BLM

Environmental Assessment for the Grieve Unit CO_2 Enhanced Recovery Project Natrona County, Wyoming

WY-050-EA11-108

Prepared for the Bureau of Land Management,
Lander Field Office

July 2012

FINDING OF NO SIGNIFICANT IMPACT
Environmental Assessment: WY-050-EA11-108
Grieve Unit CO_2 Enhanced Oil Recovery Project
BLM Federal Oil and Gas Leases
WYW-015813, WYW-015814, WYW-015815,
WYW- 015824, & WYW- 016008

Finding of No Significant Impacts:
Based on my review of the analysis of the Grieve Unit CO_2 ($GUCO_2$) Enhanced Oil Recovery (EOR) project (Project) Environmental Assessment (EA), I have determined that the Proposed Action is in conformance with the approved land use plan, and will not have any significant impact on the human, natural and physical environment. Therefore, an environmental impact statement is not required.

The EA shows that adverse impacts to the surface ownership/land use and grazing; socioeconomics/environmental justice; cultural/paleontological resources and Native American religious concerns; soils/watershed; water resource; air quality; vegetation/wetland/noxious weeds; wildlife/fisheries; threatened , endangered, candidate, and special status species; wild horses; visual resources; transportation; and from the use of hazardous materials will all be minor, short term, necessary and due impacts. Potentially, substantial positive economic impacts could result for the operator, and local, state, and federal, governments.

The Lander Resource Management Plan (LRMP) provides for the use of these public lands for this type of drilling and natural gas exploration and development. The Proposed Action will be in conformance with these land use plans, and no amendments to the LRMP will be necessary to implement the Proposed Action

ACTING FOR

Field Manager, Lander Field Office, Rick VanderVoet — Date 7/26/12
Attachment: EA No. WY-050-EA11-108

DECISION RECORD
Environmental Assessment: WY-050-EA11-108
Grieve Unit CO_2 Enhanced Oil Recovery Project
BLM Federal Oil and Gas Leases
WYW-015813, WYW-015814, WYW-015815,
WYW- 015824, & WYW- 016008

Introduction:
Elk Petroleum, along with Tri-State Generation and Transmission (Tri-State), a utility power supplier, have filed, or will be filing, ten Applications for Permit to Drill, numerous Sundry Notices to re-work existing wells, and four rights-of-way (ROW) applications with the Bureau of Land Management, Lander Field Office. The APD and Sundry Notice documents were filed on June 10, 2011 and August 19, 2010. The specific proposal is to drill and install associated facilities for these wells located in Sections 16, 21, 22, 26, 27, Township 32 North, Range 85 West, on BLM Federal oil and gas leases WYW-015813, WYW-015814, WYW-015815, WYW-015824, and WYW- 016008. The Sundry Notice and APD documents include proposals to construct access roads and pipelines, and utility lines which will be tied into existing oil field facilities. One ROW application has been filed for a CO_2 pipeline line with a meter station. Additional ROW proposals will be filed to include a 25 kV utility line, a 230 kV line and a new network load point substation.

Decision:
It is my decision to authorize the Sundry Notices, APD documents, ROW applications submitted by Elk. The APD documents included the Grieve Unit #53, #54, # 55, #57, #58, #59, #60, and #61 wells and infrastructure. The wells and facilities are located on Federal Oil and Gas Leases WYW-015813, WYW-015814, WYW-015815, WYW-015824, & WYW-016008. The wells and related activities are administered by the Lander Field Office, State of Wyoming. Design features and procedures are included in the Sundry Notice, APD documents, ROW applications as Conditions of Approval (COA) and Stipulations.

Rationale for Decision:
The decision to approve the Proposed Action is based on the following: 1) consistency with resource management plan and land use plan; 2) national policy; 3) agency statutory requirements; 4) relevant resource and economic issues; 5) application of measures to avoid or minimize environmental impacts; 6) finding of no significant impact; and 7) public comments.

1. Consistency with Resource Management Plan and Land Use Plan
Current policies for development and land use decisions within this area are contained in the *Lander Resource Area Resource Management Plan (RMP) EIS* (BLM 1986) and the *Lander Resource Area RMP Record of Decision (ROD)* [BLM 1987]. The RMP states, "In areas of moderate, low and no potential for occurrence of oil and gas, this plan will allow for enhanced management of the surface resources, while providing opportunities for exploration and development of the oil and gas. Conversely, in areas of high potential for the occurrence of oil and gas or in areas of established production, this plan will allow for enhanced management of

exploration and development activities by minimizing the restriction imposed on these activities."

2. National Policy
The Grieve Unit CO2 (GUCO2) Enhanced Oil Recovery (EOR) Project (Project) is a private exploration and development operation of federal oil and gas leases, which is an integral part of the BLM oil and gas leasing program under the authority of Mineral Leasing Act of 1920, as amended and the Federal Land Policy and Management Act of 1976, as amended. The United States continues to rely heavily on foreign energy sources. Oil and gas leasing is needed to encourage development of domestic oil and gas reserves to reduce the United States' dependence of foreign energy supplies. The BLM oil and gas program is designed to encourage such development. Therefore, the decision is consistent with national policy.

3. Agency Statutory Requirements
The decision is consistent with all federal, state, and county authorizing actions, which are required to implement as part of the Proposed Action. All pertinent statutory requirements applicable to this proposal were considered including informal consultation and formal conferencing with the U.S. Fish and Wildlife Service (USFWS). Cultural surveys and compliance with Section 106 of the National Historic Preservation Act will be completed prior to approval of permits for individual components.

4. Relevant Resource and Economic Issues
Potential environmental impacts from the Project proposal to surface and subsurface resources identified in the Environmental Assessment are considered minor and all deemed acceptable with mitigation. The economic benefits derived from the implementation of the Proposed Action in the form of continuing employment opportunities, equipment, services, and potential revenues should production are considered important.

5. Application of Measures to Avoid or Minimize Environmental Impacts
Federal environmental protection laws, such as the Clean Air Act, and the National Historic Preservation Act, apply to all lands and are included as part of the standard oil and gas lease terms and the terms and conditions of the APD and Sundry Notice documents. The adoption of these measures identified in Chapter 2.0 and 4.0 of the Project EA provide practicable means to avoid or minimize potential environmental impacts. Should conditions warrant, additional, measures could be applied to individual permits subject to additional analysis.

6. Finding of No Significant Impact
Based upon the analysis contained in the Environmental Assessment for the Project and with the implementation of the protection measures, I have determined that the proposed action will not cause any significant impacts on the human, natural, and physical environment. Therefore, an environmental impact statement is not required.

7. Opportunity for Public Involvement
Scoping is an important part of the National Environmental Policy Act (NEPA) process and is used to determine the scope of issues to be addressed and for identifying the key issues related to a proposed action (40 CFR 1500.7). The scoping process can involve federal, state, and local

government agencies, resource specialists, industry representatives, local interest groups, and members of the public. Scoping is an interdisciplinary process.

The APD documents were received by the Lander Field Office on June 10 and August 19, 2011. In accordance with 43 CFR 3162.3-1 (g), the notice was made available to the public for comment for 30 days ending July, 30 and September 19, 2011 respectively. The applications were considered technically and administratively complete on September 19, 2011.

In addition a scoping notice was printed in the Casper Star Tribune and posted on the BLM LFO website in December 8, 2011. This notice described the project and requesting that any comments regarding the project be submitted to BLM by January 13, 2012. Public comments were received and reviewed by BLM specialist. Each issue presented was compared against the Proposed Action, operator committed and BLM required design features. If the concern was relevant to the proposal and was not adequately covered by the design features mitigation was applied in the EA.

Compliance and Monitoring:
Monitoring will be done by the area Natural Resource Specialist, Surface Compliance Technician, Petroleum Engineering Technicians, and Reality Specialist to insure compliance with this authorization.

Appeals:
Under BLM regulations, this decision is subject to administrative review in accordance with 43 CFR 3165. Any request for administrative review of this decision must include information required under 43 CFR 3165.3(b) (State Director Review), including all supporting documentation. Such a request must be filed in writing with the State Director, Bureau of Land Management, P.O. Box 1828, Cheyenne, Wyoming 82003, no later than 20 business days after this Decision Record is received or considered to have been received. Any party who is adversely affected by the State Director ' s decision may appeal that decision to the Interior Board of Land Appeals, as provided in 43 CFR 3165.4.

ACTING FOR

Field Manager, Lander Field Office, Rick VanderVoet

7/26/12
Date

Attachment: EA No. WY-050-EA11-108

Grieve Unit CO_2 Enhanced Recovery Project
Environmental Assessment

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CHAPTER 1: PURPOSE AND NEED

1.1 Introduction

This Environmental Assessment (EA) has been prepared to disclose and analyze the environmental consequences of the Grieve Unit CO_2 ($GUCO_{2)}$ Enhanced Oil Recovery (EOR) project (Project) as proposed by Elk Petroleum Incorporated (Elk). The EA is a site specific analysis of potential impacts that could result with the implementation of a proposed action or alternatives to the proposed action. The EA assists the BLM in project planning and ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether any "significant" impacts could result from the analyzed actions. "Significance" is defined by NEPA and is found in regulation 40 CFR 1508.27. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of "Finding of No Significant impacts" (FONSI). If the decision maker determines that this project has "significant" impacts following the analysis in the EA, then an EIS would be prepared for the project. If not, a Decision Record (DR) may be signed for the EA approving the selected alternative, whether the proposed action or another alternative. A DR, including a FONSI statement, documents the reasons why implementation of the selected alternative would not result in "significant" environmental impacts.

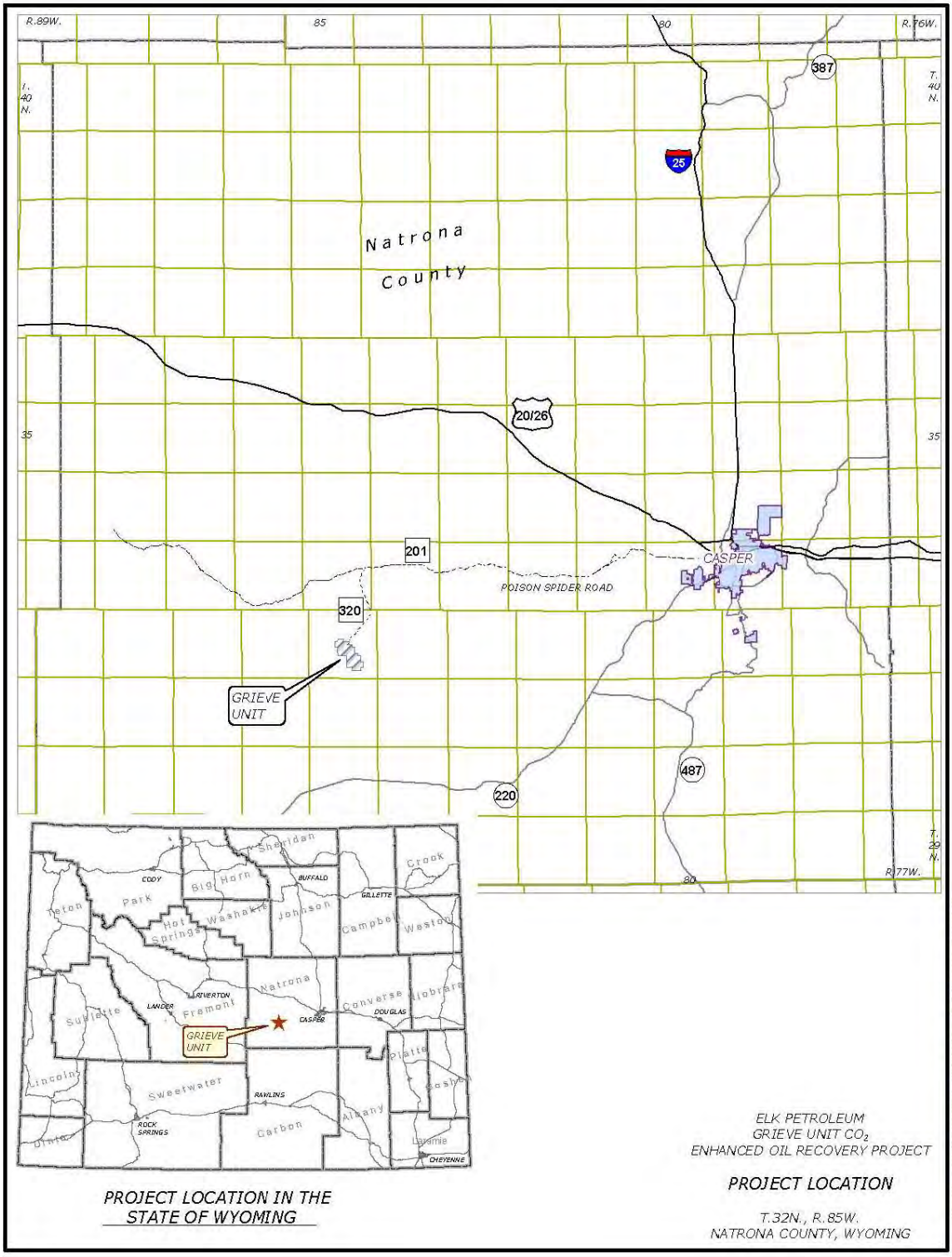
1.2 Background

The Grieve Unit lies within the Gas Hills Management Unit of the Lander Field Office of the Bureau of Land Management. Figure 1.2.1 provides a general location map showing the Grieve Unit CO_2 Enhanced Oil Recovery project and its location in central Wyoming.

Elk, the operator of the Grieve Unit, proposes to implement enhanced recovery from the Cretaceous Muddy "Grieve Sand" in the Grieve Unit using a miscible CO_2 flood with water injection to assist with reservoir re-pressurization. The Grieve Unit is an excellent CO_2 candidate as the field has not undergone secondary water-flood production.

Crude oil has been produced from the Cretaceous Muddy "Grieve Sand" in the Grieve Field since 1954; the area was later unitized. The Grieve Unit is made up of Federal, State and Fee minerals, which are held by the Grieve Unit designation. The field was initially developed and produced conventionally; in 1960 production rates were enhanced through gas injection, in 1977 the reservoir was "blown down" as the natural gas and oil were depleted. Production continues at low rates, currently, two wells are in operation, one well is producing crude oil and the other is a produced water injection well. In 2009, one well was drilled and shut-in. A map of the existing Grieve Unit is identified as Figure 1.2.2.

Figure 1.2.1: Location map of the Grieve Unit CO_2 enhanced oil recovery project area



Elk proposes to drill a total of 10 new crude oil and injection wells, on 6 new well pads, in the existing Grieve Unit in western Natrona County, Wyoming. Eight of these proposed wells are located on BLM managed surface or will access the federal mineral estate. Other project components include: a 3.62 mile CO_2 pipeline, a 3.75 mile 230 kV power line and substation, a new 2.62 mile underground 25 kV power distribution line and substation, replace and expand the existing infield gathering/injection system flow lines and a new CO_2 recycling and production facility. A project description for the project was received by the Lander Field Office (LFO) in March 10, 2011.

1.3 Need for the Proposed Action

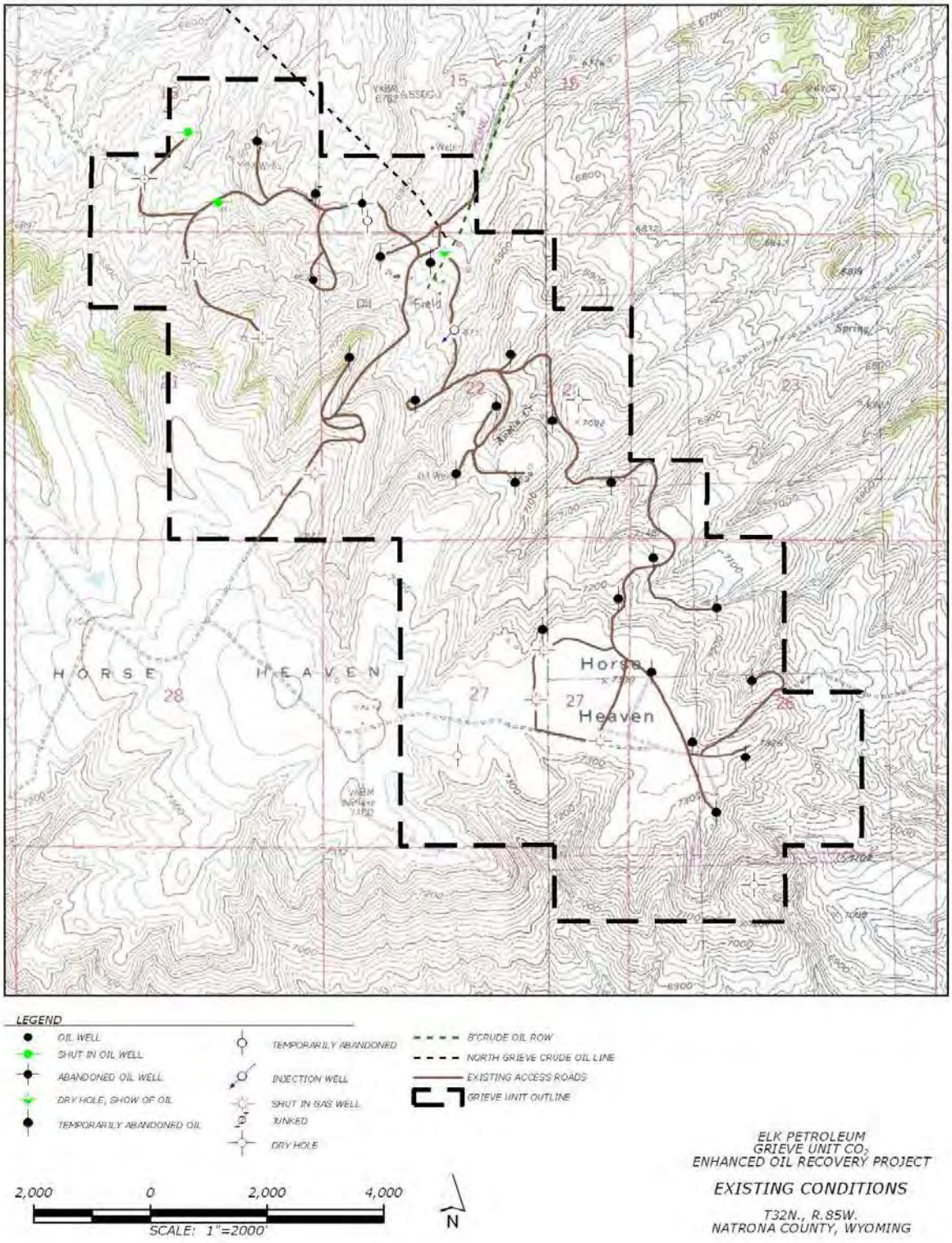
Elk, along with Tri-State Generation and Transmission (Tri-State), a utility power supplier, have filed, or will be filing, eight Applications for Permit to Drill, numerous Sundry Notices to re-work existing wells, and three rights-of way applications. The need is for BLM to respond to the applicants proposals to exercise valid existing rights by developing minerals within the Federal Grieve Unit WYW-109538X and corresponding Federal Leases. Consistent with the lease terms and conditions the operator shall explore and develop the federal minerals and, if successful, to produce the oil in commercial quantities.

Concurrent with BLM's requirements is the need for Western Area Power Administration (Western), a federal agency under Department of Energy, to respond to a new network load point of delivery along its existing Badwater to Spence 230-kV transmission line. Western must consider interconnection requests to its transmission system in accordance with its Open Access Transmission Tariff (Tariff) and the Federal Power Act (FPA), as amended. Western satisfies FPA requirements to provide transmission service on a non-discriminatory basis through compliance with its Tariff. Under the Tariff, Western offers capacity on its transmission system to deliver electricity when capacity is available. In reviewing interconnection requests, Western must ensure that existing reliability and service is not degraded. If BLM approves the Grieve Unit EOR project, Western would construct, operate, and maintain a switchyard at the requested point of delivery.

1.4 Purpose of the Proposed Action

BLM is considering approval of a submitted proposal by the operator of the Federal Grieve Unit and utility supplier to develop new and enhance existing facilities for exploration and production of hydrocarbon resources under the authority of the Mineral Leasing Act of 1920 (the MLA), as amended, the Mining and Minerals Policy Act of 1970, the Federal Land Policy and Management Act of 1976 (FLPMA), the National Materials and Minerals Policy, Research, and Development Act of 1980, and the Federal Onshore Oil and Gas Leasing Reform Act of 1987. The intent of the MLA and its implementing regulations is to allow lessees to explore for and develop oil and gas or other mineral reserves on federally administered lands, including enhancing the production from depleted leases already under conventional production. FLPMA mandates that BLM manage public lands on the basis of multiple use [43 U.S.C. § 1701(a) (7)]. Minerals are identified as one of the principal uses of public lands in Section 103 of FLPMA and

Figure 1.2.2 - The existing Grieve Unit



are recognized as an appropriate use of federal lands and minerals in the Lander Resource Management Plan, signed June 9, 1987.

Consistent with these rights and authorities, the Operator of the leases have filed eight Applications to Permit to Drill, numerous Sundry Notices to conduct oil and gas operations as well as a right-of-way application for the proposed CO_2 pipeline, meter station and access road. The Operator will also be filing right-of-way applications for the proposed underground 25 kV power distribution line and the 230 kV power transmission line. BLM will consider approval of the proposed drilling and subsequent operations in a manner that avoids or reduces impacts on approximately 171 acres of BLM surface and/or mineral estate.

Western proposes to consider the request under its Tariff provisions and will identify and construct any system modifications necessary to accommodate the proposed point of delivery. Western's Federal action of approving the interconnection and any system modifications would be implemented through the construction of a sectionalizing switchyard and associated infrastructure for the interconnection to the Badwater to Spence 230 kV transmission line.

1.5 Conformance with BLM Land Use Plan

BLM management decisions for lands within the $GUCO_2$ Project Area are contained in the Final Resource Management Plan/Environmental Impact Statement for the Lander Resource Area, Lander, Wyoming (BLM 1986). Additional guiding documents include: Grazing Supplement to the Final Resource Management Plan/Environmental Impact Statement for the Lander Resource Area, Lander, Wyoming (BLM 1986) (BLM 1987); and Record of Decision for the Lander Resource Management Plan, signed June 9, 1987. The Lander Resource Management Plan (LRMP) is currently undergoing revision.

The environmental analysis that supports the decisions made in the LRMP is documented in LRMP EIS (1986). Resource and management values described in the LRMP that are applicable to the Proposed Action are described in Chapter 3, Affected Environment. The Lander Field Office "Summary of the Analysis of the Management Situation for the Lander Resource Management Plan Revision," dated June 30, 2009, was also considered in the development of Chapter 3 of the EA.

The Lander Resource Management Plan states that "public lands will be made available for oil and gas leasing and development to the maximum extent possible, while giving due consideration to the protection of other significant resource values." The proposed project area is located in the Gas Hills Management Unit (GHMU) and is open for oil and gas leasing/development activities in conformance with the RMP. All the lands in the $GUCO_2$PA have been leased. Surface disturbing activities, including mineral exploration and development, are permitted in the GHMU, subject to the guidelines and constraints found in the LRMP. Generally, many of those are expressed as stipulations attached to the oil and gas leases.

The Grieve Unit CO_2 Enhanced Oil Recovery Project EA will incorporate the appropriate decisions, terms, and conditions of use described in the RMP. Site specific use authorizations [i.e., ROWs, permits] for well pads, roads, pipelines, and associated facilities will be processed

through the BLM Application for Permit to Drill (APD) and Sundry Notice process. In accordance with 43 CFR 1610.5-3, the Proposed Action has been reviewed and has been found to be in conformance with the LRMP.

1.6 Relationship to Statutes, Regulations, or other Plans

Drilling of federal minerals is subject to the BLM's Onshore Oil and Gas Orders (43 CFR Subpart 3164 – Special Provisions). BLM Onshore Order Nos. 1 and 2 require an applicant to comply with the following conditions:

- Operations must result in the diligent development and efficient recovery of resources;
- All activities must comply with applicable federal, state, and local laws and regulations applicable to federal leases;
- All activities must include adequate safeguards to protect the environment;
- Disturbed lands must be properly reclaimed; and
- All activities must protect public health and safety.

Onshore Order No. 1 specifically states that lessees and Operators should be held fully accountable for their contractors' compliance with the requirements of the approved permit and/or plan (43 CFR Part 3160; March 7, 2007).

Pipeline and road rights-of-way on federal lands would be issued under the authority of the MLA of 1920, as amended, or the FLPMA. Right-of-way grants authorizing construction of ancillary facilities, access roads, and pipelines would provide Operators certain rights subject to the terms and conditions incorporated into the grant by the BLM.

The development of this project would not affect the achievement of the Wyoming Standards for Healthy Rangelands (August 1997).

The proposed Project would comply with all applicable federal, state, and local agency laws, plans, and permits required for this activity, including, but not limited to, those issued by the US Environmental Protection Agency (EPA), US Office of Pipeline Safety (OPS), US Fish and Wildlife Service (FWS), Wyoming Oil and Gas Conservation Commission (WOGCC) that has regulations and standards affecting well spacing, permits, and safety, Wyoming Department of Environmental Quality (WDEQ) which has jurisdiction over air and water quality, Wyoming State Historic Preservation Office (SHPO), and the Wyoming State Engineers Office (WSEO). The following list (Table 1.6.1) includes the other authorities that may apply to BLM actions.

The area was assessed as per the Wyoming Instruction Memorandum (IM) WY-IM-2012-019 (Greater Sage-grouse Habitat Management Policy on Wyoming Bureau of Land Management (BLM) Administered Lands including the Federal Mineral Estate), the Governor's Greater Sage-Grouse Core Area Protection Strategy, executive Order 2011-5 (2011), the State Land and Investments Board Greater Sage-grouse Core Area Guidelines (2009, to be revised). The IM directs the BLM to analyze Greater Sage-grouse habitat out to a minimum of four miles from the project location. This analysis is to occur both within and outside of the Greater Sage-grouse core areas (core areas as designated by the Wyoming Governor's Executive Order EO 2011-5).

The Proposed Action is in conformance with the *State of Wyoming Land Use Plan* (Wyoming State Land Use Commission 1979), and the Natrona County Development Plan (1998) and complies with all other relevant federal, state, and local laws. Table 1.1 provides an overview of major laws applicable to oil and gas development and an overview of the key regulatory requirements that would govern oil and gas project implementation. Additional approvals, permits, and authorizing actions may be necessary.

Table 1.6.1: Major Federal, State, and Local Permits, Approvals, and Authorizing Actions Applicable to Oil and Gas Development in Natrona County, Wyoming

Agency	Permit, Approval, or Action	Authority
United States		
Bureau of Land Management (BLM)	Rights-of-way (ROW) grants and temporary use permits for power lines, pipelines, off lease access roads and central tank batteries on BLM-managed land	Mineral Leasing Act of 1920, as amended (30 U.S.C. 185); Onshore Oil and Gas Unit Agreements: Unproven Areas, as amended (43 C.F.R. 3180); FLPMA of 1976 (43U.S.C. 1701)
	Authorization for flaring and venting of natural gas on BLM-managed land	Mineral Leasing Act of 1920, as amended (30 U.S.C. 181 et seq.); Requirements for Operating Rights Owners and Operators, as amended (43 C.F.R. 3162)
	Plugging and abandonment of a well on BLM-managed land	Mineral Leasing Act of 1920, as amended (30 U.S.C. 181 et seq.); Requirements for Operating Rights Owners and Operators, as amended (43 C.F.R. 3162)
	Antiquities and cultural resource permits on BLM-managed land	Antiquities Act of 1906, as amended (16 U.S.C. 431-433); Archaeological Resources Protection Act of 1979, as amended (16 U.S.C. 470aa-47011); Preservation of American Antiquities, as amended (43 C.F.R. 3)
	Approval to dispose of produced water on BLM-managed land	Mineral Leasing Act of 1920, as amended (30 U.S.C. 181 et seq.); Special Provisions, as amended (43 C.F.R. 3164); Onshore Oil and Gas Order No. 7 as amended (58 Federal Register 47,354)
Fish and Wildlife Service (USFWS)	Coordination, consultation and impact review of federally listed threatened and endangered (T&E) species	Fish and Wildlife Coordination Act (16 U.S.C. 661-666c); Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C.

		1536); Bald Eagle Protection Act (16 U.S.C. 668-668dd)
	Migratory bird impact coordination	Migratory Bird Treaty Act (16 U.S.C. 704)
Environmental Protection Agency (EPA)	Spill Prevention Control and Countermeasures (SPCC) Plans	Oil Pollution Prevention, as amended (40 C.F.R. 112)
State of Wyoming		
Department of Environmental Quality, Water Quality Division (WDEQ/WQD)	WYPDES permits for discharging waste water and storm water runoff	WDEQ-WQD Rules and Regulations, Chapter 18; Wyoming Environmental Quality Act, Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311); Section 405 of the Federal Water Pollution Control Act (Clean Water Act) (codified at 33 U.S.C. 1345); EPA administered (40 C.F.R. 122); State Program Requirements (40 C.F.R. 123); EPA Water Program Procedures for Decision-making, as amended (40 C.F.R. 124)
	Administrative approval for discharge of hydrostatic test water	Wyoming Environmental Quality Act, Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311)
Department of Environmental Quality, Air Quality Division (WDEQ/ADQ)	Permits to construct and permits to operate	Clean Air Act, as amended (42 U.S.C. 7401 et seq.); Wyoming Environmental Quality Act, Article 2, Air Quality, as amended (W.S. 35-11-201 through 35-11-212)
Wyoming Board of Land Commissioners/Land and Farm Loan Office	Approval of oil and gas leases, ROWs for long-term or permanent off-lease/off-unit roads and pipelines, temporary use permits, and development on state lands	Public Utilities, W.S. 37-1-101 et seq.
Wyoming Oil and Gas Conservation Commission (WOGCC)	Permit to drill, deepen or plug back (APD process)	WOGCC Regulation, Chapter 3, Operational and Drilling Rules, Section 2 Location of Wells
	Permit to use earthen pit (reserve pit)	WOGCC Regulations, Chapter 4, Environmental Rules, Including Underground Injection Control Program Rules for Enhanced Recovery and Disposal Projects, Section 1, Pollution and Surface

		Damage (Forms 14A and 14B)
	Authorization for flaring or venting of gas	WOGCC Regulations, Chapter 3, Operational and Drilling Rules, Section 45 Authorization for Flaring or Venting of Gas
	Permit for Class II underground injection wells	Underground Injection Control Program: Criteria and Standards, as amended (40 C.F.R. 146); State Underground Injection Control Programs, State-administered program- Class II Wells, as amended (40 C.F.R. 147,2551)
	Well plugging and abandonment	WOGCC Regulations, Chapter 3, Section 14, Reporting (Form 4) Section 15, Plugging of Wells, Stratigraphic Toxic, Core, or Other Exploratory Holes (Form 4)
State Engineer's Office (WSEO)	Permits to appropriate ground water (use, storage, wells, dewatering)	W.S. 41-3-938, as amended (Form U.W. 5)
Wyoming Preservation Office (SHPO)	Cultural resource protection, programmatic agreements, consultation	Section 106 of National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et req.) and advisory Council Regulations on Protection of Historic and Cultural Properties, as amended (36 C.F.R. 800)
County		
Natrona County	Strive for consistency with the 1998 Natrona County Development Plan; Area H Rattlesnake Hills.	

1.7 IDENTIFIED ISSUES AND RESOURCES

BLM is directed by guidance, statute, or regulation to describe the environment of area(s) to be affected or created by alternatives under consideration. CEQ regulations direct BLM to concentrate effort on attention on important issues, especially the presence or absence of the potentially significant resources presented in Table 1.7.1. All areas presented in Table 1.7.1 were considered but many were not considered pertinent to the proposed action or affected to a degree of any importance and therefore were not carried forward for further analysis. If particular resources are not affected beyond minimal amount, or if the resource is not present, there will be no further discussion of the resources in the Affected Environment (Chapter 3), or in any of the subsequent impact analysis. The discussion of these environmental impacts is therefore restricted to topics related to resources which are affected and carried forward for analysis.

Table 1.7.1 – Potentially Significant Resources

Resource	Guidance or authority	Present in Project Area
Floodplains	EO 11998; 10 CFR 1022	Not present
Wetlands	EO 11990; 10 CFR 1022, CEQ 1508.27(b)(3)	Present
Threatened, endangered, or candidate species and/or their critical habitat , and other special status (e. g., state-listed) species	CEQ 1508.27(b)(9)	Present - greater sage-grouse, Ferruginous hawk and white-tailed prairie dog
Prime or unique farmland	7 USC 4201; CEQ 1508.27(b)(3)	Not present
State or national parks, forests, conservation areas, or other areas of recreational, ecological, scenic, or aesthetic importance	CEQ 1508.27(b)(3)	Not present
Wild and Scenic Rivers	16 USC 1271; CEQ 1508.27(b)(3)	Not present
Natural resources (e.g., vegetation, rangeland, soils, minerals, fish, wildlife, water bodies)	CEQ 1508.8	Present – vegetation, rangelands, soils, minerals, and wildlife. No fisheries present.
Coastal Zone areas	16 USC 1451 et seq.	Not present
Property of historic, archeological, or architectural significance (including sites on or eligible for the National Register of Historic Places and the National Registry of Natural Landmarks	EO 11593; CEQ 1508.27(b)(3)(8)	Not present
Native American Concerns	EO 13007	Present
Minority and low-income populations (including a description of their use and consumption of environmental resources)	EO 12898	Not present
Migratory Birds	EO 13186	Present

1.7.1 Relevant Issues and Resources

The BLM internal and public scoping processes led to the identification of the following land and resource management issues and concerns potentially associated with the Proposed Action, relevant issues carried forward in this analysis include the following:

1.7.1.1 Climate, Climate Change, & Air Quality

- Potential effects to air quality due to increased traffic, emissions, production activities and associated effects on existing county, state, and BLM roads.

- Impacts to climate change and the State of Wyoming commitment to CO_2 (Green House Gas) sequestration and enhanced recovery of oil from existing fields.

1.7.1.2 Cultural

- Provide protection of cultural and Native American resources, including protection of sites within the project area.

1.7.1.3 Wildlife including T&E, Special Status Species

- Ensuring protection of the BLM designated Special Status Species ferruginous hawks and other raptors during nesting season, sagebrush obligate song birds and white-tailed prairie dog.
- Protection of the BLM designated Special Status Species greater sage-grouse potentially affected by the project including all seasonal habitats with specific emphasis on protection of designated Core Population Areas.
- Effect of project related noise on greater sage-grouse.
- Indirect, connected, related, long-term and cumulative impacts of the project on wildlife habitats and diversity.
- Cumulative effects of the proposed project when combined with ongoing crude oil and natural gas drilling and development.

1.7.1.4 Soils

- Soil productivity and erodibility are potentially affected by project construction activities.

1.7.1.5 Vegetation including Invasive Non-Native Species, Threatened and Endangered and Special Status Species

- Ensuring protection of the BLM designated Special Status Species and their habitats.
- Project related impacts to rangeland condition and plant community diversity.
- Control of invasive, non-native species (weeds).
- Project disturbance reclamation.

1.7.1.6 Water Quality (Groundwater & Surface Water)

- Impacts on wetlands and riparian areas.
- Impact to ephemeral and intermittent drainages from erosion from disturbed sites.
- Possible effects to surface and groundwater resources from well drilling and completion, construction and operations activities.
- Exotic organisms such as Aquatic Invasive Species (AIS) will be controlled as required by the Wyoming Game and Fish Department (WGFD).

1.7.1.7 Socioeconomics

- Impacts of the project to the Federal, State, local economies.
- Providing opportunity for alternative energy sources including wind projects.

1.7.2 Resources Considered but Eliminated from Further Analysis

Using the same evaluation process discussed in Section 1.7.1, above, the following land and resource management issues and concerns were determined not to be relevant to this project and were eliminated from Further Analysis.

1.7.2.1 Floodplains - none are present

1.7.2.2 Prime or Unique Farmlands Soils - none are present

1.7.2.3 Wild and Scenic Rivers - none are present

1.7.2.4 Coastal Zone Areas - none are present

1.7.2.5 Minority and low-income Populations

1.7.2.6 State, or Natural Parks, Forests, Conservation Areas, or other Areas of Recreational, Ecological, Scenic, or Aesthetic Importance

- The proposed project is in an area designated as VRM Class IV, which is highly tolerant of manmade/industrial features.
- None of the other listed resources are present in the area.

1.7.2.7 Historical and Paleontological

- There are no known historical or architectural resources in the project area.
- There are no known paleontological resources in the project area.

1.7.2.8 Social

- Environmental justice and impacts to minority communities will not occur as a result of the project. While the Eastern Shoshone and Northern Arapaho tribes are residents of Fremont County and were consulted relative to Native American cultural resources the reservation is located over one hundred twenty miles to the west of the project area. The cities of Riverton and Casper, and their associated minority communities are over 120 and 50 miles away, respectively, and will not be directly affected by the project.

1.7.2.9 Geologic/physiologic

- No geologic hazards are known to occur in the project area.
- Locatable and leaseable minerals would not be affected by the project as BLM LFO knows of no deposits or other proposals for development of these resources. Leaseable minerals in the project area are held by Elk.

1.7.2.10 Wild Horses

- There are no BLM designated wild horse herd management areas (HMAs) in the project area.

1.7.2.11 Rangeland and Other Land Uses

- No direct impacts to grazing/livestock management infrastructure due to project related construction as design features will be implemented to eliminate any impacts.
- No impacts on grazing lessees and private land owners.
- The ability to graze livestock in the project area will not be affected by the project; the number of animals permitted as animal unit months or AUMs will not be changed as a result of the project.

1.7.2.12 Recreation

- No impacts to recreation and leisure activities resulting from the project, including no loss of accessibility of the area to hunters.
- Hunting opportunities will not change as wildlife in the area has, over the last 50 years, either habituated to the well field activities or has moved to other areas.
- There are no BLM authorized commercial outfitters in the project area.

1.7.2.13 Wildlife including Threatened and Endangered and BLM Special Status Species related issues determined not to be relevant and will not be discussed further in this EA:

- WGFD has determined that big game critical winter ranges will not be impacted by the project.
- The Wyoming State Engineers Office (2012) has determined that the North Platte River Species, as defined in the Endangered Species Act (ESA), would not be affected by the project as the area is not hydrologically connected to the North Platte River.
- There are no fisheries were identified in the project area.
- The 2005 Statewide Programmatic Biological Assessment (BA) for Black-footed Ferrets (BLM 2005) indicates three historic ferret observations are known from the Lander Field Office (FO), all from Fremont County. Only one significant prairie dog complex has been identified in the FO (BLM 2005); all other areas in Lander field office, including the Grieve Unit project area, were deemed "block cleared" (BLM 2005, WGFD 2004). Therefore, the project area is not likely to provide habitat for black-footed ferrets. In addition, the BA (BLM 2005) determined that oil and gas projects in the block cleared areas were "Not likely to adversely affect" meaning that all effects to the species and its critical habitat are beneficial, insignificant, or discountable (BLM 2005). A concurrence letter from the USFWS was received by BLM, with the direction that when an activity occurs within a FO that *could* impact black-footed ferrets, then specific additional consultation must take place (BLM 2005). The project area is not likely to adversely affect black-footed ferrets.

1.7.2.14 Vegetation including Invasive Non-Native Species, Threatened and Endangered and Special Status Species related issues determined not to be relevant and will not be discussed further in this EA:

- No Threatened or Endangered plant species or their habitats were identified as being potentially impacted by in the project actions.
    - No individuals or populations of blowout penstemon were found during field surveys, and based on the lack of suitable habitat characteristics; local habitat was

confirmed unsuitable for blowout penstemon. A data request from the Wyoming Natural Diversity Database (WYNND) indicates there have been no known occurrences of blowout penstemon within or near the proposed project area (WYNDD 2011).

- No individuals or populations of Ute ladies'-tresses were found during field surveys, and based on the lack of suitable habitat characteristics, local habitat was confirmed unsuitable for Ute ladies'-tresses. A data request from the WYNND indicates there have been no known occurrences of Ute ladies'-tresses within or near the proposed project area (WYNDD 2011).

1.8 Summary

The proposed project is consistent with all applicable Federal, State and local laws and regulations and is in conformance with applicable land Use Plans and leases. The Operator holds active Federal, State and Fee oil and gas leases in the established Grieve Unit. The Operator is responsible for the application and acquisition of appropriate permits. In addition, Elk has entered into contracts for the shipping and delivery of CO_2 from ExxonMobil and Anadarko and the delivery of power from the Western Area Power Authority (Western). This EA evaluates the effect of the proposed action on natural resources and the environment given the successful implementation of the design features discussed in Chapter 2.

CHAPTER 2 - PROPOSED ACTION AND ALTERNATIVES

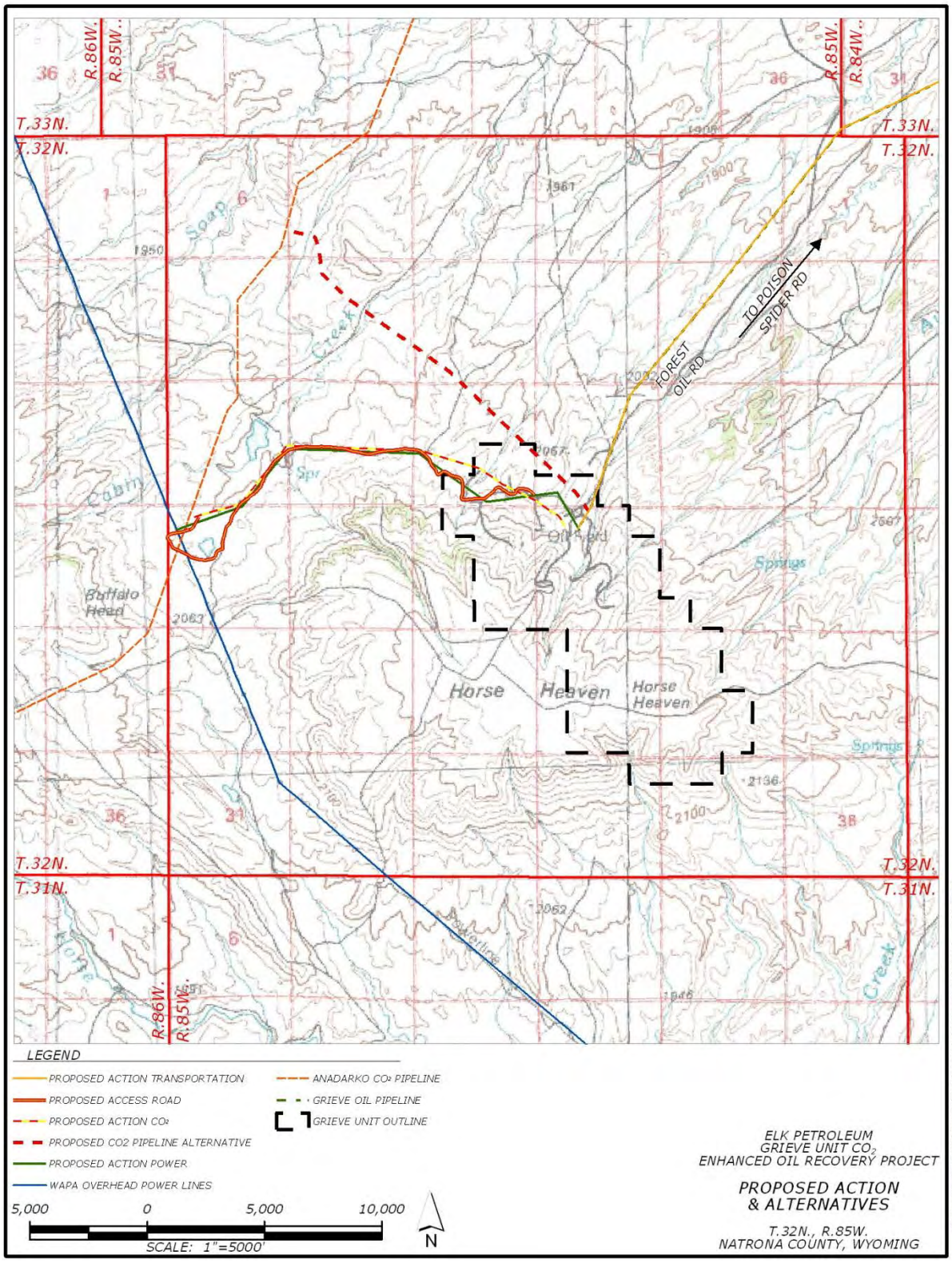
2.1 INTRODUCTION

Elk met with the Lander BLM staff in March 2011 to discuss their proposal for enhanced oil recovery at the existing Grieve Unit using CO_2 re-pressurization. Following this initial meeting and subsequent field visits, BLM LFO requested Elk evaluate various alternatives to some of the components of their proposal. Changes were made to the Elk proposal as a result of these analyses, including re-routing the CO_2 pipeline, relocation or changes to some well sites and the underground installation of the 25 kV power distribution line. As a result of these deliberations, the No Action and the Proposed Action alternatives are evaluated in detail in this EA (Figure 2.1.1).

- Section 2.2 provides the No Action Alternative, which would result in a continuation of the current production of one well in the field. In the event that the Operator submitted applications for additional work in the Unit, the BLM would evaluate each under a separate NEPA process.
- The Proposed Action is discussed in Section 2.3 and includes the drilling of ten new wells, the installation of a CO_2 pipeline, an aboveground 230 kV transmission line, an underground 25 kV power distribution line, two electrical substations, replacement and enlargement of the existing infield fluids gathering and distribution system, and the replacement of the existing central production facility. Existing wells will be reworked and/or plugged under Sundry Notice approvals. Crude oil production in response to reservoir re-pressurization with CO_2 and produced water is expected to be significant.
- Section 2.4 provides an overview of Alternatives Considered but Eliminated from Further Analysis and includes a CO_2 pipeline co-located in the existing Grieve to North Grieve crude oil pipeline right-of-way, above ground installation of the 25 kV power line, and a variety of additional considerations.

Potential impacts to sage-grouse, cultural sites and wetlands were identified relative to the Grieve/North Grieve crude oil right-of-way alternative, while disruptions in sage-grouse habitat conservation were identified as issues for the installation of the aboveground 25 kV distribution line. The Proposed Action, through the application of BLM required COAs and Stipulations and Design Features, avoids or minimizes impacts to wetlands, cultural sites, BLM Special Status Species, including sage-grouse, and maximizes the re-use and co-location of infrastructure.

Figure 2.1.1 – Grieve Unit CO_2 project proposed action and alternatives considered



2.2 ALTERNATIVE A – NO ACTION

CEQ regulations at 40 CFR 1502.14(d) require that an environmental analysis include the alternative of No Action. Under the No Action alternative, the Proposed Action will not take place. Inclusion of the No Action alternative allows the comparison of the environmental effects of taking no action with those of permitting the proposed activity or an alternative activity to go forward.

Consideration of the No Action alternative is required even if the federal agency is under legislative command to act. In the case of the Grieve Unit CO_2 EOR project, the operator possesses oil and gas leases that grant the "right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the lease (Form 3110-2). BLM can constrain further development of the leases and the Unit according to lease stipulations and can condition proposed development activities so they are pursued in ways that avoid, minimize or mitigate environmental impacts. The principal purpose of the No Action alternative is to provide a benchmark, enabling the public and the decision maker to compare the relative magnitude of the environmental effects of the action alternatives.

For analytical purposes, the Grieve Unit CO_2 EOR No Action Alternative means that the CO_2 project components of the Proposed Action will not be approved on federal surface or mineral estate; the associated well pads, roads and pipelines will not be constructed, production facilities as proposed will not be installed, and the associated production and CO_2 injection activity will not take place. Elk could continue producing the Unit in its current form; it is comprised of 24 existing inactive wells, 2 active wells and a simple tank battery; a No Action Alternative decision would forgo the opportunity to recover an additional 12 million barrels BBL of crude oil from the field. Elk could apply for permits through the BLM Sundry Notice process for updates to existing wells and infrastructure. Crude oil is currently being transported via Poison Spider Road to Casper via haul truck. The Grieve Unit is currently marginally productive due to a loss of reservoir energy. BLM could request Elk to plug uneconomic wells.

