources (which include historic resources) are affected during construction activities and prescribes protective measures to preclude adverse impacts.

5.3.7 Socioeconomics

The D&D Alternative would have an adverse impact to the current socioeconomic and social environment because the current workforce at the site would be reduced. Implementing this alternative would adversely affect the local and regional economy.

5.3.8 Waste Management

Because operations at the NPR-3 site would cease under the D&D Alternative, hazardous materials and other wastes would not be generated once facilities were decommissioned and all wastes associated with decommissioning were disposed of.

5.3.9 Accidents and Intentional Destructive Acts

With the closure of the site under the D&D Alternative, the possibility of accidents such as spills and fires and intentional destructive acts would be reduced and ultimately eliminated. If DOE chose to divest itself of the site, it is reasonably foreseeable that at some point in the future, production activities could begin under another entity, again posing similar accident risks.

5.4 IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES

Resources committed to the Proposed Action would include financial resources, labor, construction materials and equipment, and the crude oil and natural gas to be extracted. “Irreversible commitment” of resources refers to those resources that would remain committed throughout the life of the project. “Irretrievable commitment” refers to resources used, consumed, destroyed, or degraded during construction, operation, or abandonment of the project and cannot be retrieved or replaced. Such irreversible and irretrievable commitments of resources associated with the Proposed Action facilities, support structures, and pipelines are described below.

5.4.1 Land Features and Uses

The facilities, support structures, and pipelines would cross mixed-use areas of rangeland used for sheep and cattle grazing and for scattered oil and gas fields and associated exploration, extraction, and processing facilities. Following project construction, the areas would be revegetated and would eventually be returned to their current condition and land use. Oil and gas extraction and processing would be permanently excluded from use of the permanent corridors for the life of the projects. This is considered an irreversible commitment of land, but does not represent an irretrievable commitment of this resource because the areas could be reclaimed for oil and gas exploration and processing following the abandonment of the facilities or pipelines.

The Proposed Action could also result in the irreversible and irretrievable disturbance of archaeological resources within the construction activities, if any were encountered. Because measures are in place and

proposed to provide for the proper treatment of these resources and collection of valuable scientific data, this effect is not considered a significant adverse impact even though disturbance would result in an irretrievable change to these resources.

5.4.2 Endangered Species and Ecosystems

Because no threatened or endangered species are known to inhabit the project area, no loss of critical biological resources would be anticipated as a result of the proposed projects. Natural vegetation would be disturbed, although irreversible or irretrievable losses of significant species, habitat, or ecosystems would not be expected to occur.

5.4.3 Socioeconomic Considerations

The Proposed Action would result in the irreversible commitment of capital to finance the project. Once committed, this capital would be dedicated to the completion of the action and would not be available for other uses. This financial commitment could result in a short-term stimulation of the local economy. No new infrastructure demands or requirements for publicly funded services would be anticipated in connection with the Proposed Action.

5.4.4 Resources Lost and Uses Pre-empted

Because the Proposed Action areas are located adjacent to existing electrical distribution lines, pipeline ROWs, and roads, the projects under the Proposed Action would not be expected to curtail the range of planned beneficial uses of the environment.

5.4.5 Finite Resources

Construction of the proposed facilities, support structures, and pipeline and compressor station would require the irreversible commitment of steel, coatings, concrete, and other construction materials. These materials would not be irretrievably lost, however, as they could be used for other purposes or salvaged and recycled following the end of the useful life of the infrastructure.

The crude oil and natural gas to be transported under the Proposed Action would be delivered for consumption. This represents an irreversible irretrievable commitment of this non-renewable natural resource. In addition, project-related consumption of fuel, lubricants, and other materials and supplies represents a similar irreversible and irretrievable commitment of resources.

5.5 SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Under the Proposed Action, if all the proposed projects described in Section 3.1.2 were implemented, approximately 85 or 123 acres (34 or 50 hectares) (depending on the corridor selected for the EOR project) of land would be designated for aboveground facilities and for ROW corridors for belowground pipelines in areas currently characterized by open rangeland and oil- and gas-related heavy industrial use. Because the buildings and corridor laterals would be located in areas currently under this mixed use, including grazing lands, and because the project area is in a region rich in oil and gas reserves, no short- or long-term change in land use diversity is anticipated. Siting the proposed facilities in the proposed locations would be consistent with local land use policies.

The Proposed Action would provide a short-term benefit to the human environment by providing facilities dedicated to the enhancement of crude oil and natural gas extraction. The Proposed Action could greatly enhance the long-term productivity of low-production oil fields (stripper oil fields). In addition, new technologies developed under the Proposed Action could ultimately enhance the nation's oil and gas resources and reserves; however, without an efficient or economic way to transport oil and gas resources to a demand market, such long-term benefits would not be realized at the national level.

Short- and long-term alterations to the local ecosystem were evaluated, and no adverse impacts would be expected under the Proposed Action.

5.6 COMPARISON OF ALTERNATIVES

Table 5-1 compares and summarizes the environmental consequences under the Proposed Action (the Preferred Alternative), the No Action Alternative, and the D&D Alternative.

Table 5-1. Environmental consequences of the alternatives

Resource	Proposed Action	No Action Alternative	D&D Alternative
Land Resources and Aesthetics	Depending upon which corridor for the EOR project were selected, an estimated 85 acres (Corridor A) or 123 acres (Corridor B) (34 and 50 hectares, respectively) of ground surface would be disturbed. An estimated 25 acres (10 hectares) of surface would be disturbed annually for ongoing operations. The proposed activities would not represent a change in the visual character of the area.	An estimated 25 acres (10 hectares) of surface would be disturbed annually for ongoing operations. The proposed activities would not represent a change in the visual character of the area.	Existing land uses at the project site would be discontinued, and most of the facilities related to current operations would be decommissioned. Cessation of operations could improve the visual quality of the immediate area. However, because the areas surrounding the NPR-3 site are not classified by the BLM as visually sensitive or unique and are without significant visual classification from the BLM, no beneficial impacts to the visual resources of the area would be expected
Air Quality	Due to the remote location of the proposed site, the short-term increase in air pollutant emissions is not expected to result in an adverse impact. WDEQ has reviewed the emissions from ongoing operations and determined that the emissions are considered insignificant.	Air emissions would be considered short-term and minimal. WDEQ has reviewed the emissions from ongoing operations and determined that the emissions are considered insignificant.	Air emissions would be considered short-term and minimal. Fugitive dust caused by wind erosion would be reduced significantly. The site is currently in compliance with applicable air quality rules and regulations; therefore, under the D&D Alternative, any changes in air quality would likely be negligible
Water Resources	Construction activities are not proposed through water bodies. No impacts to surface water quality from construction runoff or construction activities are expected. Operations would continue to meet current water quality criteria and regulatory limits imposed as part of the NPDES permit.	No adverse impacts would result from normal operations. The continued operations would likely meet existing water quality permit levels and meet the term of the site's existing NPDES requirements.	Discontinued operations would likely result in upset conditions downstream of the NPR-3 site. The site is currently in compliance with applicable water quality rules and regulations; any changes in water quality would likely be negligible and would not affect the status of the site with regard to regulatory compliance.

Table 5-1. Environmental consequences of the alternatives (continued)

Resource	Proposed Action	No Action Alternative	D&D Alternative
Geology, Soils & Prime and Unique Farmlands	No unique geologic or soil hazards are present that cannot be addressed via routine design and construction techniques. The site does not posses prime or unique farmlands. There are no conditions that would challenge constructability. Standard practices for erosion and stormwater controls would mitigate sedimentation impacts.	No unique geologic or soil hazards are present that cannot be addressed via routine design and construction techniques. The site does not posses prime or unique farmlands. There are no conditions that would challenge constructability. Standard practices for erosion and stormwater controls would mitigate sedimentation impacts.	No unique geologic or soil hazards are present that cannot be addressed via routine design and construction techniques. The site does not posses prime or unique farmlands. There are no conditions that would challenge constructability. Standard practices for erosion and stormwater controls would mitigate sedimentation impacts.
Biological Resources	Depending upon which option of the EOR project were selected, an estimated 85 acres (Corridor A) or 123 acres (Corridor B) (34 and 50 hectares, respectively) of mixed grass prairie vegetation would be disturbed under the Proposed Action. An estimated 25 acres (10 hectares) of surface would be disturbed annually for ongoing operations associated with the Proposed Action.	Approximately 25 acres (10 hectares) of mixed grass prairie vegetation would be disturbed annually as a result of new well development and associated infrastructure is constructed. Approximately 10 acres (4 hectares) would be revegetated annually as a result of plugging and abandonment activities are completed.	Approximately 85 acres (34 hectares) of mixed grass prairie vegetation would be disturbed annually as a result of decommissioning existing facilities and removing/abandoning in-place linear facilities and associated infrastructure. However, approximately 95 acres (38 hectares) would be revegetated annually as a result of decommissioning the facilities and linear facilities as well as plugging and abandonment activities are completed. Several miles of wetland/aquatic habitat and a wildlife water source would be lost in on-site and off-site drainages due to the cessation of produced water discharges.
Cultural Resources	No known cultural, archaeological, or historical resources would be impacted. Site procedures would be applied to prevent or mitigate impacts to resources that might be uncovered through subsurface excavation.	No known cultural, archaeological, or historical resources would be impacted. Site procedures would be applied to prevent or mitigate impacts to resources that might be uncovered through subsurface excavation.	No known cultural, archaeological, or historical resources would be impacted. Site procedures would be applied to prevent or mitigate impacts to resources that might be uncovered through subsurface excavation.