A finding of No Action does not preclude development of the federal mineral estate in the future. BLM will evaluate any future proposal on its own merits. Proposals for exploration or development, including rights-of-way for access across federal lands, will be subject to site-specific analysis prior to approval or authorization. Future proposals to develop the hydrocarbon resource and exercise existing lease rights on Federal mineral estate will be received and processed by the BLM on a case-by-case basis.

2.3 ALTERNATIVE B – PROPOSED ACTION

Overview and Summary

The Environmental Assessment for the project considers all modifications, surface disturbances, and disruptions, within and outside the Unit, associated with the Proposed Action. Upgrades to operating facilities within the Grieve Unit will be permitted through the BLM Sundry Notice approval process. The Cumulative Effects Analysis (Chapter 4.2) will include not only the Proposed Action and all modifications, surface disturbances, and disruptions associated with the Proposed Action but also the existing facilities and anticipated operation of the CO_2 project.

In order to implement the proposed Grieve Unit CO_2 ($GUCO_2$) enhanced oil recovery (EOR) project Elk will make the following modifications to the existing Grieve Unit infrastructure including new electrical service and a CO_2 pipeline into the field from the west.

a) **CO_2 pipeline and delivery point:** Elk has entered into a CO_2 purchase agreement with ExxonMobil, and a tie-in agreement with Anadarko, for delivery of CO_2 to the field. The Anadarko CO_2 line is located approximately 3.62 miles to the west of the Grieve Unit. Elk will build a new eight inch CO_2 pipeline connecting the Anadarko line to the Grieve Unit. A 1 acre CO_2 meter station will be installed on a 5 acres site at the connection point of the Grieve and Anadarko CO_2 lines.

b) **New and existing wells** will be drilled, recompleted or plugged and abandoned to achieve the most efficient reservoir re-pressurization and production pattern.

c) **Existing access roads, well sites, gathering lines and electricity** will be used to the maximum extent possible.

d) **In-field liquids gathering and distribution systems** will consist of three sets of flow lines in a corridor branching off to the respective wells. These trunk lines will roughly follow the route of the existing natural gas/crude oil gathering pipeline system and branch off to the individual wells via the most direct cross country route or parallel to the well site access roads, depending on topography and the location of existing flow lines in the Unit.

e) **One centralized production, separation and CO_2 re-pressurization facility** is anticipated. This will be constructed at the site of the existing Grieve Unit central facility in an effort to minimize surface disturbance.

f) **Electricity:** It is estimated at 15,000 to 20,000 horse power will be needed for the proposed CO_2 project, to accomplish this:

1. Tri-State will construct a new 3.75 mile overhead 230 kV power line from the existing Western system to the Grieve Unit central facility.

2. Two electrical sub-stations/switchyards will be necessary for the proposed overhead power line; a switchyard will be located at the interconnect point with the Western system and a substation in the Grieve Unit.

3. Electrical service will be needed at the CO_2 pipeline tie-in point meter station; this will be drawn from the in-field power infrastructure and installed underground, generally following the CO_2 pipeline access ROW, from the existing Grieve #17 well back to the meter station, approximately 2.6 miles of line.

4. The well-field infrastructure will continue to be electrified using the existing power service; any new in-field power will be installed underground, to the extent feasible. The nature of those upgrades is unknown and will be analyzed if and when the need arises.

g) **Crude oil will be transported to market** via the existing 8 inch crude oil line from the Grieve Unit to a pipeline terminal located in Mountain View/Casper.

h) **Reclamation of disturbed areas** will be expedited, following the site specific reclamation plan developed for the project (Appendix B).

2.3.1 Construction

Following is a general discussion of proposed construction techniques to be used by Elk during project implementation. These construction techniques will be generally applicable to all drill sites, pipelines, and access roads within the project area, but may vary in detail between the individual well sites. Estimates of anticipated surface disturbance were generated from the development that has occurred in the Grieve Unit to date and design specification for the various infrastructure components. The disturbance anticipated from the development of the proposed project is shown in Table 2.3.1. Total short-term project disturbance is estimated at 171.0 acres. After successful interim reclamation, long-term disturbance is estimated at 35 acres.

Table 2.3.1 - Anticipated surface disturbance from Grieve Unit CO_2 EOR proposed action

Category	Proposed Action Components	Proposed Action Disturbance Assumptions	New Short Term (ST) (acres)	New Life of Project (LOP) (acres)
Multi-well pads	4	New wells average initial disturbance average 3.3 acres; reduced to 1.5 acres *	13.2	6.0
Single well pads	2	New wells initial disturbance average 3.0 acres; reduced to 1.04 acres **	6.0	2.08
Monitoring well	-0-	Re-enter existing well	-0-	-0-
Well site access roads	0.5 mi	Initial construction 24 ft wide Reduced to 16 ft driving surface	1.45	0.96
Centralized facility and Horse Heaven Substation	-0-	Remove unnecessary and antiquated equipment; replace with new and reclaim unused areas.	-0-	-0-
Un-used wells	-0-	Plug and abandon; reclaim sites; assume 1.04 acres each	2.08	-0-
In-field gathering/ injection pipelines (single lines)	3.7 mi	Follow the alignment of the existing infield gathering lines and access roads to the extent possible; construction ROW 40 ft wide	18.08	-0-
In-field gathering/ distribution pipelines (multiple lines)	4.5 mi	Follow the alignment of the existing infield gas line and access roads to the extent possible; construction ROW 100 ft wide	54.75	-0-
Western Buffalo Head substation	10.0 acres	Locate Western breakers and step-down sub-station	10.0	10.0
Western existing 230 kV transmission line ROW fiber optics	11.2 mi.	String overhead along existing 230kV line, replacing existing ground wire; existing Western ROW	-0-	-0-

Table 2.3.1 - Anticipated surface disturbance from Grieve Unit CO_2 EOR proposed action

Category	Proposed Action Components	Proposed Action Disturbance Assumptions	New Short Term (ST) (acres)	New Life of Project (LOP) (acres)
Tri-State 230 kV transmission line ROW* **	3.75 mi	3.75 mi; 21 to 24 H-brace pole and 6 to 8 three pole structures (average disturbance 0.15 acre per structure)	3.6	0.02
Tri-State 230 kV transmission line ROW, structure access roads	0.33 mi	16 ft wide unimproved 2-track structure access roads	0.63	0.63
25 kV underground distribution line	2.6 mi.	2.6 miles; located on the south edge of the CO_2 pipeline construction ROW disturbance. Trenching of 355 ft. of wetlands (10 ft blade width)	0.05	-0-
CO_2 tie-in meter station	5.0 acres	Fenced yard with building containing metering equipment and outside pipeline connections	5.0	2.5
CO_2 connector line ROW	3.62 mi.	75 ft initial construction disturbance width	32.90	-0-
Power line / CO_2 line access road	3.5 mi.	24 ft wide construction, 16 ft. LOP	10.11	6.75
Total acres of new disturbance			**171.05 ST**	**34.94 LOP**

assume no new disturbance on existing well sites
* Initial new well disturbance average 3.3 acres reduced to 1.5 acres for operations
** Initial new well disturbance average 3.0 acres reduced to 1.04 acres for operations
*** Will use in-filed common staging area during construction

a) Well Pad Construction

Multi-well pads will be prepared by clearing an area approximately 325 feet by 200 feet; an average pad disturbance is estimated at 3.3 acres, including cut-and-fill, per pad. Single well pads will measure 325 X 175 feet, resulting in approximately 3.0 acres per site. Well locations will be cleared of vegetation and topsoil as appropriate and determined in the Reclamation Plan (Appendix C). Recovered topsoil will be stockpiled for future use in reclamation. The well locations will be leveled using standard cut-and-fill construction techniques as provided in the BLM "Gold Book" (DOI/USDA 2006). Once drilling operations have been completed and production ensues, well pads will be partially reclaimed, resulting in life-of-project disturbance of 1.5 acres per multi-well pad and 1.04 acres for single well pads. See Appendix D (APD with Master Surface Use Plan of Operations) for a typical multi-well site layout. In the unlikely event that a newly drilled well is not productive the entire site will be reclaimed as directed in the Reclamation Plan (Appendix B). New well pad locations are indicated on Figure 2.3.1.

Components of the well pad include a lined, earthen reserve pit with a liner having a permeability less than 10^{-7} cm/sec., generally described as 12–mil reinforced poly, to contain drilling fluids, cuttings, and water produced during drilling and completion operations. Venting of any gas produced will be over an unlined emergency pit. These emergency pits are unlined as they serve as backdrop to any flaring necessary for safety during the operations. Gas venting is

not anticipated. All pits will be constructed in accordance with BLM IM-2012-007 (BLM 2011a; Appendix D) requirements. The reserve pits on the multi-well pads will measure approximately 120 feet long by 80 feet wide and 12 feet deep while the single well pad reserve pits will be approximately 75 X 50 feet. One side of the pits will be ramped with a 2:1 slope. The reserve pit will be fenced on three non-working sides during drilling; the fourth side will be fenced at the time the rig is removed (Appendix C).

b) Road Construction

Elk proposes to use existing crowned and ditched roads to and within the project area to the extent possible; new roads will be constructed only as needed. Construction of new well access roads in the GUCO$_2$PA is estimated to be less than 0.5 miles and 3.5 miles of improved access road to the CO_2 pipeline tie-in point/power line substation.

The proposed project map (Figure 2.3.1) indicates existing and proposed road locations. Due to the size and weight of vehicles expected to regularly travel roads in the project area, all roads will be crowned and ditched, with a 14 to 16 foot driving surface, turn-outs and a 24-foot initial disturbance width. Culverts, low water crossings, and cattle guards will be installed where necessary and approved in well specific APDs and ROWs; gravel surfacing will be installed where needed. All disturbances related to access roads will be reseeded with the exception of the driving surface. Details of the proposed road construction can be found in Appendix C.

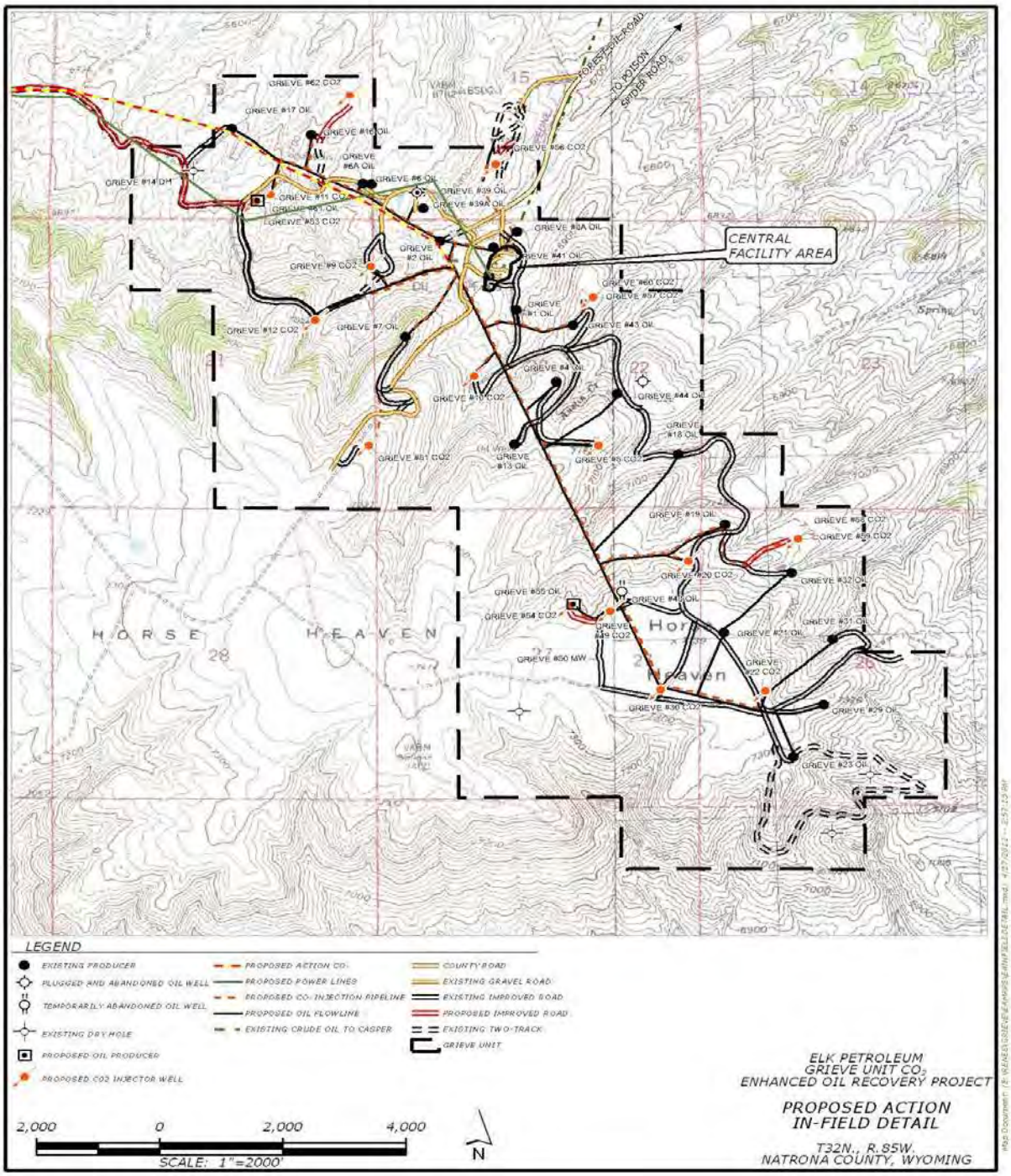
Proposed roads will be established as follows:

- Use of existing Collector Roads (multi-purpose, upgraded roads),
- Use of existing Resource Roads to access well roads,
- Development of new Well Roads,
- Development of Special Purpose Roads to access the CO_2 pipeline meter station, power structures and substation.

An estimate of workforce and traffic for the Proposed Action is found in Table 2.3.3. Vehicle traffic required for the implementation/construction of the Proposed Action will include:

- Equipment needed for road and well site construction activities,
- Drilling rigs, work-over rigs and associated equipment,
- Water trucks for drilling, and various construction activities,
- Well completion service company activity,
- Pipeline and in-field gathering and injection system construction,
- 230 kV overhead power line and sub-stations equipment delivery and installation,
- 25 kV underground power line installation,
- Central facility equipment delivery and construction,
- Well site, road and pipeline reclamation operations, and
- Light truck traffic associated with daily field operations and maintenance.

Figure 2.3.1 – In-field development detail of the proposed Grieve Unit CO_2 project



The locations of the proposed roads have been placed to maximize transportation efficiency and reduce redundancy. Roads will be closed and reclaimed by the Operator when they are no longer required for operations, unless otherwise directed by the BLM or the private landowners.

Project related roads will be maintained by the operator. The Operator and Natrona County will work cooperatively to maintain the county roads.

Roads and pipelines on BLM-administered public lands constructed in association with the Proposed Action will require BLM right-of-way authorizations and/or Sundry Notices, which could include additional mitigation to further minimize environmental impacts.

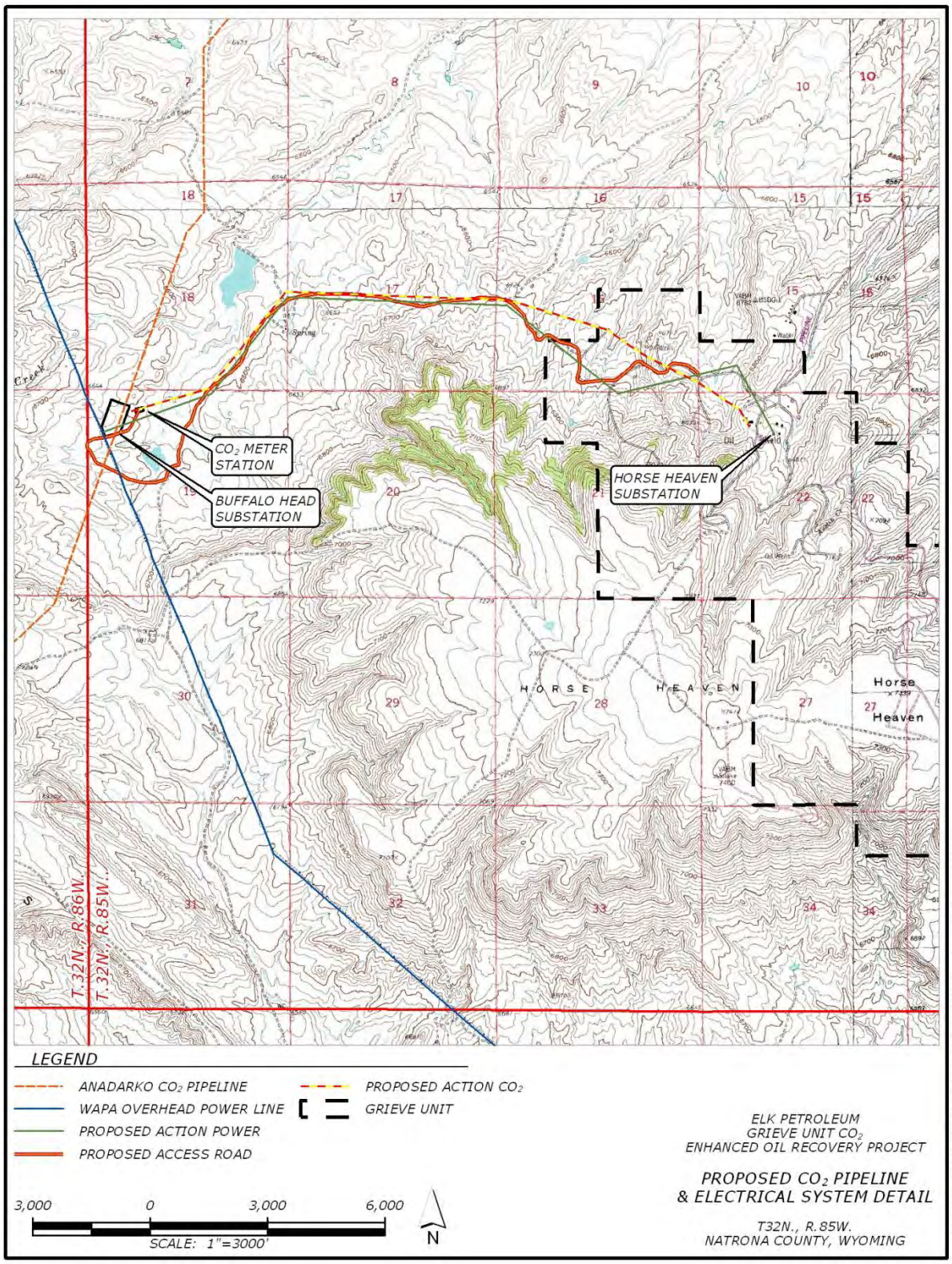
c) Pipeline Construction

The in-field pipeline system will be installed to all existing and proposed production and injection wells. The main trunk lines will be constructed within a 100-foot-wide construction corridor, generally following the existing disturbance corridor for the out-of-service natural gas/gathering system; each well will be connected using the corridor previously used, cross country or parallel to the well site access road, whichever is most direct.

CO_2 pipeline construction will follow the appropriate Department of Transportation/Office of Pipeline Safety (DOT/OPS) construction standards as detailed in the CO_2 Pipeline ROW SF-299 application (Figure 2.3.2). Pipeline construction will involve a standard sequence of operations: pipe stringing, trench excavation, pipe bedding, pipe lowering, pipe padding, and trench backfilling. All materials, equipment, and techniques, including quality assurance/control checks, will be to industry standard and DOT/OPS regulations. The construction disturbance width, including topsoil stripping, will be 100 feet with the exception of wetland areas where underground boring installation will be used and on areas of steep topography that require wider side slope lay-backs. The pipeline trench will be excavated mechanically with a track excavator to a depth that allows at least 3.5 feet of material to be placed on top of the pipeline. Trench width will be approximately 36 inches. Soil will be backfilled promptly into the trench following installation. Site re-grading will occur where necessary. Reclamation of the pipeline construction right-of-way will be initiated per BLM requirements; storm water/erosion control mitigations will be applied and maintained until the pipeline vegetation is re-established. The commitment to bore under designated wetlands precludes the need for US Army Corps of Engineers (USACE) wetland permits.

Approximately 1,575 BBL of water will be needed for pipeline integrity/hydro testing purposes. The source of this water will be Muddy produced water which will be recycled back into the produced water system and reused for reservoir re-pressurization.

Figure 2.3.2 – Proposed CO_2 pipeline and electrical system alignment



A CO_2 meter station will be needed at the tie-in of the Grieve CO_2 line to the existing Anadarko line. This station will be a 5 acre tract at the west end of the Grieve CO_2 line (Figure 2.3.2). The 1 acre fenced meter station comprises a steel building to house electronic metering

equipment, lighting, heaters, remote monitoring devices and piping manifolds. Additional above ground piping will be inside the fenced area. Redundant energy sources will be available at the meter station in the event of an electrical power failure. The exact configuration of this redundant power source is not currently known, but will likely be a combination of solar and propane generated electricity and heat.

d) Power Line Construction

It is estimated at 15,000 to 20,000 horse power will be needed for the proposed CO_2 project. Elk and the area power suppliers (High Plains Power and Tri-State) asked Western to conduct a feasibility study for obtaining power, from the existing Western transmission lines, for the Grieve Unit. Western has determined that power is available in their system for the Grieve CO_2 project. The existing Western 230 kV power line is located approximately 3.75 miles to the west of the Unit (Figure 2.3.2).

Tri-State will construct a new 3.75 mile overhead 230 kV power distribution line from the Western system to the Grieve Unit central facility. Elk will ask BLM to approve a SF-299 application and POD for construction of this new line. Power line construction along a new ROW will require an approved BLM SF-299 ROW application and POD; the detail on the construction of the distribution line can be found in the permit application and SF-299 (Figure 2.3.2).

Two electrical sub-stations/switchyards will be necessary for the proposed overhead power line; one will be located at the interconnect point with the Western system and another in the Unit (Figure 2.3.2).

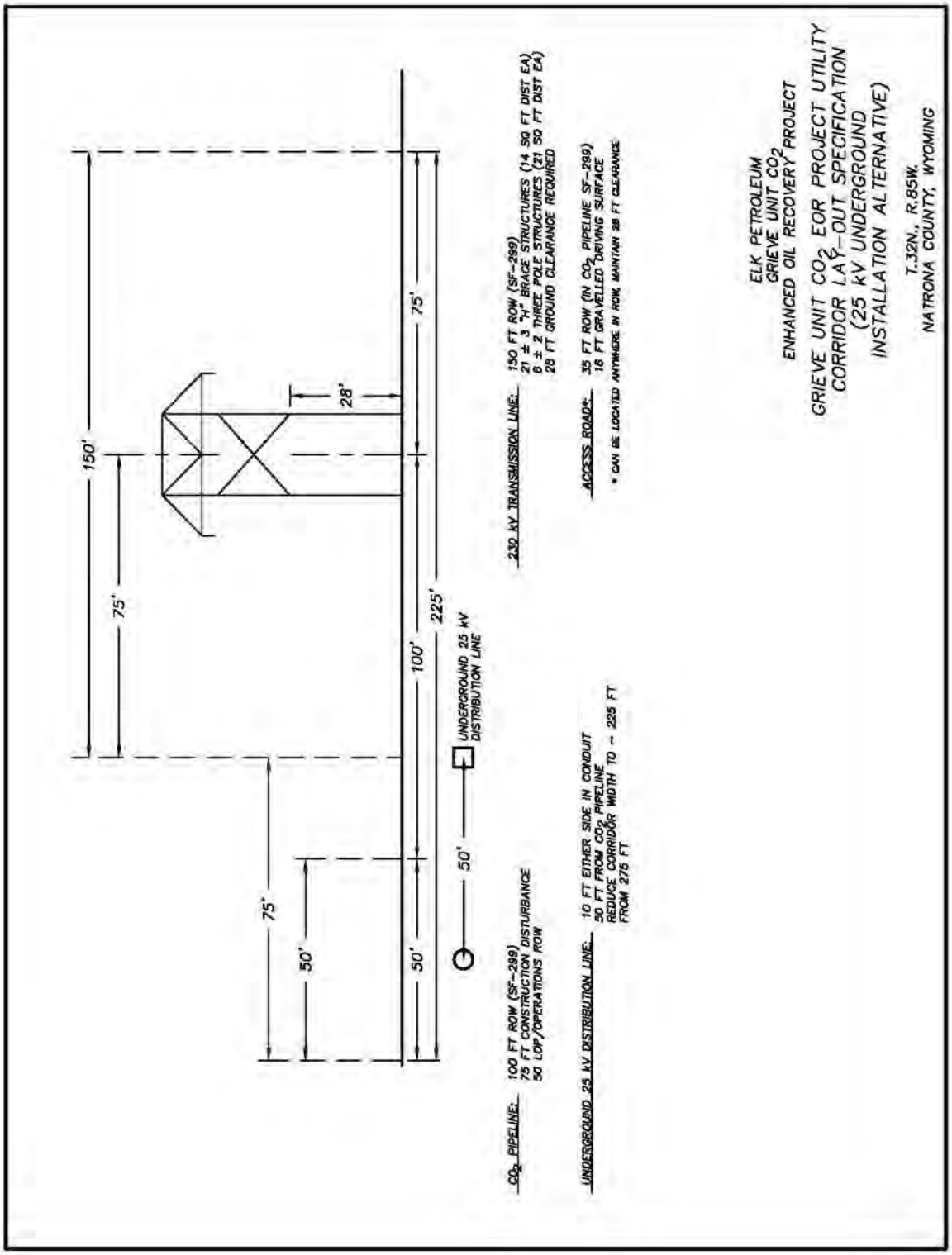
1) **Western will provide a right-of-way application to the BLM for approval of their new Buffalo Head switchyard**, this facility will be located on a 10 acre tract at the west end of the Tri-State 230-kV power line (NW Section 19) and to the east of the existing Western lines. This secure and fenced yard will house three-ring 230-kV 1200 Amp power circuit breakers and associated breaker pads, bus pole supports, and modular control building. For communications, Western will install approximately 11.2 miles of new overhead fiber optic ground wire from its Spence Substation to the proposed Buffalo Head Switchyard by replacing the existing over-head ground wire on the line. Splice boxes or "pulling sites" would be located at the substations. Additional "pulling sites" may be required depending on the cable reel or spool length and "pulling sites" would be located within the existing ROW easement for the Badwater to Spence transmission line.
2) **The Horse Heaven sub-station** will be located on private land at the existing Grieve Unit central facility (center N ½ Section 22) and house the necessary transformer equipment for the in-field service.

Electricity for the CO_2 pipeline tie-in point meter station will be drawn from the in-field power infrastructure and installed underground, along the south side of the CO_2 pipeline construction ROW, from the Grieve #17 well site back to the meter station. The SF-299 ROW application and POD for this power line will be provided by Elk to BLM for approval prior to construction. The underground line will be installed along the southern edge of the CO_2 pipeline ROW construction disturbance, resulting in no additional removal of vegetation or soils except for five wetland crossing areas.

The in-field production equipment will continue to be electrified using the existing power service. Existing pole structures will be used to the extent possible, new in-field power will be installed underground, to the extent feasible. Upgrades to the existing in-field electrical distribution system may be necessary as production increases. The nature of those upgrades is unknown and will be analyzed if, and when, the need arises.

It is anticipated that the co-located utility corridor configuration will be as depicted in Figure 2.3.3.

Figure 2.3.3 – Co-located utility corridor schematic



2.3.2 New and Existing Wells (Drilling, Work Over and Completion)

Three types of wells are needed for implementation of the Grieve Unit miscible CO_2 flood (with water injection to assist with reservoir re-pressurization), including water supply wells, CO_2/water injectors and oil producers. Existing wells will be worked over or recompleted under the Sundry Notice process while new wells will require approved Applications for Permit to Drill (APD). Sundries and APDs on federal surface or mineral estate must be approved by both the BLM and the Wyoming Oil and Gas Conservation Commission (WOGCC), all other wells must be approved only by the WOGCC. It is anticipated that eighteen (18) CO_2/water injection wells will be needed for efficient implementation of CO_2 EOR.

a) Drilling

Elk proposes ten new wells (Table 2.3.2) on six pads to augment the existing wells; eight of these wells, located on four pads, will require approved BLM and WOGCC APDs. The other two wells are located on State and fee lands and minerals requiring only WOGCC approval. An example BLM APD and MSUPO is provided as Appendix C. Eight of these will be new wells will be completed as injection wells into the Muddy formation and could serve several functions, including:

1) Water injection to assist with reservoir re-pressurization for oil recovery,
2) CO_2 injection to assist with reservoir re-pressurization,
3) Produced water management, and
4) Pressure maintenance of the crude oil reservoir.

Two of the anticipated injection wells may be used as water supply wells during the re-pressurization phase of the project and recompleted as Muddy injection wells following reservoir "fill-up." Two new crude oil wells will be used for production of the field. Some of the anticipated producing wells may be utilized as water injectors for reservoir re-pressurization for a period of time. These wells have been or will be approved through the State of Wyoming/USEPA UIC program, as necessary.

Table 2.3.2 – Grieve Unit proposed well locations (all are located in T32N-R85W, Natrona County)

Well Name	Surface Location	Bottom Hole Location	Well Type
Grieve Unit #53*	SWSE Sec. 16	NWNE Sec. 21	CO_2/H_2O Injection
Grieve Unit #54*	SWNE Sec. 27	NENW Sec. 27	CO_2/H_2O Injection
Grieve Unit #55*	SWNE Sec. 27	NENE Sec. 27	Oil Production
Grieve Unit #56	SESW Sec. 15	Fee surface and minerals	CO_2/H_2O Injection
Grieve Unit #57*	SWNE Sec. 22	SENE Sec. 22	CO_2/H_2O Injection
Grieve Unit #58*	NENW Sec. 26	SWSW Sec. 23	CO_2/H_2O Injection
Grieve Unit #59 *	NENW Sec. 26	SENW Sec. 26	CO_2/H_2O Injection
Grieve Unit #60*	NWNE Sec. 22	NWNE Sec. 22	CO_2/H_2O Injection
Grieve Unit #61*	SWSE Sec. 16	NWNE Sec. 21	Oil Production
Grieve Unit #62	NESE Sec. 16	State surface and	CO_2/H_2O Injection

Table 2.3.2 – Grieve Unit proposed well locations (all are located in T32N-R85W, Natrona County)

Well Name	Surface Location	Bottom Hole Location	Well Type
		minerals	

* shared surface locations

Four two-well pads will measure roughly 325 X 200 ft., and two single well pads will be roughly 325 X 175 feet.

Drilling commences following construction of the access road and well pad when a drilling rig is transported to the well site and erected on the prepared well pad, refer to Section 2.3.1(a). Additional equipment and materials needed for drilling operations will also be trucked to the well site.

Drilling will begin by digging a rectangular pit, called a cellar, where the hole will be drilled. The cellar provides space for the casing head spools and blowout preventers that will be installed under the rig. The rat- and mouse- holes are also drilled under the rig. Drilling operations normally include (1) keeping a sharp bit on the bottom of the drill pipe in order to drill as efficiently as possible, (2) adding a new joint of pipe as the hole deepens, (3) tripping the drill string out of the hole to put on a new bit and running it back to the bottom as needed to achieve the desired depth, and (4) casing installation and cementing in the hole.

The wells are expected to be approximately 6,500 feet in depth. The average time from spud to completion is approximately 30 days, with drilling occurring for 15 to 20 of those days. The time required for completion activities depends on testing, geology, availability of equipment and the economics of the well in question. Individual well site drilling and completion operations could be delayed due to BLM site specific timing stipulation compliance. Well control systems will be designed to meet the conditions likely to be encountered in the boreholes and will be in conformance with BLM and State of Wyoming requirements. Drilling and completion operations will be permitted through the State of Wyoming Department of Environmental Quality (DEQ), Air Quality Division (AQD). No abnormal temperatures or pressures are anticipated. No hydrogen sulfide gas (H_2S) has been encountered in or known to exist from previous wells drilled to similar depths in the general project area. Appendix C contains greater detail on anticipated drilling procedures.

Water needed for drilling operations will be produced water from the Muddy formation. Water for cementing purposes will either be hauled from fresh water sources in Casper or taken from the existing water well and reservoir owned and operated by Elk and located within the Grieve Unit. The existing water well is the Grieve Unit #6 located in the NE Section 15-T32N-R85W, State of Wyoming Permit Number PI3567P. Elk has no plans to drill additional water wells for the proposed Grieve CO_2 EOR project.

Water will be hauled via tank truck over existing roads from the point of diversion to the proposed drilling locations. No additional construction will be required on/along the proposed

water haul routes and no off-lease federal lands will be crossed on/along the proposed water haul routes.

Approximately 7,500 barrels (Bbl) of water will be needed for drilling each well with another 5,000 Bbl needed, for construction, dust control and completion, over the life of the well. The actual water volume used in drilling operations will be dependent upon the depth of the well and any losses that might occur during drilling.

Drilling mud will consist of fresh water, native clays, and bentonite gel. During drilling and completion operations, certain wastewaters will be generated, including mud return fluids, in addition to any produced formation water. Following completion of the well, all drilling and formation fluids will be circulated back to the reserve pit.

During drilling operations a reserve pit is fenced on three sides; once the rig is moved off location the pit is fenced on all four sides to prohibit wildlife or livestock from entering the pit. If feasible, reserve pit fluids may be recycled to other drilling locations to reduce the volumes of water needed. After the reserve pit is completely dry, the pit is backfilled or, as an alternative, pit contents could be hauled to DEQ approved disposal facilities. The operator will comply with BLM IM No. WY-2012-007, Management of Oil and Gas Exploration and Production Pits (BLM 2011a).

Well sites will be reclaimed and pits closed as required by Operating Order Number 1 (BLM 2007) and IM No.WY-2012-007 (BLM 2011a), "Earthwork for interim and final reclamation must be completed within 6 months of well completion or well plugging (weather permitting). All pads, pits, and roads must be reclaimed to a satisfactorily revegetated, safe, and stable condition, unless an agreement is made with the landowner or Surface Managing Agency to keep the road or pad in place. Pits containing fluid must not be breached (cut) and pit fluids must be removed or solidified before backfilling. Pits may be allowed to air dry subject to BLM or FS approval, but the use of chemicals to aid in fluid evaporation, stabilization, or solidification must have prior BLM or FS approval. Seeding or other activities to reestablish vegetation must be completed within the time period approved by the BLM or the FS (BLM 2007)."

Hazardous materials, as defined by Occupational Health and Safety Act (OSHA), may be used in the drilling and completion of the Grieve Unit CO_2 Project. Routine drilling, completion and production operation wastes are exempt from the hazardous waste regulations found in Resource Conservation and Recovery Act (RCRA) (40 CFR 261.4). It is not anticipated that materials or chemicals considered hazardous under Superfund Amendment and Reauthorization Act of 1986 (or CERCLA) as amended, the RCRA or extremely hazardous wastes as defined in 40 C.F.R. 355 will be used in the Proposed Action. If a hazardous waste were to be generated as the result of an unusual operation it will be segregated for appropriate disposal. A complete accounting of all hazardous materials that may be utilized during project development and production operations are identified in the Operators OSHA required Worker-Right-to-Know or Hazard Communication Plan.

b) Existing Well Workovers

Existing wells will be worked over or recompleted following approval under the BLM and WOGCC Sundry Notice processes.

It is anticipated that eighteen (18) CO_2/water injection wells are needed for efficient implementation of CO_2 EOR project; ten of these will be existing Grieve Unit wells. These wells will be re-completed to serve specific functions, including:

1) Water injection to assist with reservoir re-pressurization,
2) CO_2 injection for oil recovery,
3) Produced water management, and
4) Pressure maintenance of the crude oil reservoir.

Eight (8) existing wells will continue to be used for production of the field. An additional eleven (11) existing wells may be utilized as needed, likely as crude oil producers, based on reservoir analysis and optimization. Some of the producing wells may be utilized as water injectors for re-pressurization for a period of time. These wells will be approved through the State of Wyoming/EPA UIC program as necessary.

As mentioned in Section 2.3.2 a), it is anticipated that two or more new or existing wells would be completed or re-completed into the Cloverly, Tensleep or Madison to provide the volumes of water needed for initial reservoir re-pressurization. Once reservoir "fill-up" had occurred these wells would be re-completed into the Muddy for use as either injection or production wells.

c) Well Completion

Well completion operations isolate aquifers and hydrocarbon-containing formations with surface and production casing and cement to prevent CO_2, oil and/or water movement from formation to formation and isolate the production zones. Completion operations also stimulate well bores through fracturing, perforating, acidizing or other activities appropriate to the reservoir characteristics. All well casing and cementing operations on these wells will be conducted in compliance with applicable rules and guidance and with BLM Operating Order No. 2 (BLM 1988) and the WOGCC rules. The intended purpose of the well (i.e. CO_2 injector, water injector, crude oil producer) will dictate the downhole completion process conducted. As the field progresses through time, and as dictated by reservoir response to re-pressurization, wells may be re-completed to accommodate a change in use, these operations will be permitted through the BLM and/or WOGCC Sundry Notice process, as appropriate. Individual well site completion operations could be delayed due to BLM site specific timing stipulation compliance.

In past Grieve Unit operations, hydraulic fracturing or "fracking" has not been used due to the high quality of the reservoir rock. It is not anticipated that hydraulic fracturing of the reservoir rock will be used in future operations of the Grieve CO_2 project. In the event that fracturing is necessary the operator will comply with BLM and WOGCC hydraulic fracturing rules.

During completion and testing, any gas flow will be vented or flared over the un-lined emergency pit. Venting or flaring at oil and gas facilities is regulated by three agencies, the WDEQ/AQD, the WOGCC and the BLM. Each agency regulates these activities with a slightly different objective. The WDEQ is concerned about the emission of regulated pollutants while the WOGCC and BLM are concerned about the loss or waste of the natural gas resource and the

loss of royalty income. All three agencies are concerned about safety of the public with regard to the venting of H_2S gas. No H_2S has been encountered in the Grieve Unit CO_2 project area; in addition, large volumes of natural gas are not expected.

2.3.3 CO_2 and Water Injection/Re-Pressurization

Elk requested, through the WOGCC, an aquifer exemption for the Cretaceous Muddy "Grieve Sand" throughout the Grieve Unit (GGA 2011). WOGCC and the EPA have approved (WOGCC 2012) this request. As provided in Section 2.3.2, Elk will inject into 10 existing wells and eight new wells, at various locations in the field, into the Muddy as part of the miscible CO_2 flood with water injection to assist with reservoir re-pressurization.

It is assumed that CO_2 and water injection will occur over an 18 to 24 month period prior to reservoir pressure being adequate to produce crude oil. While CO_2 injection will not require additional compression and will be accomplished using pipeline delivery pressure, some additional horsepower (500 to 1000 hp) will be required for water injection. At this time, it is anticipated that adequate electrical power is available in the field for this operation, if this power is not available temporary electrical generators may be used and located at the central facility, if these are needed they will be permitted through the WDEQ/AQD.

It is estimated that 860 BCF (billion cubic feet) of CO_2 will be injected over the 25 year life of the project; of this 220 BCF would be purchased, the remaining 640 BCF would be recycled CO_2.

Water for reservoir re-pressurization will be obtained from new or existing wells in the field which will be completed or re-completed in one of the water bearing formations, the Cloverly, Tensleep or the Madison. Approximately fifty-two million barrels of water will be needed over the 25 year life of the project; of this, approximately 22 million Bbl would be taken from the water supply wells, mentioned above, for initial re-pressurization. The remaining 30 million BBL would be seventy-five percent recycled Muddy produced water with 25 percent make-up water from one of the water supply wells in the field. All water supply wells will be permitted and approved through the WOGCC, BLM and WSEO, as appropriate.

The intended purpose of a well (i.e. CO_2 injector, water injector, crude oil producer) may change as the field re-pressurization and oil recovery progresses through time. Changes in well use will be dictated by reservoir response to re-pressurization; wells may be re-completed to accommodate a change in use, these operations will be permitted through the BLM and/or WOGCC Sundry Notice process, as appropriate. Injection wells will be approved through the State of Wyoming UIC program, as necessary.

2.3.4 Production

Artificial lift systems (ALS), including beam pumping units, have been used at production wells in the Grieve Unit in the past, to facilitate removal of formation water and crude oil. It is anticipated that under CO_2 EOR conditions these wells will flow naturally; in the alternative, ALS will be installed, and removed, as needed, to facilitate production in the field.

Installed well site production facilities will include, as applicable and appropriate, the wellhead and ALS, or injection manifold and a free-standing solar or electricity powered computerized monitoring, control, and telemetry panel. Together these units will occupy less than 1 acre at each well head.

The produced fluids stream will be transported to the central facility via the in-field distribution/gathering system. This production stream will require separation of oil, water and CO_2 in a three-phase separator at the central facility. Following separation, CO_2 is recycled and pressurized for re-injection into the reservoir via the in-field distribution system; crude oil is stored in on-site tankage until sufficient volumes have been collected for shipping down the sales pipeline; produced water is also held in tankage until re-injected into the reservoir for pressure maintenance or disposal. Separation equipment and tankage will be situated at the central facility within containment dikes and in compliance with an EPA required Spill Protection Countermeasure and Control (SPCC) Plan.

Disposal of produced water, if not injected for reservoir pressure maintenance, will be in accordance with a plan approved by the BLM as provided for in Operating Order No. 7, Disposal of Ground Water (BLM 1993). Produced water disposal operations are also regulated by WDEQ and/or the WOGCC, as appropriate. All injection wells will be permitted through the WOGCC and BLM approval processes and through the State of Wyoming UIC program, as necessary.

2.3.5 Operations and Maintenance

After CO_2/water injection has been initiated, routine field operations will occur on a year-round basis, weather and site conditions permitting. Maintenance of the various mechanical components of CO_2 EOR project will occur at intervals recommended by manufacturers, or as needed, based on telemetry and on-site visits. The CO_2 pipeline meter station will be monitored remotely from the central facility and visited on a regular basis as will the Western Buffalo Head substation.

A well-facility operator will visit each well pad daily to ensure that equipment is functioning properly. All operations will be conducted in accordance with industry standards for safe and efficient operation. All project roads and wells will be inspected periodically by the Operator, the BLM and WOGCC. The Operator will be responsible for maintaining access roads to minimize any resource damage or loss and ensure safe operating conditions. Field road maintenance operations typically include blading and/or gravel additions. Winter maintenance includes blading to remove snow from the access roads and the well pads. Field office and equipment yards are proposed at the central facility.

2.3.6 Workforce and Traffic

The expected traffic levels associated with the Proposed Action are addressed in Table 2.3.3, which provides a conceptual representation of types and maximum frequencies of typical traffic that could be expected during the various construction, drilling and production phases. The ‘Trip Type’ column lists the various service and supply vehicles associated with this type of activity and tends to demonstrate a maximum activity level. The ‘Round-Trip Frequency’ column includes the number of trips, both external (i.e., to/from each project area) and internal (within each project area).

Table 2.3.3 – Grieve Unit CO_2 EOR project traffic and workforce estimates.

Trip Type	Round-Trip Frequency	Manpower
Construction (roads and well sites)*(estimate 4 days per well site)*		
Two ton truck	2/day	
Pick-up trucks	3/day	
Seed Driller and tractor	1/day	
Rubber tired backhoe	1/day	
Track hoe	1/day	
Dozer	2/day	
Road grader	2/day	
Water wagon/water truck	2/day	
Scraper	2/day	
Belly dump tractor and trailer	3/day	
Drilling *(15-20 days per well; 1 well at a time)*		
Rig move	10 trucks/well	
Rig supervisor	1/day	
Rig crews	2 vehicles/day	
Engineers	2/week	
Mechanics	1/week	
Supply delivery	2/week	
Water truck	1/week	
Mud trucks	1/week	
Drill bit/tool delivery	2/week	
Pipe/tubulars	1/wk	
Fuel	1/wk	
Completion *(10 days per well completion)*		
Small truck mounted rig/crew	1/day	
Cement crew	3 trucks/2 trips	
Consultant	1/day	
Well loggers/Perforators	1 trip/well	
Fracing/stimulation equipment	1 /day	
Fracing/stimulation crews	1 /day	
Power systems placement	2/day	
Other field development	3/day	
Testing and operations	2/day	
Fuel	1/wk	
Workovers *(15-20 days per well; 1 well at a time)*		
WO Rig move	2 trucks/well	
WO Rig supervisor	1/day	
WO Rig crews	2 vehicles/day	
Engineers	2/week	
Mechanics	1/week	
Supply delivery	2/week	
Water truck	1/week	
Mud trucks	1/week	
Drill bit/tool delivery	2/week	
Pipe/tubulars	1/wk	
Fuel	1/wk	
CO_2 Pipeline Construction		
Bulldozers	5 for 10 days	5 for 10 days
Track Backhoes	4 for 10 days	4 for 10 days

Table 2.3.3 – Grieve Unit CO_2 EOR project traffic and workforce estimates.

Trip Type	Round-Trip Frequency	Manpower
Tired Backhoes	2 for 8 days	2 for 8 days
Brushhogs	2 for 4 days	2 for 4 days
Side booms	4 for 10 days	4 for 10 days
Tractors/drills	4 for 5 days	4for 5 days
Welding Trucks	10 for 12 days	20for 12 days
½ ton Pick-ups	8 for 25 days	8 for 25 days
¾ ton Pick-ups	5 for 25 days	5 for 25 days
1 ton truck	3 for 29 days	3 for 29 days
5 ton truck	2 for 15 days	2 for 15 days
Semi-dump trucks	2 for 4 days	2 for 4 days
Stringing trucks	5 for 15 days	5 for 15 days
NDT trucks	2 for 15 days	4 for 15 days
CP trucks	2 for 12 days	4 for 12 days
Day Labors		8 for 25 days
In-Field Flowline Systems Construction		
Bulldozers	5 for 20 days	5 for 20 days
Track Backhoes	5 for 20 days	5 for 20 days
Tired Backhoes	2 for 10 days	2 for 10 days
Bushhogs	2 for 8 days	2 for 8 days
Side booms	5 for 10 days	5 for 10 days
Tractors/drills	3 for 8 days	5 for 8 days
Welding trucks	4 for 25 days	8 for 25 days
½ ton Pickups	3 for 35 days	3 for 35 days
¾ ton Pickups	6 for 35 days	6 for 35 days
1 ton Trucks	4 for 35 days	4 for 35 days
5 ton Truck	2 for 20 days	2 for 20 days
Semi-dump trucks	2 for 20 days	2 for 20 days
Stringing trucks	2 for 15 days	2 for 15 days
NDT trucks	2 for 10 days	2 for 10 days
CP trucks	2 for 2 to 10 days	4 for 2 to 10 days
Day labors		25 for 30 days
Central Facility Construction *(approximately 8 months to complete)*		
Bulldozers	2 for 30 days	2 for 30days
Track Backhoes	1 for 25 days	1 for 25 days
Tired Backhoes	2 for 45 days	2 for 45 days
Bushhogs	1 for 2 days	2 for 2 days
Manlifts	4 for 65 days	4 for 65 days
Large Crane Truck	1 for 20 days	1 for 20 days
Small Crane Truck	4 for 60 days	4 for 60 days
Welding trucks/ 8	8 for 120 days	16 for 120days
½ ton Pickups/ 8	8 for 240 days	8 for 240days
¾ ton Pickups/ 5	5 for 240 days	5 for 240 days
1 ton Trucks/ 5	5 for 180 days	5 for 180 days
5 ton Truck/ 1	1 for 70 days	1 for 70 days
Semi-dump trucks/ 2	2 for 40 days	2 for 40 days
Off Road Fork Lift/ 5	5 for 160 days	5 for 160 days
NDT trucks/ 2	2 for 45 days	2 for 45 days
Semi-Trucks/ 2	2 for 50 days	2 for 50 days
Day labors		25 for 210 days
25 and 230 kV Line Power Construction *(approximately 6 months to complete)*		

Table 2.3.3 – Grieve Unit CO_2 EOR project traffic and workforce estimates.

Trip Type	Round-Trip Frequency	Manpower
Bulldozers	1 for 10 days	1 for 10 days
Track Backhoes	1 for 20 days	1 for 20 days
Tired Backhoes	1 for 20 days	1 for 20 days
Bushhogs	2 for 6 days	2 for 6 days
Manlifts	4 for 40 days	4 for 40 days
Large Crane Truck	1 for 10 days	1 for 10 days
Small Crane Truck	2 for 15 days	2 for 15 days
½ ton Pickups	4 for 180 days	4 for 180 days
¾ ton Pickups	4 for 120 days	4 for 120 days
1 ton Trucks	3 for 40 days	3 for 40 days
5 ton Truck	1 for 15 days	1 for 15 days
Semi-dump trucks	1 for 5 days	1 for 5 days
Off Road Fork Lift	2 for 45 days	2 for 45 days
Semi-Trucks	1 for 30 days	1 for 30 days
Day labors		15 for 195 days
Substation Construction *(approximately one year to compete both)*		
Bulldozers	2 for 12 weeks	
Excavator	2 for 12 weeks	
Grader	2 for 12 weeks	
Water truck*	1 for 12 weeks	
Tractor trailers	6 to 8 for 45 weeks	
Pressure digger	1 for 12weeks	
Concrete trucks	16 for 12 weeks	
Materials trucks	6 for 12 weeks	
Backhoe	1 for 12 weeks	
Bucket trucks	2 for 18 weeks	
Boom trucks	2 for 18 weeks	
Man-lifts	2 for 18 weeks	
Cranes	2 for 18 weeks 2 for 4 weeks	
1 ten wheeled trucks	1 for 4 weeks	
Pickups	4 to 15 for 52 weeks	
Bobcats	3 for 3 weeks	
Production/Long-term Workforce		
Production foreman	1/5days/wk	
Field operators	10/day	
I&E techs	2/day	
Well field maintenance and pumpers trucks	2/day	

* Water trucks may be necessary during all phases of construction to minimize fugitive dust and for fire suppression.

The flow of activity in the development of the Grieve Unit CO_2 EOR project will, generally, be as follows:

1) Continue existing well workovers and re-entries,
2) Construct the CO_2 pipeline and meter station, reconstruct access road
3) Install 25 kV underground power to meter station,
4) Install in-field distribution and gathering pipeline systems,
5) Construct new well locations and access roads,
6) Drill and complete new wells, connect to distribution and gathering systems,
7) Remove unneeded existing equipment at the central facility site,

8) Construct the new central facility,
9) Construct overhead power line from Buffalo Head to central facility,
10) Construct electrical substations, and
11) Continue reclamation activities.

Some of these activities will occur simultaneously, completion of all new project components should be complete in three or four work seasons, should the project be approved. The field work season in the Grieve Unit is typically April to November, and dependent on weather and BLM site specific stipulations for resource protection. All work will be followed by reclamation activities.

2.3.7 Reclamation and Abandonment

Another major component of the Grieve Unit CO_2 proposal is the reclamation of unneeded areas existing disturbance in the field. Fifty-six years of equipment and production modifications have occurred in the Grieve Unit, resulting in a considerable quantity of out-of-service equipment, necessitating a significant housekeeping effort. This effort will occur primarily of private lands associated with the central facility. Work on the federal mineral estate or BLM managed lands will be approved though the Sundry Notice process. This work will be completed over an extended period of time and could include the following:

1) Plug and abandon unneeded wells,
2) Remove unnecessary existing production equipment and infrastructure including tanks, treaters, separators, power lines and poles, concrete bases, etc.,
3) Close and backfill any existing production pits,
4) Remove existing houses and backfill the cellars. These are located on private land and off the unit but are related to previous Grieve Unit operations, and
5) Reclaim disturbed areas associated with above activities.

In addition to reclaiming unneeded areas of the existing Grieve Unit, new project components will be reclaimed through re-seeding and stabilization. All surface disturbing activity will be covered by a Storm Water Pollution Protection Plan (SWPPP) as required by the WDEQ/Water Quality Division. The WDEQ/WQD will not release the SWPPP until "uniform perennial vegetative cover with a density of 70% of the typical or native background vegetative cover for the area has been established on all disturbed unpaved areas and areas not covered by permanent structures" (WDEQ/WQD May 2011).

The seed mixes for reclamation will be recommended or approved by the LFO based on the information found in the GUCO$_2$PA Reclamation Plan (Appendix B). The seed mixes are based on both the pre-existing vegetative community and the soil types found in specific sites within the project area. Seeding rates are assumed for drill seeding. Seeding rates will be doubled if seed were broadcast. Reclamation success criteria will be determined based on the BLM standards for final and interim reclamation. The identified seed mixes could be modified or added to by the BLM, as needed or required to meet the LFO objectives for reclamation; the LFO uses the Wyoming Reclamation Plan as a guide in developing acceptable project level reclamation plans.

Weed control is integral to the success of project reclamation; the $GUCO_2PA$ Weed Management Plan, found in Appendix E, will be followed. Forbs and shrubs may be seeded after grasses have become established and weedy species are under control. A variety of forb and shrub species and their seeding rates can be found in the Reclamation Plan (Appendix B).

Following construction, all areas not occupied by Proposed Action features, or needed for field operations, will be reclaimed in the next growing season, or as directed by the authorizing agency. All disturbed areas, not needed for operation, will be reclaimed to the approximate landform existing prior to construction. Remaining disturbed areas will be reclaimed following abandonment of project components. Stockpiled topsoil will be used as part of the seedbed preparation. Reclamation and site stabilization techniques will be applied as specified in the Reclamation Plan. Unnecessary or redundant road segments may be cooperatively reclaimed by the Operator with concurrence from BLM and local landowners/allotment lessees.

Any mulch applied to areas with high soil erosion potential, or where use is otherwise indicated, will be free from mold and noxious weed seeds. Site preparation may include ripping or chiseling to break up compacted soils, increase water penetration, promote root growth, and control erosion. Soil amendments may be recommended depending on soil type and reclamation potential.

Implementation of the Proposed Action will result in surface disturbance. Estimates of that disturbance are found in Table 2.3.1. Interim reclamation of individual well sites will result in LOP disturbance of 1.5 acres for two well pads and 1.04 acres for single well pads. During the project development phase the access road driving surface, turn-outs, drainage structures and installation of storm water best management practices (as found in the SWPPP) could result in full use of the 24-foot right-of-way. The in-field gathering and distribution system 100-foot construction ROW will be disturbed as will the 225-foot wide corridor used for the CO_2 pipeline, power line and access road corridor. However, all these areas, with the exception of the 16-foot driving surface of the access road, will be reclaimed in their entirety.

2.3.8 Design Features of the Proposed Project

Design Features include all applicable agency rules and regulations, Standard Operating Procedures, Stipulations (including Conditions of Approval) and best management practices that have become commitments and are enforceable under this EA. These Design Features are included as part of the proposed project as Conditions of Approval in an effort to prevent or reduce environmental effects from occurring during project implementation and to minimize the type and magnitude of effects to resources in the project area. Many Design Features are cross-cutting and will benefit numerous resources for example; those features listed for protection of Water Resources are protective of Soils, Vegetation and Wetlands.

The Design Features to which Elk has committed in agency submittals, agreed upon based on the on-site inspections with BLM, or as regulated and required by BLM and other applicable agencies are compiled below.

Design features are different from Mitigation Measures, as used in this EA. Mitigation measures are practices that are were not incorporated into the Proposed Action or Alternatives but that

analysis determined would work to further reduce impacts to specific resources, these are identified as applicable and appropriate in Chapter 4.

2.3.8.1 Climate, Climate Change, & Air Quality

- The Operator will contact the Wyoming Department of Environmental Quality (WDEQ), Air Quality Division to determine the permit requirements, prior to the installation of any oil and gas well production equipment. The Air Quality Division will provide the owner/operator with forms and guidelines for permitting and controlling air contaminant emissions from this equipment. The operator will adhere to all applicable local, state, and federal air quality regulations and standards. The operator will adhere to all applicable ambient air quality standards, permit requirements (including preconstruction, testing, and operating permits), motorized equipment and other regulations, as required by the State of Wyoming, Department of Environmental Quality, Air Quality Division (WDEQ-AQD).
- The production of dust will be significantly reduced through accepted dust abatement techniques. Techniques include, but are not limited to, the seeding of all disturbed areas that are not utilized during the well production phase (i.e. borrow ditches and topsoil and spoil piles) and the application of water to roadways during dry periods.
- The operator will not allow burning garbage or refuse at well locations or other facilities. Any flaring will be conducted under the permitting provisions of Chapter 6, Section 2 (Oil and Gas Production Facilities Permitting Guidance) of the Wyoming Air Quality Standards and Regulations and the WOGCC rules.

2.3.8.2 Cultural

A Class III cultural inventory for proposed project has been completed.

- Elk will adhere to the proposed well pad relocation delineated in the field within the following legal locations: *T.32N., R.85W., Sections 22 N½SW¼NE¼, S½NW¼NE¼ (Grieve Unit 57/60 well pad)*

  Prior to any surface disturbing activities, Elk shall install temporary protective fencing along the north and east edges of the subject well pad. Prior to installation, locations and types of fencing will be determined by the BLM. The fencing will be left in place until all work is completed.
- Elk will provide an archeologist, with a current BLM Cultural Resources Use Permit, to monitor ground clearing operations and inspect the open pipeline trench at the following locations: *T.32N., R.85W., Section 19 All (access roads, power lines, pipeline and Buffalo Head Switchyard)*

  Blade Monitoring: The archeologist shall notify the BLM prior to beginning blade monitoring. Construction methods shall be utilized which will allow the identification of cultural resources without endangering the personnel monitoring the construction activities. The archeologist will specify the depths of cuts made by earth moving equipment. Monitoring will continue until work is completed or until strata that could possibly contain cultural resources will no longer be disturbed. If potentially significant cultural resources are identified, and the archeologist determines that further operations will affect the resource, Elk will suspend all activities in the vicinity of such a discovery until notified to proceed by the BLM. BLM will evaluate, or will have evaluated, such discoveries in accordance with the *Monitor Blading and Open Trench Inspection Discovery Plan for the Grieve Unit CO_2 Powerline, Powerline Access Roads, and CO_2 Pipeline Alternate Route 2*. The decision as to

the appropriate measures to mitigate adverse effects to significant cultural resources shall be made by BLM after consulting with Elk.

Open Trench Inspection: Open trench inspection will take place before soil, lines, or other materials are placed in the trench.

The archeologist will notify BLM prior to beginning the open pipeline trench inspection. Soil stratigraphy shall be recorded whether or not cultural resources are discovered. If cultural resources are discovered in the trench, BLM will evaluate, or will have evaluated, such discoveries in accordance with the *Blading Monitor and Open Trench Inspection Discovery Plan for the Grieve Unit CO_2 Powerline, Powerline Access Roads, and CO_2 Pipeline Alternate Route 2*. The decision as to the appropriate measures to mitigate adverse effects to significant cultural resources will be made by BLM after consulting with Elk.

Treatment of cultural resources discovered: Excavations, methods, analysis, results, and report write up will follow guidelines as outlined in the *Blading Monitor and Open Trench Inspection Discovery Plan for the Grieve Unit CO_2 Powerline, Powerline Access Roads, and CO_2 Pipeline Alternate Route 2*.

Within 5 working days, Elk will notify BLM of the date construction is completed. A report of all archeological activities, including descriptions of soil stratigraphy, shall be submitted to BLM within 30 days of completion of the field work. If the report is not completed within 30 days of the end of construction, the archaeologist will notify BLM of the preliminary results in writing or via email, reason for the delay, and estimated report completion date. If the report is authorized as preliminary, a final report shall be submitted to BLM within 6 months of completion of field work.

- Any cultural and/or paleontological resource (historic or prehistoric site or object or fossil) discovered by Elk, or any person working on his behalf, on public or Federal land shall be immediately reported to BLM. Elk will suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by BLM. An evaluation of the discovery will be made by BLM to determine appropriate actions to prevent the loss of significant cultural or scientific values. Elk will be responsible for the cost of evaluation and any decision as to proper mitigation measures shall be made by BLM after consulting with Elk. One National Register Eligible resource was found near the well pad and additional cultural monitoring will be required at this site. The well location is not considered to occur in a high potential for vertebrate fossils and/or scientifically significant nonvertebrate fossils area. If cultural or paleontological resources are discovered at any time during construction, all construction activities will stop and the BLM will be immediately notified. Work will not resume until a Notice to Proceed is issued by the BLM.

2.3.8.3 Wildlife including Threatened and Endangered and BLM Special Status Species

- All pits and open cellars will be fenced to limit access by wildlife and livestock. Fencing will meet BLM specifications found in the Gold Book (DOI/USDA 2006).
- Netting will be placed over all production pits to minimize access by migratory birds and wildlife. Netting will also be required over reserve pits that have been identified to contain oil, as defined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), section 101 (14), as determined by visual evaluation.
- Offsite activities in the project area by operational personnel that are unrelated to the proposed project will be prohibited. All project employees will be notified of all applicable wildlife laws and penalties associated with unlawful take and harassment.

- Anti-perching devices will be required on all above ground power structures, including the 230 kV power line, associated with the proposed action. Any new power line facilities shall be constructed in accordance with the standards outlined in *Suggested Practices for Raptor Protection of Power Lines* (Raptor Research Foundation, Inc, 1996, as updated). The BLM reserves the right to require modifications or additions to all power line structures placed in the project right-of-way, should they be necessary to ensure the safety of large perching birds. Such modifications and/or additions shall be made by the holder of the ROW permit without liability or expense to the United States government.
- Raptor nesting timing restrictions – Surface disturbing and/or disruptive activities will be prohibited within ¾ mile of active raptor nests from February 1 to July 31. Actual distances and dates may vary based on topography, species, season of use, and other pertinent factors.
- Minimize disturbance to BLM designated Special Status Species habitats.
- Greater sage-grouse (*Within Core Areas):*
    - Surface occupancy and/or disruptive activities are prohibited on or within a six tenths (0.6) mile radius of the perimeter of occupied sage-grouse leks.
    - Surface disturbing and/or disruptive activities are prohibited from March 15 to June 30 in all nesting and early brood-rearing habitats inside core regardless of distance from the lek.
    - Disruptive activity is restricted on or within six tenths (0.6) mile radius of the perimeter of occupied sage-grouse leks from 6 pm to 8 am from March 1 to May 15.
    - New noise level, at the perimeter of a lek, should not exceed 10dBA above ambient levels from 6pm to 8am during the initiation of breeding (March 1 to May 15).
    - Surface disturbing and/or disruptive activities are prohibited in winter concentration areas from December 1 to March 14.
- Utilize native plant species for reclamation purposes (preferably local seeds and species that are preferred by sage grouse).
- The 25 kV electric distribution line to the Meter Station, and any enlargement of service in the field, will be installed underground to minimize disruptions to sage-grouse Core habitat areas.
- To minimize the possible impacts of project related noise on wildlife, muffle and maintain all motorized equipment according to manufacturers' specifications.
- Remote monitoring of wells and pipelines to reduce field visits during operations and reduce stress on raptors and other wildlife.

The following wildlife related issues have been determined not to be relevant and will not be discussed further in this EA:

- WGFD has determined that big game critical winter ranges will not be impacted by the project.
- The 2005 Statewide Programmatic Biological Assessment (BA) for Black-footed Ferrets (BLM 2005) indicates three historic ferret observations are known from the Lander Field Office (FO), all from Fremont County. Only one significant prairie dog complex has been identified in the FO (BLM 2005); all other areas in Lander field office, including the Grieve Unit project area, were deemed "block cleared" (BLM 2005). Therefore, the project area is not likely to provide habitat for black-footed ferrets. In addition, the BA (BLM 2005) determined that oil and gas projects in the block cleared areas were "Not likely to adversely affect" meaning that all effects to the species and its critical habitat are beneficial,

insignificant, or discountable (BLM 2005). A concurrence letter from the USFWS was received by BLM, with the direction that when an activity occurs within a FO that *could* impact black-footed ferrets, then specific additional consultation must take place (BLM 2005). The project area is not likely to adversely affect black-footed ferrets.

- The Wyoming State Engineers Office (2012) has determined that the USFWS listed Platte River Species, as defined in the Endangered Species Act (ESA), would not be affected by the project as the area is not hydrologically connected to the North Platte River.
- There are no fisheries were identified in the project area.

2.3.8.4 Soils

- Soil productivity and erodibility are potentially affected by project construction activities.
- Construct all project components in accordance with the soils protection measures provided in the *Gold Book, Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* (DOI/USDA 2006). Topsoil will be salvaged from all disturbed areas.
- Install runoff and erosion control measures such as water bars, berms, and interceptor ditches as needed and in accordance with the WDEQ/WQD SWPPP.
- Existing roads will be used whenever possible. Standards for road design will be consistent with BLM guidance (DOI/USDA 2006).

2.3.8.5 Vegetation including Invasive Non-Native Species, Threatened and Endangered and Special Status Species

- Minimize disturbance to BLM designated Special Status Species habitats.
- The operator has prepared a Reclamation Plan (Appendix B) for all aspects of the Proposed Action. The plan meets the interim and final reclamation objectives of Chapter 6 of The *Gold Book, Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* (DOI/USDA 2006).
- Interim well site reclamation consists of minimizing the footprint of disturbance by reclaiming all portions of the well site not needed for production. Interim road reclamation consists of reclaiming portions of the road not needed for vehicle travel.
- Final reclamation occurs when the operator plugs the wells due to a commercially unviable well sites or the end of production. Final road reclamation includes re-contouring the road back to the original contour, seeding, and any other techniques that would be helpful to improving reclamation success (DOI/USDA 2006).
- The operator has prepared a Weed Management Plan (Appendix E). Weeds would be controlled on all disturbed areas during the life of the project. Weed control methods would be in accordance with guidelines established by the EPA, BLM, or appropriate authorities.
- Project roads not required for routine operation and maintenance of producing wells and ancillary facilities will be reclaimed and revegetated, with BLM and landowner/allotment lessee concurrence.

The following vegetation related issues have been determined not to be relevant and will not be discussed further in this EA:

- No Threatened or Endangered plant species or their habitats were identified as being potentially impacted by in the project actions.
    - No individuals or populations of blowout penstemon were found during field surveys, and based on the lack of suitable habitat characteristics; local habitat was confirmed

unsuitable for blowout penstemon. A data request from the Wyoming Natural Diversity Database (WYNND) indicates there have been no known occurrences of blowout penstemon within or near the proposed project area (WYNDD 2011).

- No individuals or populations of Ute ladies'-tresses were found during field surveys, and based on the lack of suitable habitat characteristics, local habitat was confirmed unsuitable for Ute ladies'-tresses. A data request from the WYNND indicates there have been no known occurrences of Ute ladies'-tresses within or near the proposed project area (WYNDD 2011).

2.3.8.6 Water Quality (Groundwater, Surface Water and Wetlands)

- Culverts will be installed on all ephemeral and intermittent drainage road crossings; all designated wetlands will be bored to facilitate pipeline construction.
- The Buffalo Head substation is designed with a storm water retention pond.
- Construction of well sites and other non-linear features within 500 feet of surface water and/or riparian areas or within 100 feet of the inner gorge of ephemeral channels will be prohibited. Possible exceptions to this will be granted by the BLM for linear features based on an environmental analysis and site-specific mitigation plans.
- Equipment servicing, fueling and staging operations will not occur within 500 feet of streams or riparian areas.
- Sanitary sewage facilities (portable chemical toilets) will be provided at designated locations and will not be located within 500 feet of a waterway or wetland.
- All crossing of wetlands will be bored under if feasible or if boring is found to be more destructive than trenching (i.e. likely to perforate a perched water table). Trenching may be allowed if disturbance is minimal (less than 1/10 acre). In the event wetlands are trenched, monitoring will be required following construction, and annually thereafter, until successfully reclaimed.
- Wells will be cased during drilling; case and cement all wells in accordance with BLM Onshore Order No. 2 and WOGCC rules to protect all high quality water aquifers. High quality water aquifers are aquifers with known water quality of 10,000 TDS or less. Wells will adhere to the appropriate BLM and WOGCC cementing policy.
- Construct reserve pits as directed in BLM Operating Order No. 1 and BLM IM No. WY-2012-0007. The reserve pit will be lined with reinforced synthetic liner, minimum 12 mil thickness with permeability less than 10^{-7} cm/sec. and a bursting strength of 175 x 175 pounds per inch (ASTMD 75179) or according to stipulation.
- Maintain two foot of freeboard on all reserve pits to minimize the risk of overflowing. Shut down drilling operations until the problem is corrected if leakage is found outside the pit.
- All tank batteries and facilities designed to contain fluids will be surrounded by an impervious dike designed to contain 110% of the contents of the largest vessel should a leak or spill occur. Spill Prevention Control and Countermeasure Plans (SPCC) will be written and implemented as necessary, in accordance with 40 CFR 112. Spills of oil, gas, or any other potentially hazardous substance will be reported immediately to the BLM and WDEQ/WQD, and will be mitigated immediately, as appropriate, through cleanup or removal to an approved disposal site.
- Protect ground water by adhering to all requirements of the WOGCC/EPA permit for underground injection of CO_2 and produced water (WOGCC 2012).

- In the event that wells require hydraulic fracturing adhere to the provisions of the WOGCC and BLM rules regarding this activity.
- Hydrostatic test water used in conjunction with pipeline testing and all water used during construction activities from sources having sufficient quantities and appropriation permits approved by the State of Wyoming SEO and WDEQ/WQD.
- Hydrostatic test water will be re-used by injection into the Muddy for reservoir re-pressurization.
- Install runoff and erosion control measures such as water bars, berms, and interceptor ditches as needed and in accordance with the WDEQ/WQD SWPPP.

2.3.8.7 Socioeconomics

- Federal, State, local economies all stand to benefit from the successful implementation of the Proposed Action.
- Implementation of the Proposed Action does not interfere with existing opportunities for the development of alternative energy sources, including wind projects, in the area.
- There are no BLM authorized commercial outfitters in the project area.

Overarching Design Features associated with the project implementation include:

Facilities:

- The existing and new access roads will be designed, constructed, and/or maintained as a crowned and ditched road in accordance with the minimum standards of a local or resource road as established in the *BLM Road Standards Manual, Section 9113, and in The Gold Book, Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* (DOI/USDA 2006). No flat blading of access road is permitted.
- Facilities will be standard in size. All permanent OSHA exempt above ground production facilities will be painted the color C*arlsbad Canyon* (2.5Y 6/2) or *Covert Green* 18-0617 TPX.

Transportation:

- Except in emergency situations, access will be limited to dry conditions to prevent severe rutting (creation of ruts in excess of 4" deep) of the road surface. If rutting occurs all processes will cease until the roads are of proper condition. All road damage will be fixed by grading. Culverts will be installed where needed to allow drainage in all draws and natural drainage areas. On-site reviews will be conducted with BLM personnel for approval of proposed access prior to any construction.
- Snow removal equipment will be equipped with shoes to keep the blade six (6) inches above the natural ground surface. Locations of snow stockpiles, if needed, will be designated in advance by the Authorized Officer.

BLM Lease Stipulations:

- A *Lease Notice (LN)* that any surface use or occupancy within the following areas is strictly controlled or, if absolutely necessary, prohibited: 1) slopes in excess of 25 percent; 2) within 500 feet of surface water and/or riparian areas; 3) where material is frozen or during periods when the soil material is saturated or when watershed damage is likely to occur; 4) within 500 feet of Interstate highways and 200 feet of other existing rights-of-way (i.e., U.S. and

State highways, roads, railroads, pipelines, power lines); or 5) within ¼ mile of occupied dwellings. The prohibition could require relocating proposed operations up to 200 meters, but not off the leasehold, and prohibiting surface disturbance activities for up to 60 days.

Health and Safety

- Health and safety issues are regulated by State and Federal occupational safety programs and compliance is the responsibility of the Operator and their contractors.
- The management of solid wastes generated by the project components including produced water, crude oil and reserve pit fluids are regulated by State and Federal environmental programs and compliance is the responsibility of the Operator and their contractors.
- Sanitary wastes are disposed of in portable toilets for long-term construction, drilling and completion operations. These wastes are hauled to municipal sewage treatment plants for final disposal.
- Produced water within the project area is currently managed through the use of permitted injection/disposal wells. These facilities have been permitted by the WOGCC, the WDEQ and the BLM.
- Elk has a responsibility to comply with the State and Federal regulations applicable to their operations. Documents regarding spill response planning, Community Right-to-Know reports, SPCC Plans, etc., are maintained by the company.
- Elk and their contractors will follow common wildfire safety operating procedures including the BLM requirements for minimizing the risk wildfire from project related construction activities; the risk is not unique to this project. Pipeline and site construction fire-prevention measures are in place during the summer construction season. These include using equipment with spark arrestors, welding in cleared areas only and the ready availability of fire extinguishers or water trucks in the event fire occurs. Natrona County, the BLM, and the companies working in the area implement, and require, extra precautions in the event of drought or high fire danger.
- Elk Petroleum provided information to Natrona County Road and Bridge Department regarding the potential for a substantial increase in heavy equipment traffic on Poison Spider Road. In 2011, the County invested substantial funds and manpower to improving the road surface and safety. Poison Spider is also used by seasonal residents of the Rattlesnake Hills, the surrounding rural residents and livestock operators as well as numerous recreationalists and "Sunday-drivers."
- The United States Department of Transportation (USDOT) regulations also address the safe transportation of hazardous materials (i.e. crude oil, drilling mud chemicals, etc) on the national roads and highways. The USDOT Office of Pipeline Safety (OPS) provides regulatory oversight of pipelines carrying hazardous liquids such as crude oil and CO_2.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

In accordance with 40 CFR 1502.14(a), the BLM is required to explore and evaluate all reasonable alternatives. The following alternatives were considered by the BLM but found to be unreasonable as discussed below. Thus, these alternatives were eliminated from detailed study.

The following alternative utility alignments were evaluated.

Sage-grouse Core Avoidance Alternative
Consideration was given to a route up and over Horse Heaven to the south to connect into the Western power grid and the Anadarko CO_2 pipeline thus greatly reducing but not eliminating potential disturbance and disruption impacts to the sage-grouse core area. This route was determined to be unreasonable due to the need for year-round access for the CO_2 meter station and the power lines; topographically the route would include numerous steep sections and would be longer for all utilities resulting in greater surface disturbance. During the winter the route would be impassable thus requiring an alternative access route to be constructed or improved. The Proposed Action alignment takes advantage of an existing access route and provides for the shortest interconnection distances from the existing power grid and CO_2 pipeline to the existing Grieve central facility and all operations are supported by one access road.

Alternative 230 kV Alignment Routes were evaluated. In the original Elk proposal the 230 kV power line was not co-located with the CO_2 line and access road, and would, therefore, have required a separate year-round access road to be constructed. BLM requested an analysis of alternative routes that would follow, partly or entirely, the originally proposed CO_2 pipeline route (refer to the following discussion of the CO_2 Pipeline Route). All of the routes considered would have significantly added to the overhead disruptions in the sage-grouse Natrona Core Area as well as potentially impacting an active golden eagle nest and sites of Native American cultural importance.

Alternative Western Communications Infrastructure
Western determined they need the ability to communicate with the proposed Buffalo Head substation. They considered the use of microwave transmission of signal using the existing microwave tower on Horse Heaven. It was determined that this structure did not have the height needed to relay communications between the Spence and Buffalo Head substations. Consideration was then given to installing a new microwave tower on Horse Heaven. In order for this to work, given terrain considerations, Western would have to replace the existing 60 foot Horse Heaven tower with a 200 foot tower and install a second 200 foot microwave tower at the Buffalo Head substation. Western determined the replacement of 11.2 miles of existing 230 kV line ground wire with a fiber optics ground wire is a more reasonable alternative.

Well pad locations were moved to address topography and Native American cultural resource issues. One well location was changed due to steep terrain, this change reduced overall surface disturbance from the well pad cuts and fills and access road construction. Two well pads were evaluated by the affected tribes, resulting in one pad being moved slightly and re-designed; the other pad was determined to be acceptable as proposed. The number of proposed new wells was increased by the Operator but the number of well pads stayed the same due to the commitment to use directional drilling to the extent feasible.

CO_2 Pipeline Route
Elk originally proposed to install the CO_2 line and access road parallel to the existing North Grieve Unit crude oil pipeline ROW, and tie into the existing Anadarko CO_2 line at the juncture with the North Grieve Unit crude oil line (Figure 2.1.1). Access for pipeline alignment construction and operations included an additional 1.9 miles of new and long term disturbance. In addition, preliminary resource evaluation disclosed (a) potential impacts to significant Native

American cultural sites, (b) potential disruption to an active golden eagle nest, (c) potential disruption to the Soap Creek sage-grouse lek as well as additional disturbance and disruption in the Natrona Core Area, and (d) numerous wetland crossings. The Proposed Action CO_2 pipeline alignment avoids or significantly reduces these potential resource conflicts in addition to co-locating all utilities and access roads into a single corridor.

Overhead Installation of the 25 kV Power Line

Consideration was also given to installing the 25 kV power line overhead from the Grieve #17 to the CO_2 meter station. This would have added another 75 feet to the width of the utility corridor as well as additional power poles (disruptions in the form of above ground structures and potential raptor perches) sage-grouse Core Area.

CHAPTER 3 - AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter presents the potentially affected existing environment of the impact area as identified by BLM interdisciplinary team (IDT) or public scoping and presented in Chapter 1.

This chapter also provides the baseline for comparison of impacts to those same resources as described in Chapter 4.

See Chapter 2 for details of the proposed project components and the area involved as well as the design features developed for application to the proposed project in an effort prevent or reduce environmental effects from occurring during project implementation and to minimize the type and magnitude of effects to resources in the project area. The various regulatory programs affecting the proposed project, as discussed in Chapter 1, will be addressed as appropriate in the following discussion of the Affected Environment. Figure 2.1.1 shows the area involved in the proposed project and possible project component locations; however, the project area is not necessarily the area to be analyzed for each of the resources discussed below. The size and location of these areas vary depending on the resource and is described in each resource section.

3.2 GENERAL SETTING

The Grieve Unit CO_2 project lies within the Wyoming Basin ecoregion, Rolling Sagebrush Steppe (Chapman et al. 2004). This ecoregion is a broad arid intermontane basin interrupted by hills and low mountains and dominated by grasslands and shrublands. The semiarid Rolling Sagebrush Steppe is a vast region of rolling plains with hills, cuestas, mesas, terraces, and near, ridges, alluvial fans, and outwash fans. Potential natural vegetation is mostly sagebrush steppe the mountains, footslopes, with the eastern edge of the region having more mixed grass prairie (Chapman et al. 2004).

Much of the region is used for livestock grazing. The region contains major natural gas and petroleum producing fields. The Wyoming Basin also has extensive coal deposits along with areas of trona, bentonite, clay, and uranium mining (Chapman et al. 2004).

The project is located within the eastern extents of the Wind River Basin. The Wind River Basin is a topographical depression that is bounded by the Wind River Mountains to the west and southwest, the Sweetwater Arch to the south, the Casper Arch to the east, and the Owl Creek Mountains to the North. The predominate topographic feature within the project area is a relatively flat plateau named Horse Heaven that lies at an elevation of 7,300 feet above mean sea level. This plateau rises 1,000 feet above the surrounding area and has several ephemeral stream drainages that form steep gullies that come off the plateau in a radial geometry. The Horse Heaven Plateau is situated approximately 2.5 miles east of the Rattlesnake Hills which run in a northwest to southeasterly trend.

The drainages from the project area run from the Horse Heaven plateau in a northeasterly direction. Eventually these drainages run into the west-to-east flowing Poison Spider Creek, a tributary to the North Platte River.

Average annual precipitation is 6 to 16 inches and varies with elevation and proximity to mountains. The region has a continental climate with cold winters and mild summers. Precipitation is greatest from spring to summer, tapering off during the fall and winter months. An average of 76.9 inches of snow falls during the year (annual high 137.6 inches in 1982), with the majority of the snow distributed evenly between November and April.

3.3 RESOURCES/ISSUES BROUGHT FORWARD FOR ANALYSIS

Only those environmental elements and resources identified as potentially being affected and discussed in Chapter 1 are discussed below. The description of the affected environment portrays what is, not what would be if the proposal is approved.

3.3.1 Climate, Climate Change, & Air Quality

3.3.1.1 Climate

The $GUCO_2$ project area is located in a semiarid (dry and cold), mid-continental climate regime. The area is typified by dry, windy conditions with limited rainfall and long, cold winters. The nearest meteorological measurements were collected at the Casper, Wyoming airport(1948-2010), located 53 miles east of the project area at an elevation of 5,340 feet amsl (WRCC 2011).

The annual average total precipitation at Casper, Wyoming is 12.0 inches, with annual totals ranging from 6.6 inches (1988) to 20.5 inches (1982). Precipitation is greatest from spring to summer, tapering off during the fall and winter months. An average of 76.9 inches of snow falls during the year (annual high 137.6 inches in 1982), with the majority of the snow distributed evenly between November and April.

The region has cool temperatures, with average temperature (in degrees Fahrenheit [˚F]) ranging between 13.0˚F and 33.7˚F in January to between 54.1˚F and 87.7˚F in July. Extreme temperatures have ranged from -41˚F (1990) to 104˚F (1954). The frost free period generally occurs from May through September.

The closest comprehensive wind measurements are collected at the Casper/Natrona County International Airport meteorological monitoring station located northwest of Casper, Wyoming, 53 miles east of the $GUCO_2$PA. As is typical for central Wyoming, the prevailing wind is generally from the south and west.

The frequency and strength of winds greatly affect the transport and dispersion of air pollutants. The annual mean wind speed is 12 miles per hour (mph), and that relatively high average wind speed indicates the presence of good dispersion and mixing of any potential pollutant emissions resulting from the $GUCO_2$ project area.

3.3.1.2 Climate Change and Air Quality

The Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS) are health-based standards which define the maximum concentration of air pollutants allowed at all locations to which the public has access. EPA criteria air pollutants for which standards exist are carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 10 microns in effective diameter (PM_{10}), particulate matter less than 2.5 microns in effective diameter ($PM_{2.5}$), and sulfur dioxide (SO_2).

Air quality monitoring is conducted near the project area for PM_{10} and $PM_{2.5}$ at the Casper City and County Building at Center and C Streets. The nearest measurements of NO_2, SO_2, and O_3 are monitored by WDEQ-AQD at South Pass in Fremont County, 100 miles west-southwest of the project area. The nearest CO measurements are collected in Uinta County at the Murphy Ridge monitoring site.

The monitored concentrations described above are considered ambient air background concentrations, and are used as an indicator of existing conditions in the region. These concentrations are assumed to include emissions from industrial sources in operation and from mobile, urban, biogenic and other non-industrial emissions sources. They are considered by WDEQ-AQD to be the most representative of background conditions within the project area, and are compared to the WAAQS and NAAQS in Table 3.3.1.1. The project area is designated as attainment for all criteria pollutants.

Federal air quality regulations adopted and enforced by WDEQ-AQD limit incremental emission increases to specific levels defined by the classification of air quality in an area. The Prevention of Significant Deterioration (PSD) Program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. Incremental increases in PSD Class I areas are strictly limited, while increases allowed in Class II areas are less strict. The project area and surrounding areas are classified as PSD Class II. The closest Federal PSD Class I area is the Bridger Wilderness Area, which is approximately 101 miles west of the project area.

Table 3.3.1.1 - Monitored air pollutant background concentrations and Wyoming and National Ambient Air Quality Standards (µg/m^3)

Pollutant	Monitoring Site	Averaging Time	Measured Background Concentration	Wyoming and National Ambient Air Quality Standards	Incremental Increase Above Legal Baseline	
					PSD Class I	PSD Class II
Carbon Monoxide (CO)	Murphy Ridge[1]	1-hour	1026	40,000	n/a	n/a
		8-hour	798	10,000	n/a	n/a
Nitrogen Dioxide (NO_2)	South Pass[2]	Annual	0.4	100	2.5	25
		1-hour	10.0	188(NAAQS)	n/a	n/a
Ozone (O_3)	South Pass[2]	8-hour[4]	141.1	157	n/a	n/a

Table 3.3.1.1 - Monitored air pollutant background concentrations and Wyoming and National Ambient Air Quality Standards (µg/m^3)

Pollutant	Monitoring Site	Averaging Time	Measured Background Concentration	Wyoming and National Ambient Air Quality Standards	Incremental Increase Above Legal Baseline	
					PSD Class I	PSD Class II
Particulate matter (PM_{10})	Casper[3]	24-hour	30	150	8	30
		Annual	16	50 (WAAQS)	4	17
Particulate matter ($PM_{2.5}$)	Casper[3]	24-hour[5]	12.3	35	n/a	n/a
		Annual	4.6	15	n/a	n/a
Sulfur Dioxide (SO_2)	South Pass[2]	1-hour	31.4	196(NAAQS)	n/a	n/a
		3-hour	11.4	1,300	25	512
		24-hour	1.9	365(NAAQS) 260(WAAQS)	5	91
		Annual	0.3	80(NAAQS) 60(WAAQS)	2	20

Source: WDEQ-AQD, 2011b.
[1] Background data collected at Murphy Ridge, Wyoming during 2008, WDEQ-AQD.
[2] Background data collected at South Pass, Wyoming, 2009, (1-hour SO_2, 2008) WDEQ-AQD.
[3] Background data collected in Casper, Wyoming. 2010, WDEQ-AQD.
[4] From EPA's Air Quality System (AQS) Quick Look Report (AMP450). Ozone values were flagged with an AQS qualifier code "ro", which means WDEQ is investigating the possibility of a stratospheric ozone intrusion exception event.
[5] 3-year average of the 98th percentile 24-hour concentrations.

The WDEQ-AQD, under its EPA-approved State Implementation Plan, is the primary air quality regulatory agency responsible for determining potential impacts once detailed industrial development plans have been made, and those development plans are subject to applicable air quality laws, regulations, standards, control measures, and management practices. Therefore, the WDEQ-AQD has the ultimate responsibility for reviewing and permitting the project prior to its operation. Unlike the conceptual 'reasonable, but conservative' engineering designs used in NEPA analyses, any WDEQ-AQD air quality preconstruction permitting demonstrations required would be based on very site-specific, detailed engineering values, which would be assessed in the permit application review. Any facility developed under the proposed action which meets the requirements set forth under Wyoming Air Quality Standards and Regulations (WAQSR) Chapter 6 will be subject to the WDEQ-AQD permitting and compliance processes.

All NEPA analysis comparisons to the PSD Class I and II Increments are intended to evaluate a threshold of concern, and do not represent a regulatory PSD increment consumption analysis. The determination of PSD increment consumption is an air-quality regulatory agency responsibility. Such an analysis would be conducted as part of the New Source Review process for a major source, as would an evaluation of potential impacts to Air Quality Related Values (AQRV) such as visibility, aquatic ecosystems, flora, fauna, etc. performed under the direction of the WDEQ-AQD in consultation with federal land managers, or would be conducted to determine minor source increment consumption.

The 1977 Clean Air Act amendments established visibility as an AQRV that Federal land managers must consider. The 1990 Clean Air Act amendments contain a goal of improving visibility within PSD Class I areas. The Regional Haze Rule finalized in 1999 requires the states, in coordination with federal agencies and other interested parties, to develop and implement air quality protection plans to reduce the pollution that causes visibility impairment.

Visibility impairment is measured in terms of change in light extinction or change in deciview (dv). Potential changes to regional haze are calculated in terms of perceptible "just noticeable change in visibility" when compared to background conditions. A dv change of 1.0 or 2.0 (equivalent to a 10 percent and 20 percent change in extinction) represents a small but perceptible change in visibility. The BLM considers a 1.0 dv change to be a significance threshold for visibility impairment, although there are no applicable local, state, tribal, or federal regulatory visibility standards. Other federal agencies use a 0.5 dv change as a screening threshold for significance.

Visibility conditions can be measured as standard visual range (SVR). SVR is the farthest distance at which an observer can just see a black object viewed against the horizon sky; the larger the SVR, the cleaner the air. Visibility within the Project Area and the surrounding region of central Wyoming is considered to be very good. Continuous visibility-related optical background data have been collected in the PSD Class I Bridger Wilderness, as part of the Interagency Monitoring of Protected Visual Environments (IMPROVE) program. The average SVR at the Bridger Wilderness is over 200 kilometers (Visibility Information Exchange Web System – VIEWS, 2011).

Atmospheric deposition refers to the processes by which air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems, and it is reported as the mass of material deposited on an area per year (kg/ha-yr). Air pollutants are deposited by wet deposition (precipitation) and dry deposition (gravitational settling of pollutants). The chemical components of wet deposition include sulfate (SO_4), nitrate (NO_3), and ammonium (NH_4); the chemical components of dry deposition include SO_4, SO_2, NO_3, NH_4, and nitric acid (HNO_3).

The National Acid Deposition Program (NADP) and the National Trends Network (NTN) station monitors wet atmospheric deposition and the Clean Air Status and Trends Network (CASTNET) station monitors dry atmospheric deposition at a site near Centennial/Brooklyn Lake, which is approximately 101 miles south-southeast of the project area. The total annual background deposition (wet and dry) reported as total nitrogen (N) and total sulfur (S) deposition for year 2009 at the Centennial site is 3.13 kg/ha-year and 1.68 kg/ha-year, respectively (EPA, 2011).

Total deposition levels of concern (LOC) for atmospheric deposition have been established for sensitive areas in the $GUCO_2$ project area region. The "red line" LOC represents an estimate of the total pollutant loadings that each sensitive area can tolerate. If an analysis done under Federal Land Managers' Air Quality Related Values Work Group (FLAG) Report (FLAG 2010) guidelines indicates loading above these values, it may be suggested that the land manager recommend a reduction of emissions from new sources unless data are available to indicate that no AQRVs in the PSD Class I area are likely to be adversely affected. The "green line" LOC

represents the total pollution loadings (current plus proposed new source contribution) below which a land manager can recommend a permit be issued for a new source, unless data are available that indicate otherwise. Cumulative impacts plus background are compared to these LOCs. The sulfur deposition "red line" LOC for Class I areas surrounding the $GUCO_2$ project area is 20 kg/ha-yr and sulfur deposition "green line" is 5 kg/ha-yr. The nitrogen deposition "red line" LOC for Class I areas surrounding the $GUCO_2$ project area is 10 kg/ha-yr and nitrogen deposition "green line" is 3-5 kg/ha-yr (Fox et al., 1989). It is understood that the Forest Service no longer considers these levels of concern to be protective; however, in the absence of alternative Federal Land Managers' approved values, comparisons with these values is made. The BLM uses these values as NEPA analysis thresholds since they are considered the levels below which significant impacts are not likely to occur.

The FLAG provides Deposition Analysis Thresholds (DATs), which are 0.005 kg/ha/yr for both N and S in the western U.S., as significance thresholds for N and S deposition when analyzing direct impacts from a proposed facility subject to New Source Review. However, 0.005 kg/ha/yr represents an assumed natural background level and is considered ultra-conservative for NEPA analyses.

The total GHG emissions from all sources in the State of Wyoming were approximately 56 million metric tons of CO_2e (Center of Climate Strategies [CCS] 2007) in 2005.

3.3.2 CULTURAL RESOURCES

Western Archaeological Services (WAS) conducted a Class III survey of the entire project area in 2011 and 2012. The objectives of a Class III cultural resource inventory are to provide a complete record of the cultural properties, identifiable from surface and natural exposures (profiles), occurring within the study area, and to determine the relationship of the cultural resources to proposed disturbance areas. Federal involvement in the undertaking includes the review of all permits and administrative responsibility for all affected cultural resources.

Modern disturbances have impacted the project area, including uranium prospecting pits, buried pipelines, well locations and their associated access roads and pipelines, reclaimed well locations, two-track trails, upgraded roads, fences, other oil field facilities, overhead power lines, stock dams and ponds, livestock and wildlife grazing, erosion, deflation, and various activities associated with ranching and energy development. Factors affecting preservation of cultural resources in the general project area include overgrazing, bioturbation, cryoturbation and wind deflation.

File searches from the State Historic Preservation Office (SHPO) and records at WAS were consulted as baseline data for this project. General Land Office Maps (GLO) on the SHPO web site were also consulted to determine if any previously documented historic resources were present in the vicinity of the project area.

Standard survey methodology was used to conduct the inventory. Standard 30 meter wide transects were employed for coverage of the block surveys and linear rights-of-way. Where present, subsurface deposition exposed in stream cut banks, road cuts, pipeline disturbances,

animal burrows, or animal trails were examined. Ant hills were examined for the presence of micro-artifacts including pressure flakes or small beads. Bedrock exposures were also closely examined. Due to the prevalence of prehistoric stone circle and cairn sites in the project area, any area outside of but within close proximity to the project area considered to have high potential for containing these sites was examined. Such areas would include wind-sheltered benches and/or ridge crest margins with an open visual aspect.

A total of 70 block acres and 347.96 linear acres were inventoried during the current project. Of this, 10 block acres and 63.62 linear acres lie on State of Wyoming Land, 60 block acres and 171.51 linear acres lie on public land and 123.35 linear acres lie on private land.

Six isolated resources, five newly recorded sites, and two previously recorded sites were identified. Three sites are historic in age including the Alcova to Copper Mountain transmission line, historic cabins, and a historic telephone line. Four sites are prehistoric and consist of campsites, stone circles, and cairns. All but two prehistoric sites are considered not eligible for the National Register of Historic Places (NRHP).

Tribal consultation was conducted in October and November of 2011; as a result, two of the newly recorded prehistoric sites were determined eligible for the NRHP.

Project area soils consist of mixed residual/colluvial sandy clay/sandy clay loam with gravel, lag cobble, and small boulder content on ridge crests, and mixed residual/alluvial sand/sandy clay in the drainage bottoms in Sections 15, 16, 17, 21, and 22, T32N, R85W. Topography flattens in Sections 18 and 19, T32N, R85W, as the land approaches a broad, marshy area at the confluence of multiple ephemeral drainages from which Cabin Creek continues to the northeast. Soils within this area consist of mixed residual/alluvial silty sandy clay in the drainage bottom, and residual and alluvial silty sandy clay on the raised benches and margins of the drainage. Some small, sparse areas of eolian sheet sands and low dunes of undetermined depth have formed in this area, particularly along the western margin of Cabin Creek in the NW¼ SW¼ of Section 19, T32N, R85W. The mixed residual/colluvial sandy clay/sandy clay loam, mixed residual/alluvial sand/sandy clay has a low to no potential for containing intact, buried cultural deposits, while the mixed residual/alluvial silty sandy clay has a low potential and the eolian sheet sands have a limited potential. The eolian sands represent the only areas of perceived depositional potential in the entire project area.

3.3.3 WILDLIFE INCLUDING THREATENED AND ENDANGERED AND BLM SPECIAL STATUS SPECIES

Wildlife habitats that could be affected by the project include areas which would be physically disturbed by well, road, pipeline, power line and production facility construction. Zones of influence are those areas surrounding a given human activity which could also affect wildlife use. These disturbance areas vary with wildlife species and kind of human activity.

Many species of birds, mammals, amphibians, and reptiles may be found within the Wyoming Basin. The most common large game animals found in the project area are pronghorn antelope, mule deer, and elk. Other mammals include coyote, fox, skunk, badger, white-tailed prairie dog,

whitetail jackrabbit, and a variety of small rodents. The area also contains greater sage-grouse. Raptors found in the area include ferruginous hawk, golden eagle, prairie falcon, and burrowing owl.

Reptiles found in the study area include northern sagebrush lizard, short-horned lizard, intermountain wandering garter snake and the prairie rattlesnake (Cerovski et al. 2004). Amphibians are uncommon in the area but the tiger salamander and the northern leopard frog may be found in the project area. The proposed development is not expected to impact the common species found in the project area; therefore, they are not considered in this analysis. Those species considered in this document include species considered by the USFWS as threatened, endangered, candidate or proposed for listing status, as well as big game species, raptors, and BLM sensitive species.

Information regarding the occurrence of species included in this analysis was obtained from several sources. Greater sage-grouse lek locations, seasonal big game range designations, raptor nest locations, and locations for threatened and endangered species were obtained from the Wyoming Game and Fish Department's (WGFD) Wildlife Observation System, the BLM GIS database, the Wyoming Natural Diversity Database (WYNDD) and field surveys. Management of wildlife in Wyoming is split between the WGFD, which is responsible for species management, and the land manager, who has responsibility for the habitat. In the Grieve Unit project area, which comprises mostly public land, BLM is the primary land manager.