Table 5-1. Environmental consequences of the alternatives (continued)

Resource	Proposed Action	No Action Alternative	D&D Alternative
Socioeconomics	Positive impacts would be related to increased employment opportunities and revenues paid to federal, state, and local governments.	Continued operations would maintain the current beneficial effect on the economy of the immediate area and the region.	The socioeconomic environment would likely be adversely affected.
Waste Management	Management of hazardous and nonhazardous materials on the site would be required during construction and operation. Based on quantities, waste management plans would be prepared and implemented. No adverse impacts would occur.	There would be no change in operations or change in generation of wastes or hazardous materials; no adverse impacts would occur.	Hazardous materials and other wastes would not be generated; no adverse impacts would occur.

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6.0 APPLICABLE PERMITS AND REQUIREMENTS

Environmental Survey Plan

Annual Site Environmental Report

Environmental Protection Implementation Plan (EPIP)

Spill Prevention Control and Countermeasure Plan (SPCC)

Environmental Monitoring Plan, NPR-3

Emergency Readiness Assurance Plan

2002 Environmental Protection Implementation Plan

Chemical Hygiene Plan

Waste Minimization & Pollution Prevention Plan – NPR-3

Hazard Communication Plan

Respiratory Protection Program

NPDES PERMIT NUMBERS

- WY0032115 Peripheral Water Injection Facility
- WY0028894 Tank Battery B-1-3
- WY0028274 B-TP Battery
- WY0028274 B-TP Battery #2

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8.0 LIST OF AGENCIES AND PERSONS CONSULTED

- U.S. Fish & Wildlife Service - Cheyenne, Wyoming Field Office
- Wyoming State Historic Preservation Office
- Bureau of Land Management - Casper Field Office
- Wyoming Game & Fish Department - Cheyenne Office
- Natrona County
- Wyoming Department of Environmental Quality - Water Quality Division
- Wyoming Oil & Gas Conservation Commission

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APPENDIX A SWEA Announcement Letter and Distribution List

DOE mailed the scoping letter shown in this appendix to the businesses, agencies, and organizations shown in the following mailing list.

Rocky Mountain Oilfield Testing CENTER

June 18, 2007

m97
Serial No.:CDT/MJT/00.1779

Name
Company
Address
City, State Zip

Subject: Notice of Scoping – Rocky Mountain Oilfield Testing Center / Naval Petroleum Reserve Number Three Site-Wide Environmental Assessment (DOE/EA-1583)

The U.S. Department of Energy (DOE) is beginning the preparation of a Site-Wide Environmental Assessment (SWEA) for action proposed over the next five years at the Rocky Mountain Oilfield Testing Center (RMOTC) and Naval Petroleum Reserve No. 3 (NPR-3). The DOE manages NPR-3, also known as Teapot Dome Oil Field, as the only operating oil field in the continental United States owned by the U.S. government. This field is located in Natrona County, Wyoming, approximately 35 miles (56 km) north of the City of Casper, and covers an area of 9,481 acres (3,837 hectares). Production at NPR-3 peaked in 1981 and has declined since until it has become a mature stripper field

As NPR-3 production has decreased, there has been an increase in use of the same facilities and personnel in support of government and private industry testing, demonstration and evaluation of new oil field and environmental technologies. In parallel with these activities has been a continued effort toward restoration of the field. These activities include plugging and abandoning of uneconomic wells, reclamation and restoration of abandoned sites including dismantling surface facilities, batteries, roads, test satellites, and associated electrical distribution systems when they are no longer needed for production or RMOTC operations. All of these activities are expected to continue through the next five years.

In addition to ongoing activities at NPR-3, this SWEA will address the expanded operation of RMOTC over the next fire years. The activities anticipated represent a substantial change to the scope and character of operations approved in National Environmental Policy Act (NEPA) documentation approved in 1998. Consequently, new (NEPA) documentation is required. The activities include increased emphasis on the testing and demonstration of energy related technologies and the production of NPR-3 energy reserves in a manner consistent with best practices of the oil and gas industry. The result will be a center of excellence where industry can partner with government in developing new and improved energy extraction technologies.

FIRST CLASS

U.S. Department of Energy • Naval Petroleum and Oil Shale Reserves in Colorado, Utah and Wyoming
907 N. Poplar Street, Suite 150 • Casper, WY 82601 • 307.233.4800 • 888.599.2200 • www.rmotc.com

JUN 18 2007

Expanded operation of RMOTC may include the following projects:

1. **Complex Well Test Facility.** The Complex Well Technology Testing Facility (CWTTF) would develop, test, and evaluate fit-for-purpose equipment, fluids, and processes for improved performance in high angle wells. In addition to testing and qualifying extended reach drilling (ERD) products, the facility would have multiple uses including testing horizontal, multi-lateral and deep water technologies, vibration and harmonic studies, buckling studies, and verification of drilling methods.

2. **Wind Turbine Pilot Project.** The primary economic driver for oil production is the cost of the electricity required to pump the oil from the ground. Part of RMOTC's mission is the demonstration of best practices and state-of-the-art technologies for extending the life of mature oil fields. In an effort to enhance the economic viability of NPR-3, RMOTC proposes to install up to six, wind power generators ranging in power generation from 10 to 24 kilowatts and integrate this energy source into NPR-3 production activities.

3. **Tensleep Formation EOR Project.** RMOTC proposes to test the viability and effectiveness of gravity-stable (e. g. injecting at or near the structural crest, and producing from wells and perforations located lower on the structure) CO2 injection for enhanced oil recovery (EOR) in the fractured Tensleep reservoir in Section 10 of NPR-3. The CO2 needed to support this effort would be delivered via a new pipeline constructed along either a 13-mile route from Anadarko's nearby Salt Creek Oil Field, (roughly 10 miles west of NPR 3) across shrub-steppe habitat with several crossings of intermittent stream beds on mixed private, State of Wyoming, Bureau of Land Management, and Department of Energy-owned lands, or along a shorter alternative pipeline route initiated on the Salt Creek Oilfield entering NPR-3 at its northern field boundary with Salt Creek.

4. **Biotreatment Facility Upgrade Project.** RMOTC proposes to upgrade its existing biotreatment facility used to treat produced waters from oil and gas production at NPR-3. The primary functions of the biotreatment facility consist of oil-water separation; cooling, blending, and biological treatment of produced waters. The existing treatment facility is in need of upgrading due to age and in anticipation of new permit requirements for RMOTC's waste water discharges.

5. **NPR-3 Gas Compression Plant Evaluation**. RMOTC proposes to evaluate the mechanical integrity of the Gas Plant, update the technical information, evaluate the efficiency and profitability of the facility, and to explore options for reducing operating costs and reducing the risk. Any repairs or replacement of existing equipment would occur within the existing footprint of the current Gas Plant.

6. **Gas Flow Loop.** RMOTC proposes to complete the construction and operate the Gas Flow Loop (GFL) facility to test flow assurance problems associated with a deepwater environment by mimicking those problems in a more test-friendly on-shore facility. The facility currently consists of five buried flow-loops. The total

approximate length of the five loops is 20,000 feet. The loops come together at the Water Treatment Facility (WTF). There are additional storage tanks, buildings, and supply lines associated with the WTF which may be utilized during testing operations. This facility was partially completed under a previous Cooperative Research and Development Agreement with a number of industry partners.

Pursuant to the requirements of the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations for implementing the procedural provisions of NEPA (40 CFR Parts 1500-1508), and DOE's implementing procedures for compliance with NEPA (10 CFR Part 1021), DOE is preparing a draft SWEA to:

- Identify any adverse environmental effects that cannot be avoided should these proposed actions be implemented.
- Evaluate viable alternatives to the proposed actions, including a no action alternative.
- Describe the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.
- Characterize any irreversible and irretrievable commitments of resources that would be involved should these proposed actions be implemented.

The range of reasonable alternatives that DOE intends to assess in the SWEA includes:

1. Preferred action: Continue the test and evaluation of energy related technologies in parallel with the operation and production of NPR-3 consistent with the best practices of the oil and gas industry. As described above, expand operations at RMOTC to include the creation of a complex well technology testing facility, an expanded flow loop facility for evaluation of flow assurance technologies, EOR technologies, including CO_2 floods, and renewable technologies such as wind and/or solar energy supplemental to traditional fossil energy recovery technologies.

No action: Production and operation of NPR-3 using conventional technologies together with the limited test and evaluation of energy related technologies.