3.3.3.1 General Wildlife Species

Big Game Species

Elk (*Cervus elaphus*), pronghorn antelope (*Antilocapra americana*), and mule deer (*Odocoileus hemionus*) occur on the project area during various times of the year. Big game populations are managed by the WGFD within designated "herd units." The BLM manages habitat on federal lands and split estate lands where the surface remained with the federal government.

Big game seasonal habitats are designated by the WGFD as winter, yearlong, winter/yearlong, crucial winter, crucial winter/yearlong, spring/summer/fall and out (non-use areas). Winter ranges are used by a substantial number of animals from mid-November through April. Winter/yearlong ranges are occupied throughout the year but, during winter, additional animals from other areas migrate there. Yearlong ranges are occupied throughout the year and usually do not increase in population through the winter season. Crucial winter and crucial winter/yearlong describes a seasonal range that has been documented as a determining factor in a population's ability to maintain itself at or above population objective over the long term. Overlapping use of winter and winter/yearlong habitats by two or more species is a greater management concern than those areas used by a single species (WGFD 2010b).

Spring/summer/fall ranges are used before and following conditions of freezing temperatures, deep snow and other winter attributes. If an area has little or no recorded use of big game activity it is designated as "out."

Elk The Grieve Unit CO_2 project falls within the Rattlesnake Elk Herd Unit 742, as designated by WGFD. The Rattlesnake elk herd is a relatively small population with potentially significant interchange with adjacent herd units in the Bighorn Mountains, Green Mountain, and Ferris Mountains. Elk frequently cross the southern herd unit boundary (the Dry Creek Road) (WGFD 2010a). While elk are frequently seen in the existing oil field and surrounding area, WGFD has not identified any specific seasonal habitat, or range, in the Grieve Unit area.

Pronghorn The project area is within the southern portion of Rattlesnake Pronghorn Herd Unit 745 and the northern edge of Beaver Rim Herd Unit 632. These very large herd areas have a combined population objective of greater than 37,000 animals (WGFD 2010a). There is a large amount of interchange between these two herd areas. The pronghorn population is generally believed to be stable although WGFD biologists have expressed concern regarding the over objective populations and the poor sagebrush leader growth. For the purpose of this analysis, the portion of the herd unit analyzed is limited to the Grieve Unit CO_2 project area.

The majority of the proposed action falls within the Rattlesnake Herd Unit in winter/yearlong habitat. The remainder of the pronghorn habitat in the project area is classified as spring/summer/fall. Pronghorn are commonly seen in this habitat from early March through mid-November. Preferred pronghorn habitat may be characterized by a sagebrush/rabbit-brush plant community with an open view. The WGFD has not designated any crucial winter range for pronghorn in the project area or vicinity.

Mule Deer The project area is within the Rattlesnake Mule Deer Herd Unit 758. The population objective for the herd unit is 5,500 while the model estimate for the 2010 population was 4,533 or 17.6% below objective (WGFD 2010a). The population has been below objective since 2006, primarily due to poor fawn productivity and survival (WGFD 2010a).

Approximately two-thirds of the $GUCO_2$ project falls within WGFD designated winter/yearlong mule deer habitat; no crucial winter range for this species are found in or around the Grieve Unit project.

Other Mammals

The Grieve Unit area is home to many species of non-listed, non-sensitive wildlife, including coyote (*Canis latrans*), white-tailed jackrabbit (*Lepus townsendi*), desert cottontail (*Sylvilagus audubonii*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), various species of rodents, and bats. There are no anticipated effects to other mammals from the proposed action and these species will not be discussed further. Species that are Threatened, Endangered, Proposed and Candidate under the Endangered Species Act (ESA) are discussed in Section 3.3.3.2; BLM Special Status Species are discussed in Section 3.3.3.3.

The cottontail rabbit is the only species of "small game" occurring within the project area. The species, which is found in the project area, is the desert cottontail (*Sylvilagus audubonii*) (Cerovski et al. 2004). Usually seen during early morning and late afternoon, they are generally inactive during mid-day. As with most cottontails, they occupy tall vegetation, rock outcrops and where escape cover may be found.

Upland Game Birds
Greater sage-grouse (*Centrocercus urophasianus*) and mourning dove (*Zenaida macroura*) are the only upland birds which occur within the project area. Greater sage-grouse is discussed in Section 3.3.3.2.

Mourning Dove are relatively common in the area from mid-April through early September. The habitats used include open ponderosa pine forest, juniper woodland, deciduous riparian corridors, sagebrush steppe and grasslands with shrubs (Faulkner 2010). Nesting is most common along deciduous riparian corridors, although nests can be found a few feet off the ground in sagebrush, greasewood and other indigenous shrubs. Doves may nest more than once each season depending on arrival date, weather, nesting success and other factors.

Raptors

A variety of raptor species are known to occur in and around the project area during various seasons of the year. Raptor surveys of the Grieve project area were conducted in the spring of 2011. Nesting habitat was identified for golden eagle (*Aquila crysaetos*), ferruginous hawk (*Buteo regalis*), red-tailed hawk (*Buteo* j*amaicensis*), American kestrel (*Falco sparverius*), great-horned owl (*Bubo virginianus*) and burrowing owl (*Athene cunicularia*). Two active golden eagle, two ferruginous hawk and three red-tailed hawk nests were located during the 2011surveys (Table 3.3.3.1 and Figure 3.3.3.1). Four other active nests were also located; these were determined to be non-raptor nests, likely black-billed magpie. Twelve inactive nests were also identified in the survey area. No occupied nests were found during spring 2012 surveys of previously identified and newly located nests within 1 mile of any proposed project component.

It is possible that some of the older documented raptor nests may have deteriorated beyond being suitable for raptor nesting and the nest sites are no longer available or used by breeding raptors. Nevertheless, nest sites with nests in suitable condition have the potential to be active in any given year. Moreover, each year new nests are built. All raptors and their nests are protected from take or disturbance under the Migratory Bird Treaty Act (16 USC, §703 *et seq.*) and Wyoming [Revised] Statute (WRS 23-1-101 and 23-3-108). Golden and bald eagles also are afforded additional protection under the Bald and Golden Eagle Protection Act, amended in 1973 (16 USC, §669 *et seq.*).

The Grieve Unit project area provides significant cliff or stick-nest habitat to support the species discussed above. Ferruginous hawks have the advantage of nesting on the elevated rock features, plateaus and poorer substrates that occur in the area. The scattered white-tailed prairie dog colonies and badger burrows found in the project provide ample nesting habitat for burrowing owls. Great-horned owl pellets are found in the area, therefore, it is presumed they may nest somewhere in the area.

Raptors of casual occurrence include prairie falcon (*Falco mexicanus*), northern harrier (*Circus cyaneus*), and rough-legged hawk (*Buteo lagopus*). Other raptor species such as the sharp-shinned hawk (*Accipiter striatus*, a forest species) and short-eared owl (*Asio flammeus*, a wetland/forest species) may be seen here during spring and/or fall migration. Bald eagle habitat

does not exist within the project area. The Lander and Casper BLM Field Office databases identified ten known and historic raptor nests in the project area. A number of the project area federal oil and gas leases contain raptor stipulations.

Neotropical Songbirds

Many species of neotropical songbirds utilize the project area for breeding, feeding, migration, and as year-round habitats. All habitats throughout the project area are used to some degree by these species, but especially sagebrush-grassland, mountain shrub, and riparian vegetation communities. The Migratory Bird Treaty Act (16 USC, §703 *et seq.*) protects 836 migratory bird species (to date) and their eggs, feathers, and nests from disturbances. Several migratory raptors and songbird species are also listed as BLM Sensitive Species (Section 3.3.3.3).

Table 3.3.3.1 - Grieve Unit project area raptor surveys – May and June 2011

Nest ID # on map	WP #/ Photo No. (GUXXX)	Easting*	Northing*	QQ S-T-R	Substrate (if known)	Status **	Species, condition and data source
HISTORIC BLM RECORD LOCATIONS							
001	BLM 1	330596	4734338	NWSW 18-32-85	No nest located	N	Historic FH; BLM 1 record location
002	BLM 2	330404	4735943	NWSW 7-32-85	No nest located	N	Historic FH; BLM 2 record location
003	BLM 3	333774	4735718	NWSE 9-32-85	No nest located	N	Historic FH; BLM 3 record location
004	BLM 4 /GU007	332411	4734785	SENW 17-32-85	Stick pile on rock outcrop	IA	Inactive FH; Disheveled; white wash
		332326	4734967	NENW 17-32-85			BLM 4 record location
005a	GU008/BLM 5	331846	4734534	SENW 18-32-85	cottonwood	NR	Near dam on Cabin Ck. Reservoir; lg. nest; inactive; Historic FH; two nests; magpie?
005b	GU009/ BLM 5	331847	4734526	SENW 18-32-85	cottonwood	NR	Near dam on Cabin Ck. Reservoir; med. nest; inactive; Historic FH; two nests; magpie?
		331645	4374664	SWNE 18-32-85			BLM 5 record location
006	GU015 /BLM 9	334065	4736895	SESW 4-32-85	Stick pile on ridge	IA	Historic FH; old nest; inactive
		334078	*4736870*	*SESW 4-32-85*			*BLM 9 record location*
007	GU016/ BLM 10	334166	4736987	SESW 4-32-85	Stick pile on ridge	IA	Historic FH; old nest; inactive

Table 3.3.3.1 - Grieve Unit project area raptor surveys – May and June 2011

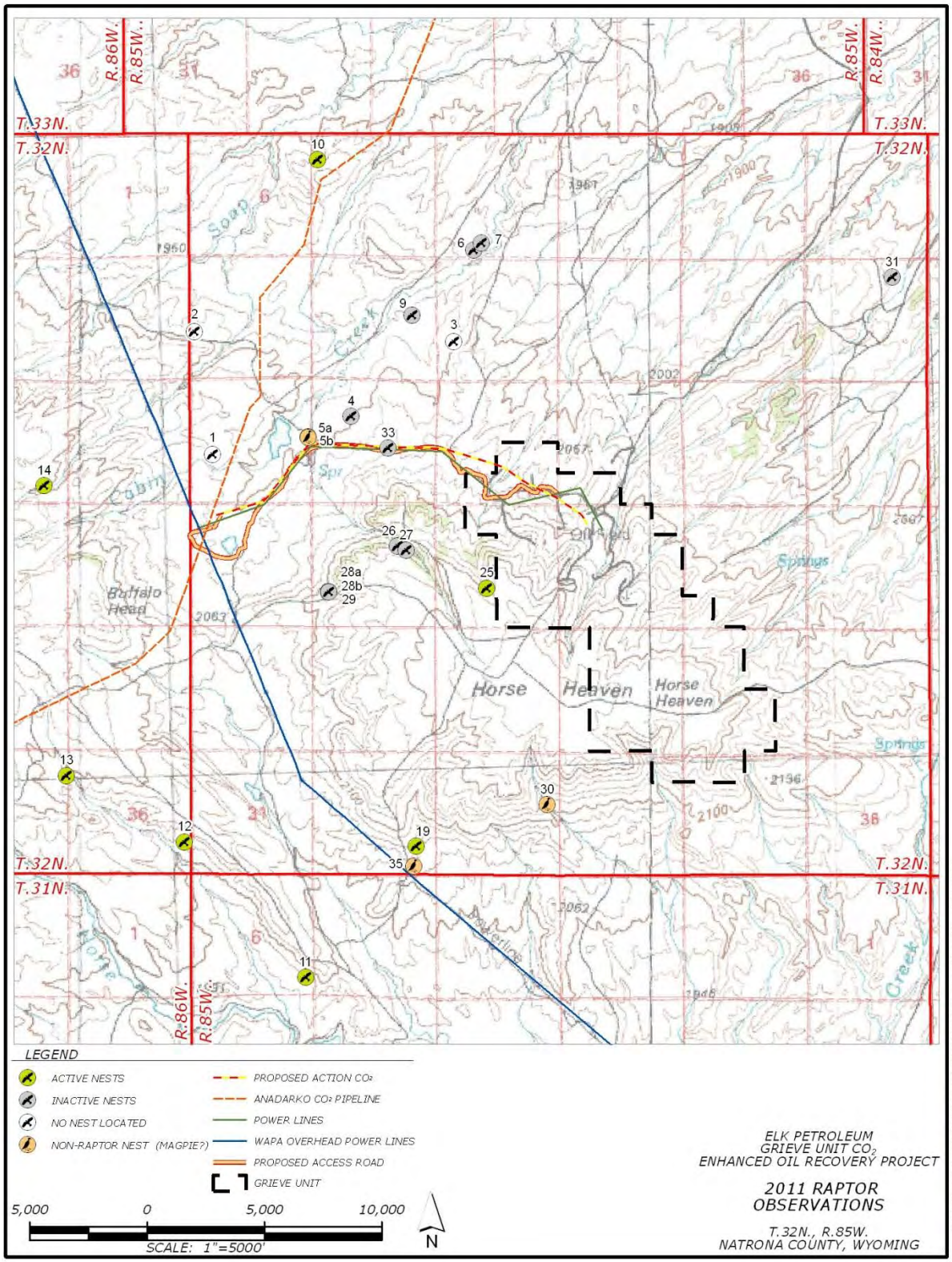
Nest ID # on map	WP #/ Photo No. (GUXXX)	Easting*	Northing*	QQ S-T-R	Substrate (if known)	Status **	Species, condition and data source
		334186	*4736981*	*SESW 4-32-85*			*BLM 10 record location*
009	GU019/ BLM 11	333241	4736076	SENE 8-32-85	Stick pile	IA	Historic FH; inactive (photo hard copy only)
		333363	*473181*	*SENE 8-32-85*			*BLM 11 record location*
010	GU022/BLM 12	332067	4738128	NWNW 5-32-85	Rock outcrop	A	Golden eagle; active nest; two downy white young observed
		331914	*4738188*	*NENE 6-32-85*			*BLM 12 record location*
NEW OBSERVATIONS							
011	GU010	331622	4727524	SESE 6-31-85	Rock outcrop	A	Two adult FH flying near nest; active; feathers and white wash observed
012	GU011	330092	4729325	NESE 36-32-86	Rock outcrop	A	Nest in good condition; evidence of usage inc white wash; adult FH spotted in nest during May 13 aerial survey; movement in nest?
013	013	328590	4730228	NENE 35-32-86	Cottonwood	A	RTH; active nest observed from air; two adults in area; *no photos*
014	GU004/014	328398	4733996	SESE 14-32-86	Cottonwood tree	A	RT; active nest; two adults in area; 350 yds. from PD town; no sign of BO or MP
019	GU014	333103	4729181	SESE 32-32-85	Cottonwood	A	RT seen leaving nest; active
025	GU042/GU043	334107	4732507	NESW 21-32-85	Aspen	A	Stick nest; GE (?) feather below aspen (GU 042)
026	GU044	332963	4733084	SWNE 20-32-	Pine tree	IA	Unknown (RT?); inactive

Table 3.3.3.1 - Grieve Unit project area raptor surveys – May and June 2011

Nest ID # on map	WP #/ Photo No. (GUXXX)	Easting*	Northing*	QQ S-T-R	Substrate (if known)	Status **	Species, condition and data source
				85			
027	GU045/GU046	333079	4733028	SENE 20-32-85	Aspen	IA	Large stick nest; inactive
028a	GU047	332060	4732517	NWSW 20-32-85	Pine tree	IA	Stick nest #1 (larger); inactive
028b	GU048	332060	4732517	NWSW 20-32-85	Pine tree	IA	Two nests in same tree; both inactive (GU047/048/049)
029	GU049	332057	4732517	NWSW 20-32-85	Pine tree	IA	Stick nest #2 (smaller); inactive
030	GU050	334819	4729679	SENE 33-32-85	Shrub (willow?)	NR	Small stick nest; magpie
031	GU051	339483	4736398	NWNE 12-32-85	Stick pile on ridge	IA	Remnants of old stick pile
033	GU057	332883	4734359	NWSE 17-32-85	Pine tree	IA	Two small stick nests; one in poor condition; both inactive
035	GU013	333068	4728926	SESE 32-32-85	Cottonwood	NR	Two nests; no evidence of activity; magpie?

* NAD 83, UTM Zone 13
** N = no nest located A = active raptor nest IA = inactive raptor nest NR = non-raptor nest (magpie?)

Figure 3.3.3.1 - Raptor nests in the Grieve Unit project area



3.3.3.2 Threatened and Endangered Wildlife Species

The U.S. Fish and Wildlife Service suggests that this analysis examine the habitat for the federally designated threatened, endangered, proposed or candidate wildlife species which may occur in the project area (Table 3.3.3.2). The statuses of these potentially affected federally designated species are summarized below.

Table 3.3.3.2 - Threatened and endangered wildlife species possible in project area

Species	Status *	Habitat	Status in Project Area / Comments
Black-footed ferret	**E**	Prairie dog colonies	Eight polygons identified outside the project. Under 200 acres in complex. Not likely to adversely affect determination; falls with block cleared area (Cerovski 2004).
Platte River Species	**E**	Perennial tributaries	WSEO (2012) has determined no ground water depletion associated with project; No effect determination.
Greater Sage-grouse	**Warranted but Precluded**	Sagebrush steppe	One known active lek within 4 miles of $GUCO_2PA$; available associated seasonal habitat; State designated "Core Area."

*** T** - threatened, **E** - endangered, **P** – proposed for listing

Greater Sage-grouse is a sagebrush obligate found entirely in the western United States and Canada, primarily in the intermountain west. Wyoming contains more sage-grouse than all other states combined. The species remains common in Wyoming because its habitat is relatively intact compared to other states. In western Natrona County, as in most of Wyoming, the harsh climate has limited habitat loss and conversion to settlements and agriculture. Historically, disturbance to greater sage-grouse habitat in the area resulted from livestock grazing and oil field development. The greater sage-grouse is considered a sagebrush ecosystem umbrella species, which assumes that conserving its habitats will benefit other species of conservation concern who share the same habitats (i.e., pygmy rabbit, sage thrasher, and sage sparrow; Rowland *et al.* 2006).

Sage-grouse depend on extensive areas of sagebrush for food and cover throughout the year. This dependency includes using sagebrush for forage, nesting habitat, brood-rearing habitat, and winter thermal cover. In addition, sage-grouse require a variety of sagebrush habitat types to meet life-history requirements. Typically, strutting grounds or leks are located in open patches within sagebrush habitat and the surrounding area is considered potential nesting habitat. Nesting habitat tends to have higher sagebrush density, taller live and residual grasses, more live and residual grass cover, and little bare ground (Connelly *et al.* 2004). Mesic habitats also are important for brood-rearing during the summer and fall months. The proximity of nesting habitat to brood-rearing habitat increases its value for broods, but may increase risk for nests (Dzialak *et al.* 2011).

Sage-grouse exhibit fidelity to leks, winter and summer areas, and nesting areas (Schroeder *et al.* 1999). They may be affected by sagebrush community disturbance and removal. Sage-grouse tend to avoid areas that may provide perching or roosting opportunities for raptors (i.e., fence posts, power lines, and structures). Human activity during the breeding season may disrupt lek attendance and affect local breeding success. Populations across the west have declined from historic levels due to a wide range of factors including drought, habitat loss, and habitat degradation (Connelly and Braun 1997, Braun 1998, Connelly *et al.* 2000 and 2004).

As stated in the draft Lander RMP (BLM 2011b), "greater sage-grouse populations have been declining across the western United States, prompting several petitions to list them as threatened under the ESA. In March 2010, the USFWS announced its 12-month finding that listing of the greater sage-grouse is "warranted but precluded." Thus, the species is designated as a candidate for listing with the USFWS and will be reviewed annually to determine if the listing status should be changed. As identified in the USFWS 2010 finding, the greater sage-grouse population in the planning area is part of Management Zone II, one of seven Management Zones for greater sage-grouse delineated by the Western Association of Fish and Wildlife Agencies based upon ecological and biological attributes, which includes sage-grouse populations throughout the Wyoming Basin (USFWS 2010). Threats to greater sage-grouse in Management Zone II are discussed at length in the USFWS finding and would apply to the planning area."

Greater sage-grouse population levels throughout the (Lander) planning area plummeted during the 1990s and then experienced a resurgence in the 2000s. This resurgence is thought to be related to precipitation events that promoted grass growth, thus aiding survival of young (BLM 2011b). Threats to greater sage-grouse include degradation, loss, and fragmentation of habitat, predation, West Nile virus, and human disturbance during sensitive periods (BLM 2011b).

Research is beginning to demonstrate that sage-grouse are sensitive to noise, most notably when it affects habitats used during breeding and nesting seasons (Blickley et al. 2012). Noise related to ongoing workover activities may exceed 55 dBA within close proximity to the equipment or operation in question. No site specific noise data are available for the project area; but it is assumed that ambient noise levels within the area to be 30 to 40 dBA. The project area is subject to frequent strong winds which may add 5 to 10 dBA to normal ambient levels. Locally higher noise levels may be experienced proximal to operating workover and completion operations.

Certain conservation measures and stipulations are enforced by the BLM in accordance with the BLM sensitive species management guidance (BLM 2010a) and by state agencies under the Governor's Executive Order 2011-5 (WGFD 2011a). This Executive Order (EO) is implemented in sage-grouse habitat on public as well as on private lands, where the activities on private and state land are subject to review or approval by state or federal agencies.

It is the policy of WY BLM (IM No. WY-2012-019, BLM 2012) to manage sage-grouse seasonal habitats and maintain habitat connectivity to support population objectives set by the Wyoming Game and Fish Department. This guidance is consistent with guidelines provided in the Wyoming Governor's Sage-Grouse Implementation Team's Core Area Protection strategy and the Governor's Executive Order (Order 2011-5) and provides restrictions on surface

disturbance and disruptive activities during certain times of the year. As described in IM No. WY-2012-019, the LFO will consider and evaluate the following sage-grouse habitat conservation measures related to timing, distance, and density for all proposed projects.

Greater sage-grouse populations are hunted in some areas of Wyoming, including the project area (WGFD 2011a). Since 1995, sage-grouse harvest numbers have been reduced by earlier opening dates, shorter hunting season length, and lower bag limits.

WGFD sage-grouse database identified no leks within two miles of the project area (Figure 3.3.3.2) while 15 leks area known within 11 miles of the project. Of these, only three leks have been consistently unoccupied since the early 1980's. Scattered data exists for approximately 50 percent of these leks until the year 2000 when survey effort in the area increased significantly (WGFD 2011b). Although inconsistency in the number of leks surveyed each year is evident in the data, the surveyed leks are generally occupied. Since 2006, there has been a general decline in the number of birds attending leks in the area and this trend is consistent with that seen for the Natrona and Greater South Pass Core Areas as well as the Statewide trend (Figure 3.3.3.3) (Taylor et al. 2011 using WGFD 2011b data).

Greater sage-grouse aerial surveys were conducted over the project area in April and May 2011 in an effort to determine use of the area by the species. Much of the project falls within the State designated Natrona Core Population Area (Figure 3.3.3.2). The survey area was defined by buffering the Grieve Unit and associated pipeline and power line routes by four miles. The area was surveyed using small aircraft, following the Wyoming Game and Fish Department survey protocol, on April 15, April 28 and May 6, 2011. No new leks were observed during the aerial flights although grouse were observed throughout the survey period on the Austin Creek and Burnt Wagon leks, located 7 and 5 miles to the northeast of the survey area, respectively (Figure 3.3.3.2). Opportunistic records of grouse were made when in the field conducting other surveys (Figure 3.3.3.4); these include six grouse on April 15, a concentrated area of scat piles and a few late summer chicks. Ground surveys are coordinated annually by the WGFD, the 2011 peak male lek attendance data for the leks within the vicinity of the project indicated Austin Creek was attended by 41 males, Burnt Wagon by 8 males and Soap Creek by 12 males. One lek (Soap Creek) is located just shy of 4 miles northwest of the project boundary and was attended by 12 males in 2011 (WGFD 2011b).

Figure 3.3.3.2 – Greater sage-grouse grouse leks in the vicinity of the Grieve Unit

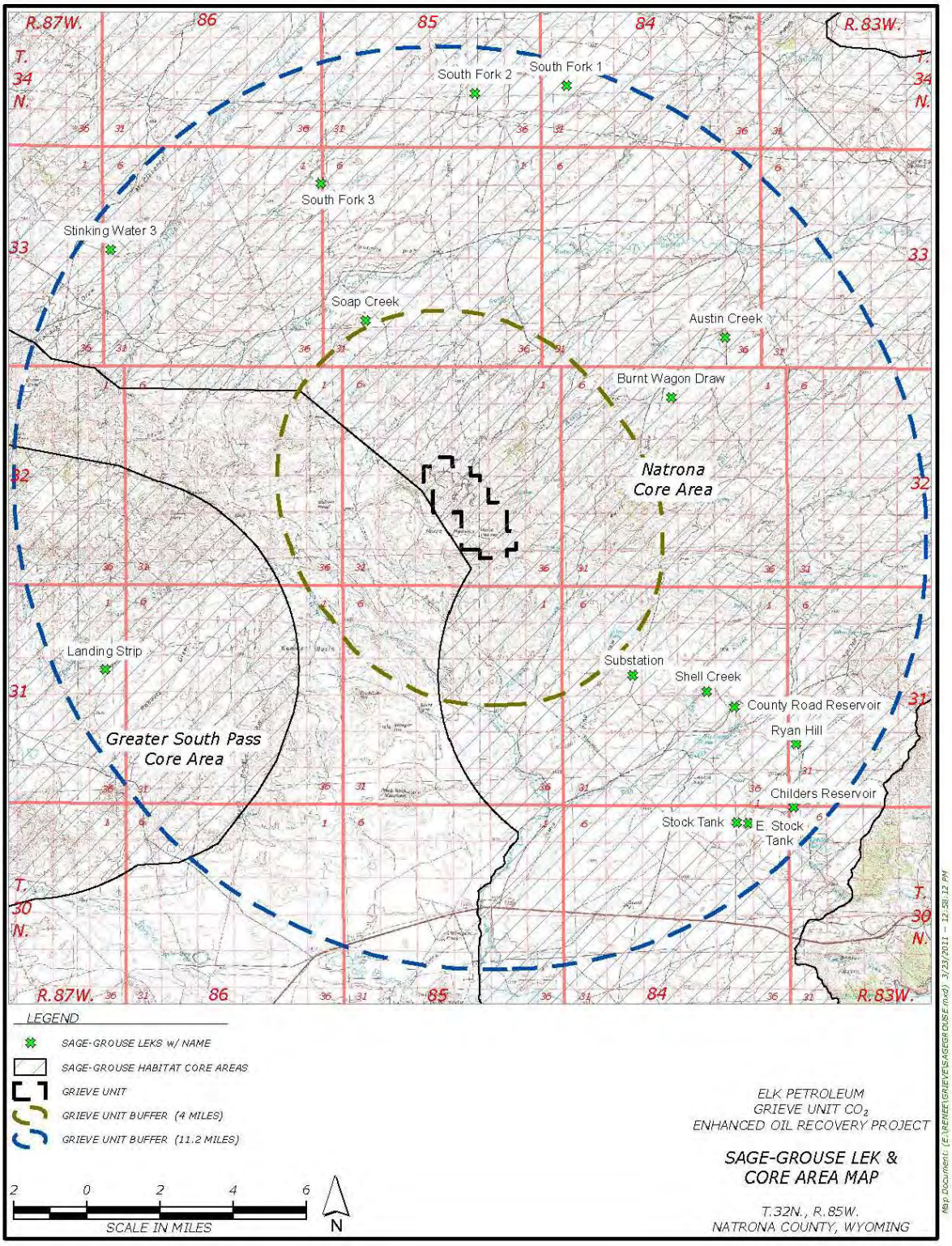


Figure 3.3.3.3 - Grieve Area average peak male lek attendance comparisons

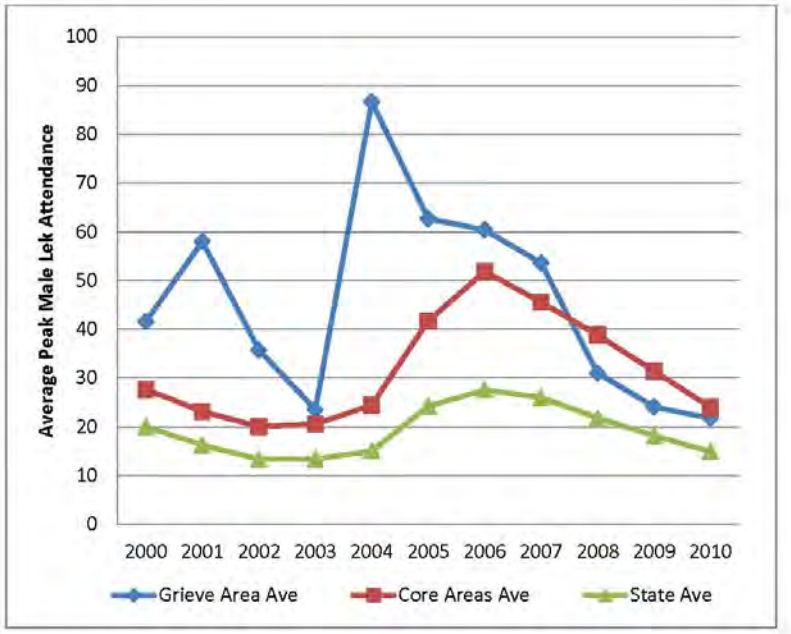
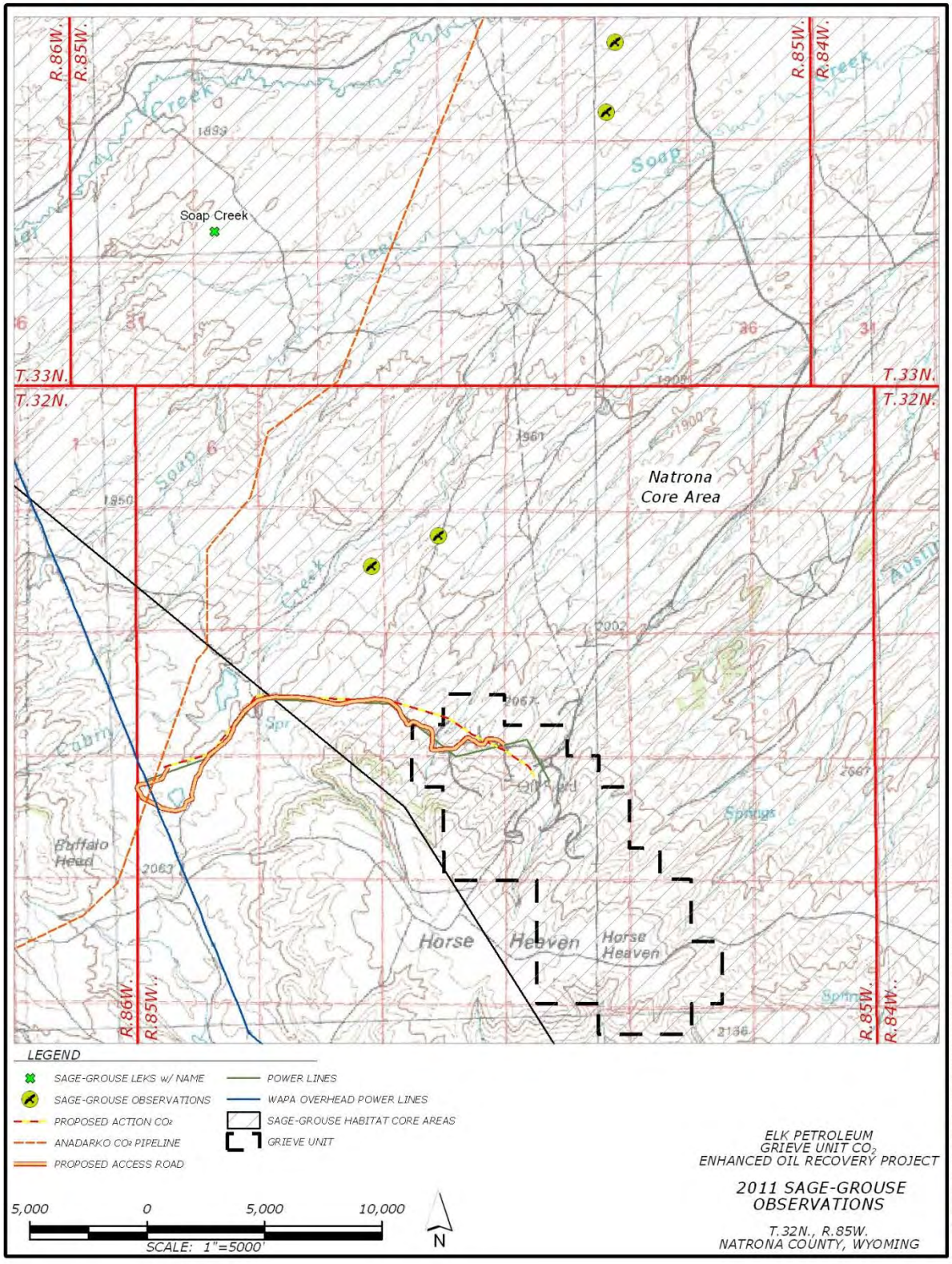


Figure 3.3.3.4 - Greater sage-grouse observations in the Grieve Unit project area



3.3.3.3 BLM LFO Sensitive Wildlife Species List

The assessment area for sensitive wildlife species is the $GUCO_2PA$ boundary. The Wyoming BLM sensitive species and management policy (BLM 2010a) emphasizes planning, management, and monitoring of sensitive species and directs management of these species to avoid or minimize adverse impacts. It is not the intent of the policy to create severe restrictions on activities such that other multiple use activities cannot occur. The policy goals of this policy are to:

- Maintain vulnerable species and habitat components in functional BLM ecosystems,
- Ensure sensitive species are considered in land management decisions,
- Prevent the need for species listing under the Endangered Species Act 1973, and
- Prioritize needed conservation work with an emphasis on habitat.

Fourteen terrestrial wildlife species designated by the BLM as sensitive are present, potentially present, or historically documented within the project area, or potentially could be affected by the Proposed Action (Table 3.3.3.3). The following species descriptions, and associated literature citations, were taken from the BLM Wyoming Sensitive Species Policy and List (BLM 2010a).

Table 3.3.3.3 - BLM LFO Sensitive Wildlife Species List within or near the Grieve Unit project area occurrence potential and habitat associations

Common Name	Scientific Name	Occurrence Potential[1]	Habitat Association[2]
Mammals			
Long-eared myotis	*Myotis evotis*	pp	Caves, forest, shrublands
Swift fox	*Vulpes velox*	pp	Grasslands
Townsend's big-eared bat	*Corynorhinus townsendii*	pp	Caves, forest, shrublands
White-tailed prairie dog	*Cynomys leucurus*	P	Sagebrush-grasslands
Birds			
Brewer's Sparrow	*Spizella breweri*	pp	Sagebrush
Burrowing owl	*Athene cunicularia*	pp	Grasslands
Ferruginous hawk	*Buteo regalis*	P	Sagebrush-grasslands
Loggerhead shrike	*Lanius ludovicianus*	P	Shrublands
Long-billed curlew	*Numenius americanus*	pp	Grasslands
Mountain plover	*Charadrius montanus*	pp	Grasslands
Sage sparrow	*Amphispiza belli*	P	Sagebrush
Sage thrasher	*Oreoscoptes montanus*	P	Sagebrush
Amphibians			
Great Basin spadefoot	*Spea intermontana*	pp	Spring seeps, sagebrush
Northern leopard frog	*Rana pipiens*	pp	Plains and foothills ponds

[1] *Occurrence potential includes: present (P), potentially present (pp);(Cerovski 2004; BLM 2010a, TEC unpublished data).*
[2] *Cerovski 2004.*

Mammals

Townsend's Big-eared Bat is distributed throughout most of Wyoming but is concentrated in the southeastern and north-central portions of the state (Hester and Grenier 2005). Townsend's big eared bat requires undisturbed roosting structures such as caves or abandoned mines during all seasons and stages of its life cycle. Also, *C. townsendii* has high degree of site fidelity. The major threats on BLM-administered lands are: the disturbance or loss of roost sites in caves and abandoned mines due to recreation in caves, mine reclamation, and renewed mining; loss, degradation, and disturbance of foraging habitat; pesticides and other contaminants (Gruver and Keinath 2003; Gruver and Keinath 2006). Habitat for this species is not known to occur in the project area; this species will not be discussed further in this document.

Long-eared Myotis occurs throughout most of Wyoming at elevations between 5000 and 9800 ft. This species inhabits primarily coniferous forest and woodland (Hester and Grenier 2005). Long-eared Myotis uses a wide variety of roosts, including buildings, rock crevices, and hollow trees. Roosts are more likely to be found in close proximity of foraging sites and water sources. The major threats on BLM-administered lands are: disturbance or modification of the roost environment caused by human activities; alteration of foraging areas such as wetlands and riparian systems; wind energy development; chemicals used in forest management practices and toxins associated with mining operations (Buseck and Keinath 2004). While the species has not been documented in the project area, suitable habitat for the species is present.

Swift Fox occurs in the northeastern, east-central, southeastern, and south-central portions of the state (WGFD 2006). This species is generally uncommon (Dark-Smiley and Keinath 2003), and its population trend within Wyoming is currently unknown (Stephens and Andersons 2005). Swift foxes require large open areas of prairie and grassland habitats (Dark-Smiley and Keinath 2003). The major threats on BLM-administered lands are: collisions with automobiles; destruction and fragmentation of suitable habitat due to energy development; predation and interspecific competition (with coyote and red fox); decline of colonial rodent populations (Stephens and Andersons 2005). While the species has not been documented in the project area, suitable habitat is present.

White-tailed Prairie Dog is distributed in the western and the central parts of Wyoming, mostly dominated by sagebrush (WGFD 2005). In June 2010 the FWS announced a determination that the white-tailed prairie dog did not warrant protection under the Endangered Species Act, noting, "We know that white-tailed prairie dog colonies exist in areas with long-term oil and gas development. Some of the largest and most robust colonies are located near areas of intense oil and gas development" (FWS 2010d). White-tailed prairie dog abundance continues to fluctuate dramatically at the local scale. Population status and trends are unknown but are suspected to be stable (WGFD 2006). Sylvatic plague, poisoning, recreational shooting, and habitat loss and fragmentation due to energy development, livestock grazing, and road development are considered the major threats (Keinath 2004). The species has recently undergone a downward trend and it is thereby designated as Sensitive in Wyoming. The white-tailed prairie dog is present throughout the project area

Birds

Numerous sagebrush obligate species of passerine birds migrate through, nest and raise their young within the project area. Among the several hundred species of birds known to occur in the western Natrona County some are species of high federal concern. Greater sage-grouse, sage thrasher, Brewer's sparrow, sage sparrow, mountain plover and loggerhead shrike are seen here during the spring. Other common birds include western bluebird, vesper sparrow, white-crowned sparrow and horned larks.

Sage Sparrow occurs in the summer throughout most of the state where sagebrush is present (WGFD 2005). Sage Sparrows prefer large and undisturbed tracts of tall and dense sagebrush. The main threat is habitat loss, degradation and fragmentation due to invasion of cheatgrass, wildfires and prescribed burns, off-road motorized use, grazing and increasing road and energy development (Holmes and Johnson 2005). Suitable sagebrush habitat is widespread and abundant within the project area and the sage sparrow is expected to breed, and has been observed, within the project area.

Burrowing Owl reaches its highest concentration (in Wyoming) in the south and east, although Borrowing Owls occur and breed throughout most of the state (WGFD 2006). This species requires short-grass habitats and prefers open areas within grasslands, deserts and shrub-steppes (McDonald et al. 2004). The major threats are: habitat loss and fragmentation due to invasion of cheatgrass, energy and road network development (Lantz et al. 2004); declining of colonial burrowing mammals, especially prairie dogs; human disturbance; the use of insecticides and rodenticides; loss to predation (McDonald et al. 2004). Potential burrowing owl habitat (prairie dog and badger burrows) exists in the project area, but the species was not observed during the 2011 project level field surveys.

Ferruginous Hawk breeds across a large portion of Wyoming, and some individuals are found during winter in the southern part of the state. This species occupies arid and open grassland, and shrubsteppe (Travsky and Beauvais 2005). Ferruginous hawks rely on large areas of native grass and shrubs with abundant prairie dogs, other ground squirrels, and jackrabbits (Travsky and Beauvais 2005). Also, this species is sensitive to human activities and disturbances during the breeding season and appears to have high site fidelity (Travsky and Beauvais 2005; Gillihan et al. 2004). The major threats on BLM-administered lands are: habitat loss and fragmentation due to energy development, increasing road density and cheatgrass invasion; declining prairie dogs and ground squirrel activities; human disturbance during the reproductive period; overgrazing; recreational activities, especially motorized vehicle trails; wind energy development (Travsky and Beauvais 2005; Collins and Reynold 2005). Field surveys, in 2011, documented two active and six inactive ferruginous hawk nests (Table 3.3.3.1 and Figure 3.3.3.3) in the Grieve project survey area.

Mountain Plover is found throughout Wyoming in suitable habitat (WGFD 2006). Mountain Plover nests in grasslands, mixed grassland areas, short-grass prairie, shrub steppe, cultivated lands, and prairie dog towns. This species has a narrow range of habitat requirements and appears to have a high degree of site fidelity (Smith and Keinath 2004; Dismore 2003). The major threats are: loss, degradation, and fragmentation of nesting habitat; disturbance by human activities; eradication of prairie dog colonies (68 FR 53083). In May 2011, the FWS determined that the Mountain Plover does not warrant protection under the Endangered Species Act. Suitable habitat for this bird is generally considered flat grasslands with sparse, low growing vegetation and bare ground. Habitats where prairie dogs are found offer much of the needed requirements. Preferentially,

plover nests are found on slopes seldom exceeding 5% during nesting, but during fledging, the clutch and adult may be found utilizing denser vegetation and steeper terrain. Although habitat is present, no mountain plover were observed in the 2011 field surveys conducted for the Grieve project.

Loggerhead Shrike, like all shrikes in Wyoming, are migratory and occur throughout the state. According to Dorn and Dorn (1999) the Loggerhead Shrike is a "common summer resident" in Wyoming from roughly March through September. Important habitat characteristics are the presence of dense shrubs or trees for nesting with nearby open herbaceous areas for foraging (grasslands or pastures) and a high perch density (Keinath and Schneider 2005). The major threats are loss and degradation of breeding and wintering habitats, cattle grazing, collisions with vehicles, and drought (Keinath and Schneider 2005; Wiggins 2005). The preferred habitats of the loggerhead shrike are present in the project area.

Long-billed Curlew can be found throughout most of Wyoming in suitable habitat. Long-billed Curlew occurs in a variety of grasslands communities, from short grass prairies to cultivated hay fields to sagebrush-grasslands (Dark-Smiley and Keinath 2004). The greatest threat to this species on BLM-administered lands in Wyoming is habitat loss, degradation, and fragmentation due to urban and oil/gas development, climate change, and some invasive species infestations. Other threats are: disturbance during breeding season by excessive vehicle traffic, recreation, grazing and nest destruction caused by the agricultural practice called "dragging" (Dark-Smiley and Keinath 2004; Sedgwick 2006). The species was not observed during the 2011 field surveys, suitable breeding habitat for the curlew is present in the project area.

Sage Thrasher is considered a common summer resident and occurs throughout most of Wyoming where sagebrush is present (WGFD 2005). Sage thrashers are sagebrush obligates and seem to be quite selective in sites used for nesting and breeding habitat (Buseck et al. 2004). The greatest threat to Sage Thrasher is habitat loss, modification, and fragmentation due to invasion of nonnative plant species (cheatgrass), agricultural practices, fire, urban and natural resource development, and increased recreational activity (Buseck et al. 2004). Suitable sagebrush habitat is widespread and abundant within the Grieve project area. The sage thrasher is expected to breed within the project area.

Brewer's Sparrow is considered a common summer resident in Wyoming and occurs throughout most of the state (WGFD 2005). The Brewer's Sparrow is a sagebrush obligate. The major threats on BLM-administered lands are habitat loss, degradation and fragmentation due to road and oil/gas development, invasion of cheatgrass, livestock grazing, wildfires and prescribed burns (Holmes and Johnson 2005). Brewer's sparrow is expected to breed within the project area.

Amphibians

Northern Leopard Frog The Fish and Wildlife Service recently determined the Northern Leopard Frog does not warrant protection under the Endangered Species Act (USFWS October 2011). It is found in most of Wyoming, around beaver ponds (WGFD 2005). Northern leopard frogs require small fishless ponds for reproduction and upland habitats for summertime foraging (Smith and Keinath 2004; 2007). The major threats include: loss and degradation of habitat due to livestock grazing, urban development, oil and gas development, poor forestry practices, groundwater pumping,

mining, invasive plant species, and non-native predators; diseases; road impacts, water pollution, air pollution, and effects due to climate change (74 FR 31389). Suitable habitat for the species does occur in the project area.

Great Basin Spadefoot occurs mostly west of the Continental Divide in the Wyoming Basin and the Green River Valley, but is also found east of the divide in Fremont and Natrona counties (WGFD 2005). The Great Basin Spadefoot relies on both aquatic and terrestrial environments. They also require safe passages between these areas and loose soil to burrow (Buseck et al. 2005; WGFD 2005). The major threats include: habitat alteration and fragmentation due to road and oil/gas development, water manipulation, and environmental contamination; invasive plant species, such as cheat grass, and non-native predators (Buseck et al. 2005). Habitat for this species occurs in the project area.

3.3.4 SOILS

3.3.4.1 General Description of Major Soil Types

The Natural Resource Conservation Service (NRCS) completed an order 3 soil survey in 1985 of Natrona County which includes the Proposed $GUCO_2$ project area (NRCS 1997). All soils information found within this document is derived from the NRCS Natrona County Soil Survey. A total of 17 soil series and 12 soil map units occur within the project area (Table 3.3.4.1 and Figure 3.3.4.1).

Table 3.3.4.1 - NRCS map unit symbols and map unit descriptions found within the proposed Grieve Unit CO_2 EOR project area according to the NRCS Soil Survey of Natrona County, Wyoming.

Map Unit Symbol	Map Unit Description
104	Alcova - Stunner, 3-15% slopes
110	Aquic Ustifluvents, saline, 0-3% slopes
129	Boettcher - Pinelli - Worfman loams, 3-15% slopes
137	Brownsto - Lupinto complex loams, 6-40% slopes
162	Cragosen gravelly loam, 6-30% slopes
163	Cragosen - Chalkcreek Association, 3-45% slopes
183	Forelle loam, 2-9 % slopes
184	Forelle - Diamondville complex, 3-15 % slopes
217	Lupinto - Alcova complex, 3-30% slopes
227	Orella - Cadoma - Petrie clay loams, 3-30% slope
256	Rock Outcrop - Ustic Torriorthents, shallow - Rubble land complex, 30-100% slopes
285	Tisworth sandy loam, 0-5% slopes

The majority of soil series are very deep and have a predominant loam soil surface texture. Other surface textures found include gravelly loam, cobbly loam, clay loam, sandy loam and fine

sandy loam. Soils are generally well drained. Most soils have formed in alluvium and slopewash alluvium derived from various sources.

3.3.4.2 Erosion Potential

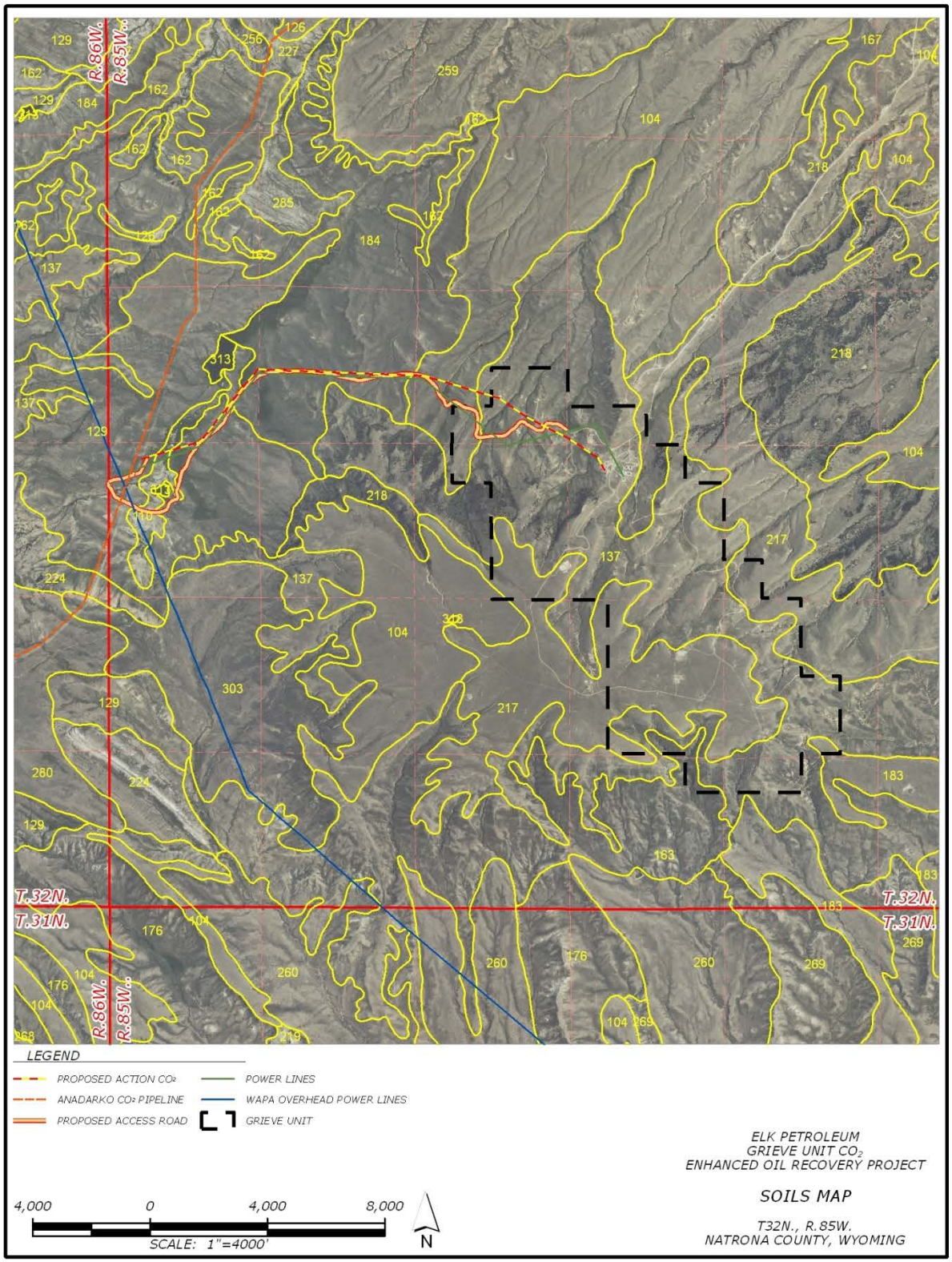
Most of the soils found within the project area are susceptible to wind and water erosion. The soils generally have a severe water erosion hazard with rapid surface runoff and a moderate wind erosion hazard.

3.3.4.3 Soil Ratings and Limitations

Within the project area, suitability of soil as a source of topsoil is rated generally as poor and is limited by small stones, slope, high clay content, depth to rock, excess salt, excess sodium and reclamation difficulty. The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth (NRCS 1997).

The NRCS rating for the construction of roads is considered mostly as severe which means that soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possible increased maintenance are required (NRCS 1997). Soils are generally limited for road construction by slope, flooding, frost action, shrink-swell, low strength, depth to rock, and large stones.

Figure 3.3.4.1 - Soils in project area and vicinity



Limited Reclamation Potential Soils
Limited Reclamation Potential (LRP) areas are defined by the Lander Field Office. The following site and soil characteristics were used to identify LRP areas:

1. Soil textures with poor water holding capacity;
2. Soil textures prone to excessive amounts of erosion by wind or water;
3. Soils with high levels of salts that interfere with plant growth;
4. Soils on slopes in excess of 25%;
5. Soil profiles that limit water holding capacity and/or create rooting-zone limitations; and
6. Coarse fragments that limit common reclamation practices.

LRP determinations identified NRCS map units that met the proper criteria. The LRP map units located within the project area included Map Unit 110 – Aquic Ustifluvents, saline, 0-3% slopes and Map Unit 137 -Brownsto - Lupinto complex loams, 6-40% slopes. NRCS map Unit 110 affects the NW ¼ of section 19, T33N R85W and the SE ¼ of section 18, T33N R85W. NRCS map unit 137 affects the majority of soil located within the project boundary. See Figure 3.3.4.1 for LRP designated areas.

Soils with Excess Salts
Reclamation processes could be hindered by excess salts in the soil which limit the ability of plants to take up water or high sodium concentrations which cause the dispersion of clay particles resulting in a massive structure (soil sealing), which impedes water movement. According to the NRCS the Orella and Tisworth soil series have excess salts or high sodium concentrations.

Soil Compaction
Soil compaction negatively affects plant growth, nutrient cycling, and water infiltration, percolation, and storage, due to decreased pore space and increased density. Increased runoff and erosion may result from the compaction. Soils are more resistant to compaction when they are dry, have well-developed structure or high aggregate stability, vegetative cover, and high organic matter (NRCS 2001). Sandy loam, loam, and sandy clay loam soils compact more easily than other soils (NRCS 2001). Based on surface horizon texture, the majority of soil series are susceptible to compaction.

3.3.4.4 Hydric Soils and Hydrologic Soil Groups

Hydric soils are defined by the National Committee for Hydric Soils as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register 1994). No soils series found within the project area are considered as hydric by the Natrona County NRCS; however, hydric soils were identified during wetland delineation field work and were located mainly in drainage bottoms and flood plains. NRCS Map unit 185-Tisworth sandy loam, 0-5% slopes is found within the project area and may contain the minor inclusion of the hydric Typic Fluvaquents series on floodplains. The Typic Fluvaquent series is hydric criteria code 4 which means that the soil is frequently flooded for long durations or very long durations during the growing season. It meets hydric flooding criteria but does not meet saturation or ponding criteria.

Hydrologic soil groups refer to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil that is bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff (NRCS 1997). Soils are assigned to four groups. The majority of soil series found within the project area are in group D, these soils have a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material (NRCS 1997). Several soil series are also found in hydrologic group B; soils in this group have moderately low runoff potential when thoroughly wet and water transmission through the soil is unimpeded (NRCS 1997).

3.3.4.5 Biological Soil Crusts

The following discussion of biological soil crusts is taken from the United States Geological Survey (USGS 2006).

"Biological soil crusts are formed by living organisms and their by-products, creating a crust of soil particles bound together by organic materials. Chemical and physical crusts are inorganic features such as a salt crust or platy surface crust, often formed by trampling."

"The general appearance of the crusts in terms of color, surface topography, and surficial coverage varies. This color is due in part to the density of the organisms and to the often dark color of the cyanobacteria, lichens, and mosses. Crusts generally cover all soil spaces not occupied by vascular plants, and may be 70% or more of the living cover."

"Crusts play an important role in the environment. Because they are concentrated in the top 1 to 4 mm of soil, they primarily affect processes that occur at the land surface or soil-air interface. These include soil stability and erosion, atmospheric nitrogen-fixation, nutrient contributions to plants, soil-plant-water relations, infiltration, seedling germination, and plant growth."

"Crusts are well adapted to severe growing conditions, but poorly adapted to compressional disturbances. Domestic livestock grazing, and more recently, recreational activities (hiking, biking, and off-road driving) and military activities place a heavy toll on the integrity of the crusts. Disruption of the crusts brings decreased organism diversity, soil nutrients, stability, and organic matter. Full recovery of crust from disturbance is a slow process, particularly for mosses and lichens."

Biological soil crusts likely are found throughout the project area, no specific surveys were conducted.

3.3.4.6 Existing Soil Disturbances

Soil disturbance exists within the project area, fifty-six years of oil production has resulted in equipment and production facilities scattered throughout the Grieve Unit. According to BLM-LFO disturbance data, existing soil disturbances occur on approximately 230 acres and includes pipelines, utility lines, roads, facilities, well pads, production pits, and production equipment and infrastructure. In addition, circa 1960, four housing units and a school were built immediately to the south of the Unit boundary. The area was homesteaded in the late 1800's by the Grieve

family, and livestock grazing operations have occurred in the area since then. As a result of that activity there are man-made stock water ponds, fences, old structures and ranch roads.

3.3.5 VEGETATION INCLUDING INVASIVE NON-NATIVE SPECIES, THREATENED AND ENDANGERED AND SPECIAL STATUS SPECIES

3.3.5.1 Plant Communities in the Grieve Unit Project Area

The proposed $GUCO_2$ project area is located in the Western Range and Irrigated Land Resource Region within the Central Desertic Basins and Plateaus Major Land Resource Area (MLRA 34A) (NRCS 2006). MLRA 34A is primarily located in the Wyoming Basin Province of the Rocky Mountain System. The majority of MLRA 34A is characterized by a semi-desert grass-shrub zone. Average annual precipitation within this zone is 8 to 16 inches (NRCS 2006). Elevation within the proposed project area generally ranges from approximately 6,210 to 7,370 feet above sea level.

Based on plant community descriptions for the 10-14" Precipitation Zone High Plains Southeast Ecological Site Descriptions (ESD) (Brazee 2008 a-g) and field observations, uplands within the proposed disturbance area of the $GUCO_2$ project area are dominated by sagebrush shrublands primarily composed of Big Sagebrush/Mid-Grass plant community and sagebrush grasslands composed of Bluebunch Wheatgrass/Rhizomatous Wheatgrass plant community. Grasslands composed of a Rhizomatous Wheatgrass/Needle-and-thread plant community are less common and interspersed throughout the sagebrush shrublands and grasslands. Saline lowlands are comprised of Alkali Sacaton/Basin Wildrye plant communities. Non-saline drainages and lowlands are dominated by Western Wheatgrass/Kentucky Bluegrass, Nebraska Sedge/Bunchgrass, and Baltic Rush/Annual Forb plant communities. Limber Pine is common on the southern hills of the $GUCO_2$ project area, but occurrence is limited within the proposed disturbance area.

Big Sagebrush/Mid-Grass Plant Community

The Big Sagebrush/Mid-Grass plant community is found on Loamy ecological sites primarily on level plains, slopes, and along drainage edges with shallow to moderately deep soils in the western portion of the proposed disturbance area. Big sagebrush (*Artemisia tridentata*) dominates the site. The understory is composed primarily of western wheatgrass (*Elymus smithii*), needle-and-thread (*Hesperostipa comata*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*) prairie junegrass (*Koeleria macrantha*), Sandberg bluegrass (*Poa secunda*), and threadleaf sedge (*Carex filifolia*). Other shrub species include birdfoot sagebrush (*Artemisia pedatifida*), green rabbitbrush (*Chrysothamnus viscidiflorus*), and rubber rabbitbrush (*Ericameria nauseosa*). Total ground cover for this plant community is typically 80-90% (Brazee 2008a).

Bluebunch Wheatgrass/Rhizomatous Wheatgrass Plant Community

The Bluebunch Wheatgrass/Rhizomatous Wheatgrass plant community is found on Shallow Loamy ecological sites on rolling slopes or rough, broken topography with shallow soils primarily in the eastern portion of the proposed disturbance area. Dominant grasses within this community include bluebunch wheatgrass (*Elymus spicata*), western wheatgrass, blue grama,

threadleaf sedge, and Sandberg bluegrass. Big sagebrush, birdfoot sagebrush, and green rabbitbrush are common. Total ground cover for this plant community is typically 40-60% (Brazee 2008b).

Rhizomatous Wheatgrass/Needle-and-thread Plant Community
The Rhizomatous Wheatgrass/Needle-and-thread plant community is found on Loamy ecological sites on nearly level to gentle slopes with moderately deep soils in isolated locations in the western portion of the disturbance area. This site is dominated by western wheatgrass, needle-and-thread, bluebunch wheatgrass, green needlegrass, prairie junegrass, blue grama, and Sandberg bluegrass. Shrub cover within this community is less than 25% and composed primarily of big sagebrush and rubber rabbitbrush. Total ground cover for this plant community is typically 80-90% (Brazee 2008a).

Alkali Sacaton/Basin Wildrye Plant Community
The Alkali Sacaton/Basin Wildrye plant community is found on Saline Subirrigated ecological sites located primarily in the southwestern portion of the proposed utility corridor. Common plant species within the community include alkali sacaton (*Sporobolus airoides*), Sandberg bluegrass, Nuttall's alkaligrass (*Puccinellia nuttalliana*), western wheatgrass, tufted hairgrass (*Deschampsia caespitosa*), bluejoint reedgrass (*Calamagrostis canadensis*), and Baltic rush (*Juncus balticus*). Basin wildrye (*Elymus cinereus*) was absent in this community within the proposed disturbance area. Shrubs are a minor component of this plant community and consist of big sagebrush and rubber rabbitbrush. Total ground cover for this plant community is typically 80-90% (Brazee 2008c).

Western Wheatgrass/Kentucky Bluegrass Plant Community
The Western Wheatgrass/Kentucky Bluegrass plant community is found on Subirrigated ecological sites within ephemeral drainages with moderately deep to deep soils throughout the proposed disturbance area. Western wheatgrass, Kentucky bluegrass (*Poa pratensis*), and green needlegrass dominate. Low growing sedges and forbs are common. Silver sagebrush (*Artemisia cana*), big sagebrush, and rubber rabbit brush are present. Total ground cover for this plant community is typically greater than 95% (Brazee 2008d).

Nebraska Sedge/Bunchgrass Plant Community
The Nebraska Sedge/Bunchgrass plant community is found within drainages with seasonal to permanent water regimes. All occurrence of this community are within drainages classified as wetlands, based on field surveys, and are found in isolated locations throughout the proposed disturbance area. Dominant species include Nebraska sedge (*Carex nebraskensis)*, Prairie cordgrass (*Spartina pectinata*), and alkali sacaton, tufted hairgrass, and bluejoint reedgrass. Total ground cover for this plant community is typically greater than 95% (Brazee 2008g).

Baltic Rush/Annual Forbs Plant Community
The Baltic Rush/Annual Forbs plant community is found in similar topographic positions as the Nebraska Sedge/Bunchgrass plant community. All occurrence of this community are within drainages classified as wetlands, based on field surveys, and are found in isolated locations throughout the proposed disturbance area. Baltic rush (*Juncus balticus*) is the dominant species. Other common species include Kentucky bluegrass, Timothy (*Phleum pratense*) and carpet

bentgrass (*Agrostis stolonifera*). Annual forbs are not as prevalent within the disturbance area as described in the ESD. Total ground cover for this plant community is typically greater than 95% (Brazee 2008g).

Limber Pine Plant Community
The Limber Pine plant community is isolated primarily to the steeper slopes located in the southern portion of the project area; however, isolated stands are located throughout the project area and within the proposed disturbance area on Very Shallow and Shallow Loamy ecological sites. The canopy of this community is dominated by limber pine (*Pinus flexilis*). The understory is dominated by low growing shrubs and grasses. Shrub species include birdfoot sagebrush, common snowberry (*Symphocicarpus albus*), and big sagebrush. Western wheatgrass is the dominant grass species. Total ground cover for this plant community is typically 60-80%.

3.3.5.2 Invasive Non-Native Species

Non-native species invasion and establishment has become an increasingly important result of previous and current disturbance in Wyoming. These species often out-compete desirable plant species and reduce the overall production of desired grasses, forbs, and shrubs, which serve as forage sources for livestock and wildlife. Additionally, sites dominated by invasive, non-native species often have a different visual character that may negatively contrast with surrounding undisturbed vegetation. The proposed Grieve Unit CO_2 EOR Project Area is subject to noxious weed infestation, especially on new disturbances.

Surveys for Wyoming State Listed Noxious Weeds, Wyoming Weeds of Concern, and Natrona and Fremont County Declared Weeds were conducted within the proposed Grieve Unit CO_2 EOR Project Area (Wyoming Weed and Pest Council 2010a, 2010b, and Fremont County Weed and Pest 2011). Survey areas included current and proposed disturbance areas. Surveyed weed species observed during the weed inventory were GPS located or marked on aerial imagery maps.

Three Wyoming State Listed Noxious Weeds were observed: diffuse knapweed (*Centaurea diffusa*), spotted knapweed (*Centaurea maculosa*), and Canada thistle (*Cirsium arvense*). Six Natrona County Declared Weeds were observed: showy milkweed (*Asclepias speciosa*), cheatgrass (*Bromus tectorum*), wild licorice (*Glycyrrhiza lepidota*) (also listed as Wyoming Weed of Concern), curlycup gumweed (*Grindelia squarrosa*), halogeton (*Halogeton glomeratus*), and foxtail barley (*Hordeum jubatum*). Occurrences, of these species, were typically within and along existing disturbances; however, observations also occurred within native areas proposed for disturbance. Observed species were typically found as isolated individuals or small populations. Refer to the Weed Management Plan (Appendix E) for locations of weed species observed within the proposed project area.

3.3.5.3 BLM LFO Sensitive Plant Species List

Special status species are: (1) Threatened, Endangered, and Candidate species and (2) BLM Sensitive Plant Species. A Special Status Species report for the Grieve CO_2 project area is on file at the BLM LFO.

The BLM has developed a list of sensitive plant species for public lands in Wyoming to help focus management efforts toward maintaining habitats under a multiple use mandate and to prevent the future listing of threatened and endangered species under the ESA. This list is reviewed annually to determine additions and deletions based on recommendations from BLM and non-BLM authorities (BLM 2010a). Those sensitive species identified on the BLM LFO sensitive species list are found on Table 3.3.5.2.

Of the eleven BLM LFO sensitive species, two sensitive plant species were determined to have potential habitat or were present within the proposed project area: Rocky Mountain twinpod (*Physaria saximontana* var. *saximontana*) and limber pine (*Pinus flexilis).*

Rocky mountain twinpod is found on sparsely vegetated rocky slopes of limestone, sandstone or clay (BLM 2010a). This habitat was very limited within the proposed project area (0.6 acres); only occurring at one location between the proposed CO_2 pipeline corridor and access road in NW ¼ SW ¼ of Sec. 17, T32N R85W. A *Physaria spp.* was found at this location; however, due to the timing of the survey (after the flowering period), the plant was not identified beyond genus. This species has not been previously documented within or near the proposed project area (WYNDD 2010).

Limber pine occurs at timberline and lower elevations with sagebrush, usually on western slopes and isolated on eastern slopes of the Rocky Mountains (BLM 2010a). Populations of this species were present within the proposed disturbance and project areas, covering approximately 90.9 acres of the project area. Of these 90.9 acres, approximately 86.7 acres occur outside of the proposed disturbance area. Isolated stands within the proposed disturbance area occur in the SE ¼ SW ¼ Sec. 15, T32N R85W; SE ¼ NE ¼ of Sec. 21, T32N R85W; and SW ¼ NE ¼, NW ¼ NW ¼, and SW ¼ NW ¼ of Sec. 22, T32N R85W encompassing approximately 4.16 acres (based on buffered disturbance boundaries). A small isolated stand of five mid-sized trees and approximately five saplings is also present between the proposed CO_2 pipeline corridor and access road in NW ¼ SW ¼ of Sec. 17, T32N R85W near the proposed 230kV distribution line. Results of the WYNDD data request did not include information for limber pine occurrences within the proposed project area (WYNDD 2011).

Table 3.3.5.1 - BLM Sensitive Plant Species List for the Lander Field Office

Common Name	Scientific Name	Preferred Habitat	Potential Habitat Present within Proposed Project Area	Likely to Occur
Meadow pussytoes	*Antennaria arcuta*	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands	No	No
Porter's sagebrush	*Artemisia porteri*	Sparsely vegetated badlands of ashy or tuffaceous mudstone and clay slopes	No	No
Dubois milkvetch	*Astragalus gilviflorus* var.	Barren shale, badlands, limestone, and redbed slopes	No	No

Table 3.3.5.1 - BLM Sensitive Plant Species List for the Lander Field Office

Common Name	Scientific Name	Preferred Habitat	Potential Habitat Present within Proposed Project Area	Likely to Occur
	purpureus	and ridges		
Cedar rim thistle	*Cirsium aridum*	Barren, chalky hills, gravelly slopes, and fine textured, sandy-shaley draws	No	No
Owl Creek miner's candle	*Cryptantha subcapitata*	Sandy-gravelly slopes and desert ridges on sandstones of the Wind River Formation	No	No
Fremont bladderpod	*Lesquerella fremontii*	Rocky limestone slopes and ridges	No	No
Beaver rim phlox	*Phlox pungens*	Sparsely vegetated slopes on sandstone, siltstone, or limestone substances	No	No
Rocky Mountain twinpod	*Physaria saximontana* var. *saximontana*	Sparsely vegetated rocky slopes of limestone, sandstone, or clay	Yes	Unknown
Limber pine	*Pinus flexilis*	Timberline and at lower elevation with sagebrush	Yes	Yes
Persistent sepal yellowcress	*Rorippa calycina*	Riverbanks and shorelines, usually on sandy soils near high-water line	No	No
Barneby's clover	*Trifolium barnebyi*	Ledges, crevices, and seams on reddish-cream Nugget Sandstone outcrops	No	No

3.3.6 WATER RESOURCES

3.3.6.1 Surface Water

Stream Classification and Water Use

The Wyoming Department of Environmental Quality, Water Quality Division (WDEQ/WQD 2001) classifies Wyoming surface water resources according to quality and degree of protection. The Wyoming Game and Fish Department also categorizes surface waters as to their ability to support fisheries and other aquatic life.

Surface waters in the project area are within the Poison Spider hydrologic unit (HUC 101800-070403); Poison Spider is a sub-drainage within the North Platte River HUC, discussed above. All the surface waters in the project area and vicinity are considered to be Class 3B surface waters (WDEQ 2001). Specifically, Cabin Creek Reservoir and Cabin Creek, a tributary to Soap Creek and an un-named tributary to Poison Spider Creek, both of which are tributaries to the unimpaired, Class 3B portion of Poison Spider Creek (WDEQ 2010), would be potentially

affected by the proposed project. Poison Spider Creek is located more than ten stream miles northeast of the Grieve Unit. Drainage systems to the south of Horse Heaven are dry and unclassified (WDEQ 2001).

WDEQ/WQD defines *Class 3B waters* (WDEQ/WQD 2000) as: tributary waters including adjacent wetlands that are not known to support fish populations or drinking water supplies and where those uses are not attainable. Class 3B waters are intermittent and ephemeral streams with sufficient hydrology to normally support and sustain communities of aquatic life including invertebrates, amphibians, or other flora and fauna which inhabit waters of the state at some stage of their life cycles. In general, 3B waters are characterized by frequent linear wetland occurrences or impoundments within or adjacent to the stream channel over its entire length. Such characteristics will be a primary indicator used in identifying Class 3B waters.

Surface Water Quality

The water quality characteristics of surface waters generally reflect the chemical nature of precipitation in the region and the geologic strata over which the water flows. Water sampling results are often compared to a numerical standard defined for protection of drinking water, aquatic organisms, and other beneficial water uses. While water quality data exists for lower Poison Spider Creek (WDEQ 2010) there are no surface water quality data available for the surface waters in the vicinity of the Grieve Unit.

Surface Water Rights

Surface water rights in the project area date from 1900, the majority were obtained in the name of James Grieve or Lulu Grieve (WSEO 2011). These irrigation appropriations are generally from Canyon Creek. In the 1940's the Dumbell Ranch obtained surface water rights from Poison Spider Creek and Cabin Creek, including the Cabin Creek Reservoir (WSEO 2011). The proposed project will not affect these water rights or their associated conveyance and storage structures.

3.3.6.2 Groundwater

The Grieve Unit (T32N, R85W) is located in the southeast portion of the Wind River Basin. The Wind River Basin is located in almost the exact center of Wyoming and, in general, is an asymmetrical syncline with its axis nearest and parallel to its north and east edges (WSGS website, 2012). The basin's northern side is bounded by the Bridger-Owl Creek-Washakie mountain ranges, while the south side is bounded by the Granite Mountains. The west side of the basin is bounded by the east-dipping flanks of the Wind River Range. The east side is bounded by topographically low Casper Arch, which is a broad upfold of sedimentary rocks which separates the Wind River Basin and the Powder River Basin. The bounding mountain ranges and the Casper Arch do not allow groundwater to leave the Wind River Basin.

Paleozoic and Mesozoic sediments within the basin are highly deformed and are exposed along the basin bounding uplifts. Recharge occurs through precipitation and runoff on the exposed strata and the resulting groundwater migrates down-dip towards the center of the basin. Tertiary

sediments were deposited after deformation of the Paleozoic and Mesozoic sediments and are relatively flat-lying. Groundwater flow to the Tertiary sediments occurs through precipitation, runoff and movement of water from underlying aquifers upwards along faults and fractures (Hinckley and Heasler, 1987). Only Mesozoic aquifers are exposed in the Grieve Unit area. All are Cretaceous in age, are northwest trending and dip into the basin. They are the Cloverly (Kj), Frontier (Kf), Mesaverde (Kmv) and the Lance (Klm) formations. The Phayles Sandstone is the basal member of the Mesaverde Fm. Tertiary aquifers in the Grieve Unit area are the Paleocene Fort Union Fm (Tfu), the Eocene Wind River Fm (Twdr), the Oligocene White River Fm (Twr) and undifferentiated Miocene rocks to the south.

Groundwater Rights

Existing groundwater rights within one mile of the project area consist of 2 wells permitted for miscellaneous use, refer to the discussion below.

Springs

Numerous springs occur in the general vicinity of the Grieve project; many of these have been developed, to some extent, to enhance the water available for agricultural activities in the area.

Shallow groundwater

There are no domestic use water wells listed in the WSEO database within one mile of the Grieve Unit, and there is only one well listed for stock use, the well depth is 300 feet. This well is located in Section 15-T32N-R85W, in the general vicinity of the abandoned Grieve Unit field housing area (WSEO 2011). The only other well in the search area is the Grieve Unit #6. This well has a depth of 917 feet and is listed for miscellaneous use; historically the Grieve #6 provided water for the employee housing area and school house as well as stock water and some industrial use (Forest Oil 1992). The well will flow to surface in the spring, suggesting a shallow completion and surface recharge; it has been used to fill a nearby pond for the surface owner; the TDS is low (Table 3.3.6.1). The Grieve #6 production interval is unknown; though it has an open hole interval from 748 to 917' and a casing part at 667', the artesian flow in the spring and low TDS suggest a shallower source (GGA 2011).

Analysis of logs from the Grieve 31-21 suggests that the Phayles Sand, at a depth of approximately 700 feet, is the lowermost USDW (underground source of drinking water) with TDS (Total Dissolved Solids) in the range of 2,000 to 2,500 mg/l (GGA 2011).

Based on the available information, the depth to shallow, fresh groundwater sources for domestic or stock use that may be impacted by the proposed injection operation is approximately 300 feet (GGA 2011).

Table 3.3.6.1 - Shallow groundwater quality analyses in the Grieve Unit #6

Parameters	Standards		Summary Statistics
	General Water Quality Indicators		
	Drinking Water[1]	Livestock[1]	Grieve Unit #6

Table 3.3.6.1 - Shallow groundwater quality analyses in the Grieve Unit #6

Parameters	Standards		Summary Statistics
General Water Quality Indicators			
Specific Conductance (umho/cm)			718
pH (standard units)	6.5-8.5	6.5-8.5	8.9
Total Hardness (mg/L)			<5
Total Dissolved Solids (mg/L)	500.0	5,000.0	461
Ionic Constituents			
Calcium (mg/L)			1
Magnesium (mg/L)			0.02
Sodium(mg/L)			106
Potassium(mg/L)			3
Chloride (mg/L)	250.0	2000.0	6
Bicarbonate (mg/L)			378
Nitrate + Nitrite (mg/L)	--	100.0	NT[2]

1 WDEQ/LQD Quality Standards for Wyoming Groundwaters (WDEQ/WQD 2008b)
2 NT - Not tested

Deep groundwater

In association with historical Grieve Unit operations, the WOGCC had granted aquifer exemptions in portions of the Unit. The exemptions were for produced water disposal by injection into either the Cloverly (6,800 ft. bgs) or the Muddy Sand (6,600 ft. bgs). The permitted injection wells included the Grieve Unit #1 and the Grieve Unit #49, both of which are currently plugged and abandoned or shut-in, respectively.

In addition, Elk has been granted an aquifer exemption for the Muddy Sand covering the entire Grieve Unit for purposes of CO_2 and water injection to re-pressurize the reservoir and enhance oil production (GGA 2011, WOGCC 2012). The basis for the aquifer exemption is three fold: 1) the Grieve Unit has produced significant hydrocarbons, 2) the Muddy Sand is located at approximately 6600 feet - a depth that is not likely to be developed for water supply, and 3) the Muddy Sand exhibits TDS over 7000 mg/l (Table 3.3.6.2) (GGA 2011, WOGCC 2012).

Approval of the Aquifer Exemption was contingent upon many factors demonstrating the integrity of the injection well and isolation of the injection zone (GGA 2011). One of the factors considered by the WOGCC and EPA was, "Injection wells shall be cased and the casing cemented in such a manner that damage will not be caused to fresh water sources."

Table 3.3.6.2 - Groundwater quality analysis for the Muddy formation in the Grieve Unit

Parameters	Standards		Summary Statistics
General Water Quality Indicators			
	Drinking Water[1]	**Livestock[1]**	**Grieve Unit #9**

Specific Conductance (umho/cm)			13000
pH (standard units)	6.5-8.5	6.5-8.5	7.44
Total Hardness (mg/L)			106
Total Dissolved Solids (mg/L)	500.0	5,000.0	7780
	Ionic Constituents		
Calcium (mg/L)			25
Magnesium (mg/L)			11
Sodium(mg/L)			2934
Potassium(mg/L)			21
Chloride (mg/L)	250.0	2000.0	2765
Bicarbonate (mg/L)			3945
Nitrate + Nitrite (mg/L)	--	100.0	NT[2]

1 WDEQ/LQD Quality Standards for Wyoming Groundwaters (WDEQ/WQD 2008b)
2 NT - Not tested

3.3.6.3 Wetlands and Riparian Areas

Waters of the United States

Waters of the U.S. is a collective term for all areas subject to regulation by the U.S. Army Corps of Engineers (ACOE) under Section 404 of the Clean Water Act (CWA). Waters of the U.S. include the territorial seas, interstate waters, navigable waterways (such as lakes, rivers, and streams), special aquatic sites, and wetlands that are, have been, or could be used for travel, commerce, or industrial purposes; tributaries; and impoundments of such waters. All channels that carry surface flows and that show signs of active water movement are Waters of the U.S. Similarly, all open bodies of water (except ponds and lakes created on upland sites and used exclusively for agricultural and industrial activities or aesthetic amenities) are Waters of the U.S. (EPA 33 CFR § 328.3(a)). Such areas are regulated by the ACOE and EPA. Any activity that involves discharge of dredge or fill material into or excavation of such areas is subject to regulation by the ACOE pursuant to Section 404 of the CWA. Some of the drainages within the project area (as identified from field surveys) exhibit wetland characteristics but may be considered non-jurisdictional wetlands or non-jurisdictional waters of the United States by the ACOE.

Wetlands are aquatic features characterized by three specific components: hydric soils, a dominance of hydrophytic plants, and wetland hydrology. These areas are often inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a vegetation community typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. These sites are typically highly productive and diverse, and provide habitat for many wildlife species. Wetlands play an important role in controlling floodwaters, recharging groundwater, and filtering pollutants (Niering 1985). The National Wetlands Inventory map (EPA 2011) indicates limited wetlands habitat within the

Grieve Unit CO_2 EOR project area, including a few scattered areas of "freshwater emergent vegetation" along the proposed utility corridor.

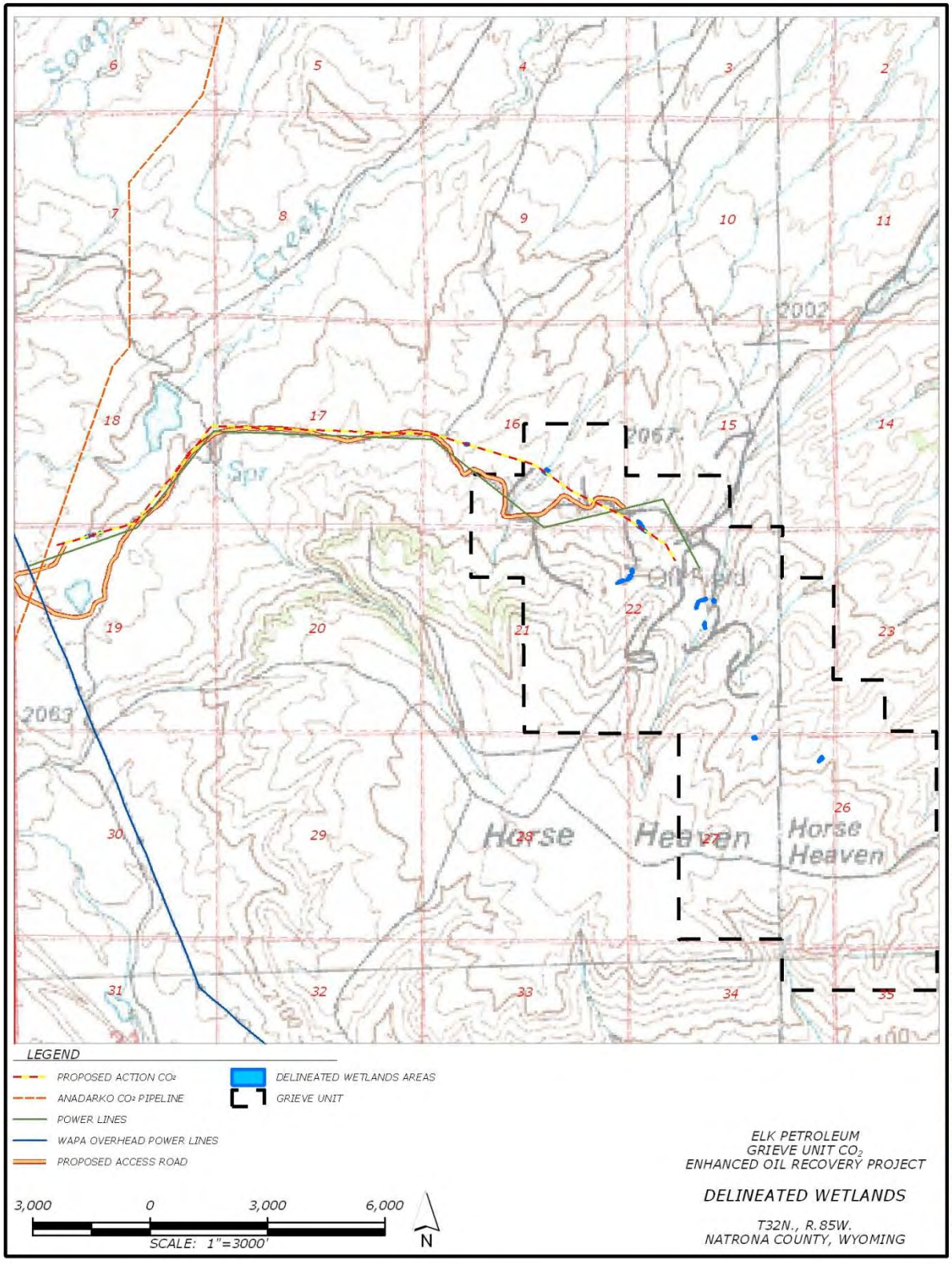
Field observations conducted in August 2011 indicated the presence of wetland hydrology, a dominance of hydrophytic vegetation, and the presence of hydric soils within the proposed action area for the $GUCO_2$ pipeline, as well as, the overhead and underground power lines (Figure 3.3.6.1). Dominant vegetation species include; Nebraska sedge (*Carex nebrascensis*), Baltic rush (*Juncus balticus*), Common threesquare (*Schoenoplectus pungens*), and Common spikerush (*Eleocharis palustris*). The total acreage of wetlands affected by the proposed project disturbance is approximately 1.53 acres.

These wetlands are classified as Palustrine Emergent, seasonally flooded (PEMC) wetlands, diked/impoundment (PEMCh) wetlands, or Palustrine Aquatic Bed, semipermanently flooded, diked/impoundment (PABFh) wetlands (Cowardin 1978). These wetlands are located within perennial, intermittent, and ephemeral drainages, and open water (either natural or manmade). Hydrology for most wetlands within the project area are dependent upon spring runoff and precipitation. However, the hydrology of a few wetlands located within the Grieve Unit CO_2 project area is potentially maintained by seeps. Field observations indicated that wetlands are not present at the proposed well pad locations as these areas were dominated by upland vegetation and hydric soils were not present. Approximately 0.6 acres of wetlands are located along the proposed alignment of the CO_2 pipeline and underground 25 kV underground power distribution line (Figure 3.3.6.1).

Historic NWI mapping of the project area included classifications of Palustrine Aquatic Bed, semipermanently flooded, diked/impounded (PABFh) and Palustrine Unconsolidated Bottom, semipermanently flooded, excavated (PUBFx). These wetland classifications are either not affected by the purposed disturbances or were not field verified.

The project area is approximately 20 miles from the closest traditional navigable water (TNW), the North Platte River. The U.S Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook dated June 1, 2007 prevents making a positive determination of a significant nexus if the tributary is "so remote to make the effect of the TNW speculative or unsubstantial." However, for purposes of this report, all identified wetlands are considered jurisdictional due to their connection to Poison Spider Creek, which is connected to the North Platte River. Final determination of jurisdictional decision lies within the USACE.

Figure 3.3.6.1 - Grieve project area delineated wetlands



3.3.7 SOCIOECONOMICS

The Grieve Unit project lies wholly within Natrona County. The geographic area of analysis for socioeconomic effects includes western Natrona County, focusing on the project area and the greater Casper metropolitan area of central Wyoming.

Population and Employment Demographics

Like Wyoming in general, Natrona County is once again in a period of economic growth in response to an overall up-turn in oil and gas, uranium and alternative energy development. This follows closely on the heels of an energy "crash" that lasted from the third quarter of 2008 to mid-2009. Casper continues to be the most diverse energy sector support center of the state, as it has been since the early days of the oil industry in the late 1800's. Casper is home to a number of regional offices for oil and gas operations companies, field service providers, and industry trade associations as well as consulting engineering support firms. The oil and gas industry drives the economy of Natrona County, or as stated by the Wyoming Department of Workforce Services (WDWS) (2011) regarding the economic upturn realized in 2011, "job growth showed up in Natrona County where many drilling companies and oil & gas field service firms are located (WDWS 2011)."

As the major energy industry support center of the State, the number of wells spudded throughout the state has a direct correlation to the employment rate in Natrona County. Natrona County, and the region, is experiencing an increase in other forms of energy production, including resurgence in uranium and a growing wind energy sector.

According to the WDWS, the August 2011 unemployment rate in Natrona County was 5.7 percent, slightly higher than the statewide average of 5.5 percent and significantly lower than the nationwide average of 9.1 percent (WDWS 2011). At that time Natrona County reported a workforce of 41,270, almost 39,000 of which were employed. This represents an improvement from the 7.0 percent unemployment rate seen in August 2010 (WDWS 2011). The total income improvements seen in Natrona County were driven by a 30% increase in total mining sector payroll, which includes the oil and gas industry. The next largest growth was seen in the manufacturing sector with an 18.3 percent increase in total payroll over the same period (WDWS 2011). As stated in the 2010 Wyoming Consensus Revenue Estimating Group, or CREG, report, "minerals related employment is one of the key predictors of sales and use tax income" in Wyoming.

The U.S. Census Bureau estimates that Natrona County population grew from 66,533 in 2000 to 75,450 in 2010, a 14.2 percent increase over the ten year period. The majority of the residents live in Casper, with an estimated 2010 population of 55,316.

The population growth in Natrona County over the last decade absorbed most of the existing multi-family affordable single family housing and rental units. With the 2009 economic downturn and the cooling of the oil and gas industry the housing picture changed resulting in few housing starts in central Wyoming. Foreclosures were up. Currently, there are ample housing units for sale, empty rental units and vacancies in many hotels (G. Taylor, pers. com. 2011). In

addition, an estimated 294 new privately-owned residential building permits were issued in 2010 comprising an additional 807 living units (USBC 2010).

Public Services

The nearest law enforcement and emergency response services to the Grieve Unit CO_2 project area is Casper, approximately 53 miles to the east. Wyoming Medical Center, located in Casper, is an accredited Regional Trauma Center with helicopter transport capability.

Economic Diversity

Natrona County is heavily reliant on the minerals industries for its tax base. In addition to minerals, other economic activities that occur within and near the Grieve Unit are livestock grazing and outdoor recreation, principally hunting and wildlife watching. Uranium and wind energy project planning and development are increasing in central Wyoming.

Although there is widespread support for oil and gas development in communities near the study area, the health of public lands and the protection of wildlife and wildlife habitat are also very important to many residents (Blevins et. al.2004, BLM 2003 and 2006).

CHAPTER 4 - ENVIRONMENTAL EFFECTS (IMPACTS) AND CUMULATIVE IMPACTS

4.1 INTRODUCTION

This chapter provides an analysis of the potential environmental consequences that could result from implementation of either the No Action or the Proposed Action, the development of the Grieve Unit CO_2 ($GUCO_2$) project.

This chapter analyzes impacts to the following relevant issues, as identified in Chapter 1, and is organized by resource in the same order as found in Chapters 2 and 3:

Climate, Climate Change, & Air Quality

- Potential effects to air quality due to increased traffic, emissions, production activities and associated effects on existing county, state, and BLM roads.
- Impacts to climate change and the State of Wyoming commitment to CO_2 (Green House Gas) sequestration and enhanced recovery of oil from existing fields.

Cultural

- Provide protection of cultural and Native American resources, including protection of sites within the project area.

Wildlife including Threatened and Endangered and Special Status Species

- Ensuring protection of the BLM designated Special Status Species ferruginous hawks and other raptors during nesting season, sagebrush obligate song birds and white-tailed prairie dog.
- Protection of the BLM designated Special Status Species greater sage-grouse potentially affected by the project including all seasonal habitats with specific emphasis on protection of designated Core Population Areas.
- Effect of project related noise on greater sage-grouse.
- Indirect, connected, related, long-term and cumulative impacts of the project on wildlife habitats and diversity.
- Cumulative effects of the proposed project when combined with ongoing crude oil and natural gas drilling and development.

Soils

- Soil productivity and erodibility are potentially affected by project construction activities.

Vegetation including Invasive Non-Native Species and Special Status Species

- Protection of the BLM designated Special Status Species and their habitats.
- Project related impacts to rangeland condition and plant community diversity.
- Control of invasive, non-native species (weeds).
- Project disturbance reclamation.

Water Quality (Groundwater & Surface Water)

- Impacts on wetlands and riparian areas.

- Impact to ephemeral and intermittent drainages from erosion from disturbed sites.
- Possible effects to surface and groundwater resources from well drilling and completion, construction and operations activities.

Socioeconomics

- Impacts of the project to the Federal, State, local economies.
- Providing opportunity for alternative energy sources including wind projects.

Design features which are measures, proposed by the applicant and/or required by the BLM, that would avoid or reduce impacts have been identified in Chapter 2, Section 2.3.8. The following impact assessment takes these design features into consideration. If, after successful implementation of design features, impacts remain these impacts are either unavoidable or can be eliminated or reduced through the implementation of mitigation measures. Any additional opportunities to mitigate impacts are presented in this chapter under the mitigation summary for each resource. Such measures are designed to further reduce or avoid unnecessary or undue impacts. BLM will conduct Inspection and Enforcement (I&E) throughout the life of the field.

Chapter 4 provides the scientific and analytical basis for comparisons of the alternatives, and provides a disclosure of the probable consequences (impacts, effects) of each alternative. Residual effects are those impacts, if any, that remain after the application of the design features and any identified additional mitigation measures.

4.2 GENERAL ANALYSIS ASSUMPTIONS

Impacts have been categorized according to the phase of development and duration of activities on the resources. Temporary impacts would be defined in this section as impacts that occur during of construction and drilling operations and any additional activities that are limited in duration of not more than 30-45 days. Short-term impacts would be defined as impacts to the resources that persist after drilling operations have been completed and remains until interim reclamation has been successfully completed. Short-term impacts could last up to 5 years or until interim reclamation standards are achieved. Long-term impacts would be defined as the life of the producing well, which typically is more than 20 years or until the well has been abandoned and final reclamation standards have been achieved.

Impacts are also categorized by direct or indirect, and beneficial or adverse. The analysis identifies these types of impacts and compares the alternative accordingly.

Direct impacts are those effects that are caused by the action and occur at the same time and place. Indirect impacts are those effects that are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Sometimes it is difficult to separate these to impacts and so the effects maybe describe together.

4.3 RELEVANT ISSUES AND RESOURCES - IMPACT ANALYSIS

4.3.1 CLIMATE, CLIMATE CHANGE, & AIR QUALITY

- Potential effects to air quality due to increased traffic, emissions, production activities and associated effects on existing county, state, and BLM roads.

- Impacts to climate change and the State of Wyoming commitment to CO_2 (Green House Gas) sequestration and enhanced recovery of oil from existing fields.

Air pollutant emissions would occur temporarily during infrastructure and field development and over the Life of the Project (LOP) during oil production. These emissions would impact air quality in the project area. Pollutants emitted would include particulate matter less than 10 microns in diameter (PM_{10}), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC), and sulfur dioxide (SO_2).

The emission of these pollutants and their air quality impacts are limited by regulations, standards, and implementation plans established under Wyoming Air Quality Standards and Regulations (WAQSR). Under FLPMA and the Clean Air Act, the BLM cannot conduct or authorize any activity that does not conform to all applicable local, state, tribal, or federal air quality laws, statutes, regulations, standards, or implementation plans. As such, significant impacts to air quality from project-related activities would result if it is demonstrated that:

- National Ambient Air Quality Standards (NAAQS) or Wyoming Ambient Air Quality Standards (WAAQS) would be exceeded; or
- Class I or Class II PSD Increments would be exceeded; or
- Air Quality Related Values (AQRVs) would be impacted beyond acceptable levels.

All NEPA analysis comparisons to PSD Class I or Class II increments are intended to evaluate a threshold of concern, and do not represent a regulatory PSD increment consumption analysis. The determination of PSD increment consumption is an air quality regulatory agency responsibility. Such an analysis would be conducted to determine minor source increment consumption or, for major sources, as part of the New Source Review process. The New Source Review process would include an evaluation best available control technologies (BACT) and evaluate potential impacts to AQRV such as visibility, aquatic ecosystems, flora, fauna, etc., performed under the direction of federal land managers.

4.3.1.1 Impacts of Alternative A: No Action

4.3.1.1.1 Direct and Indirect Impacts

Under the No Action Alternative the proposed action and all its associated components would not be constructed, and no additional drilling would occur on federally managed lands and leases. As a result, no additional air emissions would be generated and no additional impacts to air quality would occur from the development of the federal mineral estate. The area would be in compliance with all ambient air quality standards and PSD increments. There would not be any impacts to AQRVs, including regional haze and atmospheric deposition at the distant PSD Class I Bridger Wilderness Area. In addition there would not be any impact to climate change.

4.3.1.1.2 Cumulative Impacts

Under the No Action Alternative, the well sites and access roads would not be constructed and no drilling would occur. As a result, no air emissions would be generated and no impacts to

cumulative air quality or to AQRV's would occur from this development. In addition there would not be any impact to climate change.

4.3.1.1.3 Mitigation Measures - not applicable

4.3.1.1.4 Residual Impacts - not applicable

4.3.1.1.5 Monitoring and/or Compliance - not applicable

4.3.1.2 Impacts of Alternative B: Proposed Action

4.3.1.2.1 Direct and Indirect Impacts

Emission sources would occur as part of field development (construction) and oil production. Construction emission sources include vehicle traffic, well pad and road construction, pipeline construction, construction of field support facilities including centralized production and power lines and substations, and well drilling and completion activities. These activities would temporarily elevate pollutant levels, but impacts would be localized and would occur only for the short-term duration of the activities.