2. Decommissioning: DOE would stop testing and production activities at NPR-3 and begin a complete environmental restoration of the field.

3. Divestiture: DOE would stop testing and production activities. Environmental liabilities would be reduced to the point that the field could be sold or transferred to another entity.

The SWEA will describe the environmental impacts that could be caused by the implementation of any of the alternatives and, if necessary, will identify possible

1

mitigation measures to reduce or eliminate those impacts. The SWEA will describe the potentially affected environment and the impacts that may result to:

- Meteorology/Air Quality
- Geology/Soils
- Biological Resources
- Water Resources (including surface and groundwater)
- Historic, Archaeological, and Cultural Resources
- Land Use
- Noise
- Infrastructure
- Aesthetics
- Socioeconomics

As part of DOE's NEPA scoping process, we would welcome learning of any issues or comments that you might have in regard to our Proposed Action that should be addressed in the SWEA. Please provide any comments or questions via phone, email, fax, or US mail by July 14, 2007 to:

DOE NEPA Compliance Officer
DOE RMOTC/NPR-3
907 North Poplar, Suite 150
Casper, WY 82601

Fax: 307-233-4851
Toll Free Voice:1-888-599-2200
- **Email: RMOTCSWEA@rmotc.doe.gov**

As preparation of the SWEA proceeds, periodic updates and other relevant information will be provided on the project web page http://www.rmotc.com

We look forward to hearing from you.

Clarke D. Turner
Director, Rocky Mountain Oilfield Testing Center
& Naval Petroleum Reserve No. 3

jec/5430/msw

2

MAILING LIST – ORGANIZATIONS AND AGENCIES

American Wildlands
Anadarko Petroleum Corp.
Aquarius II
Arnell Oil Company
Audubon Society
Audubon Wyoming
Bill Owens
Biodiversity Conservation Alliance
Bradley JC
Buck Allemand
Carol Bowers, Secretary
Carpenter Brice G Realty
Casper Dirt Riders
Chuck Lanham
Citation Oil & Gas Corporation
Coalbed Methane Coordination Coalition
Conservancy of the Phoenix
Dick Wilder
Elk Petroleum Inc
Ellbogen Oil Producers
Elva Allemand
Farleigh Oil Properties
Foundation for North American Wild
Four G Oil Co
Gas Ventures
Gastech Inc
Governor's Planning Office
Independent Petroleum Association of Mountain States
Izaak Walton League
James Allemand
Kemmerer Historic Preservation Commission
Kirkwood Oil & Gas
Lucille Dumbrill, Treasurer
Lyn George Geologist
Mabel Brown
Mary Garman
Mary Owens
Mike Jording, President
Mormon Trails Association
Mountaintop Consulting LLC
Murie Audubon Society
Nance Petroleum Corporation
National Association of Attorneys General
National Governor's Association
National Wildlife Federation
Natrona County Conservation District
Natrona County Historic Preservation Commission
Natrona County Public Library
NEPA State Planning Department, Office of the Governor
North American Pronghorn Foundation
North Platte Valley Conservation District
North Star Operating Co
Pathfinder Back Country Horsemen
Patty Myers
Perri Allemand
Petroleum Association of Wyoming
Platte River Parkway Trust
Platte River Rod and Gun Club
Powder River Basin Resource Council
Public Lands Advocacy
Rawhide Western Inc
Raymond Allemand
Rick Ewig, Vice President
Rocky Mountain Elk Foundation
Sierra Club
South Goshen Conservation District
State Historical Preservation Office
Stovall Oil Co
Sweetwater County Historical Museum
Teselle Inc.
The Conservation Fund
The Honorable Dave Freudenthal, Governor of Wyoming
The Land Trust Alliance
The Nature Conservancy
The Wilderness Society
The Wildlife Society, Wyoming Chapter
Thorofare Resources
Tom Allemand
Town of Glenrock
Town of Mills
Trout Unlimited
Twiford Exploration Inc
U.S. Environmental Protection Agency
U.S. Fish & Wildlife Service
Underwood Oil & Gas
US Department of Energy, Office of Environment, Security, Safety and Health
US Fish and Wildlife Service
USDI National Park Service
Warren E & P Inc
Western Land Exchange Project
Western Resource Advocates
Wildlife Habitat Council
Wold Oil Properties

Wyoming Association of Municipalities
Wyoming Back Country Horsemen of America
Wyoming County Commissioners
Wyoming Department of Agriculture
Wyoming Department of Environmental Quality
Wyoming Department of State Parks and Cultural Resources
Wyoming Fly Casters Association,
Wyoming Game and Fish Department
Wyoming Mining Association
Wyoming Natural Diversity Database
Wyoming Office of State Lands and Investments
Wyoming Oil and Gas Conservation Commission
Wyoming Outdoor Council
Wyoming Sportsman's Association
Wyoming State Historic Preservation Office
Wyoming State Historical Society
Wyoming State Planning Office
Wyoming Stockgrowers Association
Wyoming Wilderness Association
Wyoming Woolgrowers Association
Zephyr Exploration
Wyoming Motorcycle Trails Association
Bureau of Indian Affairs

MAILING LIST – INDIVIDUALS

Darby Collins, DOE
Dr. Kate Winthrop
Jerry Cordova
Marsha Butterfield, USFS
Outdoor Women of Wyoming
V. Allemand
Mr. Jay St. Goddard Chairman
Mr. Fredrick Auck Chairman Tribal Business Council
Mr. Ivan Posey Chairman
Mr. Gregg Bourland Chairman
Mr. John Yellow Bird Steele President
Mr. Eugene Littlecoyote President
Ms. Marilyn Parsons
Sebastian "Bronco" LeBeau Tribal Historic Preservation Officer
Cultural Resource Coordinator
Mr. Conrad Fisher - Tribal Historic Preservation Officer
JoAnn White - Tribal Historic Preservation Officer
Ms. Reba Tehran
Mr. Terry Gray Cultural Resource Coordinator
Mr. Darrin Old Coyote Cultural Director
Mr. Steven Brady
Mr. William Kindle President
Mr. Richard Brannon Chairman
Arlen Shoyo
Mr. Carl Venne Chairman

APPENDIX B Scoping Comments

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road – Suite 308
Cheyenne, Wyoming 82009

In Reply Refer To:
ES/61411/W.35/WY07FA0464

JUL 13 2007

Mr. Clarke D. Turner
Rocky Mountain Oilfield Testing Center
And Naval Petroleum Reserve No. 3
Attn: DOE NEPA Compliance Officer
907 North Poplar – Suite 150
Casper, Wyoming 82601

Dear Mr. Turner:

Thank you for your letter of June 29, 2007, received in our office on July 2, requesting comments on the U.S. Department of Energy's (DOE) preparation of a Site-Wide Environmental Assessment for operations at the Rocky Mountain Oilfield Testing Center and Naval Petroleum Reserve No. 3 in Natrona County, Wyoming. We are providing you with comments on (1) threatened, endangered and candidate species, (2) migratory birds, and (3) wetlands and riparian areas. The U.S. Fish and Wildlife Service (Service) provides recommendations for protective measures for threatened and endangered species in accordance with the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Protective measures for migratory birds are provided in accordance with the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703 and the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668. Wetlands are afforded protection under Executive Orders 11990 (wetland protection) and 11988 (floodplain management), as well as section 404 of the Clean Water Act. Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956, as amended, 70 Stat. 1119, 16 U.S.C. 742a-742j.

In accordance with section 7 of the Act, my staff has determined that the following threatened or endangered species may be present in or near the project area. We would appreciate receiving information as to the current status of each of these species within the project area.

RECEIVED
JUL 17 2007

Modification of buffer sizes may be permitted where biologically supported and in coordination with the U.S. Fish and Wildlife Service.

Black-footed ferret: Black-footed ferrets may be affected if prairie dog towns are impacted. Please be aware that black-footed ferret surveys are no longer recommended in black-tailed prairie dog towns statewide or white-tailed prairie dog towns except those noted in our enclosed February 2, 2004, letter. However, we encourage the federal agency to protect all prairie dog towns for their value to the prairie ecosystem and the myriad of species that rely on them. We further encourage you to analyze potentially disturbed prairie dog towns for their value to future black-footed ferret reintroduction.

Ute ladies'-tresses: Ute ladies'-tresses (*Spiranthes diluvialis*) is a perennial, terrestrial orchid, 8 to 20 inches tall, with white or ivory flowers clustered into a spike arrangement at the top of the stem. *S. diluvialis* typically blooms from late July through August; however, depending on location and climatic conditions, it may bloom in early July or still be in flower as late as early October. *S. diluvialis* is endemic to moist soils near wetland meadows, springs, lakes, and perennial streams where it colonizes early successional point bars or sandy edges. The elevation range of known occurrences is 4,200 to 7,000 feet (although no known populations in Wyoming occur above 5,500 feet) in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows. Soils where *S. diluvialis* have been found typically range from fine silt/sand, to gravels and cobbles, as well as to highly organic and peaty soil types. *S. diluvialis* is not found in heavy or tight clay soils or in extremely saline or alkaline soils. *S. diluvialis* seems intolerant of shade and small scattered groups are found primarily in areas where vegetation is relatively open. Surveys should be conducted by knowledgeable botanists trained in conducting rare plant surveys. *S. diluvialis* is difficult to survey for primarily due to its unpredictability of emergence of flowering parts and subsequent rapid desiccation of specimens. The Service does not maintain a list of "qualified" surveyors but can refer those wishing to become familiar with the orchid to experts who can provide training or services.

If the proposed project may affect a listed species, consultation with the Service pursuant to section 7(a)(2) of the Act will be required. Section 7 (a)(1) of the Act directs Federal agencies, or their representatives, to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation and recovery of listed species. Therefore we encourage you to incorporate measures into the project design for the conservation of listed species.

If it is determined that any Federal agency program or project "is likely to adversely affect" any listed species, formal consultation should be initiated with this office. Alternatively, informal consultation can be continued so the Service can assist you to determine how the project could be modified to reduce impacts to listed species to the "not likely to adversely affect" threshold. If it is concluded that the project "is not likely to adversely affect" listed species, you should request the Service to review the assessment and concur with the determination of not likely to adversely affect.

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bird nest or nest tree is prohibited. For golden eagles, inactive nest permits are limited to activities involving resource extraction or human health and safety. Mitigation, as determined by the local Service field office, may be required for loss of these nests. No permits will be issued for an active nest of any migratory bird species, unless removal of an active nest is necessary for reasons of human health and safety. Therefore, if nesting migratory birds are present on, or near the project area, timing is a significant consideration and needs to be addressed in project planning.

If nest manipulation is proposed for this project, the project proponent should contact the Service's Migratory Bird Office in Denver at 303-236-8171 to see if a permit can be issued for this project. No nest manipulation is allowed without a permit. If a permit cannot be issued, the project may need to be modified to ensure take of a migratory bird or eagle, their young, eggs or nest will not occur.

In order to promote the conservation of migratory bird populations and their habitats, the Service recommends the (Federal Agency) implement those strategies outlined within the Memorandum of Understanding directed by the President of the U.S. under the Executive Order 13186, where possible.

Mountain Plover: Although the Service has withdrawn the proposal to list the mountain plover (*Charadrius montanus*) and we will no longer be reviewing project impacts to this species under the Act, we continue to encourage conservation of this species as it remains protected under the MBTA. Measures to protect the mountain plover from further decline may include (1) avoidance of suitable habitat during the plover nesting season (April 10 through July 10), (2) prohibition of ground disturbing activities in prairie dog towns, and (3) prohibition of any permanent above ground structures that may provide perches for avian predators or deter plovers from using preferred habitat. Suitable habitat for nesting mountain plovers includes grasslands, mixed grassland areas and short-grass prairie, shrub-steppe, plains, alkali flats, agricultural lands, cultivated lands, sod farms, and prairie dog towns. We strongly encourage the development of protective measures with an assurance of implementation should mountain plovers be found within the project area.

Greater Sage-grouse: The Service has determined that the greater sage-grouse (*Centrocercus urophasianus*) is unwarranted for listing at this time. However, we continue to have concerns regarding sage-grouse population status, trends and threats, as well as concerns for other sagebrush obligate species. Habitat loss and degradation, as well as loss of population connectivity have been identified as important factors contributing to the decline of greater sage-grouse populations rangewide (Braun 1998, Wisdom et al. 2002). Therefore, any activities that result in loss or degradation of sagebrush habitats that are important to this species should be closely evaluated for their impacts to sage-grouse. In the event that proposed activities may affect greater sage-grouse or their habitat we recommend the development and implementation of appropriate mitigative measures, in coordination with the Wyoming Game and Fish Department, to minimize potential impacts to sage-grouse.

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303(d) Streams: Salt Creek is listed on the State of Wyoming's 303(d) list for impaired waters of the state. Appropriate measures should be taken in order to achieve Total Maximum Daily Load (TMDL) goals set by the state for this stream/creek. The Service recommends implementing Best Management Practices in order to control erosion and minimize sediment entering the stream, stabilizing the stream banks by incorporating plantings and seed mixtures of native species, and using temporary sediment basins to control erosion during construction activities.

Thank you for your efforts to ensure the conservation of threatened and endangered species in Wyoming. If you have any questions regarding this letter or your responsibilities under the Act, please contact Pedro Ramirez, Jr. at (307) 772-2374, extension 236.

Sincerely,

Patricia Dalton

for Brian T. Kelly
Field Supervisor
Wyoming Field Office

Enclosure

cc: WGFD, Non-Game Coordinator, Lander (B. Oakleaf)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne (V. Stelter)

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7

Enclosure 1

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
4000 Airport Parkway
Cheyenne, Wyoming 82001

In Reply Refer To:
ES-61411/BFF/WY7746

February 2, 2004

Dear Interested Party:

This letter is to inform you that black-footed ferret (*Mustela nigripes*) surveys are no longer necessary in black-tailed prairie dog colonies statewide or in white-tailed prairie dog towns except those noted in the attachment. In response to requests from numerous entities and our own review of the situation regarding ferret surveys, the U.S. Fish and Wildlife Service (Service) and others have been evaluating the potential for a previously unidentified black-footed ferret population to occur in Wyoming and the need for conducting black-footed ferret surveys across the entire state. This issue has been especially pertinent when evaluating various activities for compliance with the Endangered Species Act of 1973 (Act), as amended (16 USC 1531 *et seq*).

The black-footed ferret was listed as an endangered species in 1967, prior to the Act (under the Endangered Species Preservation Act of 1966). The Act prohibits the take of listed species without proper permits and places an additional requirement on activities funded, authorized or carried out by Federal agencies to ensure that such actions will not jeopardize the continued existence of any listed species. The latter process is known as interagency consultation and is outlined in section 7(a)(2) of the Act (50 C.F.R. § 402.13) .

The Service developed the 1989 *Black-footed Ferret Survey Guidelines for Compliance with the Endangered Species Act* (Survey Guidelines) to assist with section 7 consultations for ferrets. The Survey Guidelines provide a mechanism to evaluate the possibility of locating existing ferrets in prairie dog colonies by examination of the size, density, and juxtaposition of existing prairie dog colonies. The key points of the strategy are to determine the existence of ferrets or an area's potential for ferret recovery and either may be used in section 7 consultations when determining whether an action may affect the black-footed ferret. The Survey Guidelines can be followed by interested parties (federal agencies and their partners) during the section 7 consultation process to make determinations on whether an activity may adversely affect ferrets. However, an unintended drawback to the Survey Guidelines is that repetitive surveys may be undertaken to evaluate possible impacts to ferrets on prairie dog colonies that have already been searched or that didn't present any realistic opportunities for ferret reintroduction.

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If you have any questions regarding this letter or your responsibilities under the Act, please contact Mary Jennings of my staff at the letterhead address or phone (307) 772-2374, extension 32.

Sincerely,

/s/ Brian T. Kelly

Brian T. Kelly
Field Supervisor
Wyoming Field Office

Enclosure (1)

cc: WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)
FWS, BFF Recovery Coordinator, Laramie, WY (M. Lockhart)

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Enclosure 1

Black-footed Ferret Survey Block Clearance List **February 1, 2004**

The following blocks of black-footed ferret habitat are cleared from the recommendation for ferret surveys:

1. All black-tailed prairie dog towns in Wyoming

2. All white-tailed prairie dog towns in Wyoming **EXCEPT** those identified in the following table.

Complex Name	Townships	Ranges	Complex Name	Townships	Ranges
Baxter Basin	T18,T19, T20	R103, R104	Fifteen Mile	T47-T49 T48	R97, R98 R96 (west half)
Big Piney	T 28 T29, T30, T31	R111, R112 R109-R111	Flaming Gorge	T12, T13 T12-T14 T13	R109 R108 R107
Bolton Ranch	T17 T18, T19	R86, R88 R86-R88	Manderson	T47, T48 T49	R90, R91 R91
Carter	T16, T17 T18	R114-R116 R115	Moxa	T15, T16 T17, T18 T19, T20 T21 T22, T23 T24	R112, R113 R111-R113 R111-R114 R110-R113 R111-R113 R112
Continental Divide	T16 T17 T18 T19 T20	R93-95 R92-95, 98-100, 97-98 R92-96, 98-99 R92-96 R92-95	Pathfinder	T27 T28 T29	R85, R86 R85-R89 R85, R89
Cumberland	T16 T17-T19 T19, T20	R118 R117 R116	Saratoga	T14 T15 T16	R82, R83 R82-R84 R83-R85
Dad	T15, T16 T17	R90-R93 R92, R93	Seminoe	T23, T24	R84, R85
Desolation Flats	T13 T14 T15 T16	R93-95 R93-94 R93-94, 96 R93-96	Shamrock Hills	T22, T23 T24, T25 T26	R89, R90 R89 R89, R90

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Rd, Suite 308A
Cheyenne, Wyoming 82009

In Reply Refer To:
ES-61411/W.35/WY07SL0455

SEP 12 2007

Michael J. Taylor
U.S. Department of Energy
907 N. Popular Street, Suite 150
Casper, Wyoming 82601

Dear Mr. Taylor:

Thank you for your letter and attached maps referencing several proposed projects related to expanded operations at the Department of Energy's (DOE) Rocky Mountain Oil Field Testing Center, Naval Petroleum Reserve (NPR-3) located in Natrona County, Wyoming. Your letter, dated August 13, 2007, was received in the Wyoming Field Office on August 15. Your letter states that expanded operations at the Rocky Mountain Oil Field Testing Center may include (1) a Complex Well Test Facility, (2) Wind Turbine Pilot Project, (3) Tensleep Formation Enhanced Oil Recovery Project, (4) Bio-treatment Facility Upgrade Project, (5) NPR-3 Gas Compression Plant Evaluation, and (6) Gas Flow Loop Project. You have requested that the U.S. Fish and Wildlife Service (Service) provide you with a list of threatened and endangered species that may be present within Natrona County pursuant to the Endangered Species Act of 1973 (Act), as amended, 16 U.S.C. 1531 *et seq*.