Fugitive dust emissions (PM_{10} and $PM_{2.5}$) would result from work crews commuting to and from the work site and from the transportation and operation of equipment during construction. Wind-blown fugitive dust emissions would also occur from open and disturbed land during construction. Gas venting is not anticipated; however, any gas releases during the development of 10 proposed new wells would be regulated by WDEQ-AQD. Sulfur is not present in the oil found in the Grieve Unit CO_2 Project Area; therefore, no hydrogen sulfide (H_2S) emissions would occur during well development or during production.

Emissions from construction were quantified using accepted methodologies, including manufacturer's emission factors, EPA emission factors, and engineering estimates. Total criteria pollutant emissions from construction of both a single well and field-wide are shown in Table 4.3.1.

Table 4.3.1 – Estimated Grieve Unit CO_2 project construction emissions

Activity	Tons					
	PM_{10}	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_2**	**VOC**
Single Well:						
Well Pad Construction	0.066	0.006	--	--	--	--
Well Pad and Road Construction Traffic	0.76	0.08	--	--	--	--
Well Pad and Road Construction Heavy Equipment	0.006	0.006	0.17	0.096	0.005	0.015
Drill Rig Engines	0.083	0.083	2.48	1.43	0.09	0.17
Drilling Traffic	0.34	0.034	--	--	--	--
Completion Engines	0.041	0.041	1.24	0.72	0.046	0.083
Completion Traffic	0.55	0.05	--	--	--	--
Total Single-Well Construction Emissions (tons/well)	**1.9**	**0.30**	**3.9**	**2.2**	**0.1**	**0.3**

Table 4.3.1 – Estimated Grieve Unit CO_2 project construction emissions

Activity	Tons					
	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_2	VOC
Field-Wide:						
Well Pad Construction	0.38	0.04	--	--	--	--
Well Pad and Road Construction Traffic	0.76	0.08	--	--	--	--
Well Pad and Road Construction Heavy Equipment	0.03	0.03	1.00	0.58	0.03	0.09
Support Facilities Construction	11.49	1.09	--	--	--	--
Support Facilities Construction Traffic	1.82	0.18	--	--	--	--
Support Facilities Construction Heavy Equipment	0.14	0.14	4.29	2.48	0.12	0.38
Substation Construction	10.30	0.98				
Substation Construction Heavy Equipment	0.26	0.26	7.74	4.47	0.22	0.69
Pipeline Construction	35.56	3.37	--	--	--	--
Pipeline Construction Traffic	0.98	0.10	--	--	--	--
Pipeline Construction Heavy Equipment	0.05	0.05	1.40	0.81	0.04	0.12
Drill Rig Engines	0.83	0.83	24.76	14.31	0.91	1.65
Drilling Traffic	3.38	0.34	--	--	--	--
Completion Engines	0.41	0.41	12.38	7.15	0.46	0.83
Completion Traffic	5.49	0.55	--	--	--	--
Total Annual Field-Wide Construction Emissions (tons/year)	**79.4**	**9.2**	**51.6**	**29.8**	**1.8**	**3.8**

During production in the field, vehicle traffic traveling on unpaved roads during routine field operations and maintenance activities would result in emissions of fugitive dust. Well sites would be powered by electricity; therefore, no diesel combustion equipment would be required at well sites during production. The product would be piped to the centralized production facility, where CO_2 and water are separated from the oil. CO_2 is pressurized for reinjection, oil is stored for shipment, and produced water is piped to the injection wells for reinjection. The separation process is a closed system and compression at the centralized facility is powered by electricity; therefore air pollutant emissions from the central production facility would be expected to be negligible. Pollutant emissions from wells during production would be limited to any pressure release required during the estimated 10 well workovers per year in the field.

Production equipment is subject to current and future WDEQ-AQD O&G production facility BACT guidance. Annual emissions calculated for production activities are summarized in Table 4.3.1.2.

Table 4.3.1.2 – Estimated Grieve Unit CO_2 project annual production

emissions

Activity	Tons/Year					
	PM_{10}	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_2**	**VOC**
Workover Rig Engines	0.14	0.14	4.29	2.48	0.16	0.29
Production Traffic	4.67	0.46	--	--	--	--
Emergency Generator	0.005	0.005	0.21	1.68	0.01	0.05
Total Annual Production Emissions	**4.8**	**0.6**	**4.5**	**4.2**	**0.2**	**0.3**

As shown in Table 4.3.1.1, construction, drilling, and completion of a single well site would emit less than 4 tons of NO_x and less than 2 tons of PM_{10}. This well development phase would be temporary and would occur in isolation, with no other sites in the field under concurrent development, and the emission rates quantified would be spread over the construction period of 34 days (estimated: 4 days pad and road construction, 20 days drilling, 10 days completion).

Air pollutant concentration impacts from well production in the field would be expected to be negligible given that quantified emission rates of any one pollutant are less than 5 tons per year field-wide, as shown in Table 4.3.1.2, a result of a relatively small number of wells in the field, the use of electric line power, and no proposed stationary fuel combustion sources.

Given the quantity of emissions associated with construction and operation activities of the proposed action, project source emissions would not cause or substantially contribute to a violation of any applicable ambient air quality standard, and the proposed action would comply with all applicable PSD increments. The contribution from project source emissions to ambient pollutant concentrations and AQRV's, including regional haze and atmospheric deposition at the distant PSD Class I Bridger Wilderness Area would be negligible.

Climate change analyses are comprised of many factors, including GHGs, land use management practices, the albedo effect, etc. The tools necessary to quantify climatic impacts from this small-scale Project are presently unavailable. Therefore, climate change analysis for the purpose of this document is limited to accounting and disclosing factors that contribute to climate change.

Direct GHG emissions were estimated for the Proposed Action. Annual GHG emissions calculated for the Proposed Action are listed in Table 4.3.1.3.

Table 4.3.1.3 – Estimated Grieve Unit CO_2 project annual GHG emissions

Activity	**CO_2e Emissions (metric tons/year)**
Construction:	
Well Pad and Road Construction Heavy Equipment	17.4
Support Facilities Construction Heavy Equipment	52.1
Substation Construction Heavy Equipment	188.1
Pipeline Construction Heavy Equipment	34.0
Drill Rig Engines	2593.2
Completion Engines	1296.6

Total Construction Emissions:	**4181.3**
Production:	
Workover Rig Engines	448.8
Emergency Generator	14.8
Total Production Emissions:	**463.6**

Indirect emissions of GHG from electricity consumption also are associated with the oil and gas industry. The estimated 15,000 to 20,000 horsepower requirement for this project can be met with existing regional power availability and would require no additional generating capacity.

The total direct emissions of GHG from the Proposed Action over the 30-year LOP are approximately 18,098 metric tons, or 0.03 percent of the Wyoming budget. Impact assessment of specific Project-related activities cannot be determined.

GHG emissions from the Proposed Action are offset through the reduction in atmospheric CO_2 venting at the ExxonMobil Shute Creek Gas Plant, which will provide CO_2 to the Grieve Unit. In an order under Wyoming Oil and Gas Conservation Commission Docket 434-2010 (WOGCC 2010) and in preceding orders, ExxonMobil is required to "diligently pursue and develop a market for CO_2" to reduce the atmospheric release of marketable CO_2. The Shute Creek Gas Plant underwent a compressor expansion completed in November 2010 to increase CO_2 production from 230 Mmcf/day to 340 Mmcf/day to meet market demand. Total CO_2e emitted over the LOP from construction and production activities (18,089 metric tons, equivalent to approximately 348 Mmcf) is 0.16 percent of the 220 Bcf of CO_2 to be purchased from the Shute Creek Gas Plant for sequestration within the Grieve Unit, a volume that would otherwise be vented to the atmosphere in the absence of the sequestration market.

4.3.1.2.2 Cumulative Impacts

Cumulative impacts to air quality would include impacts from the proposed Project emissions in combination with impacts from regional background emission sources. Calculated field-wide annual emissions of criteria pollutants during production are small, as shown in Table 4.2. The cumulative impact of this small amount of air pollutant emissions on regional air quality would be anticipated to be negligible, and the Proposed Actions would be expected to have negligible impact on regional ambient air quality standards or AQRVs at the Bridger Wilderness Area.

The tools necessary to quantify climatic impacts from this small-scale project are presently unavailable. Therefore, climate change analysis for the purpose of this document is limited to accounting and disclosing factors that contribute to climate change. Both direct and indirect emissions of GHGs were estimated for the Proposed Action above, and the total of these emissions from the Proposed Action represent a small contribution, 0.03 percent, to the Wyoming GHG budget (CCS 2007).

A cumulative reduction in GHGs could occur in the region through the reduction in atmospheric CO_2 release at the ExxonMobil Shute Creek Gas Plant, which will provide CO_2 to the Grieve

Unit. Total CO_2e emitted over the LOP from construction and production activities (18,089 metric tons, equivalent to approximately 348 Mmcf) is 0.16 percent of the 220 Bcf of CO_2 to be purchased from the Shute Creek Gas Plant for sequestration within the Grieve Unit. The purchased volume would otherwise be vented to the atmosphere in the absence of the sequestration market, and facilitates a region-wide reduction in CO_2 emissions.

4.3.1.2.3 Mitigation Measures

Implementation of the design features found in Chapter 2 should avoid or reduce impacts to air quality.

The WDEQ-AQD requested the addition of the mitigation found below to assure appropriate state permits are acquired for any temporary or permanent equipment used in association with this project. With application of this measure, state requirements for permitting for emissions would be met.

- The proponent would seek appropriate permits and follow state protocol for approval of all on-site temporary or permanent equipment used in association with this project from the Wyoming Department of Environmental Quality, Air Quality Division.

4.3.1.2.4 Residual Effects

Residual effects to air quality are considered relatively transient in nature, the effect not continuing beyond final reclamation of the emitting source. The concept of "global climate change" is premised on the concept that carbon based air emissions are residual in the environment and the effects realized for decades, if not longer. The injection of CO_2 into the subsurface (sequestration) is consistent with the State of Wyoming desire to reduce overall CO_2 emissions into the environment and the statutory mission of the Enhanced Oil Recovery Commission and the Enhanced Oil Recovery Institute at the University of Wyoming (State Statute 30-8-101).

4.3.1.2.5 Monitoring and/or Compliance

Compliance with the Wyoming Department of Environmental Quality, Air Quality Division rules and regulations as outlined in the Chapter 2 Design Features, and described in detail in Chapter 3, will provide protection to the resource.

4.3.2 CULTURAL RESOURCES

4.3.2.1 Impacts of Alternative A: No Action

4.3.2.1.1 Direct and Indirect Impacts

Under the No Action Alternative, the development of the federal mineral resource associated with the Proposed Action would not occur. State and fee mineral leases could undergo further development in the Grieve Unit and the existing production operations would continue. Selection of the No Action alternative does not preclude BLM from considering new proposals on a case by case basis, if brought forward.

4.3.2.1.2 Cumulative Impacts

As demonstrated above, there would be no cumulative impacts realized from the selection of the No Action alternative.

4.3.2.1.3 Mitigation Measures - not applicable

4.3.2.1.4 Residual Impacts - not applicable

4.3.2.1.5 Monitoring and/or Compliance - not applicable

4.3.2.2 Impacts of Alternative B: Proposed Action

4.3.2.2.1 Proposed Action Direct and Indirect Effects

Analysis of potential impacts to cultural resources considers both direct and indirect impacts. Direct impacts may occur by:

- Physically altering, damaging, or destroying all or part of a resource.
- Altering characteristics of the surrounding environment that contribute to the resource's significance.
- Introducing visual or audible elements that are out of character with the property or alter its setting.
- Neglecting the resource to the extent that it deteriorates or is destroyed.

Direct impacts can be assessed by identifying the types and locations of proposed activities and determining the exact location of cultural resources that could be affected. Indirect impacts could result from the effects of project-induced changes to land use patterns. For example, the creation of new roads increases public access to the area which could result in possible illegal collection of cultural resources.

Adverse effects to historic properties would be mitigated first by avoidance, then by other measures determined in consultation with the Wyoming State Historic Preservation Office and affected Tribes as appropriate. In some instances, monitoring by a professional archaeologist of surface disturbing activity is useful to reduce the potential damage to cultural resources. Direct impacts would primarily result from construction related activities. Activities considered to have the greatest potential effect on cultural resources include blading of well pads and associated facilities and the construction of roads and pipelines. Sites located outside the project area would not be directly affected by the construction activities.

Based on the cultural resource surveys conducted in the summer of 2011 and the spring of 2012 (Section 3.3.2), cultural resource clearance is recommended for the Elk Petroleum, Grieve Unit CO_2 power line, individual power line structure access roads, utility corridor access road and CO_2 pipeline route. Six newly recorded isolates, three newly recorded sites, and two previously recorded sites were identified during the current project. The isolates are not considered to be significant cultural resources. Adjustments made in the alignment of the existing two track road that provides access for utility corridor resulted in the avoidance of one site while scattered areas of lithic scatter, recommended as not eligible, will be impacted by road re-construction activities. The eolian sands along the proposed access road re-construction represent the only areas of

perceived depositional potential in the entire project area. Due to the potential of the eolian sands in NW¼ of Section 19, T32N, R85W, a blading monitor is recommended in that area for construction of the access roads, power line, pipeline, and Buffalo Head Switchyard.

In addition, cultural resource clearance is recommended for the well locations, access roads, and in-field pipelines. Two newly recorded sites were identified during the current project. One cairn site was recommended as unevaluated pending Native American consultation. The site would not be physically impacted by construction. The viewshed of the cairn is severely impacted by an overhead power line and multiple well locations, access roads, and pipelines. The other site is a prehistoric cairn site that was recommended as unevaluated pending Native American consultation. The site could be physically impacted by construction. Tribal consultation was conducted on both sites in October and November 2011 with the Eastern Shoshone and Northern Arapaho tribal elders, observers and Tribal Historic Preservation Officer (THPO). Alternative well site locations and mitigation were provided for one site and approval granted for the other.

4.3.2.2.2 Cumulative Impacts

Disturbance and/or loss of unidentified sites or artifacts may add to the cumulative loss of information about our heritage in the project area and throughout the region, if these resources are not identified, inventoried, and/or appropriately protected or mitigated. However, such losses are not expected as the design features found in Chapter 2 would be implemented. Any potential future development projects with federal involvement would require the same level of analysis and protection. In the absence of cultural resource clearances and/or other federally mandated cultural resource protection measures on private lands, increased impacts to cultural resources may occur.

Cumulative impacts to cultural resources would be minimized by the avoidance of cultural resource sites with surface expression, and the identification and recovery of information from subsurface finds representing buried resources or sites during open trench monitoring.

4.3.2.2.3 Mitigation Measures

None recommended, application of the design features identified in Chapter 2 would minimize potential impacts to cultural resources.

4.3.2.2.4 Residual Effects

Residual effects to the cultural resources could occur even if mitigation measures are applied and unidentified resources were impacted. These effects would not rise to the level of significance.

4.3.2.1.5 Monitoring and/or Compliance

Application of the design features in Chapter 2, which provide specific monitoring requirements are adequate to protect cultural resources.

4.3.3 WILDLIFE INCLUDING THREATENED AND ENDANGERED AND BLM SPECIAL STATUS SPECIES

Standards for healthy public rangelands require that such lands are capable of sustaining viable populations and a diversity of native animal species appropriate to that habitat. Those habitats that support threatened, endangered species, species of special concern, or sensitive species will be maintained.

With increasing surface disturbance, the potential for direct and indirect impacts to wildlife increases however the use of existing transmission line corridors, utility corridors and the activity within the existing federal oil and gas unit habitat fragmentation and associated disturbance is reduced. Indirect effects would include impacts from additional noise, dust, and human presence. Some of these species may alter their behavior and home range use within the proximity of project infrastructure and adjacent areas.

4.3.3.1 General Wildlife Species

4.3.3.1.1 Impacts of Alternative A: No Action

4.3.3.1.1.1 Direct and Indirect Effects

Under the No Action Alternative, the development of the federal mineral resource associated with the Proposed Action would not occur. State and fee mineral leases could undergo further development in the Grieve Unit and the existing production operations would continue. Selection of the No Action alternative does not preclude BLM from considering new proposals on a case by case basis, if brought forward.

4.3.3.1.1.2 Cumulative Impacts

As demonstrated above, there would be no cumulative impacts realized from the selection of the No Action alternative as conditions would not change.

4.3.3.1.1.3 Mitigation Measures - not applicable

4.3.3.1.1.4 Residual Impacts - not applicable

4.3.3.1.1.5 Monitoring and/or Compliance - not applicable

4.3.3.1.2 Impacts of Alternative B: Proposed Action

4.3.3.1.2.1 Direct and Indirect Effects

The effects on wildlife resulting from the proposed project would include displacement of wildlife, loss or temporary disturbance of wildlife habitats, an increase in the potential for collisions between wildlife and motor vehicles, and an increase in the potential for illegal kill, harassment and disturbance of wildlife due to increased human presence and improved vehicle access. The magnitude of impacts to wildlife resources would depend on a number of factors including the type and duration of disturbance, the species of wildlife present, time of year, and successful implementation of avoidance and mitigation practices.

The direct disturbance of wildlife habitat in the project area likely would reduce habitat availability and effectiveness for a variety of big game and small mammals, birds, reptiles, amphibians, and their predators. An increase in mortality from increased vehicle use of roads in the project area would also be expected. An estimated 171 acres of short-term, or temporary, disturbance would be affected by new surface-disturbing project activities under the Proposed Action which would potentially affect wildlife. Interim reclamation would be implemented following each stage of project activities and is expected to return most habitats to pre-disturbance conditions in the long term. Interim reclamation is expected to reduce the number of acres lost to approximately 35 acres of direct habitat loss. Re-establishment of "pre-disturbance" conditions in the high elevation sagebrush steppe environment of the north side of the Grieve project area is likely to take more than 20 years. Re-establishment of the grass dominated habitats of Horse Heaven (the southern portion of the area) will occur over the short term.

The extent of wildlife displacement is impossible to predict for most species since the response to disturbance varies from species to species and can even vary between different individuals of the same species. After initial avoidance, some species may acclimate to the activity and begin to reoccupy areas previously avoided (Kuck *et al.* 1985). During construction, it is expected that some resident species will avoid active project areas. Disturbances from human activity and traffic would reduce wildlife use of habitats immediately adjacent to these areas by species sensitive to indirect human disturbance (noise and visual disturbance). Wildlife use of these areas would be lowest during the construction phase when human activities are more extensive and localized. Disturbance would decline during the production phase of operations and some animals may become habituated to equipment, facilities, and infrequent human presence, and may reoccupy habitats near disturbed areas.

The reaction of individual animals to noise and human presence varies depending on the intensity of the noise source and whether it is continuous or intermittent. Transient loud noises would provoke alarm responses; however, many animals habituate to more constant, lower-level noise sources that are not associated with negative visual stimuli or experiences such as being chased or hunted (reviewed in Busnel and Fletcher 1978; Weisenberger *et al.* 1996). This acclimation and reoccupation may occur following construction and drilling operations when the project moves into the production phases where less noise and human activities would take place. As a result, species might acclimate to the well-pad production facilities and use habitats adjacent to such sites, particularly at night when facilities-maintenance activities do not occur (Thompson and Henderson *et al.* 1998, Dzialak *et al.* 2011a; 2011b, Webb *et al.* 2011).

Increased traffic levels on new and existing roads could increase the potential for wildlife/vehicle collisions for the life of the project.

Due to the relatively high reproduction potential of some species and the relatively small amount of habitat disturbed, small mammal and songbird populations should quickly rebound to pre-disturbance levels following reclamation of utility corridors, unused portions of roads, well pads, and wells that prove to be unproductive. If displacement occurs re-colonization is expected once project related disturbance is reduced. No long-term effects on populations of common small mammals and songbirds are expected. Any potential impacts to amphibians are expected to be minimal due to project avoidance of riparian/wetland areas and the design features applied to wetland area pipeline crossings (see Section 4.3.6.3, Wetlands). Species that are Threatened,

Endangers, Proposed and Candidate under the Endangered Species Act (ESA) are discussed in Section 4.3.3.3; BLM Special Status Species are discussed in Section 4.3.3.4.

Big Game

Human-caused surface disturbances such as well pads, pipelines and roads can reduce use of surrounding habitat by wildlife. There is generally a zone of decreased use surrounding these sites due to the increased human activity. On average this zone extends to approximately 0.7 miles from development for big game species (Hebblewhite 2008). The area of aversion generally is the least for pronghorn and increases for elk and mule deer (Powell 2003, Berger 2006, Sawyer *et al.* 2006a). Consequently, project development impacts to big game can extend beyond the physically disturbed area.

Effects on big game species would include direct loss of habitat and forage, and increased disturbance from activities associated with the project. Disturbance of big game species during the parturition period and on winter range can increase stress and may influence species distribution and productivity (Hayden-Wing 1979, Morgantini and Hudson 1980) as well as individual survival. No crucial big game winter range has been identified for pronghorn, mule deer or elk in the project area. No crucial big game parturition areas are found in the project area. No big game migration corridors were identified in the literature (Feeney *et al.* 2004).

Big game will be affected, however the level of effect is expected to be within the acceptable range, as the project area represents less than one percent of pronghorn, mule deer, or elk winter or year-long range within the respective herd units. Individuals could be impacted by the project activities due to avoidance of human activities. Snow removal could impede big game movement if berms were too high or if there were no breaks in the berms. Design features, as found in Chapter 2 will be implemented to minimize impacts to big game species. Available habitat in the project area will be reduced until pre-disturbance reclamation conditions are achieved; big game species are expected to return to the area as they have with the existing production operations.

There is potential for an increase in poaching and harassment of big game, particularly during winter. Big game would be expected to demonstrate some avoidance of the area for the life of the project due to an increase in human presence, although some individuals may habituate to the human activity.

Upland Game Birds

No effect on migrating Mourning Dove is anticipated from implementation of the proposed action. Greater sage-grouse is discussed in Section 4.3.3.3.

Raptors

Raptor nesting and foraging habitat is found throughout much of the Grieve CO_2 project area. All raptor species and active nests are protected under the Migratory Bird Treaty Act (MBTA), golden eagles are further protected under the Bald and Golden Eagle Protection Act (BGEPA). In general, birds are more sensitive to indirect impacts, such as unexpected noises, than mammals. Literature suggests that noise levels greater than 49 dBA within breeding habitat from April 1 through June 30 are a negative impact to game and non-game birds, especially at night (WGFD 2010b). The Proposed Action could have some potential for noise impacts above

49 dBA within raptor breeding habitat during the construction phase. Development too close to nests of some species of raptors has been identified to result in the nest abandonment or failure.

There are seven active, four unknown and twelve inactive raptor nests known in and near the Grieve CO_2 project area (refer to Section 3.3.3). Active raptor nests will have a nesting season timing stipulation buffer of three-quarters of a mile from February 1 to July 31. Actual distances and dates may vary based on species, topography, season of use and other pertinent factors (BLM 2011b). These stipulations are intended to prevent nest abandonment. There is one active raptor nest within ¾ mile of or within the Grieve project area; this nest was not observed as occupied during spring 2012 surveys.

There is a reasonable potential that burrowing owls may inhabit suitable prairie dog, ground squirrel or badger burrows within the project area, although no burrowing owls were identified during the 2011 surveys. Some potential habitat loss will occur from project construction activities as white-tailed prairie dogs are seen along the access roads and on the existing well sites in the field. The project components, as proposed, do not impact the most densely populated prairie dog colonies in the project area, further reducing the possibility of impacting nesting burrowing owls. Active burrowing owl nests would be protected by a nesting season timing stipulation buffer from April1 to September 10 within ½ mile of an identified nest.

These surface disturbance and seasonal timing stipulations apply to all surface disturbing activities as well as drilling, and completion activities within the designated species specific protective buffer. Exceptions to these stipulations may be granted by the BLM AO if the nest is not active or fledglings are no longer using the nest.

4.3.3.1.2.2 Cumulative Impacts

The cumulative effects analysis area for wildlife varies depending on the habitat needs of the species. Figure 4.3.3.1 illustrates the general area of analysis, the Grieve CO_2 project buffered by ten miles. Within the ten mile buffer there are six delineated oil fields and numerous outside oil wells for a total 96 active and 194 inactive wells, crude oil and CO_2 pipelines, county roads, ranching operations, power transmission and distribution lines and one power substation.

Impacts to big game species would be as described for the Proposed Action and increased to include other on-going, permitted and reasonably foreseeable activities within the respective WGFD designated herd units.

The pronghorn herd units affected by Grieve project are very large and include in addition to the on-going activities listed above, to the north there is expanding natural gas development, to the west of the Rattlesnake Hills is the proposed Cameco in-situ uranium project as well as the reclaimed Gas Hills mining district, and to the south there have been is discussions of wind energy and transmission lines but no projects formally proposed. No crucial winter range for the species is impacted by the Grieve Unit so cumulative impacts to crucial habitat will not occur. The hunt areas affected by the Grieve project are geographically the same as the herd units described below for mule deer and elk.

The on-going, permitted and reasonably foreseeable activities within the affected mule deer and elk herd units can be described similar to those affecting pronghorn with the exception of the

Cameco project and the Gas Hills mining district. Again, no crucial winter range for either species is impacted by the Grieve Unit so cumulative impacts to crucial habitat will not occur.

Known raptor nests are identified on Figure 4.3.3.1. The cumulative impacts analysis area for raptors is the Grieve project buffered by one mile. Other on-going, permitted and reasonably foreseeable activities within this area include the existing Anadarko CO_2 pipeline and the Western Power Administration transmission lines.

4.3.3.1.2.3 Mitigation Measures

- Snow removal would be done in a manner that would not preclude movement by big game (i.e., no tall berms or regularly spaced breaks in the berms).
- All field employees and contractors will undergo training regarding wildlife sensitivity and regulations similar to the Pinedale Working with Wildlife program.

4.3.3.1.2.4 Residual Impacts

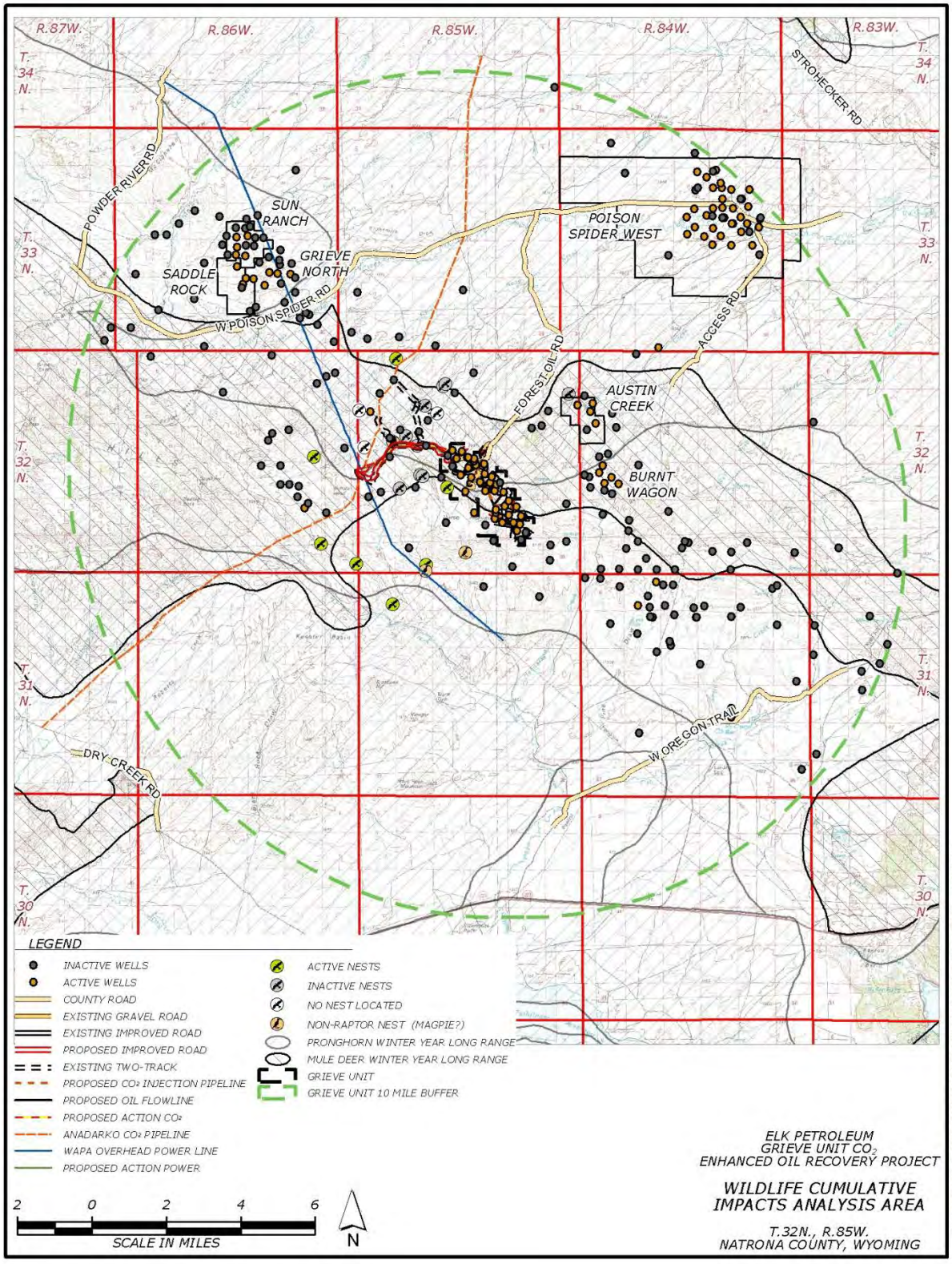
Big Game Residual Impacts - Residual effects, while not reaching the level of significance, would occur even if mitigation measures were implemented as displacement is expected and accidental mortalities may occur.

Raptor Residual Impacts - Residual effects to raptor species, while not reaching the level of significance, would occur even if mitigation measures were implemented as displacement is expected and accidental mortalities may occur. If displacement occurs re-colonization is expected once project related disturbance is reduced.

4.3.3.1.2.5 Monitoring and/or Compliance

Application of the design features in Chapter 2, which provide specific compliance requirements, are adequate to protect wildlife resources.

Figure 4.3.3.1 – Wildlife cumulative impacts analysis area



4.3.3.2 Threatened and Endangered Wildlife Species

4.3.3.2.1 Impacts of Alternative A: No Action

4.3.3.2.1.1 Direct and Indirect Effects

Under the No Action Alternative, the development of the federal mineral resource associated with the Proposed Action would not occur. State and fee mineral leases could undergo further development in the Grieve Unit and the existing production operations would continue. Selection of the No Action alternative does not preclude BLM from considering new proposals on a case by case basis, if brought forward.

4.3.3.2.1.2 Cumulative Impacts

As demonstrated above, there would be no cumulative impacts realized from the selection of the No Action alternative.

4.3.3.2.1.3 Mitigation Measures - not applicable

4.3.3.2.1.4 Residual Impacts - not applicable

4.3.3.2.1.5 Monitoring and/or Compliance - not applicable

4.3.3.2.2 Impacts of Alternative B: Proposed Action

4.3.3.2.2.1 Direct and Indirect Effects

Greater Sage-grouse

Effects to greater sage-grouse could include direct loss of habitat and forage, and increased disturbance from project related activities. Disturbance of sage-grouse during the nesting and brood rearing period and on winter concentration areas can increase stress and may influence species distribution. There may also be a potential for increased poaching and harassment or increased predation from raptors using facilities for perching. Greater sage-grouse would be expected to demonstrate avoidance of the area for the life of the project depending upon the level of human activity and where it occurs in relation to suitable habitat. Noise and human disturbance in proximity to a lek may lead to lek abandonment, reduced nesting and nest failure.

Sage-grouse can be impacted by other activities associated with project development, including increased human activity, increased traffic, noise associated with project construction, drilling and completion activities, as well as traffic and operations.

The eastern two-thirds of the Grieve CO_2 project area is within the Natrona Core Area, as defined by the Sage-Grouse Core Breeding Areas Version 3 Map (WGFD 2011a). Areas of suitable sage-grouse nesting, brood rearing and late brood rearing habitat, as well as potential winter habitat, occur within the project area disturbance area. The western portion of the utility corridor falls outside the designated core area and is dominated by grasslands. There is one lek known within four miles of the Grieve CO_2 project components (Figure 3.3.3.2); brood rearing habitats will be impacted by development in the project. This lek was occupied in 2011,

according to the WGFD 2011 database. No winter concentration areas have been identified in the project area.

The Wyoming Sage-grouse Core Area concept (WGFD 2011a) and the Wyoming BLM Instructional Memorandum for Greater Sage-grouse Habitat Management Policy (WY-2012-019) provides habitat protection to leks within the identified Core Areas and increased mitigation flexibility relative to non-Core Area leks and associated seasonal habitats. This BLM IM generally mirrors, and expands on, the protections provided by the Wyoming Core Area concept.

The Lander Field Office GIS staff ran the required project specific Density Disturbance Calculation Tool (DDCT, WGFD 2012) exercise and determined that there are approximately 568 acres of existing disturbance within the DDCT analysis area with proposed 171 acres of new disturbance. The number of disruptions on the landscape falls below 1 disruption per 640 acres and the number of acres of disturbance is less than 5% (1.07 percent) per 640 acres within the DDCT analysis area (Figure 4.3.3.2). Given the co-location of project infrastructure in previously disturbed corridors, the existing (pre-2008) federal oil and gas unit and the level of commitment to sage-grouse specific design features the WGFD and the BLM have determined that the project will not cause declines in Greater Sage-Grouse populations.

4.3.3.2.2.2 Cumulative Impacts

As discussed above, the DDCT analysis demonstrates that the existing density of oil and gas wells and the disturbance of habitat from the existing and proposed projects are within the limits provided in the DDCT and BLM IM WY-2102-019 and will not cause declines in Greater Sage-Grouse populations. The cumulative impacts analysis area is the Grieve Unit buffered by 11.2 miles (Figure 4.3.3.3). With the exception of a few scattered well proposals in existing fields, there are no known proposed or reasonably foreseeable projects located within the cumulative impacts analysis area.

4.3.3.2.2.3 Mitigation Measures

In addition to the design features listed in Chapter 2,

- Coordinate with the WGFD to determine lek monitoring needs and what data should be reported.
- Be willing to use adaptive management if declines on affected leks are observed and are attributed to the proposed project.

4.3.3.2.2.4 Residual Impacts

Residual effects, while not reaching the level of significance, would occur even if design features are implemented as habitat will be disturbed, displacement is expected and accidental mortalities may occur. If sage-grouse are displaced from suitable habitat, re-colonization is expected once project related disturbance is reduced (Harju et al. 2010).

4.3.3.2.2.5 Monitoring and/or Compliance

Application of the design features in Chapter 2 and the mitigation listed above are adequate to protect greater sage-grouse.

Figure 4.3.3.2 - Greater sage-grouse DDCT analysis area

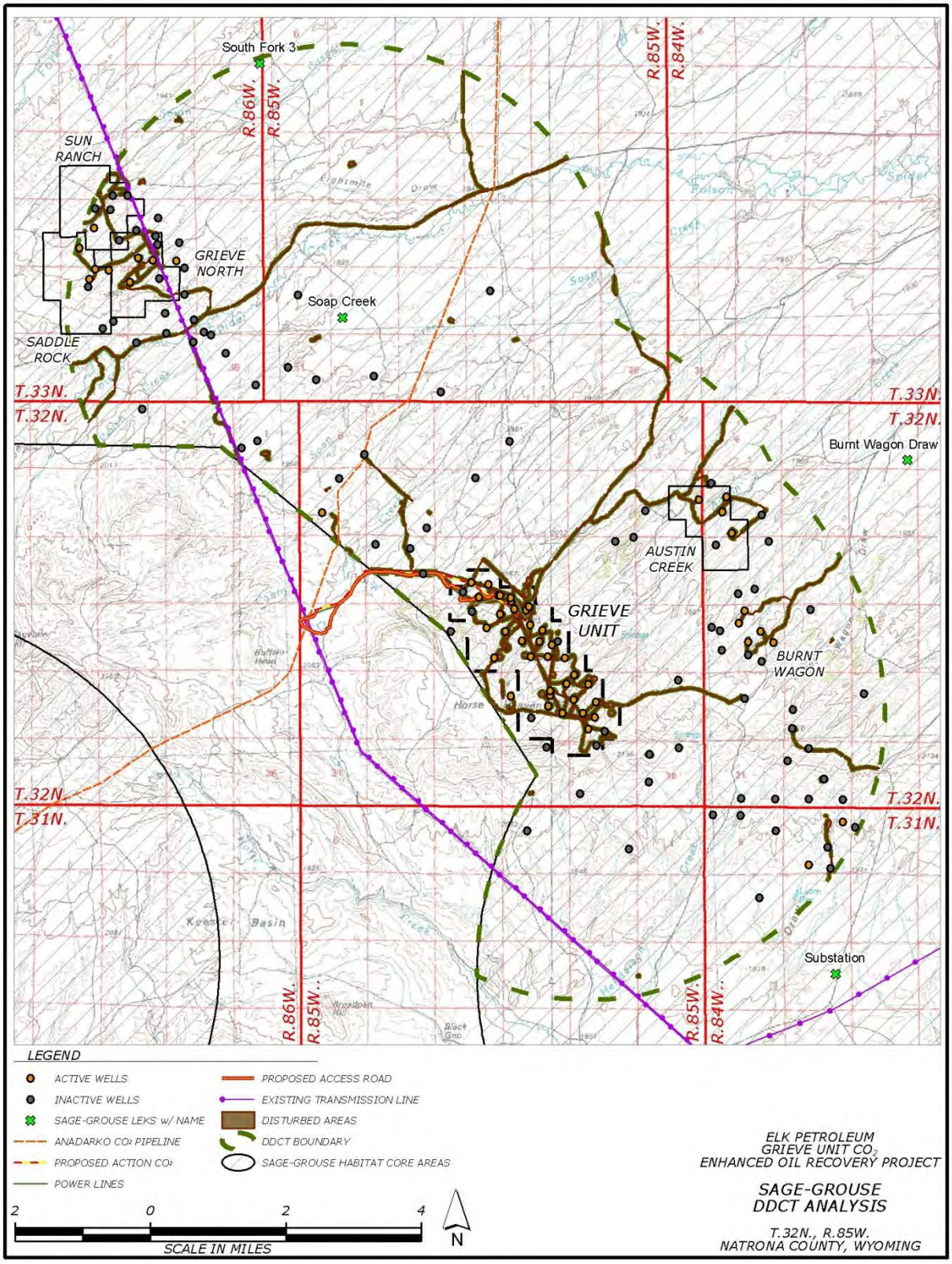
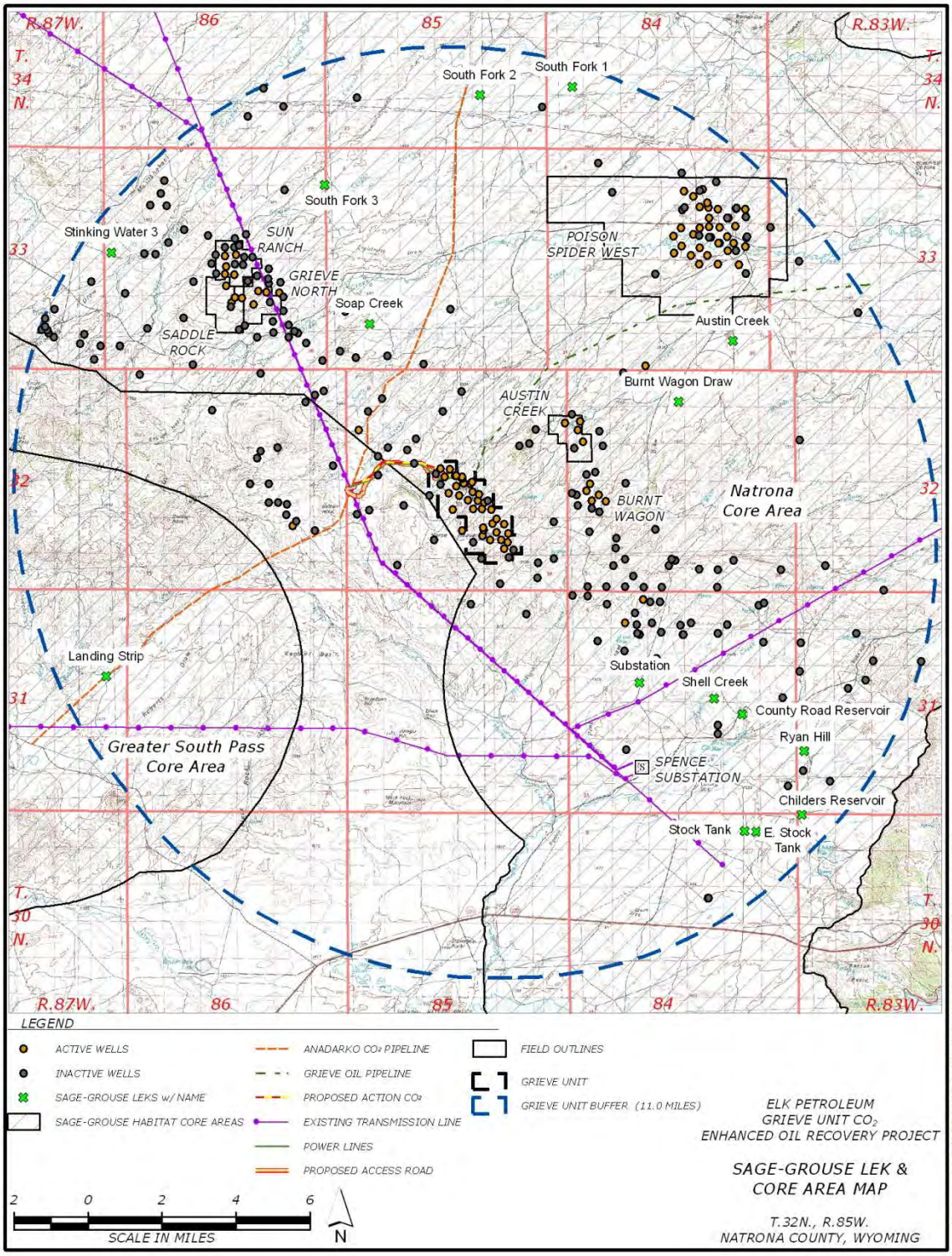


Figure 4.3.3.3 - Greater sage-grouse cumulative impacts analysis area



4.3.3.3 BLM Special Status Wildlife Species

4.3.3.3.1 Impacts of Alternative A: No Action

4.3.3.3.1.1 Direct and Indirect Effects

Under the No Action Alternative, the development of the federal mineral resource associated with the Proposed Action would not occur. State and fee mineral leases could undergo further development in the Grieve Unit and the existing production operations would continue. Selection of the No Action alternative does not preclude BLM from considering new proposals on a case by case basis, if brought forward.

4.3.3.3.1.2 Cumulative Impacts

As demonstrated above, there would be no cumulative impacts realized from the selection of the No Action alternative as conditions would not change.

4.3.3.3.1.3 Mitigation Measures - not applicable

4.3.3.3.1.4 Residual Impacts - not applicable

4.3.3.3.1.5 Monitoring and/or Compliance - not applicable

4.3.3.3.2 Impacts of Alternative B: Proposed Action

4.3.3.3.2.1 Direct and Indirect Effects

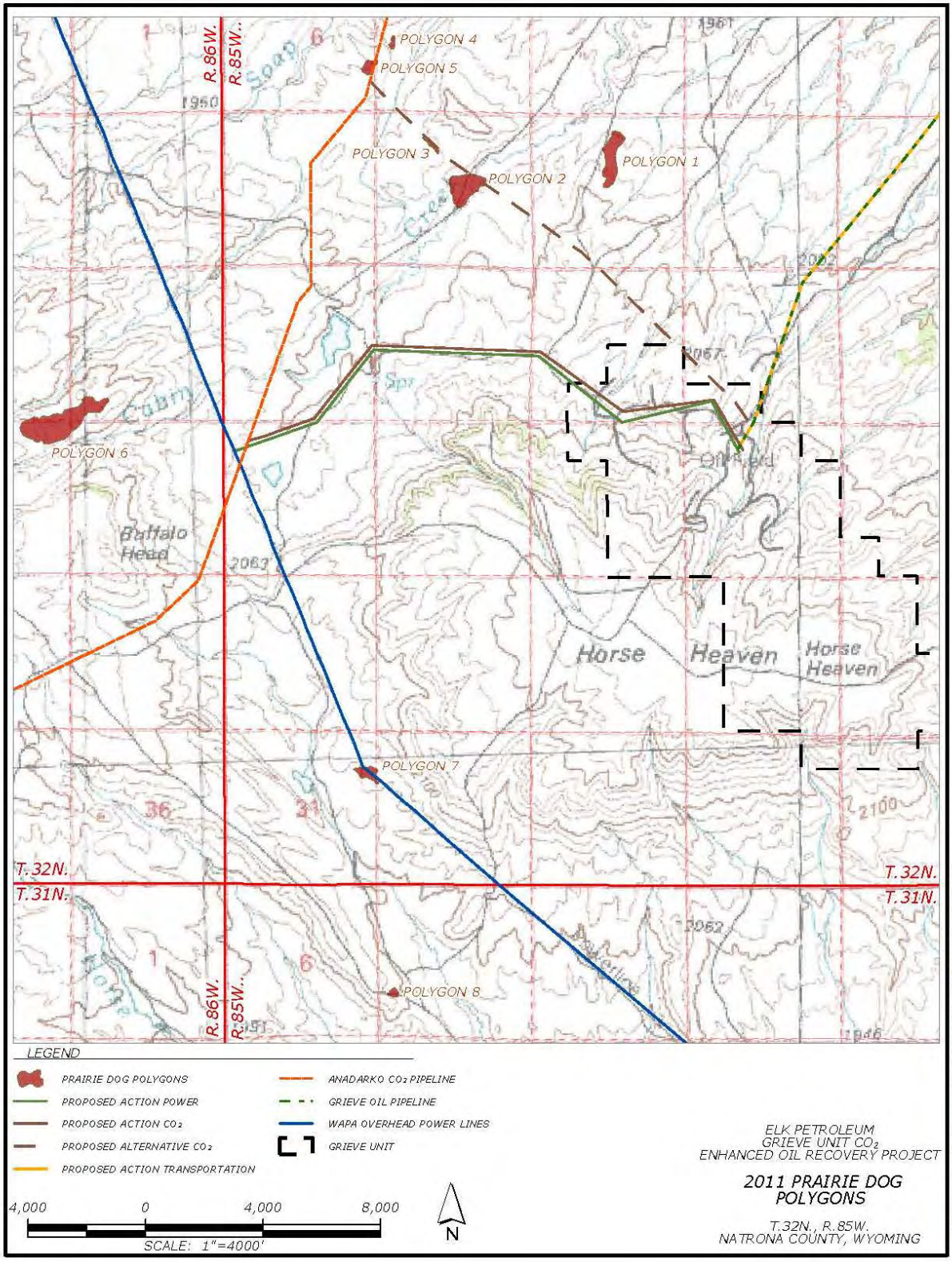
Special Status Mammal Species

Long-eared myotis has the potential to occur in the project area as their preferred roosting and hibernation habitats are found in the project area. BLM has identified equipment stacks as a potential risk to roosting bats; stack caps have been added as a mitigation measure for these species in an effort to preclude incidental roosting. No other adverse effects are foreseen.

Swift foxes have not been documented within the project area which is on the far western edge of the known range of the species in Wyoming (Cerovski 2004). The development associated with implementation of the Proposed Action would result in the temporary loss of suitable foraging habitat; but these negative impacts will be minimized and are not expected to require federal listing of this species.

White-tailed prairie dog burrows are scattered throughout the project area and the larger colonies mapped during the summer of 2011. White-tailed prairie dogs are found throughout the currently developed well field area. The major project components, as proposed, will not impact these mapped colonies (Figure 4.3.3.4). Implementation of the Proposed Action would likely result in direct disturbance of some individual prairie dog burrows and the temporary loss of foraging habitat. Pipelines are thought to contribute to the expansion of prairie dog colonies.