Threatened and Endangered Species

In accordance with section 7(c) of the Act, I am providing you with information on threatened or endangered species, or species proposed for listing under the Act, that may be present in the project area.

Species	Status	Habitat
Black-footed ferret (*Mustela nigripes*)	Endangered	Prairie dog towns
Ute ladies'-tresses (*Spiranthes diluvialis*)	Threatened	Seasonally moist soils and wet meadows of drainages below 7000 feet elevation
Platte River species	Endangered	Downstream riverine habitat of the Platte River in Nebraska

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Black-footed ferrets may be affected if prairie dog towns are impacted. Please be aware that black-footed ferret surveys are no longer recommended in black-tailed prairie dog towns statewide or white-tailed prairie dog towns except those noted in our enclosed February 2, 2004, letter. However, we encourage the DOE to protect prairie dog towns for their value to the prairie ecosystem and the myriad of species that rely on them. We further encourage you to analyze potentially disturbed prairie dog towns for their value to future black-footed ferret reintroduction.

If white-tailed prairie dog towns or complexes greater than 200 acres will be disturbed, surveys for ferrets may be recommended in order to determine if the action will result in an adverse effect to the species. Surveys are recommended even if only a portion of the white-tailed prairie dog town or complex, as identified in our enclosed letter, will be disturbed. According to the *Black-Footed Ferret Survey Guidelines* (USFWS 1989), a prairie dog complex consists of two or more neighboring prairie dog towns less than 7 km (4.3 miles) from each other. If a field check indicates that prairie dog towns may be affected, you should contact this office for guidance on ferret surveys.

Ute ladies'-tresses is a perennial, terrestrial orchid, 8 to 20 inches tall, with white or ivory flowers clustered into a spike arrangement at the top of the stem. S. *diluvialis* typically blooms from late July through August, however, depending on location and climatic conditions, it may bloom in early July or still be in flower as late as early October. S. *diluvialis* is endemic to moist soils near wetland meadows, springs, lakes, and perennial streams where it colonizes early successional point bars or sandy edges. The elevation range of known occurrences is 4,200 to 7,000 feet in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows. Soils where S. *diluvialis* have been found typically range from fine silt/sand, to gravels and cobbles, as well as to highly organic and peaty soil types. S. *diluvialis* is not found in heavy or tight clay soils or in extremely saline or alkaline soils. S. *diluvialis* seems intolerant of shade and small scattered groups are found primarily in areas where vegetation is relatively open. Surveys should be conducted by knowledgeable botanists trained in conducting rare plant surveys. S. *diluvialis* is difficult to survey for primarily due to its unpredictability of emergence of flowering parts and subsequent rapid desiccation of specimens. The Service does not maintain a list of "qualified" surveyors but can refer those wishing to become familiar with the orchid to experts who can provide training or services.

If the proposed action will lead to water depletions (consumption) in the Platte River System, impacts to threatened and endangered species inhabiting the downstream reaches of these systems should be included in the evaluation. Platte River system depletions may affect the whooping crane (*Grus americana*), interior least tern (*Sterna antillarum*), piping plover (*Charadrius melodus*), pallid sturgeon (*Scaphirhynchus albus*) and western prairie fringed orchid (*Platanthera praeclara*). In addition, depletions may contribute to the destruction or adverse modification of designated critical habitat for the whooping crane, and proposed critical habitat for the northern Great Plains breeding population of the piping plover.

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Species of Concern

The Service has determined that the greater sage-grouse (*Centrocercus urophasianus*) is unwarranted for listing at this time. However, the Service continues to have concerns regarding sage-grouse population status, trends and threats, as well as concerns for other sagebrush obligates. The following information is provided for your use in the evaluation of proposed actions and their potential effects to the sage-grouse.

Greater sage-grouse are dependent on sagebrush habitats year-round. Habitat loss and degradation, as well as loss of population connectivity have been identified as important factors contributing to the decline of greater sage-grouse populations rangewide (Braun 1998, Wisdom et al. 2002). Therefore, any activities that result in loss or degradation of sagebrush habitats that are important to this species should be closely evaluated for their impacts to sage-grouse. If important breeding habitat (leks, nesting or brood rearing habitat) is present in the project area, the Service recommends no project-related disturbance March 1 through June 30, annually. Minimization of disturbance during lek activity, nesting, and brood rearing is critical to sage-grouse persistence within these areas. Likewise, if important winter habitats are present, we recommend no project-related disturbance November 15 through March 14.

We recommend you contact the Wyoming Game and Fish Department to identify important greater sage-grouse habitats within the project area, and appropriate mitigative measures to minimize potential impacts from the proposed project. The Service recommends surveys and mapping of important greater sage-grouse habitats where local information is not available. The results of these surveys should be used in project planning, to minimize potential impacts to this species. No project activities that may exacerbate habitat loss or degradation should be permitted in important habitats.

In Wyoming, information suggests that greater sage-grouse populations are negatively affected by energy development activities, especially those that degrade important sagebrush habitat, even when mitigative measures are implemented (Braun 1998, Lyon 2000, Naugle et al. 2006). Greater sage-grouse populations can repopulate areas developed for resource extraction after habitat reclamation for the species (Braun 1987). However, there is no evidence that populations attain their previous levels and reestablishment of sage-grouse in a reclaimed area may take 20 to 30 years, or longer (Braun 1998). Therefore, this project should be carefully evaluated for long-term and cumulative effects on the greater sage-grouse, since reclamation may not restore populations to pre-activity levels. The DOE should ensure this activity does not exacerbate greater sage-grouse declines on either a local or range-wide level.

The proliferation of power lines in treeless areas provides hunting perches for raptors, thereby resulting in increased predation of greater sage-grouse (Montana Sage Grouse Work Group 2002). Although most new powerlines can be constructed to prevent raptors from perching, greater sage-grouse still actively avoid suitable sagebrush habitats around these structures, to a distance of 0.25 miles (Braun 1998). Powerlines, especially when accompanied by other

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facilities, such as roads and fences, may also provide predator corridors into sagebrush habitat, increasing predation risks, particularly to lekking males (Montana Sage Grouse Work Group 2002).

The Service has withdrawn the proposal to list the mountain plover (*Charadrius montanus*) and we will no longer be reviewing project impacts to this species under the Act. We do however, encourage the DOE and their applicants to continue providing protection for this species as it remains protected under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703). Measures to protect the mountain plover from further decline may include (1) avoidance of suitable habitat during the plover nesting season (April 10 through July 10), (2) prohibition of ground disturbing activities in prairie dog towns, and (3) prohibition of any permanent above ground structures that may provide perches for avian predators or deter plovers from using preferred habitat. Suitable habitat for nesting mountain plovers includes grasslands, mixed grassland areas and short-grass prairie, shrub-steppe, plains, alkali flats, agricultural lands, cultivated lands, sod farms, and prairie dog towns.

Migratory Birds

Please recognize that consultation on listed species may not remove your obligation to protect the many species of migratory birds, including eagles and other raptors protected under the MBTA and Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668.

The MBTA, enacted in 1918, prohibits the taking of any migratory birds, their parts, nests, or eggs except as permitted by regulations and does not require intent to be proven. Section 703 of the MBTA states, "Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means or in any manner, to ... take, capture, kill, attempt to take, capture, or kill, or possess ... any migratory bird, any part, nest, or eggs of any such bird..." The BGEPA, prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald or golden eagles or their body parts, nests, or eggs, which includes collection, molestation, disturbance, or killing.

In order to promote the conservation of migratory bird populations and their habitats, the Service recommends the DOE implement those strategies outlined within the Memorandum of Understanding directed by the President of the U.S. under the Executive Order 13186, where possible.

On July 9, 2007, the Service published a Federal Register notice (72 FR 37346) announcing that the bald eagle (*Haliaeetus leucocephalus*) would be removed from the list of threatened and endangered species under the Act on August 8, 2007. However, the protections provided to the bald eagle under the BGEPA, and the MBTA, will remain in place. The term "disturb" under the BGEPA has recently been defined as: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior (72 FR 31332)."

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To assist with the de-listing transition, the Service has developed National Bald Eagle Management Guidelines to advise land managers when and under what circumstances the protective provisions of the MBTA and BGEPA may apply to their activities. These guidelines are available on our web page at http://www.fws.gov/migratorybirds/baldeagle.htm. The Service intends to update these guidelines as more information becomes available through adaptive management. Please be advised that the Service's Wyoming Ecological Services Office, in collaboration with the Wyoming Game and Fish Department will be modifying these guidelines in the near future to ensure they adequately address the unique conditions of our state. We will notify you of these "Wyoming" guidelines as soon as they become available. Additionally, the Service has proposed a permit structure under the BGEPA that is similar to the permit structure that exists under the Act for when impacts are unavoidable. However, this structure is currently undergoing public comment and is not yet in place. Please contact the Wyoming Ecological Services Office if you have any questions regarding this permit structure, the de-listing decision, or require technical assistance regarding any planned or ongoing activities that cannot be conducted in compliance with the MBTA, BGEPA, or the National Bald Eagle Management Guidelines.

Wind power

The Service supports the development of alternative energy sources; however, wind farms are known to have negative impacts on wildlife, especially avian and bat species, if not sited and designed with these potential impacts in mind. More importantly, potential negative effects to Federally listed species should be paramount in site selection and design of a wind power project. Selection of the best sites for turbine placement is enhanced by ruling out sites with known, high concentrations of birds and/or bats that may pass within the area swept by the rotor blades of the turbines or where the effects of habitat fragmentation will be detrimental. Development sites with comparatively low bird, bat and other wildlife values, would be preferable and would have relatively lower impacts on wildlife.

If the proposed wind power project may affect a listed species, consultation with the Service pursuant to section 7(a)(2) of the Act is recommended. Section 7 (a)(1) of the Act directs Federal agencies, or their representatives, to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation and recovery of listed species. Therefore we encourage you to incorporate measures into the project design for the conservation of listed species.

Unlike the Act, neither the MBTA nor its implementing regulations at 50 CFR Part 21, provide for permitting of "incidental take" of migratory birds. However, while it is not possible under the MBTA to absolve individuals, companies, or agencies from liability if they follow the Service's voluntary Interim Guidance on Avoiding and Minimizing Impacts from Wind Turbines (http://www.fws/gov/r9dhebfa/windenergy). The Department of Justice has used prosecutorial discretion in the past regarding individuals, companies, or agencies who have coordinated with

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the Service to develop and implement conservation efforts to minimize and/or avoid the take of migratory birds. We encourage you to work with our office during the planning process for this wind power project.

Powerlines

Two primary causes of raptor mortality are electrocutions and collisions with power lines. If any part of your projects will involve construction of new power lines or modification of existing lines, the Service urges the DOE to take strong precautionary measures to protect raptors by raptor-proofing the power lines. CFR 7 part 1724.52, allows for deviations from construction standards for raptor protection provided that structures are designed and constructed in accordance with *Suggested Practices for Raptor Protection on Power Lines. The State of the Art in 2006.* published by the Edison Electric Institute/Raptor Research Foundation. Such structures must meet the National Electrical Safety Code and applicable State and local regulations. Authority for these measures resides with Section 9 of the Act, the MBTA and the BGEPA which protects bald and golden eagles.

For our internal tracking purposes, the Service would appreciate notification of any decision made on these projects (such as issuance of a permit or signing of a Record of Decision or Decision Memo). Notification can be sent in writing to the letterhead address or by electronic mail to FW6_Federal_Activities_Cheyenne@fws.gov.

Thank you for your efforts to ensure the conservation of threatened and endangered species in Wyoming. If you have any questions regarding this letter or your responsibilities under the Act, please contact Bradley Rogers at (307) 684-1046.

Sincerely,

Patricia Gelbert

for Brian T. Kelly
Field Supervisor
Wyoming Field Office

Enclosures (2)

cc: BLM, Field Manager, Casper Field Office, Casper, WY (J. Murkin)
FWS, Fish and Wildlife Biologist, Buffalo Field Office, Buffalo, WY (B. Rogers)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (V. Stelter)
WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)

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References

Braun, C.E. 1998. Sage grouse declines in western North America: What are the problems? Proceedings of the Western Association of Fish and Wildlife Agencies 78:139-156

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Connelly J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage grouse populations and their habitats. Wildlife Society Bulletin 28(4): 967 - 985.

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Montana Sage Grouse Work Group. 2002. Draft Management Plan and Conservation Strategies for Sage Grouse in Montana. Montana Fish, Wildlife and Parks, Helena, MT.

Naugle, D.E., B.L. Walker, and K. E. Doherty. 2006. Sage-grouse Population Response to Coal-bed Natural Gas Development in the Powder River Basin: Interim Progress Report on Region-wide Lek-count Analyses.

U.S. Fish and Wildlife Service. 1989. Black-footed ferret survey guidelines for compliance with the Endangered Species Act, April 1989. U. S. Fish and Wildlife Service, Denver, Colorado and Albuquerque, New Mexico. 15pp.

Enclosure 1

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
4000 Airport Parkway
Cheyenne, Wyoming 82001

In Reply Refer To:
ES-61411/BFF/WY7746

February 2, 2004

Dear Interested Party:

This letter is to inform you that black-footed ferret (*Mustela nigripes*) surveys are no longer necessary in black-tailed prairie dog colonies statewide or in white-tailed prairie dog towns except those noted in the attachment. In response to requests from numerous entities and our own review of the situation regarding ferret surveys, the U.S. Fish and Wildlife Service (Service) and others have been evaluating the potential for a previously unidentified black-footed ferret population to occur in Wyoming and the need for conducting black-footed ferret surveys across the entire state. This issue has been especially pertinent when evaluating various activities for compliance with the Endangered Species Act of 1973 (Act), as amended (16 USC 1531 *et seq*).

The black-footed ferret was listed as an endangered species in 1967, prior to the Act (under the Endangered Species Preservation Act of 1966). The Act prohibits the take of listed species without proper permits and places an additional requirement on activities funded, authorized or carried out by Federal agencies to ensure that such actions will not jeopardize the continued existence of any listed species. The latter process is known as interagency consultation and is outlined in section 7(a)(2) of the Act (50 C.F.R. § 402.13).

The Service developed the 1989 *Black-footed Ferret Survey Guidelines for Compliance with the Endangered Species Act* (Survey Guidelines) to assist with section 7 consultations for ferrets. The Survey Guidelines provide a mechanism to evaluate the possibility of locating existing ferrets in prairie dog colonies by examination of the size, density, and juxtaposition of existing prairie dog colonies. The key points of the strategy are to determine the existence of ferrets or an area's potential for ferret recovery and either may be used in section 7 consultations when determining whether an action may affect the black-footed ferret. The Survey Guidelines can be followed by interested parties (federal agencies and their partners) during the section 7 consultation process to make determinations on whether an activity may adversely affect ferrets. However, an unintended drawback to the Survey Guidelines is that repetitive surveys may be undertaken to evaluate possible impacts to ferrets on prairie dog colonies that have already been searched or that didn't present any realistic opportunities for ferret reintroduction.

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WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)

References

Braun, C.E. 1998. Sage grouse declines in western North America: What are the problems? Proceedings of the Western Association of Fish and Wildlife Agencies 78:139-156

_____. 1987. Current issues in sage grouse management. Proc. West. Assoc. Fish and Wildlife Agencies 67:134-144

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Lyon, A.G. 2000. The potential effects of natural gas development on sage grouse (*Centrocercus urophasianus*) near Pinedale, Wyoming. Thesis, University of Wyoming, Laramie, USA.

Montana Sage Grouse Work Group. 2002. Draft Management Plan and Conservation Strategies for Sage Grouse in Montana. Montana Fish, Wildlife and Parks, Helena, MT.

Naugle, D.E., B.L. Walker, and K.E. Doherty. 2006. Sage-grouse population response to coal-bed natural gas development in the Powder River basin: Interim progress report on region-wide lek-count analyses. University of Montana.

U.S. Fish and Wildlife Service. 1989. Black-footed ferret survey guidelines for compliance with the Endangered Species Act, April 1989. U. S. Fish and Wildlife Service, Denver, Colorado and Albuquerque, New Mexico. 15pp.

Wisdom, M.J., B.C. Wales, M.M. Rowland, M.G. Raphael, R.S. Holthausen, T.D. Rich, and V.A. Saab. 2002. Performance of Greater Sage-Grouse models for conservation assessment in the Interior Columbia Basin, USA. Conservation Biology16: 1232-1242.