Figure 4.3.3.4 – White-tailed prairie dog colonies



Special Status Bird Species

Brewer's sparrow, loggerhead shrike, sage sparrow, and sage thrasher are the predominant shrub-dependent songbirds that occur within the project area (WGFD 2006, WYNDD 2007). Recent research (Gilbert and Chalfoun 2011) found that when natural gas well density reached more than 8 wells per square kilometer (> 20 wells per square mile) the observed numbers of Brewer's sparrow, sage sparrow and vespers sparrow declined. In the same study, horned lark numbers increased while sage thrashers showed no effect as a result of high density well development (Gilbert and Chalfoun 2011). There are no plans to develop the Grieve Unit to a well density that exceeds 20 wells per section. Activities under the Proposed Action may result in the removal of limited amount of shrub habitat and displace birds from the disturbance area until shrubs are re-established. Design features specific to the greater sage-grouse will also provide habitat protection for these sagebrush obligate species, in addition avoidance of sagebrush habitat to the extent feasible has been added as a mitigation measure.

Burrowing owls may be found in the project area (WGFD 2006, WYNDD 2007) but were not observed during summer 2011 field surveys or during field visits in July 2012. Suitable habitat for the species, white-tailed prairie dog colonies, will not be impacted the major project components (Figure 4.3.3.4), as proposed. Given the lack of suitable habitat, the Proposed Action is not expected to result in the federal listing of this species.

Ferruginous hawks are known to nest within the project area and were observed during the 2011 surveys (Figure 3.3.1). The primary potential impact to ferruginous hawks from project activities is disturbance during nesting, which could result in reproductive failure. Application of the design features described in Section 4.3.3.1, and listed in Chapter 2, for protection of other raptor species will be applied. Given these precautionary measures, the Proposed Action is not expected to result in the federal listing of this species.

Long-billed curlew is an uncommon summer resident, but may be locally common in suitable habitat (WGFD 2004a). The long-billed curlew has not been recorded within the project area but suitable habitat exists within the project area. This species nests on the ground near water, sometimes in a moist hollow and feeds on insects, and aquatic invertebrates (WGFD 2004a). Suitable habitat will be avoided by project construction operations and through the implementation of wetlands avoidance design features thereby reducing the potential for direct impacts to the species.

Mountain plover. The presence of prairie dog colonies (Figure 4.3.3.4) and other suitable habitats indicate that plovers may use some portions of the project area during the year although no high density white-tailed prairie dog colonies were identified in the area. The WYNDD Mountain Plover Species Assessment (WYNDD 2004) indicates that the species has been observed in the general area of the project as does the Wyoming Wildlife Atlas (Cerovski et al. 2004). Mountain plover were not observed during the 2011 wildlife surveys of the project area.

The impacts with the potential for negative effects to mountain plover populations include: loss of nesting habitat, displacement or additional stress due to increased human activities, and increased potential for vehicular collisions due to higher traffic levels on existing and new roads. Due to the general lack of bare ground in the project area, with the exception of new construction

areas, it is not anticipated the mountain plover populations will be impacted by the Proposed Action.

Special Status Amphibian Species

Northern leopard frog sightings have been documented in all counties of Wyoming although this species has not been documented in the project area. Provided that measures are taken to avoid disturbance and contamination of perennial water sources, impacts from the Proposed Action are not expected to affect the species as design features would be applied to minimize wetland disturbance.

Great Basin Spadefoot, as with the Northern Leopard Frog, this species could be present in the project area. Provided that measures are taken to avoid disturbance and contamination of perennial water sources, implementation of the Proposed Action is not expected to affect the species as design features would be applied to minimize wetland disturbance. In addition, the avoidance of sagebrush habitats, to the extent feasible, has been added as a mitigation measure to further avoid potential impacts to this species.

4.3.3.3.2.2 Cumulative Impacts

The cumulative impacts analysis area for the **swift fox, long eared myotis, white-tailed prairie dog, mountain plover and burrowing owl** is the Grieve project buffered by one mile. Other on-going, permitted and reasonably foreseeable activities within this area include the existing Anadarko CO_2 pipeline and the Western Power Administration transmission lines. White-tailed prairie dog colony polygons were mapped immediately adjacent to the Anadarko CO_2 pipeline (Figure 4.3.3.2). Given the application of the design features found in Chapter 2, no cumulative impacts to these species are anticipated.

Cumulative impacts to **sagebrush obligate bird species** were evaluated in the same manner as greater sage-grouse. On-going and permitted activities amount to less than 5 percent surface disturbance and fewer than 1 disruption per 640 acres in suitable habitat in the analysis area. There are no known proposed or reasonably foreseeable actions in the analysis area. Given the application of the design features found in Chapter 2, no cumulative impacts to these species are anticipated.

The cumulative impacts analysis area for **ferruginous hawk** is also the Grieve project buffered by 1 mile and includes the same on-going, permitted and reasonably foreseeable activities as listed relative to the white-tailed prairie dog. A similar analysis area was used for wetland dependent species (i.e. **special status amphibians and long-billed curlew**). Given the application of the design features found in Chapter 2, no cumulative impacts to these species are anticipated.

4.3.3.3.2.3 Mitigation Measures

- Flue stack caps will be placed on all fired equipment such as heater treaters and oil water separators to preclude roosting by bats or small birds.
- Avoidance of sagebrush habitat, to the extent feasible, to minimize disturbance to sagebrush obligate species including the Great Basin Spadefoot.

4.3.3.3.2.4 Residual Impacts

Residual effects to BLM special status species will be minimized through the implementation of appropriate timing limitation stipulations and other design features. If displacement occurs re-colonization is expected once project related disturbance is reduced and habitat is restored.

4.3.3.3.2.5 Monitoring and/or Compliance

Application of the design features found in Chapter 2 and the mitigation measures provided above are adequate to protect wildlife resources.

4.3.4 SOILS

4.3.4.1 Impacts of Alternative A: No Action

4.3.4.1.1 Direct and Indirect Effects

Under the No Action Alternative, the development of the federal mineral resource associated with the Proposed Action would not occur. State and fee mineral leases could undergo further development in the Grieve Unit and the existing production operations would continue. Selection of the No Action alternative does not preclude BLM from considering new proposals on a case by case basis, if brought forward.

4.3.4.1.2 Cumulative Impacts

As demonstrated above, there would be no cumulative impacts realized from the selection of the No Action alternative. Effects to soil resources would remain at current levels within the proposed project area and surrounding cumulative effects analysis area. Livestock grazing comprises the only other existing soil disturbances within the project area. Typically, soil disturbances caused by grazing are limited to soils located in drainage bottoms with higher clay content. The overall impact of this activity on the soil resource is negligible, considering the low to moderate stocking rate currently implemented.

4.3.4.1.3 Mitigation Measures - not applicable

4.3.4.1.4 Residual Impacts - not applicable

4.3.4.1.5 Monitoring and/or Compliance - not applicable

4.3.4.2 Impacts of Alternative B: Proposed Action

4.3.4.2.1 Direct and Indirect Effects

Implementation of the Proposed Action would result in the short-term loss of approximately 171 acres and LOP loss of approximately 35 acres of soil resources and associated production resulting from well pad, access road, pipeline, and power line construction; drilling activities; and hydrocarbon production. All of the Proposed Action construction activities will impact the soil resources found on the $GUCO_2$ project area. Chapter 2 provides a detailed discussion of each proposed project component and the resulting temporary/short term and LOP disturbance.

Biological impacts to soil resources would include short-term disturbance from blading and stripping of the vegetative cover and destroying the soil structure during construction of well pads, pipelines, and access roads. Soil chemistry, water holding capacity, and nutrient availability would be affected due to salvaging and stockpiling activities. The end result would be a loss in soil organic matter, microbial populations, and productivity.

A change in bulk density and infiltration due to compaction resulting from construction equipment would occur as well. Compaction would be expected up to six inches below the surface and where heavily used access roads and drilling operations on the well pad occur this could cause compaction up to two feet.

Additional impacts to the soil would result from unstable soils exposed to wind and water erosion processes. Erosion of the exposed soils further removes valuable nutrient and basically contributes to the loss of topsoil volumes. This would occur prior to the implementation of the reclamation practices on exposed soils, constructed slopes, soil and subsoil stockpiles, and other areas of new disturbance.

Once interim reclamation practices (Appendix B) are implemented and with time these sites not needed for operations would again become stable and the functionality of the soil resources would be restored. Final reclamation would occur at final abandonment of the well locations and infrastructure. Final reclamation practices would require the restoration of the soil resource to meet the reclamation standards and eventual result in full ecosystem function.

Another major component of the Grieve Unit CO_2 EOR project proposal is the reclamation of unnecessary existing disturbances from past operations that will now be fully reclaimed. Re-disturbance from reclamation activities will result in an eventual benefit to the environment.

4.3.4.2.2 Cumulative Impacts

Past, present, and future livestock grazing would continue to impact the soil resources within the cumulative effects analysis area at the current levels. Typically, soil disturbances caused by grazing are limited to soils located in drainage bottoms with higher clay content. The overall impact of this activity on the soil resource is negligible, considering the low to moderate stocking rate currently implemented.

Careful salvage of soil will be critical to maintain the quality of seed bank. Due to mixing of the A horizon with material lower in the profile during salvaging, the resulting material will likely contain less organic matter than pre-disturbance soils. Construction of well pads, pipelines, and access roads could cause compaction at the surface and up to six inches below the surface. Heavily used access roads could cause compaction up to two feet. No vehicle travel, construction or routine maintenance activities should be performed during periods when the soil is too wet to adequately support vehicles and/or construction equipment.

Existing disturbances within the $GUCO_2$ project area include pipelines, utility lines, roads, facilities, well pads, production pits, and production equipment and infrastructure. A number of these existing utilities and infrastructure will be utilized while unnecessary existing disturbances will be reclaimed. The success of historical reclamation demonstrates that natural vegetation production and soil conditions can be returned to acceptable and/or near natural amounts through proper reclamation practices.

4.3.4.2.3 Mitigation Measures

See Chapter 2 for applicable Design Features. The implementation of these measures should avoid or reduce impacts to the soils in the project area and watershed.

4.3.4.2.4 Residual Impacts

Residual effects would occur even if the design features found in Chapter 2 are implemented as soils would be dislodged during construction and operations activities and stabilized overtime with the implementation of aggressive reclamation.

4.3.4.2.5 Monitoring and/or Compliance

Application of the design features in Chapter 2, which provide specific compliance and monitoring requirements for construction and reclamation activities associated with the proposed project, are adequate to stabilize and protect the soils resource.

4.3.5 VEGETATION INCLUDING INVASIVE NON-NATIVE SPECIES AND SPECIAL STATUS SPECIES

4.3.5.1 General Vegetation and Invasive Non-native Species

4.3.5.1.1 Impacts of Alternative A: No Action

4.3.5.1.1.1 Direct and Indirect Impacts

Under the No Action Alternative, no additional disturbance or development associated with the $GUCO_2$ project would occur on BLM administered surface. However, activities previously authorized by the BLM would continue to occur. Effects to the vegetation resources would remain at current levels within those areas. The selection of the No Action alternative would not preclude BLM LFO from approving future projects through project specific NEPA analysis.

4.3.5. 1.1.2 Cumulative Impacts

As demonstrated above, there would be no cumulative impacts realized from the selection of the No Action alternative. Effects to vegetation would remain at current levels within the proposed project area and surrounding cumulative effects analysis area. Livestock and wildlife grazing comprise the only other existing disturbance to vegetation within the project area. Considering the low to moderate stocking rate currently implemented in the area the impact of livestock grazing on the soil resource is negligible, considering the low to moderate stocking rate currently implemented.

4.3.5.1.1.3 Mitigation Measures - not applicable

4.3.5.1.1.4 Residual Impacts - not applicable

4.3.5.1.1.5 Monitoring and/or Compliance - not applicable

4.3.5.1.2 Impacts of Alternative B: Proposed Action

4.3.5.1.2.1 Direct and Indirect Impacts

Implementation of the Proposed Action would result in the short-term loss of 171 acres and life of project loss of 35 acres of vegetation cover and production resulting from well pad, access road, pipeline, and power line construction; drilling activities; and production. Direct effects anticipated from the Proposed Action include short-term reduction of herbaceous vegetation and long-term loss of shrub and tree cover. Potential indirect effects include: increased potential for noxious and/or invasive plant species establishment; changes in plant community composition and diversity; and long-term reduction in vegetation cover and production resulting from soil compaction, mixing of soil horizons, and loss of soil productivity.

Disturbances, loss of vegetation cover, and loss of forage productions would be greatest during the construction and drilling phases. Interim reclamation would be implemented, as soon as possible following construction and drilling operations, in areas not required for production operations, to ensure soil stabilization and increase revegetation success. Long-term, or LOP, loss of herbaceous vegetation cover and production would only occur in areas required for the production phase of the proposed project. Over the long term slow growth species, such as Limber Pine or other trees, removed to accommodate construction activities would be experience a slight reduction in number (NRCS 2011b).

All disturbed areas will be seeded with either the Loamy/Shallow Loamy or Saline Subirrigated certified weed-free, interim reclamation seed mix approved BLM LFO, as found in the Reclamation Plan (Appendix B). Listed seed mixes are composed of adequately diverse mixtures of native grasses, forbs, and shrubs. These seed mixes will ensure soil stability, species diversity, cover, and production are restored during interim reclamation. If necessary, reclaimed areas will be fenced in order to enhance reclamation success. Reclaimed areas will be monitored, as outlined in the Reclamation Plan (Appendix B), to determine interim revegetation success. If interim revegetation success is not progressing at the anticipated rate, reseeding will be conducted, and additional measures could be required to ensure successful revegetation of the disturbed areas. Future climatic patterns, precipitation, land use, implementation of appropriate and effective reclamation practices, and control of noxious and non-native invasive species would be primary factors influencing reclamation success and effectiveness.

Disturbance of the soil during construction, drilling, and production phases; unwashed equipment; uninspected plant materials; and increased traffic create conditions suitable for noxious and invasive non-native species to establish and reproduce. Noxious and invasive non-native species may increase fire frequency and intensity, prevent or reduce the establishment of native species, change plant community composition, and reduce overall health and productivity of the native plant communities. Compliance with the proposed $GUCO_2$ Weed Management Plan (Appendix E) in conjunction with prompt, successful interim reclamation would reduce the opportunity for invasive and non-native species introduction, spread, and reproduction. The Operator will be responsible for timely and effective control of all noxious and non-native species for the life of the proposed project.

4.3.5.1.2.2 Cumulative Impacts

Vegetation resources within the proposed project area would be affected primarily by earth-work activities associated with the construction phase and increased susceptibility to non-native

species invasions resulting from soil disturbance during construction and production phases of the project. Approximately 171 acres of vegetation cover and production will be lost in the short-term as the result of well pad, road, pipeline, and power line construction; drilling activities; and production. Potential effects on vegetation resources would be minimal in the cumulative effects analysis area due to the limited duration and extent of the disturbance and mitigated through the reclamation measures outlined in the $GUCO_2$ Reclamation Plan (Appendix B) and Weed Management Plan (Appendix E). Additionally, all areas not required for production would be reclaimed as soon as possible following construction and development; reducing the total life of the project disturbance acreage to approximately 35 acres.

Currently, the Proposed Action is the only proposed or active development within the cumulative effects analysis area. Past, present, and future livestock grazing would continue to seasonally impact the vegetation resources within the cumulative effects analysis area at the current levels. Recreation use of current roads and BLM administered lands within the cumulative effects analysis area would continue at current levels. The potential for invasive non-native species invasion and expansion would continue at rates dependent on the currently approved activities. Therefore, cumulative effects would be minimal and mitigated by current management practices.

4.3.5.1.2.3 Mitigation Measures

The implementation of the applicable design features found in Chapter 2 should avoid or reduce impacts to the vegetation in the project area and watershed.

4.3.5.1.2.4 Residual Effects

Residual effects, while not reaching the level of significance, would occur even if the applicable design features are implemented due to the time needed to fully reclaim disturbed areas. In addition, residual effects would result from the opportunity for the introduction of invasive species in areas where vegetation would be disturbed and the time required to mitigate these impacts.

4.3.5.1.2.5 Monitoring and/or Compliance

Application of the design features in Chapter 2, which provide specific compliance and monitoring requirements for construction, reclamation and weed management activities associated with the proposed project, are adequate to enhance, stabilize and protect the vegetation resource in the project area.

4.3.5.2 BLM Wyoming Special Status Plant Species

The BLM has developed a list of sensitive plant species for public lands in Wyoming to help focus management efforts toward maintaining habitats under a multiple use mandate and to prevent the future listing of threatened and endangered species under the ESA. This list is reviewed annually to determine additions and deletions based on recommendations from BLM and non-BLM authorities (BLM 2010a). Those sensitive species identified on the BLM LFO sensitive species list are found on Table 3.3.5.2.

Of the eleven BLM LFO sensitive species, two sensitive plant species were determined to have potential habitat or were present within the proposed project area: Rocky Mountain twinpod (*Physaria saximontana* var. *saximontana*) and limber pine (*Pinus flexilis).*

4.3.5.2.1 Impacts of Alternative A: No Action

4.3.5.2.1.1 Direct and Indirect Impacts

Under the No Action Alternative, no additional disturbance or development associated with the development of the $GUCO_2$ project would occur on BLM administered surface. However, activities previously authorized by the BLM would continue to occur. Effects to BLM LFO sensitive plant species would remain at current levels within those areas. The selection of the No Action alternative would not preclude BLM LFO from approving future projects through project specific NEPA analysis.

4.3.5.2.1.2 Cumulative Impacts

Under the No Action Alternative, no additional disturbance or development associated with the development of the $GUCO_2$ project would occur on BLM administered surface. However, activities previously authorized by the BLM would continue to occur as well as other reasonably foreseeable activities within the cumulative effects analysis area. Effects to BLM-LFO sensitive plant species would remain at current levels within the proposed project area and surrounding cumulative effects analysis area.

4.3.5.2.1.3 Mitigation Measures - not applicable

4.3.5.2.1.4 Residual Impacts - not applicable

4.3.5.2.1.5 Monitoring and/or Compliance - not applicable

4.3.5.2.2 Impacts of Alternative B: Proposed Action

4.3.5.2.2.1 Proposed Action Direct and Indirect Effects

As stated in Section 3.3.5.4, there are eleven plant species on the sensitive plant species list for the BLM LFO management area (Table 3.3.4.2). Local habitat was confirmed unsuitable for nine of the BLM LFO sensitive plant species (BKS unpublished data). Therefore, implementation of the Proposed Action would not affect the nine BLM LFO sensitive plant species for which local habitat was confirmed unsuitable.

Suitable habitat and populations of limber pine are present within the proposed project and disturbance areas (BKS unpublished data). Implementation of the Proposed Action will directly impact a three to four individual limber pine within the proposed disturbance area. The removal of a small number of isolated Limber Pine trees will not result in the loss of the project area Limber Pine stands. This removal of isolated, individual trees is consistent with the IM WY-2011-003, "Whitebark and Limber Pine (Five Needle Pine) Management Guidelines for Wyoming BLM (BLM 2010b).

Suitable habitat and, potentially, individuals of Rocky Mountain twinpod are present within the project area and outside of the proposed disturbance area (BKS unpublished data). Implementation of the proposed project would indirectly affect habitat and/or individuals of Rocky Mountain twinpod.

However, direct and indirect effects to individuals/population and/or habitat, will not likely contribute to a trend toward federal listing or loss of viability to the populations or species. Therefore, a "not likely to adversely affect" determination is appropriate for these species.

4.3.5.2.2.2 Cumulative Impacts

Populations of limber pine and potential individuals and suitable habitat for Rocky Mountain twinpod have been identified within the proposed project area. Activities within the cumulative effects analysis area, such as recreational use of BLM administered lands and roads and grazing are not likely to affect the viability of the BLM LFO sensitive plant species within the proposed project area. Cumulative impacts for the BLM LFO sensitive species identified within the disturbance area would increase due to the removal of a small number of limber pine individuals. However, limber pine populations within the proposed project area outside of the disturbance area will likely not be impacted. Due to the limited suitable habitat present within the proposed project area for Rocky Mountain twinpod and lack of proposed activities with the identified suitable habitat, cumulative impacts to this species are minimal.

4.3.5.2.2.3 Mitigation Measures

The implementation of the applicable design features found in Chapter 2 should avoid or reduce impacts to the vegetation in the project area and watershed.

4.3.5.2.2.4 Residual Impacts

Residual effects, while not reaching the level of significance, would occur even if the applicable design features are implemented due to the time needed to fully reclaim disturbed areas. In addition, residual effects would result from the opportunity for the introduction of invasive species in areas where vegetation would be disturbed and the time required to mitigate these impacts.

4.3.5.2.2.5 Monitoring and/or Compliance

Application of the design features in Chapter 2, which provide specific compliance and monitoring requirements for construction, reclamation and weed management activities associated with the proposed project, are adequate to enhance, stabilize and protect the special status species habitat in the project area.

4.3.6 WATER RESOURCES

4.3.6.1 Surface Water

4.3.6.1.1 Impacts of Alternative A: No Action

4.3.6.1.1.1 Direct and Indirect Impacts

Under the No Action Alternative, the development of the proposed project and all its component parts would not occur. Surface water related effects consistent with the Proposed Action would be expected as State and fee mineral leases should they undergo additional developed in the Grieve Unit, the existing production operations would likely continue.

4.3.6.1.1.2 Cumulative Impacts

Under the No Action Alternative, no additional disturbance or development associated with the development of the $GUCO_2$ project would occur on BLM administered surface. However, activities previously authorized by the BLM would continue to occur as well as other reasonably foreseeable activities within the cumulative effects analysis area. Effects to surface waters in the area would remain at current levels within the proposed project area and surrounding cumulative effects analysis area.

4.3.6.1.1.3 Mitigation Measures - not applicable

4.3.6.1.1.4 Residual Impacts - not applicable

4.3.6.1.1.5 Monitoring and/or Compliance - not applicable

4.3.6.1.2 Impacts of Alternative B: Proposed Action

4.3.6.1.2.1 Direct and Indirect Impacts

Surface water in the $GUCO_2$ project area is within the North Platte River watershed but is not considered, by the Wyoming State Engineers Office (WSEO) to be hydrologically connected to the North Platte River and is, therefore, not subject to the Consent Decree between the States of Wyoming and Nebraska. There are no irrigated lands within the project area or potentially impacted by the project.

Potential direct impacts to surface water resources from the Proposed Action include effects on water quality (e.g., potential contamination of surface water resources from spills or discharges of drilling fluids, petroleum, or other chemicals used for natural gas drilling and production activities).

Contamination of surface water and groundwater can occur in oil fields. Sources of potential contamination include leaks from wellheads, fluids gathering and injection pipelines, storage tanks, and treatment facilities, as well as leaching of contaminants from impacted soils that may be associated with these facilities. In addition, accidental spills of hydrocarbon products, including fuels and petroleum products, or produced water, would have the potential to contaminate surface waters if the spills were to occur when flow was present in the surface water drainages of the proposed project area. The implementation of an appropriate Spill Prevention Countermeasure and Control (SPCC) Plan would minimize, control, and cleanup the affected area. The measures provided in the SPCC Plan would minimize the opportunity for spilled material to enter a surface water feature and subsequently impacts surface water.

Produced fluids would be separated and stored in steel tanks at the central facility. Produced water would be stored in tankage until re-injected into the Muddy formation for pressure maintenance while crude oil would be stored until shipped, via pipeline, to a Casper area

terminal. No impacts to surface water resources in or near the proposed project area are expected in association with the routine management of produced fluids.

Potential direct impacts to surface water resources from the Proposed Action also include increased sedimentation and turbidity of affected surface water as a result of surface disturbance and increased erosion into surface waters via runoff; and

Class 3B surface waters that could be affected by the Proposed Action include Cabin Creek, a tributary to Soap Creek, and an unnamed tributary to the Poison Spider Creek. Design features relative to wetland areas (see Section 4.3.6.3) would be applied as would construction storm water control practices; these activities, in addition to site specific reclamation (Appendix B), will serve to minimize any negative impact to these surface water resources.

The potential for adverse impacts to surface water resources would be greatest shortly after the start of construction activities and would likely decrease in time due to natural stabilization, reclamation, and revegetation efforts.

During construction, increased erosion and subsequent increased sedimentation to intermittent and ephemeral drainages in and near the project area may occur. Since ground-disturbing activities within close proximity to drainages have the greatest potential for impacting water resources, rapid and successful reclamation/revegetation of temporarily disturbed areas and implementation of management actions to reduce erosion are particularly important in minimizing water quality impacts and to assure maintenance of long-term stream health.

With the application of management actions contained in the various design features for erosion and runoff control, the actual amount of sediment that would be transported to the ephemeral drainages within the proposed project area would be reduced. The erosion and runoff control devices used would be specified in the Storm Water Pollution Prevention Plan (SWPPP) and Application for Permit to Drill (APD, Appendix C) prepared for each proposed well pad, access road, and other project components. With implementation of the erosion control practices and the project specific Reclamation Plan (Appendix B), the amount of increased erosion associated with the Proposed Action could be minimal.

Soils compacted on existing roads, new access roads, well pads, pipeline corridors and the substation pads generate more runoff than undisturbed sites. The increased runoff, resulting from approximately 35 acres of LOP disturbance, could lead to slightly higher peak flows in ephemeral drainages following occasional significant storm events potentially increasing erosion of the channel banks. The increased erosion could also increase turbidity in ponds and wetland areas following storm events until vegetated buffers have been re-established. The magnitude of these impacts cannot be quantified, but is expected to be negligible based on the very small increase in surface water runoff that would be generated and the application of design features.

4.3.6.1.2.2 Cumulative Impacts

The cumulative impacts would include the existing soil disturbances on approximately 230 acres (BLM LFO disturbance data) associated with the Grieve Unit and other existing infrastructure i.e. pipelines, utility lines, roads, facilities, well pads, production pits, and production equipment and infrastructure in addition to the approximately 35 acres of proposed LOP disturbance. There are no other projects proposed within the general area of the Grieve Unit.

4.3.6.1.2.3 Mitigation Measures

- In the event that equipment to be used in the Grieve project has been used in an area known to contain aquatic invasive species (AIS) or suspected to contain AIS, the following mitigation measure will be implemented: Equipment will be inspected by an authorized AIS inspector certified in the state of Wyoming prior to its use in any Wyoming water. If AIS are found, the equipment will be decontaminated.

4.3.6.1.2.4 Residual Impacts

Residual impacts resulting from implementation of the Proposed Action would likely be realized from increased erosion and subsequent sediment yield to adjacent drainages over the life of the project, even with the implementation of reclamation and the SWPPP. Over time, stabilization and reclamation of the disturbed areas of the Project would substantially reduce the potential of offsite transport of sediments.

4.3.6.1.2.5 Monitoring and/or Compliance

Application of the design features in Chapter 2, which provide specific compliance and monitoring requirements for construction, storm water management and reclamation activities associated with the proposed project, are adequate to stabilize soils, contain hazardous materials releases and protect the surface water in the project area.

4.3.6.2 Groundwater

4.3.6.2.1 Impacts of Alternative A: No Action

4.3.6.2.1.1 Direct and Indirect Impacts

Under the No Action Alternative, the additional development of the federal mineral resource and associated infrastructure as found in the Proposed Action would not occur. No additional groundwater related effects are expected from the continuation of the existing operation or enhanced development of State and fee mineral leases, should it occur. Injection into the subsurface will likely continue as long as production operations continue. New proposals for development of the Unit could be permitted by BLM if brought forward.

4.3.6.2.1.2 Cumulative Impacts

Under the No Action Alternative, no additional disturbance or development associated with the development of the $GUCO_2$ pipeline would occur on BLM administered surface. However, activities previously authorized by the BLM would continue to occur as well as other reasonably foreseeable activities within the cumulative effects analysis area. Effects to ground waters in the area would remain at current levels within the proposed project area and surrounding cumulative effects analysis area.

4.3.6.2.1.3 Mitigation Measures - not applicable

4.3.6.2.1.4 Residual Impacts - not applicable

4.3.6.2.1.5 Monitoring and/or Compliance - not applicable

4.3.6.2.2 Impacts of Alternative B: Proposed Action

4.3.6.2.2.1 Direct and Indirect Impacts

Potential impacts to groundwater resources from the Proposed Action include contamination of groundwater with produced water, drilling mud, or petroleum constituents.

Shallow groundwater, including artesian springs, in the project area would be protected by the application of Wyoming Oil and Gas Conservation Commission (WOGCC) well bore construction standards for use of water based mud for drilling through these zones and settling of appropriate casing and cement to below known sources of drinking water. All unneeded boreholes and wells will be properly cemented and abandoned in accordance with BLM and WOGCC rules.

Produced water and CO_2 injection into the Cretaceous Muddy formation has been approved by the WOGCC and the United States Environmental Protection Agency (EPA) (WOGCC Docket No. 437-2011, dated January 10, 2012). This approval (an Underground Injection, or UIC, Permit) contains injection pressure and volume limitations as well as wellbore mechanical integrity testing requirement. Therefore, injection of CO_2 and produced water into the Muddy is not expected to impact shallow ground water sources or potential underground sources of drinking water (USDW) in the project area.

Spills of fuels or produced fluids have the potential to contaminate groundwater resources, especially the shallow groundwater aquifers and springs. Spills from facilities located adjacent to ephemeral drainages would have the greatest potential to contaminate groundwater. The implementation of an appropriate SPCC Plan would minimize, control, and cleanup the affected area. The measures provided in the SPCC Plan would minimize the opportunity for spilled material to enter a surface water feature and subsequently impacts shallow groundwater.

SPCC Plan related management actions would be employed to control potential released hydrocarbons during drilling operations at each well site location as well as during the construction of the various infrastructure components. Therefore, it would be unlikely for a spill of fuel, other petroleum products or produced fluids to migrate off of a well pad or construction site and contaminate shallow groundwater aquifers. Accordingly, the potential for contamination of shallow groundwater resources by drilling or construction products or produced fluids is considered to be negligible.

No produced water would be discharged into surface water drainages or allowed to flow onto the ground surface. There is a chance that produced water could be released during operations as a result of an injection line leak or a tankage failure. New injection lines and tankage reduce this potential. Produced water storage tanks are included in the project SPCC Plan as are crude oil and fuel tanks.

Deep ground water sources would not be affected by the Proposed Action through formation parting, or "fracking," as discussed in Section 2.3.2 c.

Water Use

Another potential impact to the deep groundwater resource would be in the form of depletions to the North Platte River System although no impacts are anticipated. The Grieve Unit CO_2 project area is in an area determined by the Wyoming State Engineers Office to be non-hydrologically connected to the North Platte River System (WSEO 2012).

For the proposed drilling operations, approximately 25,000 barrels (3.2 acre-feet) of water would be needed for each well during construction, drilling and completion operations. Therefore, drilling of the 10 proposed wells would require an estimated total water use of about 250 thousand barrels, or 32 acre-feet, over the next one to five years. It is anticipated that water for drilling operations would be either produced water from the Muddy formation or from WSEO permitted water supply wells located on private lands within the Unit. Fresh water for cementing operations (hundreds of barrels) would be sourced from either Casper or shallow WSEO permitted groundwater wells in the Grieve project area. One such well is the Grieve #6 well within the unit which was used by previous operators for domestic use.

Approximately 1,600 Bbl (0.2 acre feet) of water will be needed for integrity (hydro-testing) of the pipeline systems. The fresh water used in the pipeline testing will be sourced from either Casper or from permitted shallow groundwater wells in the area. One such well is the Grieve #6 within the unit which was used by previous operators. This water would be recycled back into the water injection system and used for reservoir pressure maintenance.

Water for reservoir re-pressurization will be obtained from new or existing wells in the field which will be completed or re-completed in one of the water bearing formations, the Cloverly, Tensleep or the Madison. Approximately fifty-two million barrels of water will be needed over the 25 year life of the project; of this, approximately 22 million Bbl would be taken from the water supply wells, mentioned above, for initial re-pressurization. The remaining 30 million Bbl would be seventy-five percent recycled Muddy produced water and 25 percent make-up water from one of the water supply wells in the field. All water supply wells will be permitted and approved through the WOGCC, BLM and WSEO, as appropriate.

4.3.6.2.2.2 Cumulative Impacts

The cumulative impacts area for ground water is the Grieve Unit as the WSEO has determined the area is not hydrologically connected to the North Platte River system. As there are no other ground water uses occurring in the project area there are no cumulative impacts to the groundwater resource.

4.3.6.2.2.3 Mitigation Measures

Application of the design features in Chapter 2 and the monitoring requirements contained therein are adequate to protect the groundwater resource in the project area.

4.3.6.2.2.4 Residual Impacts

Residual effects to the shallow fresh groundwater resource from the use/consumption of approximately 0.25 acre feet are negligible.

Residual impacts of the proposed reservoir re-pressurization project include the removal of 3,808 acre feet of groundwater over the life of the project. Additional 2,880 acre feet of produced water will be recycled over the life of the project. No residual effect of the produced water resource found in the Cretaceous Muddy formation is anticipated due to the proposed re-injection practices. No residual effects to fresh or hydrocarbon formation (Cretaceous Muddy) water quality are anticipated with the application of applicable and appropriate BLM, WOGCC and industry construction and operational standards and BMPs.

4.3.6.2.2.5 Monitoring and/or Compliance

Application of the design features in Chapter 2, which provide specific compliance and monitoring requirements for wellbore construction, as well as injection and production operations are adequate to provide protection of the groundwater resources in the project area.

4.3.6.3 Wetlands and Riparian Areas

4.3.6.3.1 Impacts of Alternative A: No Action

4.3.6.3.1.1 Direct and Indirect Impacts

Under the No Action Alternative, the additional development of the federal mineral resource and associated infrastructure as found in the Proposed Action would not occur. No additional wetland and riparian area related effects are expected from the continuation of the existing operation or enhanced development of State and fee mineral leases, should it occur. New proposals for development of the Unit could be permitted by BLM if brought forward by the Operator.

4.3.6.3.1.2 Cumulative Impacts

Under the No Action Alternative, no additional disturbance or development associated with the development of the $GUCO_2$ project would occur on BLM administered surface. However, activities previously authorized by the BLM would continue to occur as well as other reasonably foreseeable activities within the cumulative effects analysis area. Effects to wetland and riparian areas would remain at current levels within the proposed project area and surrounding cumulative effects analysis area.

4.3.6.3.1.3 **Mitigation Measures** - not applicable

4.3.6.3.1.4 **Residual Impacts** - not applicable

4.3.6.3.1.5 **Monitoring and/or Compliance** - not applicable

4.3.6.3.2 Impacts of Alternative B: Proposed Action

4.3.6.3.2.1 Direct and Indirect Impacts

National wetlands inventory sites were field verified as described in Section 3.3.6. Field observations verified the presence of wetland hydrology, a dominance of hydrophytic vegetation, and the presence of hydric soils within the proposed $GUCO_2$ pipeline, overhead and underground power lines, and roads.

In an effort to preclude direct impacts to wetland areas Elk has committed to installing the CO_2 pipeline using boring methods. This 3.6 mile pipeline would cross numerous small wetland segments, approximately 0.6 acres of potential impact. In the event that boring under these wetlands is not feasible or would be more damaging than trenching (i.e. perforating a perched water table) the Operator and its contractors will return the impacted area to its pre-construction contour and completely restore the wetland function. This utility line activity would not require an ACOE Pre-construction notification (PCN). The provisions of ACOE Nationwide Permit No. 12 would be followed. Avoidance of wetland impacts also serves to protect riparian areas. Installation of the underground 25 kV power line will result in the disturbance of less than 0.05 acres of wetlands as a result of the need to blade and trench across the approximately 355 lineal feet of designated wetlands identified along the power line alignment, ACOE Nationwide Permit No. 12 provisions also apply to this activity.

Other potential impacts to wetland and riparian areas include impacts to wetland function and sedimentation, resulting from project related construction activities on non-wetland areas. Culverts will be installed properly as to not inhibit flow downstream and affect wetlands located outside the project area. Wetlands and riparian areas could also have an increased susceptibility to non-native species invasions resulting from disturbance during construction and increased traffic within the project area. Activities having the potential to spread noxious weeds into wetlands, dewater a wetland, increase sediment load into a wetland area, or alter the soil chemistry of a wetland would be mitigated through implementation of numerous design features including the Reclamation Plan (Appendix B), Weed Management Plan (Appendix E), SPCC Plan and SWPPP.

4.3.6.3.2.2 Cumulative Impacts

Historically, the North Grieve crude oil pipeline and existing in field access roads could have directly impacted wetlands and riparian area resources in the Grieve area. These areas have been fully reclaimed and design features, such as culverts, installed; indirect impacts remain associated with existing non-vegetated areas operations areas and road surfaces. The proposed project would add a potential impact to wetlands and riparian areas, the application of design features such as boring wetlands, timely reclamation, the SWPPP and SPCC planning reduce the potential for cumulative impacts.

4.3.6.3.2.3 Mitigation Measures

Application of the design features in Chapter 2 and the monitoring requirements contained therein are adequate to protect the wetland and riparian area resources in the project area.

4.3.6.3.2.4 Residual Impacts

Implementation of the operator design features, in conjunction with implementation of the Reclamation Plan (Appendix B), Weed Management Plan (Appendix E), SWPPP and SPCC plans will minimize the potential for residual impacts to delineated wetland and riparian areas.

4.3.6.3.2.5 Monitoring and/or Compliance

Implementation of numerous design features including the Reclamation Plan (Appendix B), Weed Management Plan (Appendix E), SPCC Plan and SWPPP will provide protection to wetland and riparian areas potentially affected by the proposed project as will application of the suggested mitigation measures.

In the event wetlands are trenched, monitoring will be required following construction, and annually thereafter, until successfully reclaimed.

In the event that equipment (i.e. boring equipment, water trucks, etc.) to be used in the Grieve project has been used in areas known to contain AIS or suspected to contain AIS (i.e. southern Colorado), the equipment will be inspected by an authorized AIS inspector certified in the state of Wyoming prior to its use in any Wyoming water.

4.3.7 SOCIOECONOMICS

4.3.7.1 Impacts of Alternative A: No Action

4.3.7.1.1 Direct and Indirect Impacts

Under the No Action Alternative the Proposed Action would be denied and very limited additional crude oil would be produced from the existing configuration of the Grieve Unit. While no additional project related crude oil development would take place on federal leases and the federal oil and gas lease holders would be denied their rights for drilling and enhanced recovery of the federal mineral estate some limited additional drilling and production could occur on the State and fee mineral leases. If the EOR project were denied a significant economic benefit would be denied to the leaseholders. Additional federal minerals would not be recovered and revenues from these un-recovered minerals would not be realized by the federal and state governments, nor would additional tax revenues be realized by local governments. Limited additional socioeconomic effects would be expected to occur beyond the current situation.

4.3.7.1.2 Cumulative Impacts

Under the No Action Alternative, no additional disturbance or development associated with the proposed $GUCO_2$ project would occur on BLM administered surface. However, activities previously authorized by the BLM would continue to occur.

4.3.7.1.3 Mitigation Measures - not applicable

4.3.7.1.4 Residual Impacts - not applicable

4.3.7.1.5 Monitoring and/or Compliance - not applicable

4.3.7.2 Impacts of Alternative B: Proposed Action

Population and Employment Demographics

The project will enhance local and regional economic conditions and result in the generation of local, state, and federal government tax and royalty revenues once enhanced production commences. Tax revenues to Natrona County will increase with the construction of the proposed infrastructure and the increase in the local tax base. Benefits will accrue to the state and federal governments from the sale of crude oil.

Each component of the proposed project is relatively small and of short-term duration but taken as a whole a wide variety of local and regional craftsmen and laborers will be employed. The associated workforces would not generate noticeable population effects or demand for temporary housing or local government services. The fifteen person workforce associated with the long-term production activities will likely be hired locally although some CO_2 experienced staff may be transferred into the area.

The proposal to enhance crude oil production through reservoir re-pressurization will involve a substantial capital investment. Development and operation of the project would require goods and services from a variety of local and regional contractors and vendors, from the oil and gas service industry and from other industries. Expenditures by the proponent for these goods and services, coupled with employee and contractor spending, will generate economic benefits for Natrona County, and for Wyoming in the form of taxes collected.

The Proposed Action is consistent with the desires of the State of Wyoming (State Statute 30-8-101) to encourage CO_2 sequestration and the opportunities for crude oil CO_2 EOR operations in traditionally depleted fields.

Engineering analysis indicates that approximately 5,000 barrels of oil per day could be realized from CO_2 EOR operations in the Grieve Unit. This level of production, at the current Wyoming crude oil price of approximately $60 per barrel, would yield over $100 million dollars to the United States of America over the life of the project, one-half of which is returned to the State of Wyoming. Wyoming would further benefit through severance and ad valorum taxes. Drilling rigs, rig and roustabout crews, and construction would all provide sales taxes back to the Natrona County economy.

Given the national need for additional domestically produced crude oil and the current fiscal condition of both the United States and the State of Wyoming (due to currently low natural gas and coal prices), it is reasonable to assume that the direct and indirect economic impacts of the project would be positive.

4.3.7.2.2 Cumulative Impacts

The cumulative impacts analysis area for economic could be considered in any numbers of ways, from Natrona County to the United States, taken with other energy and economic development projects the proposed Action will result in a benefit to any area of analysis considered.

4.3.7.2.3 Mitigation Measures – none identified

4.3.7.2.4 Residual Impacts

Residual effects to the economic condition of the area could include added stability to the long-term workforce and local economy. The State of Wyoming and the United States would benefit from the increase in oil royalties and severance taxes.

4.3.7.2.5 Monitoring and/or Compliance – none identified

4.4 UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts that would result from the implementation of the proposed project are those that cannot be avoided or reversed through implementation of design features or mitigated through the application of identified mitigation measures.

- **Climate, Climate Change, & Air Quality –** While not reaching the level of significance there will be unavoidable adverse impacts to air quality.
- **Cultural –** No unavoidable adverse impacts to cultural resources are anticipated.
- **Wildlife including Threatened and Endangered, and Special Status Species -** Unavoidable adverse impacts may occur relative to some individuals of some species found in the project area, none of these would reach the level of significance (threatening the survival of the population or the species). Habitats on 171 acres will be unavoidably impacted through the implementation of the project.
- **Soils -** Soils will be disrupted, removed, replaced and re-stabilized over the areas disturbed for the implementation of the Grieve CO_2 project. Some of the soils will be dislodged and not reclaimed or re-stabilized resulting in the loss of approximately 35 acres of soil productivity.
- **Vegetation including Invasive Non-Native Species and Special Status Species -** Unavoidable adverse impacts may occur relative to some individuals of some species found in the project area, none of these would reach the level of significance (threatening the survival of the population or the species). Habitat on 171 acres will be unavoidably impacted through the implementation of the project.
- **Water Quality (Groundwater & Surface Water) -** Unavoidable adverse impacts to surface waters found in the project area may occur but would not reach the level of significance (i.e. impaired function). Unavoidable adverse impacts to ground water in the project area may occur as the result of use but would not reach the level of significance (i.e. impaired function or quality).
- **Socioeconomics -** No unavoidable adverse impacts to socioeconomics are anticipated.

4.5 RELATIONSHIP OF SHORT TERM USES AND LONG TERM PRODUCTIVITY

Short term uses would be defined as impacts to the resources that persist after project infrastructure and drilling have been completed and remain up to 5 years or until interim reclamation has been successfully achieved. Long term productivity could be thought of as losses of productivity over the life of the project, which typically is more than 20 years or until the wells have been abandoned and final reclamation standards have been achieved. In the alternative long-term productivity could be defined as the enhanced yield of a resource.

- **Climate, Climate Change, & Air Quality –** In the short term air quality will be impacted by the implementation of the proposed project. Long term productivity may be enhanced due to the effects of carbon sequestration.
- **Cultural -** No short or long term impacts to the cultural resource are anticipated.
- **Wildlife including Threatened and Endangered, Special Status Species –** In the short term some individuals of some species may be displaced from the project area; losses in long term productivity of some species or their habitats may occur.
- **Soils -** In the short term soil losses will occur on 171 acres; losses of long term productivity of soils over 35 acres are also anticipated.
- **Vegetation including Invasive Non-Native Species and Special Status Species -** In the short term losses of vegetation occur on 171 acres; losses of long term productivity of vegetation over 35 acres are also anticipated.
- **Water Quality (Groundwater & Surface Water) –** Short term uses of surface water is not anticipated, nor are losses in long term productivity. Ground water will be used over the life of the project, long term losses in productivity are not anticipated.
- **Socioeconomics –** Short term and long term benefit to the socioeconomic condition of local communities will be realized through improved employment opportunities and the increased tax and royalty revenues realized to local, state and federal governments.

4.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible and irretrievable commitments of resources are those impacts resulting from the implementation of the proposed project that cannot be reversed except perhaps in the extreme long term. No irreversible and irretrievable commitments of resources have been identified relative to the implementation of the Grieve Unit CO_2 project, with the possible exception of the irreversible and irretrievable commitment of the crude oil resource though enhanced recovery production.

4.7 ANY OTHER DISCLOSURES

All necessary and appropriate disclosures have been made in the impacts analysis of each resource.

CHAPTER 5 - CONSULTATION AND COORDINATION

5.1 INTRODUCTION

The issue identification section of Chapter 1 identifies those issues analyzed in detail in Chapter 4. The ID Team Checklist provides the rationale for issues that were considered but not analyzed further. The issues were identified through the public and agency involvement process described in Sections 5.2 and 5.3 below. Resource clearances evaluated and prepared by the BLM ID Team are provided in Appendix F.

5.2 PERSONS, GROUPS, AND AGENCIES CONSULTED

Table 5.1 - List of all persons, groups, and agencies consulted for the purpose of this environmental assessment

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Matthew Hoobler	Wyoming State Engineers Office North Platte River Compact Program Lead	The Grieve project area is not hydrologically connected to the North Platter River; the proposed ground water use and will not result in a depletion and no affect to the North Platte River Species
Mary Flanderka	Wyoming Game and Fish Department Habitat Protection Coordinator	Greater Sage-grouse DDCT consultation; the Grieve project as proposed and with added design features is consistent with the Core Area Concept.

Tribes Consulted

Two newly recorded sites were identified as being of potential Native American concern during project surveys. One cairn site was recommended as unevaluated pending Native American consultation. The other site is a prehistoric cairn site that was also recommended as unevaluated pending Native American consultation. Tribal consultation was conducted on both sites in October and November 2011 with the Eastern Shoshone and Northern Arapaho tribal elders, observers and Tribal Historic Preservation Officer (THPO). Alternative well site locations and mitigation were provided for one site and approval granted for the other.

5.3 PUBLIC PARTICIPATION

A scoping notice was printed in the Casper Star Tribune, posted on the BLM LFO website in December 8, 2011. This notice described the project and requesting that any comments regarding the project be submitted to BLM by January 13, 2012. A copy of the BLM website posting and scoping notice are found as Appendix A.

5.3.1 Comment Analysis

All public comment was reviewed by the IDT, each issue presented was compared against the Proposed Action, operator committed and BLM required design features. If the concern was relevant to the proposal and was not adequately covered by the design features mitigation was applied in the EA.

5.3.2 List of Commenters

Three comment letters were received regarding the proposed Grieve CO_2 project.

- James Steidtmann - former director of the Enhanced Oil Recovery Institute at the University of Wyoming
- Wyoming Game and Fish Department – John Emmerich, Deputy Director
- Wyoming Wildlife Federation - Sarah Pizzo (National Wildlife Federation), Joy Bannon (Wyoming Wildlife Federation)

5.3.3 Response to Public Comment

Mr. Steidtmann encouraged the speedy completion of the environmental analysis due to:

(1) The suitability of the Grieve Unit for CO2 re-pressurization,
(2) The opportunity to implement the CO_2 enhanced oil recovery project,
(3) The close proximity to the Anadarko CO_2 pipeline, and
(4) The contracts being in place for the CO_2.

Response: The EA was completed in as timely a manner as possible given the number of infrastructure components and issues relative to the appropriate manner in which to evaluate potential disturbance and disruptions to the greater sage-grouse.

Wyoming Game and Fish Department brought forward the following Terrestrial considerations:

(1) No designated big game crucial winter range in the project area,
(2) No sage grouse leks in close proximity to the project, but part of the proposal falls within a core area, a DDCT should be completed and construction should not occur in core between March 15 and June 30.

Response: These issues had already been considered and included in the Design Features as appropriate.