Enclosure 1

The Service has been coordinating with the Wyoming Game and Fish Department in reviewing information about the current and historic status of prairie dog towns throughout Wyoming. In addition to the status review, we have also been reviewing the history of black-footed ferret surveys to determine whether the survey guidelines should continue to be applied across the entire state. Through this process, the Service has developed an initial list of blocks of habitat that are not likely to be inhabited by black-footed ferrets. In these areas, take of individual ferrets and effects to a wild population are not an issue and surveys for ferrets are no longer recommended. The term "block clearance" has often been used to describe this type of approach. This initial list is based largely on the quality of the habitat today, as well as information regarding past population bottlenecks that may have resulted from plague and poisoning events in particular areas and may have led to the loss of ferrets in the area.

Additional information regarding the survey effort on the specific areas not yet block-cleared is currently being reviewed by the Service. Based on this review, the Service will likely add several blocks of habitat to the list in the future. The Service will continue to collect and review information on any remaining areas to determine if they should be added to the list of areas cleared from the survey recommendation. Therefore, prior to conducting surveys, you should coordinate with the Service to determine which specific areas are recommended for surveys. We have attached our initial list of areas cleared from the ferret survey recommendation. We believe this approach is not only biologically defensible, but also allows all parties involved to focus survey effort and resources on those areas where the likelihood of discovering wild ferrets is greatest.

Please note that "block clearance" must not be interpreted to mean that the area is free of all value to black-footed ferrets. These areas, or blocks, are merely being cleared from the need for ferret surveys. Therefore, this clearance from the survey recommendations reflects only the negligible likelihood of a wild population of ferrets occurring in an area. It does not provide insight into an area's value for survival and recovery of the species through future reintroduction efforts. Nor does this clearance relieve a Federal agency of its responsibility to evaluate the effects of its actions on the survival and recovery of the species. For example, while an action proposed in a cleared area needs no survey and is not likely to result in take of individuals, the action could have an adverse effect upon the value of a prairie dog town as a future reintroduction site and should be evaluated to determine the significance of that effect. Consultation with the Service is appropriate for any agency action resulting in an effect significant enough to diminish a site's value as a future reintroduction site. Additionally, block clearance of an area does not imply that other values of maintaining the integrity of the prairie dog ecosystem are unimportant.

We appreciate your efforts to conserve listed species. Without the valuable information collected to date in association with black-footed ferret surveys, we would not be able to undertake this effort to focus ferret surveys on the most promising habitat.

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Enclosure 1

If you have any questions regarding this letter or your responsibilities under the Act, please contact Mary Jennings of my staff at the letterhead address or phone (307) 772-2374, extension 32.

Sincerely,

/s/ Brian T. Kelly

Brian T. Kelly
Field Supervisor
Wyoming Field Office

Enclosure (1)

cc: WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)
FWS, BFF Recovery Coordinator, Laramie, WY (M. Lockhart)

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Enclosure 2

Black-footed Ferret Survey Block Clearance List **February 1, 2004**

The following blocks of black-footed ferret habitat are cleared from the recommendation for ferret surveys:
1. All black-tailed prairie dog towns in Wyoming
2. All white-tailed prairie dog towns in Wyoming EXCEPT those identified in the following table.

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Big Piney	T 28 T29, T30, T31	R111, R112 R109-R111	Flaming Gorge	T12, T13 T12-T14 T13	R109 R108 R107
Bolton Ranch	T17 T18, T19	R86, R88 R86-R88	Manderson	T47, T48 T49	R90, R91 R91
Carter	T16, T17 T18	R114-R116 R115	Moxa	T15, T16 T17, T18 T19, T20 T21 T22, T23 T24	R112, R113 R111-R113 R111-R114 R110-R113 R111-R113 R112
Continental Divide	T16 T17 T18 T19 T20	R93-95 R92-95, 98-100, 97-98 R92-96, 98-99 R92-96 R92-95	Pathfinder	T27 T28 T29	R85, R86 R85-R89 R85, R89
Cumberland	T16 T17-T19 T19, T20	R118 R117 R116	Saratoga	T14 T15 T16	R82, R83 R82-R84 R83-R85
Dad	T15, T16 T17	R90-R93 R92, R93	Seminoe	T23, T24	R84, R85
Desolation Flats	T13 T14 T15 T16	R93-95 R93-94 R93-94, 96 R93-96	Shamrock Hills	T22, T23 T24, T25 T26	R89, R90 R89 R89, R90

WYOMING GAME AND FISH DEPARTMENT

5400 Bishop Blvd. Cheyenne, WY 82006

Phone: (307) 777-4600 Fax: (307) 777-4610

Web site: http://gf.state.wy.us

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DAVE FREUDENTHAL

DIRECTOR
TERRY CLEVELAND

COMMISSIONERS
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JERRY GALLES – Vice President
CLARK ALLAN
CLIFFORD KIRK
FRED LINDZEY
RON LOVERCHECK
ED MIGNERY

Action 001 D4

RECEIVED
JUL 11 2007

July 9, 2007

WER 11660
Rocky Mountain Oilfield Testing Center and
Naval Petroleum Reserve No. 3
Scoping
Teapot Dome Oil Field
Natrona County

Clarke D. Turner, Director
DOE RMOTC/NPR-3
907 North Poplar, Suite 150
Casper, WY 82601

Dear Mr. Turner:

The staff of the Wyoming Game and Fish Department has reviewed the scoping notice for the Teapot Dome Oil Field in Natrona County. We offer the following comments for your consideration.

Terrestrial Considerations:

This scoping notice generally lacks information pertaining to specific locations for proposed project implementation within the Teapot Dome Naval Petroleum Reserve. Consequently, we request information on the locations so we may comment on any site-specific wildlife concerns.

Based on this scoping notice, it appears the U.S. Government and industry are collaborating to seek innovative solutions for enhanced oil and gas recovery with improved environmental sensitivity, such as development of wind turbine technologies and water treatment methods. Because of historic and potential habitat disturbance and the opportunity for reclamation and mitigation, we recommend the project proponents consider exploring new avenues to improve reclamation practices to restore and enhance wildlife habitats impacted from oil and gas development.

Agree!

Currently, there are a myriad of efforts underway experimenting with reclamation techniques to restore sagebrush habitats in lieu of broad-scale oil and gas development and the potential for Endangered Species Act listing of the greater sage-grouse. Methods for proper sagebrush restoration and invasive weed control/native vegetation reestablishment are just beginning to be understood. Coal mines operating in northeastern Wyoming are beginning to experience success with sagebrush restoration,

"Conserving Wildlife - Serving People"

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Mr. Clarke D. Turner
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with Powder River Coal Company publishing a second edition to their manual on restoring sagebrush (in press). Consultation with the Department, Bureau of Land Management, the Natural Resources Conservation Service, the U.S. Fish and Wildlife Service, and the Northeast Wyoming Local Sage-grouse Working Group could help identify and prioritize experimentation with innovative reclamation practices including, but not limited to, sagebrush restoration and invasive weed control.

Aquatic Considerations:

If water is to be discharged into streams within the Teapot Dome Oil Field, we recommend the discharge be managed to maintain stream channel and stream bank stability.

Thank you for the opportunity to comment.

Sincerely,

JOHN EMMERICH
DEPUTY DIRECTOR

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cc: USFWS

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APPENDIX C Water Discharge Quality and Quantity Data

WYPDES SAMPLING PARAMETERS

- pH
- Chemical oxygen demand (COD)
- Conductivity
- Oil and grease
- Chloride
- Total dissolved solids (TDS)
- Radium-226

NPDES PERMIT NUMBERS

- WY0032115 Peripheral Water Injection Facility
- WY0028894 Tank Battery B-1-3
- WY0028274 B-TP Battery
- WY0028274 B-TP Battery #2

Table C-1. Water quantities and properties for potential geothermal projects

Application	Tensleep Battery		Madison 1		Madison 2	
	Brine feed	Brine discharge from treatment	Brine	Cooling water	Brine	Cooling water
Quantity, bpd	**40,000**	**40,000**	**20,000**	**30,000**	**6,000**	**9,000**
Analysis						
Cations						
Potassium, mg/l	86.9	91.5	80	88.6	79	88.6
Sodium, mg/l	604	800	554	871	642	871
Calcium, mg/l	262	259	353	259	245	259
Magnesium, mg/l	33.6	34	37	49.4	31.5	49.4
Iron-total, mg/l	<0.03	0.33	0	0.06	0.1	0.06
Anions						
Sulfate, mg/l	830	891	1,030	1,090	796	1,090
Chloride, mg/l	876	1,040	850	1,060	2,141	1,060
Carbonate, mg/l	<1.0	<1.0	0	<1	1,439	<1
Bicarbonate, mg/l	143	280	85	287	44.6	287
Solids						
TDS @180C, mg/l	3,120	3,640	2,945	3,980	3,140	3,980
Total solids, NaCl equivalents, mg/l	2,133	2,570	2,431	2,780	2,141	2,780
Chloride as NaCl, mg/l	1,444	1,710		1,750	1,439	1,750
NaCl % of TDS, mg/l	42.1	44		40.3	44.6	40.3
Sample Conditions						
pH (s.u.)	8.1	8.2	7.18	8.25	7.5	8.25
Ionic strength (u)	262	2,590		259	245	259
Accuracy (sigma)	0.01	-0.43		0.5	-1.78	0.5
Other Properties						
Calcium hardness as $CaCO_3$, mg/l	654	647		647	612	647
Magnesium hardness as $CaCO_3$, mg/l	138	140		203	130	203
Total hardness as $CaCO_3$, mg/l	792	787		850	742	850
Sodium adsorption ratio	9.31	12.4		13	10.2	13
Specific gravity	1.002	1.002		1.003	1.002	1.003
Conductivity, µmho/cm	4,680	5,420		5,840	4,780	5,840
Resistivity, 68F Ohm meter	2.137	1.845	2.5	1.712	2.092	1.712

Table C-1. Water quantities and properties for potential geothermal projects (continued)

Application	Tensleep Battery		Madison 1		Madison 2	
	Brine feed	Brine discharge from treatment	Brine	Cooling water	Brine	Cooling water
Probable Mineral Residue, Dry						
NaCl, mg/l	1,314	1,600		1,610	1,402	1,610
$CaSO_4$, mg/l	730	567		559	681	559
Na_2SO_4, mg/l	313	612		859	325	859
$Ca(HCO_3)_2$, mg/l	190	372		559	177	559
$MgSO_4$, mg/l	166	168		381	156	381
KCl, mg/l	166	146		245	47.5	245
Organics						
O&G (total recoverable) ppm	150	1.7	0	ND	0	ND

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APPENDIX D Comments and Responses

Commentors

United States Fish and Wildlife Service (USFWS)

Anadarko Petroleum Corporation

UNITED STATES FISH AND WILDLIFE SERVICE (USFWS) COMMENTS

General Comments

The USFWS suggests that " … the additional infrastructure will increase habitat fragmentation through road construction and other surface disturbances" … recommending that we "develop additional measures as discussed below and include such measures in the final EA. We also suggest that the final EA include a map indicating important wildlife habitat (e. g. raptor nest locations, black-tailed prairie dog colonies) in relation to the proposed activities."

DOE Response: DOE would like to clarify that this maturely developed oil field, extensively worked for nearly a century, is unlikely to see the kind of additional habitat fragmentation that would call for the additional protective measures recommended. Anticipated Infrastructure additions are either already been evaluated in the EA or will be addressed in future evaluations under the NEPA. DOE has intentionally avoided providing maps of important wildlife habitats in order to limit public awareness and possible disturbance of those resources. However, DOE is fully prepared to share this information with organizations having a need to know, such as the USFWS.

Specific Comments

***Black-tailed Prairie Dog*:** The USFWS is encouraging "the DOE to protect prairie dog colonies for their value to the prairie ecosystem … " noting that "Mountain plover and other species of management concern may occur in prairie dog colonies, therefore we recommend avoiding construction activities in prairie dog colonies.

DOE Response: In 2007, DOE conducted a review of the prairie dog communities and found them to be healthy. In 2008, DOE contracted a Range Manager to survey the site and provide recommendations for habitat management at RMOTC / NPR-3. He found that the previously healthy communities had been virtually eradicated, apparently as a result of a plague that infected not only the community located on the NPR-3 reserve but also on surrounding private proprieties adjacent to the field. On completion of the survey the Range Manager concluded that anticipated construction or operations activities near or adjacent to the prairie dog town would have no significant impact to the prairie dog communities. Therefore, activities planned in the near term are unlikely to have any impact upon these already decimated colonies. Black-tailed prairie dog colonies currently are managed as a Special Status Species. Operationally, DOE practices avoidance of construction activities in prairie dog colonies whenever possible or minimization of such activities where necessary.

***Raptors*:** The USFWS acknowledges information provided on raptors in the EA, but seems to discount the statement on page 81 indicating no anticipated impacts to nesting raptors from planned human activities, going on to recommend "that the final EA include provisions to coordinate with the Service to identify species-specific timing and spatial buffers to protect nest sites in the project area.

DOE Response: Current management does establish a buffer zone (controlled surface use) around raptor nest sites that considers topography and special status prey habitats surrounding the nest site. Raptor buffer zones around nests are ¼ to ½-mile in size for the period February 1 through July 31. The DOE has placed this more stringent policy to restrict and to control access to known nesting sites. All of the nests are located in very rough terrain and access to these locations has been restricted. There is no intent to develop these areas for production or testing.

***Further on Raptors*:** The USFWS goes on to note that "Two primary causes of raptor mortality are electrocutions and collisions with power lines, suggesting under the assumption "since your projects may involve construction of new power lines or modification of existing lines" … "the DOE should "implement measures to ensure raptors are protected by raptor-proofing the power lines" and clearly state the protections in the final EA.

DOE Response: DOE does not anticipate any major construction of new power lines or modification of existing lines. The experimental wind turbines are restricted to sections 3, 33 and 34. These are more than 3 miles from the nearest nest.

***Greater Sage Grouse*:** The USFWS states that "while the EA indicates that there are no known leks on the site (page 61), sage-grouse may still use the area." and then goes on to offer recommendations for the improvement of sage-grouse habitat.

DOE Response: No observations of sage grouse have been recorded. In this year's range management survey of the site, a Range Manager fully familiar with grouse habitat observed that poor soils, extensive weed invasions, and human disturbance of the area probably result in no sage-grouse habitat favorable for improvement efforts.

***Selenium Issues*:** The USFWS summarizes the potential for selenium in geologic formations underlying RMOTC/NPR-3 and recommends that, "Formation water produced along with the oil should be analyzed for selenium and other trace metals to determine if concentrations are above thresholds that may pose a risk to aquatic organisms and sensitive species of aquatic birds."

DOE Response: RMOTC is actively working with the WYDEQ to establish a baseline assessment of selenium concentrations in water, soil, and biotic samples. Results will be evaluated to assess the potential for environmental impacts identified by USFWS. If it is determined that such potentials exist, the DOE will work with WYDEQ and the USFWS to determine whether any remedial measures are required.

***Reclamation*:** The USFWS suggests that "the EA lacks specificity in requiring soil stabilization and the use of native vegetation" and suggests "clarifying the language to apply to all ground disturbing activities and include requirements for control of non-native vegetation and use of native vegetation in all reclamation.

DOE Response: The EA has been revised as suggested to indicate that soil stabilization and the use of native seed mixes recommended by the U. S. Bureau of Land Management are standard reclamation practices for reclamation of surface disturbances caused by human activities at RMOTC/NPR-3. The 2008 range management survey indicates that the suggested control of non-native vegetation in this area of long-term activity and poor soils over a 10,000 acre area would not be successful.

***Wind Power*:** The USFWS returns here to the subject of wind tower impacts on raptors and other migratory birds, citing wind farm studies in California as a basis for recommending "siting towers to minimize potential impacts to migratory birds … " suggesting "the final EA should include provisions for further coordination with the Service prior to planning wind power projects" and further requesting notification of any decision made on these projects."

DOE Response: Although DOE does not consider that the results of the large wind farms at Altamont are applicable to the small single tower installations proposed at RMOTC, their siting at least three miles from the nearest raptor nests was specifically done to address this concern. Raptors and, to a lesser extent, other migratory birds are most likely to orient their flights along the bluffs we are intentionally avoiding rather

than within the open basin selected for tower locations. DOE will inform the FWS of decisions made on the proposed wind projects, as requested, and will consult with the FWS on any future wind project.

ANADARKO COMMENTS

General Comment

The site-wide assessment analyzes the potential impacts of proposed operations at RMOTC over the next five years. One of the proposals to be implemented over the next five years is an Enhanced Oil Recovery Technologies Project (EOR Project). The EOR Project is described in detail in the EA beginning at page 18. The FOR Project proposes to use C02 from Anadarko's operations to the north of the RMOTC and includes a proposal to construct and operate a C02 pipeline lateral that would connect to Anadarko's existing C02 pipeline.

Although Anadarko supports and appreciates the efforts of the DOE to develop new technologies to improve oil and gas production, at this time Anadarko does not have any excess C02 that could be provided to DOE for purposes of this project. Because Anadarko does not have any excess C02, the proposed pipeline lateral contemplated in the EA will not likely be built. However, there may be other sources of C02 available to DOE, and to the extent such sources are available, DOE may wish to consider revising the EA to analyze any potential impacts associated with obtaining such C02, including transportation.

DOE Response: While previous discussions with Anadarko had indicated that this proposed action could be viable, based on the comment letter DOE understands that surplus CO2 is not currently available from Anadarko. As DOE evaluates the results of its ongoing EOR pilot project, the viability of a full-scale EOR project will be assessed. If and when a full-scale EOR project is deemed beneficial at some yet to be determined time in the future, DOE would again discuss with Anadarko the option of extending a CO2 pipeline to Anadarko’s existing line along one of the routes assessed in this EA. If such an option was not available or different routes would need to be considered, under DOE’s NEPA procedures, DOE may supplement this SWEA with additional analyses to support that future decision-making.