Wyoming Game and Fish Department brought forward the following Aquatic considerations:

(1) Implement best management practices for the control of sediment and other pollutants; disturbed areas should be promptly re-vegetated,
(2) Placement of equipment fueling, servicing and staging areas at least 300 feet from streams and riparian areas,
(3) Prevent the spread of aquatic invasive species by following the WGFD regulations

Response: These issues identified in (1) above had already been considered and included in the Design Features, (2) and (3) were added as specific mitigation measures.

Wyoming Wildlife Federation brought forward the following recommendations:

Wildlife

(1) Conduct a site evaluation that includes local expertise, natural resource databases, literature searches, endangered or threatened species, and critical habitats. Use this site survey to screen sites and determine whether sites are suitable for development.

Response: This was a part of the analysis.

(2) Adopt adaptive management protocols.

Response: This was a part of the analysis.

(3) Implement mitigation efforts and winter stipulations for all big game species.

Response: No big game crucial winter range is designated in the project area.

(4) Implement new technologies as developed to increase mitigation effectiveness.

Response: New technologies that mitigate impacts are a major part of the project design.

(5) Evaluate, mitigate, and develop a plan for invasive plant species. How will the company prevent the spread of invasive plants? What mitigation measures will be implemented to prevent the spread of and introduction of invasive plant species? How will the BLM evaluate the landscape to record changes in vegetation through the project? Invasive plants have a detrimental effect for wildlife, native plants, and recreation.

Response: These issues had already been considered and included in the Design Features as appropriate.

(6) Supply a comprehensive analysis of seasonal timing restrictions and the development plan as applied to all wildlife species.

Response: This was a part of the analysis.

(7) Provide current inventory studies and a full analysis of wildlife habitat, wildlife species, and current riparian and stream habitat conditions.

Response: This was a part of the analysis.

(8) Implement measures to mitigate impacts to the greater sage grouse

Response: This issue has already been considered and included in the Design Features as appropriate.

Recreation

(1) If this proposed project results in loss of access for hunting, that loss should be mitigated by access easements in nearby areas.

Response: The project will not change access for hunting from the current condition.

(2) Establish clearly stated language on public access to all public lands within the area.

Response: This is beyond the scope of this project level EA.

(3) Adopt President Bush's Executive Order 13443 from August, 16, 2007, which focuses on expanding and enhancing hunting opportunities on public lands.

Response: This is beyond the scope of this project level EA.

Water Quality

(1) Conduct a comprehensive analysis on all waterways and drainages in the proposed project area, especially waterways located near or crossing roads and staging areas.

Response: This was a part of the analysis.

(2) Conduct a complete and accurate assessment of the impacts (such as contamination and demands on water, if any), including reasonable foreseeable impacts, and baseline sampling of ground and surface water related to this proposed project.
Response: This was a part of the analysis.
(3) Implement a monitoring system and action plan for detecting spills around the proposed project area.
Response: This issue has already been considered and included in the Design Features as appropriate.
(4) Provide current inventory studies and a full analysis of wildlife habitat, wildlife species, and current riparian and stream habitat conditions.
Response: This was a part of the analysis.

Cumulative Impacts
(1) The National Environmental Protection Act requires that the BLM take into account the cumulative impacts of ongoing and likely future energy development, and any ongoing development activities taking place in the Lander Field Office.
Response: This was a part of the analysis at the appropriate resource specific scale.
(2) Develop a cumulative effects scenario that illustrates what may occur to sensitive, threatened or endangered species that are located in areas that will be impacted by the proposed project area and will see habitat changes.
Response: This was a part of the analysis at the appropriate resource specific scale.
(3) Develop a landscape-scale cumulative impacts analysis that addresses the development within and outside of the proposed project area. Include how the project will impact crucial habitat and crucial ranges (such as winter, summer and transitional) for wildlife species, including ungulate populations, as a whole. This will entail the issue of species being pushed onto less suitable habitat. In creating this analysis, the BLM must use the most up-to-date big game seasonal range designation maps that the Wyoming Game and Fish Department will provide.
Response: No big game crucial winter range is designated in the project area.
(4) Identify the amount of surface disturbance and how vegetation removal will be reclaimed.
Response: This issue has already been considered and included in the Design Features as appropriate.

5.4 LIST OF PREPARERS

Table 5.2 - List of BLM preparers

Name	Title	Responsible for the Following Section(s) of this Document
Chris Krassin	Natural Resource Specialist	BLM Project Lead
Karina Bryan	Cultural Resources and	Cultural

Table 5.2 - List of BLM preparers

Name	Title	Responsible for the Following Section(s) of this Document
	Paleontology	
Stuart Cerovski	Resource Advisor, Fluid Minerals	Minerals
Jon Kaminsky	Assistant Field Manager, Minerals	NEPA Process
Tim Kramer	Natural Resource Specialist, Fire and Fuels	Vegetation and Special Status Species
Jared Oakleaf	Outdoor Recreation Planner	Recreation
Leta Rinker	Realty Specialist	ROW advisor
Tom Sunderland	Geology	Geology
Sydney Thielke	GIS Specialist	Sage Grouse DDCT Analysis
Tim Vosburgh	General and Special Status Species Wildlife	Wildlife and Special Status Species
Kristin Yannone	Environmental Planner and Coordinator	NEPA Process

Table 5.2 - Third Party Interdisciplinary Team

Name of Preparers	Area of Expertise
Renee Taylor – Taylor Environmental Consulting	Project lead, document preparation, general and special status species wildlife, surface and ground water, transportation, socioeconomics, transportation, health and safety, noise, visual resources, and range resources
Susan Connell and Jim Zapert – Carter Lake Consulting	Air quality
Melissa Connelly - Stratigraphic Rex	Paleontology
Brian Black	Geology
Mark Knoll – Gene R. George and Associates	Geology, ground water, cartography, document review

Table 5.2 - Third Party Interdisciplinary Team

Name of Preparers	Area of Expertise
Bonnie Percy - Gene R. George and Associates	Ground water; underground injection
Katie Wilson - BKS Environmental Associates	Wetlands and COE Wetland Report
Jacob Mulinix - BKS Environmental Associates	Soils
Dawn Gardener - BKS Environmental Associates	Vegetation and special status plant species Site Specific Reclamation Plan
Clay Wood – BKS Environmental Associates	Weed Management Plan
Ben Garrison and Stacy Goodrick – Western Archaeological Services	Cultural resources

CHAPTER 6.0 - REFERENCES, GLOSSARY AND ACRONYMS

6.1 REFERENCES CITED

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6.2 GLOSSARY OF TERMS

Note: The following definitions are taken from the draft Lander Resource Management Plan (BLM 2011b), in some cases the definition was shortened to describe only the environmental classifications found in the project area.

Analysis Area: Any lands, regardless of jurisdiction, for which the BLM synthesizes, analyzes, and interprets data for information that relates to planning for BLM-administered lands.

Authorized Surface-disturbing Activities: Public Land resource uses/activities that disturb the endemic vegetation, surface geologic features, and/or surface/near surface soil resources beyond ambient site conditions that are permitted by previously-approved management actions. Examples of surface-disturbing activities include: construction of well pads and roads, pits and reservoirs, pipelines and powerlines, and most types of vegetation treatments (e.g., prescribed fire, etc.).

Big Game Crucial Winter Range: Winter habitat on which a wildlife species depends for survival. Because of severe weather conditions or other limiting factors, no alternative habitat would be available.

CO_2 or Carbon Dioxide Flood: A carbon dioxide flood is an enhanced oil recovery technique that injects fluid into the reservoir. When carbon dioxide is injected, it mixes with the oil and the two compounds dissolve into one another. The injected carbon dioxide acts as a solvent to

overcome forces that trap oil in tiny rock pores and helps sweep the immobile oil left behind after the effectiveness of water injection decreases, resulting in increased oil production.

Class II Wells:
Injection wells that are:

(1) Brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production, and may be commingled with wastewaters from gas plants, which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection.

(2) For enhanced recovery of oil or natural gas.

(3) For storage of hydrocarbons that are liquid at standard temperature and pressure.

Weed Management Plan: A plan for controlling invasive plant species that incorporates integrated weed management techniques and accounts for pertinent considerations, such as management actions and allocations affecting weeds.

Controlled Surface Use: Surface occupancy or use will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts. Identified resource values require special operational constraints that may modify the lease rights. Controlled surface use is used for operating guidance, not as a substitute for the No Surface Occupancy or Timing Limitation Stipulations.

Core Area: Executive Order 2011-5, issued by the Governor of Wyoming, delineated a Core Area to protect populations of greater sage-grouse in the state. The Order also outlines restrictions on the density of future development and other human activities that limit impacts to sage-grouse populations.

Design Features: As used in the Grieve CO_2 project EA, are Standard Operating Procedures, Stipulations (including Conditions of Approval), and Operator committed activities and procedures incorporated in to the Proposed Action, and are intended to:
(a) Avoid the impact altogether by not taking a certain action or parts of an action.
(b) Minimize impacts by limiting the degree or magnitude of the action and its implementation.
(c) Rectify the impact by repairing, rehabilitating, or restoring the affected environment.
(d) Reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action, or
(e) Compensate for the impact by replacing or providing substitute resources or environments.

Disruptive Activities: Those public land resource uses/activities that are likely to alter the behavior, displace, or cause excessive stress to existing animal or human populations occurring at a specific location and/or time. In this context, disruptive activity(ies) refers to those actions that alter behavior or cause the displacement of individuals such that reproductive success is adversely affected, or an individual's physical ability to cope with environmental stress is compromised. This term does not apply to the physical disturbance of the land surface, vegetation, or features. Examples of disruptive activities may include noise, human foot or vehicle traffic, domestic livestock roundups, or other human presence regardless of the activity. When administered as a land use restriction (e.g., No Disruptive Activities), this term may

prohibit or limit the physical presence of sound above ambient levels, light beyond background levels, and/or the nearness of people and their activities. The term is commonly used in conjunction with protecting wildlife during crucial life stages (e.g., breeding, nesting, birthing, etc.), although it could apply to any resource value on the public lands. The use of this land use restriction is not intended to prohibit all activity or authorized uses.

Ecological Site: A kind of land with a specific potential natural community and specific physical site characteristics, differing from other kinds of land in that the site has the ability to produce distinctive kinds and amounts of vegetation and to respond to management. Ecological sites are defined and described with information about soil, species composition, and annual production.

Ephemeral Stream: A stream that flows only in direct response to precipitation, and whose channel is at all times above the water table. Confusion over the distinction between intermittent and ephemeral streams may be minimized by applying Meinzer's suggestion that the term "ephemeral" be arbitrarily restricted to streams that do not flow continuously for at least 30 days (Prichard et al. 1998). Ephemeral streams support riparian-wetland areas when streamside vegetation reflects the presence of permanent subsurface water.

Exceedance: An event in which measurements of ambient air quality are above the National Ambient Air Quality standard (NAAQS) or Wyoming Department of Environmental Quality (DEQ) standard set for a particular pollutant. For example, an annual average nitrogen dioxide value of 110 micrograms per cubic meter ($\mu g/m^3$) is an exceedance of both the NAAQS and Wyoming DEQ annual average standard for nitrogen dioxide of 100 $\mu g/m^3$.

Exception: A one-time exemption for a particular site within an oil and gas leasehold. Exceptions are determined on a case-by-case basis and the stipulation continues to apply to all other sites within the leasehold.

Important Wildlife Habitat: Big game crucial winter range, big game parturition areas, designated critical migration corridors, sage-grouse breeding and nesting areas, raptor concentration areas, and critical fish spawning areas.

Integrated Weed Management: The use of all appropriate weed control measures, including fire, as well as mechanical, chemical, biological, and cultural techniques, in an organized and coordinated manner on a site-specific basis.

Intermittent Stream: A stream that flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow in mountainous areas. Confusion over the distinction between intermittent and ephemeral streams may be minimized by applying Meinzer's suggestion that the term "intermittent" be arbitrarily restricted to streams that flow continuously for periods of at least 30 days (Prichard et al. 1998).

Mitigation Measure: As used in the Grieve CO_2 project EA, are similar to a Design Feature but are these measures or practices that are not incorporated into the proposed action or alternatives and were identified through scoping or subsequent analysis to further reduce impacts of the proposed action.

No Surface Occupancy: The term "no surface occupancy" is used in two ways. It is used in one way to define a no surface occupancy (NSO) area where no surface-disturbing activities of any nature or for any purpose would be allowed. For example, construction or the permanent or long-term placement of structures or other facilities for any purpose would be prohibited in an NSO area.

Occupied Lek: A lek that has been active during at least one strutting season within the last 10 years.

Prairie Dog "Complex": Defined as a cluster of two or more prairie dog towns or colonies within 3 kilometers of each other (Clark and Stromberg 1987), and bounded by either natural or artificial barriers (Whicker and Detling 1988), which effectively isolate one cluster of colonies from interacting/interchanging with another. Prairie dogs may commonly move among colonies of a cluster, and thereby foster reproductive/genetic viability, but exhibit little emigration/immigration between clusters. A cluster may include some currently unoccupied, through physically suitable (i.e., vegetation, soils, topography, etc.), land immediately adjacent to occupied colonies that support other prairie dog-associated (ecosystem function), obligate or facultative species (e.g., swift fox, mountain plover, burrowing owl, etc.).

Produced Water: Groundwater removed to facilitate the extraction of minerals, such as coal, oil, or gas.

Proper Functioning Condition: The on-the-ground condition of a riparian-wetland area, referring to how well the physical processes are functioning and the state of resiliency that will allow a riparian-wetland area to hold together during a high-flow event, sustaining that system's ability to produce values related to both physical and biological attributes.

Rangeland: Land on which the native vegetation is predominantly grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing. This includes lands revegetated naturally or artificially when routine management of that vegetation is accomplished mainly through manipulation of grazing. Rangelands include natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows.

Rangeland Health: The degree to which the integrity of the soil and ecological processes of rangeland ecosystems are sustained.

Raptor: Bird of prey with sharp talons and a strongly curved beak, such as hawks, falcons, owls, vultures, and eagles.

Rights-of-Way: A rights-of-way (ROW) grant is an authorization to use a specific piece of public land for a specific project, such as roads, pipelines, transmission lines, and communication sites. The grant authorizes rights and privileges for a specific use of the land for a specific period of time.

Riparian Areas: Riparian areas are a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, playas, and the shores

of lakes and reservoirs with stable water levels, are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil.

Seasonal Ranges: The Wyoming Game and Fish Department has identified various ranges for big game species. These ranges are defined as follows: Summer or Spring-Summer-Fall, Severe Winter Relief, Winter, Winter/Year-long, Year-long, and Parturition or birthing areas. The classification of each area is dependent on the season of use, the severity of weather/forage conditions and life phase.

Section 106 of National Historic Preservation Act: "The head of any federal agency having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking in any state and the head of any federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places. The head of any such federal agency shall afford the Advisory Council on Historic Preservation established under Title II of this Act a reasonable opportunity to comment with regard to such undertaking" (16 United States Code 47 df).

Sensitive Sites or Resources: Sensitive sites or resources refer to significant cultural resources that are, or may be eligible, for nomination to the National Register of Historic Places.

Sensitive Species: Species designated as sensitive by the BLM State Director include species that are under status review, have small or declining populations, live in unique habitats, or require special management. BLM Manual 6840 provides policy and guidance for special status species management. The BLM Wyoming Sensitive Species Policy and List are provided in a memorandum updated annually. Primary goals of the BLM Wyoming policy include maintaining vulnerable species and habitat components in functional BLM ecosystems and preventing a need for species listing under the Endangered Species Act.

Special Status Species: Special status species are species proposed for listing, officially listed as threatened or endangered, or are candidates for listing as threatened or endangered under the provisions of the Endangered Species Act; those listed by a state in a category such as threatened or endangered, implying potential endangerment or extinction; and those designated by the State Director as sensitive (BLM 2008e).

Split-estate: Surface land and mineral estate of a given area under different ownerships. Frequently, the surface will be privately owned and the minerals federally owned.

Standards for Healthy Rangelands: A description of the physical and biological conditions or degree of function required for healthy, sustainable lands (e.g., land health standards).

Surface-disturbing Activities (or Surface Disturbance): The physical disturbance and movement or removal of land surface and vegetation. These activities range from the very minimal to the maximum types of surface disturbance associated with such things as OHV travel or use of mechanized, rubber-tired, or tracked equipment and vehicles; some timber cutting and

forest silvicultural practices; excavation and development activities associated with use of heavy equipment for road, pipeline, powerline and other types of construction; blasting; strip, pit, and underground mining and related activities, including ancillary facility construction; oil and gas well drilling and field construction or development and related activities; range improvement project construction; and recreation site construction.

Surface Water Classes and Uses: The following water classes are a hierarchical categorization of waters according to existing and designated uses.
Class 3, Aquatic Life Other than Fish. Class 3 waters are waters other than those designated as Class 1 that are intermittent, ephemeral, or isolated waters, and because of natural habitat conditions, do not support nor have the potential to support fish populations or spawning or certain perennial waters that lack the natural water quality to support fish (e.g., geothermal areas). Class 3 waters provide support for invertebrates, amphibians, or other flora and fauna that inhabit waters of the state at some stage of their life-cycles. Uses designated on Class 3 waters include aquatic life other than fish, recreation, wildlife, industry, agriculture, and scenic value. Generally, waters suitable for this classification have wetland characteristics; and such characteristics will be a primary indicator used in identifying Class 3 waters. There are four subcategories of Class 3 waters.

Visual Resource Management Classes: *Class IV.* The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. Contrasts may attract attention and be a dominant feature of the landscape in terms of scale; however, changes should repeat the basic elements (form, line, color, and texture) inherent in the characteristic landscape.

Visual Resources: The visible physical features of a landscape (topography, water, vegetation, animals, structures, and other features) that constitute the scenery of an area.

Waiver: A permanent exemption of a stipulation.

Wetlands: Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and which, under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. BLM Manual 1737, Riparian-Wetland Area Management, includes marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas as wetlands.

Wildfire: An unplanned ignition of a wildland fire (such as a fire caused by lightning, volcanoes, unauthorized and accidental human-caused fires) and escaped prescribed fires.

Wildlife-disturbing Activity: BLM-authorized activities other than routine maintenance that may cause displacement of or excessive stress to wildlife during critical life stages. Wildlife-disturbing activities include human presence, noise, and activities using motorized vehicles or equipment.

6.3 LIST OF ACRONYMS USED IN THIS DOCUMENT

AADT	Annual average daily traffic
ACOE	U.S. Army Corps of Engineers
AIS	Aquatic Invasive Species
amsl	Above mean sea level
ALS	Artificial Lift Systems
APD	Application for Permit to Drill
AO	Authorized Officer
AQD	Air Quality Division
AQRV	Air Quality Related Values
AUM	Animal Unit Month
BA	Biological Assessment
BACT	Best Available Control Technology
BBL	Barrels(s)
BBS	Breeding Bird Survey
BCF	Billion Cubic Feet
BEA	U.S. Bureau of Economic Analysis
BGEPA	Bald and Golden Eagle Protection Act
Bgs	Below Ground Surface
BKS	BKS Environmental Conultants
BLM	Bureau of Land Management
BMP	Best Management Practices
BWPD	Barrels of Water per Day
CASTNET	Clean Air Status and Trends Network
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CEQ	Council on Environmental Quality
CFR.	Code of Federal Regulations
CIAA	Cumulative Impact Assessment Area
COA	Conditions of Approval
CO_2	Carbon Dioxide
CO_2e	CO_2 Equivalent
CO	Carbon monoxide
CR	Country Roads
CREG	Consensus Revenue Estimating Group
CSU	Controlled Surface Use
CWA	Clean Water Act
DATs	Deposition Analysis Thresholds
dBA	Decibels
DDCT	Density Disturbance Calculation Tool
DOT	United States Department of Transportation
DR	Decision Record
dv	Deciview
EA	Environmental Assessment

EIS	Environmental Impact Study
EO	Executive Order
EOR	Enhanced Oil Recovery
EP	Elk Petroleum Incorporated
EPA	Environmental Protection Agency
ERMA	Extensive Recreation Management Area
ESA	Endangered Species Act
ESD	Ecological Site Descriptions
˚F	Degrees Fahrenheit
FLAG	Federal Land Managers' Air Quality Related Values Workgroup
FLM	Federal Land Managers
FLPMA	Federal Land Policy Management Act
FONSI	Finding Of No Significant Impact
FPA	Federal Power Act
FWS	United States Fish and Wildlife Service
GHG	Green House Gas
GHMU	Gas Hills Management Unit
GIS	Geographic Information System
GLO	General Land Office
GPS	Global Positioning System
GU	Grieve Unit
$GUCO_2PA$	Grieve Unit CO_2 Project Area
GUPA	Grieve Unit Project Area
HMA	Her Management Area
H_2S	Hydrogen Sulfide
IM	Instruction Memorandum
IMPROVE	Interagency Monitoring of Protected Visual Environments
IDT	Interdisciplinary Team
kV	kilovolt
LFO	Lander Field Office
LN	Lease Notice
LOC	Levels of concern
LOP	Life of Project
LRMP	Lander Resource Management Plan
LRP	Limited Reclamation Potential
LT	Long Term
LUP	Land Use Plan
MBTA	Migratory Bird Treaty Act
mg/L	Milligrams per Liter
MLA	Mineral Leasing Act
MLRA	Major Land Resource Area
mph	miles per hour
MSUPO	Multipoint Surface Use Plan of Operations
N	Total Nitrogen
N_2O	Nitrous Oxide
$Na_2 SO_4$	Sodium Sulfate

NAAQS	National Ambient Air Quality Standard
NADP	National Acid Deposition Program
NCR 201	Natrona County Road 201 (Poison Spider Road)
NCR 320	Natrona County Road 320 (Forest Oil Road)
NEPA	National Environmental Policy Act
NH_4	Ammonium
NO_2	Nitrogen dioxide
NO_3	Nitrate
HNO_3	Nitric acid
NO_x	Nitrogen oxide
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
ns	No Standard
NSO	No Surface Occupancy
NTN	National Trends Network
NWI	National Wetland Inventory
NWP	Nation Wide Permits
O_3	Ozone
OPS	U.S. Office of Pipeline Safety
OSHA	Occupational Safety and Health Administration
PCN	Pre-Construction Notification
PFC	Proper Functioning Condition
PFYC	Potential Fossil Yield Classification
PM_{10}	Particulate Matter <10 microns in diameter
$PM_{2.5}$	Particulate Matter <2.5 microns in diameter
POD	Plan of Development
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RMP	Resource Management Plan
ROD	Record Of Decision
ROW	Right Of Way
S	Total sulfur
SHPO	State Historic Preservation Office
SO_2	Sulfur dioxide
SO_4	Sulfate
SPCC	Spill Prevention and Control Countermeasure
SVR	Standard visual range
SPCC	Spill Prevention Countermeasure and Control
SWPPP	Storm Water Pollution Protection Plan
T&E	Threatened or Endangered
TDS	Total Dissolved Solids
TEPC	Threatened, Endangered, Proposed and Candidate
THPO	Tribal Historic Preservation Office
TL	Timing Limitations
TNW	Traditional Navigable Water
TPQ	Threshold Planning Quantity

ug/m^3	microgram per cubic meter
UIC	Underground Injection Control
USACE	U.S. Army Corps of Engineers
USCB	United States Census Bureau
USDOT	U.S. Department of Transportation
USDW	Underground Sources of Drinking Water
VOC	Volatile Organic Compounds
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WAAQS	Wyoming Ambient Air Quality Systems
WAQSR	Wyoming Air Quality Standards and Regulations
WAS	Western Archaeological Service
WDEQ	Wyoming Department of Environmental Quality
WDEQ-AQD	Wyoming Department of Environmental Quality Air Quality Division
WDEQ-LQD	Wyoming Department of Environmental Quality Land Quality Division
WDEQ-WQD	Wyoming Department of Environmental Quality Water Quality Division
WDWS	Wyoming Department of Workforce Services
WGFD	Wyoming Game and Fish Department's
WOGCC	Wyoming Oil and Gas Conservation Commission
WOSHA	Workers Occupational Health and Safety Administration
WSEO	Wyoming State Engineers Office
WTPD	White tailed prairie dog
WYNDD	Wyoming Natural Diversity Data Base

Appendix A: Scoping Notice and Dear Reader Letter

Release Date: 12/08/11

Contacts: Sarah Beckwith
307/347-5207

BLM Lander Seeks Input on Proposed Enhanced Oil Recovery Project

The Bureau of Land Management (BLM) Lander Field Office is seeking public comments on a proposed enhanced oil recovery (EOR) project approximately 53 miles west of Casper in Natrona County, Wyo.

Elk Petroleum, Inc., operator of the Grieve Unit in central Wyoming, has submitted a proposal to conduct EOR in the existing oil field. The Grieve Unit has been a producing field since the 1950s. Approximately 77 percent of the surface and minerals are administrated by the BLM and the remaining are state and private holdings.

It is estimated that four new well pads, access roads, CO2 pipeline, power lines and all other new project facility disturbance would result in a maximum initial surface disturbance of approximately 160 acres. All areas of new disturbance not needed for the life of the project would be reclaimed and long term surface disturbance for the proposed project is estimated to be less than 20 acres.

The Lander Field Office will prepare an environmental assessment (EA) to analyze the impacts of the proposed project. Information, including a map of the area, can be found on the website at:www.blm.gov/wy/st/en/info/NEPA/documents/lfo/grieveunit.html.

Public input is valuable early in the process and will enable the BLM to develop a well-informed EA. Comments should be submitted by Jan. 13, 2011, and may be emailed to lander_wymail@blm.gov; please include "Grieve Unit" in the subject line. Comments may also be mailed to Bureau of Land Management, Lander Field Office, Attn: Chris Krassin, 1335 Main Street, Lander, WY 82520.

Before including your address, phone number, email address or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

For more information, please contact BLM Natural Resource Specialist Chris Krassin at 307-332-8400.

SCOPING NOTICE
for
Elk Petroleum, Inc.
GRIEVE UNIT CO_2 ENHANCED OIL RECOVERY PROJECT

Bureau of Land Management
Lander Field Office
October 2011

Background

Elk Petroleum, Inc. (Elk) operator of the existing Grieve Unit in central Wyoming submitted a proposal for enhanced oil recovery (EOR) of existing oil field to the Bureau of Land Management (BLM), Lander Field Office. Elk proposes inject of CO_2 and water in the oil baring zones to increase the amount of recoverable crude oil compared to the current primary recovery of this aging oil field. The EOR is expected to extend the field's productive life while sequestering CO_2 gas. This notice is to inform the public that BLM Lander Field Office will prepare an Environmental Assessment (EA) for this proposed project.

The proposed project is located approximately 53 miles west of Casper in western Natrona County, Wyoming, and within the administrative boundary of the BLM's Lander Field Office. The Grieve Unit comprises approximately 2280 acres of State, Fee and Federal minerals and surface lands within the boundary of the Unit. Approximately 77% of the surface and minerals are administrated by BLM and the remaining 22% are State and Fee holdings.

The Grieve Field began producing crude oil from the Cretaceous Muddy "Grieve Sand" in 1954. In this same year an exploratory agreement was approved and the field became known as the Grieve Unit. Initial developed and production was conventional until 1960 when production rates were enhanced through gas injection. In 1977, the reservoir was "blown down" as the natural gas and oil were depleted. Today, production continues at low rates with only two wells producing. The last well drilled in the unit was in 2009 and it was eventually shut-in.

Description of Proposed Project

Elk proposes to develop an EOR project consisting of the following operations and maintenance activities:

1. Install a CO_2 underground pipeline and meter station,
2. Install an overhead 25 kV three-phase distribution line,
3. Install and overhead 230 kV transmission line,
4. Head Switch Yard,
5. Drill 2 new crude oil producing wells,
6. Drill 8 new alternating CO_2 injection and water disposal wells(2 of these wells are on private or state lands within the Unit),

7. Convert 4 Production wells to CO_2 injection or water disposal wells
8. Install new unit underground gas gathering and distribution lines,
9. Install new underground water disposal line
10. Upgrade and construct new access roads

The proposed number, spacing, and arrangement of the wells are designed to provide maximum recovery of crude oil remaining in place in the unit. Downhole modifications to the existing wells would be permitted through the Sundry Notice process under to BLM regulations. New wells would be permitted through the Application for Permit to Drill process under BLM regulations. For injection wells, Elk would be required to obtain an Underground Injection Control (UIC) permit from the State of Wyoming.

The production infrastructure would include a combination of entrenched CO_2 and water distribution and crude oil gathering lines running either parallel to project roads or the most direct cross country route. Centralized gathering, production, metering and compression facilities will be located at the site of the existing unit facilities.

The overhead 25 kV three-phase distribution line would connect the meter station, located at the tie-in point of the Anadarko CO_2 line and the proposed Grieve Unit CO_2 pipeline, to the field central facility. The proposed power transmission line, connecting the in-field central facility to the WAPA system, would be an overhead, H-brace structured, 230 kV line. A Head Switch yard would be constructed near this connect with the WAPA system.

The project construction activities would begin with the installation of the CO_2 line and meter station, drilling of new wells and the installation of the overhead power distribution line to the CO_2 pipeline tie-in point meter station. The overhead power transmission line would be the final feature completed on the project.

It is anticipated that injection and production will not require enhanced compression or recovery units. However, in the event mechanical injection or production units are needed the existing overhead power system will be used. Additions to the existing in-field power will be underground, where technically feasible.

The crude oil produced from the proposed project would be transported to a Casper area crude oil terminal via the existing crude oil pipeline; this action would be approved through the Sundry Notice process and is not considered in the EA.

It is estimated that the four new well pads, access roads, CO_2 pipeline, power lines and all other new project facility disturbance would result in a potential maximum initial surface disturbance of approximately 160 acres. The construction of all aspects of the proposal is expected to last three to five years. All areas of new disturbance not needed for life of project operations will be reclaimed per BLM, or surface owner, specifications. Long term surface disturbance for the proposed project is estimated to be less than 20 acres.

IDENTIFIED RESOURCE MANAGEMENT ISSUES AND CONCERNS

The following issues and concerns have been identified. This list is not meant to be an all-inclusive list, but rather a starting point for further public input and a means of identifying the resource disciplines needed to conduct the analysis.

- Potential effects to wildlife habitat within the analysis area, including big game, raptors, sage grouse, white-tailed prairie dog, black-footed ferret, and mountain plover.
- Possible effects to listed, proposed, or threatened and endangered plant and animal species.
- Potential effects to wetlands and riparian habitat.
- Potential effects to cultural and historical values within the project area.
- Possible effects to surface and groundwater resources.
- Potential effects to air quality due to increased traffic, emissions, production activities and associated effects on existing county, state, and BLM roads.
- Consistency with the State of Wyoming commitment to CO_2 (Green House Gas) sequestration and enhanced recovery of oil from existing fields.
- Reclamation of disturbed areas and control of noxious weeds.
- Cumulative effects of the proposed project when combined with ongoing crude oil and natural gas drilling and development.
- Possible effects to rangelands.
- Possible effects to commercial outfitters use.
- Possible effects to recreational activities.
- Possible effects to visual resources.

PUBLIC INVOLVEMENT

Public input is important in establishing the level and scope of the analysis. The public is encouraged to participate throughout the environmental analysis process to help in identifying the level of analysis needed, alternatives to the proposed action, other issues or concerns that should be analyzed or mitigated, and any other comments or ideas to help ensure the completeness of the analysis process.

The BLM can best use comments and resource information if submitted before the close of the public scoping period (December 7, 2011 - January 13, 2012). Please submit written comments to:

Bureau of Land Management
Lander Field Office (c/o Chris Krassin)
1335 Main Street
Lander, WY 82520

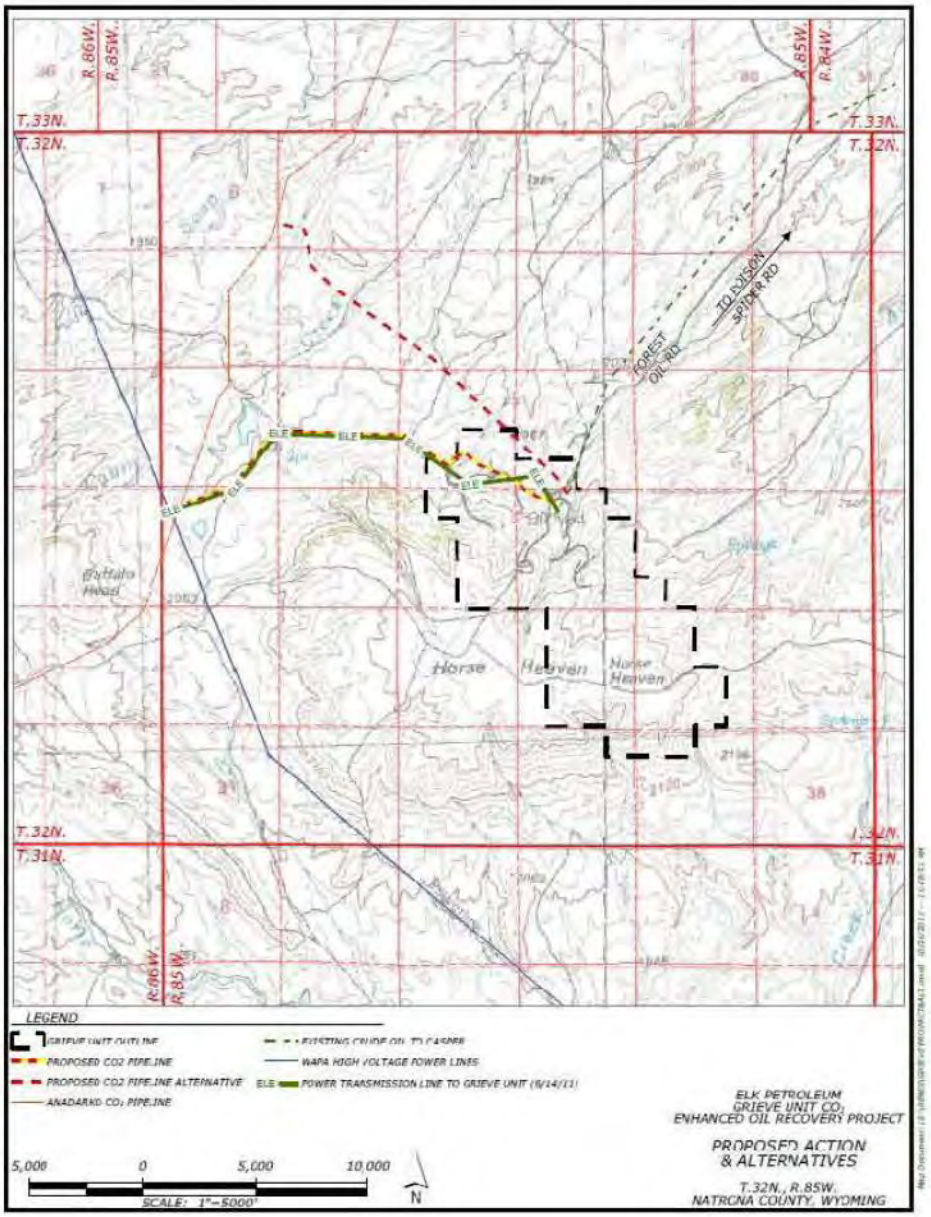
Comments may also be submitted electronically to: lander_wymail@blm.gov

Please note that comments, names, email addresses, and street addresses of the respondents, will be available for public review and disclosure at

the above address during regular business hours (7:45 a.m. to 4:30 p.m.), Monday through Friday, except holidays. Individual respondents may request confidentiality. If you wish to withhold your name, email address, or street address from public review or from disclosure under the Freedom of Information Act, you must state this plainly at the beginning of your comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

If you require additional information regarding this project, please contact Chris Krassin at the above email or street address or phone 307-332-8452.

Figure 1 – Proposed Grieve Unit CO2 Enhanced Oil Recovery Project




Grieve Field Location
Pine
Mountain
Yellowstone Highway US 20-26
Natrona County International Airport
Interstate 25
Zero Road NC 203
Poison Spider School
Poison Spider Road NC 201
NC 201
Poison Spider Road
Oil Road NC 320
Forest
Grieve Unit
Ridge
CASPER
Casper Mountain
WY 220
Alcova Highway

Appendix B: Grieve Unit CO_2 EOR Project CO_2

Site Specific Reclamation Plan

RECLAMATION PLAN

FOR THE

GRIEVE UNIT CO_2 ENHANCE OIL RECOVERY PROJECT

RECLAMATION PLAN

FOR THE

GRIEVE UNIT CO_2 ENHANCE OIL RECOVERY PROJECT

Submitted By:

ELK PETROLEUM, INC.

123 West 1st Street, Suite 550

Casper, WY 82601

Prepared By:

BKS Environmental Associates, Inc.

P.O. Box 3467

Gillette, WY 82717

April 6, 2012

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INTRODUCTION

The following reclamation plan was developed for the Elk Petroleum, Inc. (EP) Grieve Unit CO_2 Enhanced Oil Recovery Project ($GUCO_2$). EP proposes to implement enhanced crude oil recovery from the Cretaceous Muddy "Grieve Sand" using a miscible CO_2 flood with water injection to assist with reservoir re-pressurization within the Grieve Unit. Implementation of this project will require use and modification of the existing Grieve Unit infrastructure as well as construction of new infrastructure as outlined below.

Infrastructure

Construction of 3.62 miles of new eight inch CO_2 pipeline connecting the existing Anadarko CO_2 pipeline to the Grieve Unit

Installation of CO_2 handling/recycling equipment at the existing Grieve Unit central facilities

Construction of a 5 acre fenced CO_2 meter station at the tie-in point of the Anadarko and Grieve CO_2 lines

Construction of 3.75 miles of new overhead 230kV power line from the existing Western Area Power Authority (WAPA) system to the Grieve Unit central facilities

Construction of 0.33 miles of 230kV power line right of way (ROW) structure access road

Construction of two electrical sub-stations

- Buffalo Head sub-station located at the interconnect point with WAPA
- Horse Heaven sub-station located at the existing Grieve Unit central facilities

Construction of 3.75 miles of new overhead 25kV power line that generally follows the CO_2 pipeline ROW from the Horse Heaven sub-station to the tie-in point meter station

Existing power structures will be used to the extent possible, and new in-field power will be installed underground to the extent feasible

Crude oil will be transported to market via the existing eight inch crude oil line from the Grieve Unit to the Platte Pipeline terminal in Mountain View/Casper

Construction of a centralized production, separation, and compression facility and a field office at the existing Grieve Unit central facilities

In-field gathering and distribution trunk lines will contain three sets of flow lines: produced fluids, clean CO_2/water injection, and produced water

- Trunk lines will roughly follow the existing natural gas gathering pipeline system and branch off to the individual wells via the most direct route or parallel to the well site access roads
- Construction of 3.7 miles of single line in-field gathering/injection pipeline and 4.5 miles of multiple line in-field gathering/distribution pipeline

Improvement to existing and/or an addition of 3.5 miles of power line and CO_2 line access road

Existing access roads, well sites, gathering lines, and electricity will be used to the maximum extent to minimize surface disturbance

CO_2/Water Injection and Oil Wells

Operation will require 18 CO_2/water injection wells and 10 crude oil wells

Use 10 existing wells and construct 8 new CO_2/water injection wells

Use eight existing wells and construct two new crude oil wells

- An additional 11 existing wells may be utilized as needed

Construction of four new 325ft X 200ft multi-well pads

Construction of two new 325ft X 175ft single well pads

Construction of 0.5 miles of new access road to the new well pads

Existing wells will be worked over or recompleted as necessary

Un-used wells will be plugged and abandoned

Existing monitoring wells will be re-entered

The purpose of this reclamation plan is provide pre-disturbance site characteristics, including soils, vegetation, and wetland data, identify reclamation practices and processes utilized to meet reclamation standards, and document monitoring protocols for evaluation of reclamation compliance and effectiveness, on a site specific level. This document is meant to serve as an adaptive reclamation plan, which may be amended and/or revised, as necessary, to assure short term and long term reclamation goals are achieved, as well as, ensure continued compliance with agency protocols and requirements. All amendments and/or revisions will be submitted to the Bureau of Land Management-Lander Field Office (BLM-LFO) via Sundry Subsequent Report (Form 3160-5). Amendments and/or revisions will be completed and approved by the BLM-LFO Authorize Officer (AO), prior to implementation. EP will develop and submit a Final Reclamation Plan to the BLM-LFO AO prior to receipt of project abandonment.

RECLAMATION GOAL

The reclamation goal of EP and the following plan is to ensure, in the short term, the immediate stabilization of disturbed areas and provide the conditions necessary to, in the long term, facilitate eventual ecosystem reconstruction to maintain a safe and stable landscape and meet the desired outcomes of the land use plan (USDI BLM 2009). In order to meet this long term reclamation goal, the objective of interim reclamation is to re-establish landscape continuity, minimize establishment of invasive plant species, stabilize the soil at disturbed locations, and promote diversified plant communities within the Grieve Unit through reclamation techniques that initiate and accelerate ecological succession to meet wildlife habitat goals including seeding of native plant species and interim reclamation designs that minimize re-disturbance during final

reclamation (USDI BLM-LFO 2011a). If the desired outcomes of interim reclamation have not been determined a success within a five year period, the reclamation plan will be revised to mitigate the project area.

1.0 PRE-DISTURBANCE SITE CHARACTERIZATION

Project Area Description

The $GUCO_2$ is located within a non-Designated Development Area (non-DDA) of the BLM-LFO Gas Hills Management Unit and is comprised of approximately 2,300 acres of State, Fee, and Federal lands. The Grieve Unit encompasses all or portions of: Sections 5, 6, 8, 9, 15, 16, 17, 18, 19, 21, 22, 26, and 27, T32N R85W; Section 1, T32N R86W; Section 31, T33N R85W; and Sections 15, 16, 21, 22, 23, 26, 27, 34, and 35, T32N R85W.

The project area is situated on the northern flank of the Rattlesnake Range and more specifically in a topographic area locally known as "Horse Heaven". This is an upland area that is generally west of Burnt Wagon Draw, southeast of Cabin Creek, southwest of Austin Creek, east of Buffalo Head, northeast of Keester Basin, east/southeast of Garfield Peak, south of Poison Spider Creek, and generally west of the city of Casper, Wyoming. This area is characterized by gently to moderately undulating uplands dissected by numerous dendritically patterned ephemeral tributaries of Poison Spider Creek including Austin and Cabin Creeks.

Total new disturbance for the proposed $GUCO_2$ project is approximately 163.82 acres. Proposed construction designs and associated disturbance boundaries for the proposed $GUCO_2$ are located in Addendum A on the Site Specific Reclamation Map. Refer to Table 1 for a list of proposed action disturbance assumptions.

Table 1: Proposed Surface Disturbance from $GUCO_2$ Proposed Action.

Category	Proposed Action Components	Proposed Action Disturbance Assumptions	New Short Term (acres)	New Life of Project (acres)
Multi-Well Pads	4	New wells average initial disturbance average 3.3 acres; reduced to 1.5 acres *	13.2	6.0
Single Well Pads	2	New wells initial disturbance average 3.0 acres; reduced to 1.04 acres **	6.0	2.08
Monitoring Well	-0-	Re-enter existing well	-0-	-0-
Well Site Access Roads	0.5 mi	Initial construction 24 ft wide; reduced to 16 ft driving surface	1.45	0.96
Centralized Facility	-0-	Remove unnecessary and antiquated equipment; replace with new and reclaim unused	-0-	-0-

Table 1: Proposed Surface Disturbance from GUCO$_2$ Proposed Action.

Category	Proposed Action Components	Proposed Action Disturbance Assumptions	New Short Term (acres)	New Life of Project (acres)
		areas		
Un-Used Wells	-0-	Plug and abandon; reclaim sites; assume 1.04 acres each	2.08	-0-
In-Field Gathering/ Injection Pipelines (Single Lines)	3.7 mi	Follow alignment of existing infield gathering lines and access roads to extent possible; construction ROW 40 ft wide	18.08	-0-
In-Field Gathering/ Distribution Pipelines (Multiple Lines)	4.5 mi	Follow alignment of existing infield gas line and access roads to extent possible; construction ROW 100 ft wide	54.75	-0-
Buffalo Head Substation (Western Interconnect)	16.0	Locate WAPA breakers and step-down sub-station	16.0	14.0
230 kV Transmission Line ROW	3.75 mi	3.75 mi; pole every 573 ft or 21 to 24 H-brace pole and 6 to 8 three pole structures (average disturbance 0.15 acre per structure)	3.6	0.02
230 kV Transmission Line ROW Structure Access Roads	0.33 mi	16 ft wide unimproved 2-track structure access roads	0.63	0.63
25 kV Overhead Distribution Line	3.75 mi	3.75 miles; pole every 300 ft or 65 poles; 14 ft^2 per pole disturbance	0.02	0.02
CO_2 Tie-In Meter Station	5.0	Fenced yard with building containing metering equipment and outside pipeline connections	5.0	2.5
CO_2 Connector Line ROW	3.62 mi	75 ft initial construction disturbance width	32.90	-0-
Power Line / CO_2 Line Access Road	3.5	24 ft wide construction, reduced to 16 ft driving surface	10.11	6.75

Table 1: Proposed Surface Disturbance from $GUCO_2$ Proposed Action.

Category	Proposed Action Components	Proposed Action Disturbance Assumptions	New Short Term (acres)	New Life of Project (acres)
TOTAL ACRES OF NEW DISTURBANCE			**163.82**	**32.96**

NOTE: Assume No New Disturbance on Existing Well Sites

Pre-Disturbance Site Assessment

To determine baseline conditions, a pre-disturbance site assessment was conducted on August 2 and 3, 2011, by soil scientists, vegetation ecologists, and wetland specialists from BKS Environmental Associates, Inc. (BKS) of Gillette, Wyoming. BKS utilized proposed infrastructure designs and staked locations in the field to ensure the entire extent of the proposed disturbance area, as of August 2011, was evaluated during the pre-disturbance site assessment. United States Department of Agriculture National Aerial Imagery Program (NAIP) 2009 true color ortho aerial imagery (ArcGIS 2011) was used to delineate pre-disturbance plant communities and topsoil/suitable subsoil salvage depths based on field verification of NRCS soil map units and Ecological Site Descriptions (ESDs) during the pre-disturbance site assessment. During the pre-disturbance site assessment, qualitative soils and vegetation data were collected. Identification of wetlands was based on visual assessment of vegetation and hydrology indicators, as well as intrusive soil sampling to determine the presence of wetland criteria indicators. Methodology for the collection of this data and results of the assessments are provided in the appropriate sections below. Changes in disturbance boundary locations following the August 2011 surveys were evaluated based on a review of NAIP true color ortho aerial imagery and known expression of NAIP true color ortho aerial imagery within the project area, NRCS soil and ESD data, NWI data, and field data collected during the August 2011 surveys.

Site specific recommendations were made, as appropriate, during the pre-disturbance site assessment and upon review of the aerial imagery, topography, and data collected during the pre-disturbance site assessment. A site specific reclamation map was created utilizing ArcGIS mapping software to digitize the pre-disturbance site assessment observations. Well pads, substations, and central facilities were mapped based on the disturbance boundaries provided. Roads were mapped based on the construction buffers indicated in Table 1. All proposed pipelines were mapped based on a 150ft buffer as opposed to the actual 100ft construction disturbance, except at wetland locations where the buffer was reduced to 30ft. Power line disturbances were surveyed, but as the exact location of the power poles is unknown were not mapped. Due to the extended area mapped (approximately 259 acres); acreages reported in this document are greater than the actual disturbances (approximately 164 acres) that will occur during construction. The following Soils, Vegetation, and Wetland sections only document pre-

disturbance conditions within the mapped disturbance area. Refer to Addendum B for the Site Specific Reclamation Map. The Site Specific Reclamation Map includes surveyed disturbance boundaries, infrastructure, NRCS ESD and soil map units, pre-disturbance plant communities, topsoil/suitable subsoil salvage depths, BLM-LFO identified limited reclamation potential (LRP) areas, and wetlands within the proposed disturbance boundary overlain on aerial imagery.

Pre-disturbance photo documentation was conducted during the pre-disturbance site assessment. Photographs were taken at each corner of the well pad disturbance boundary looking onto the well pad toward the well locations. Photographs were also taken along the well pad access roads, project access roads, pipelines, and power lines. GPS points were taken at each photo location and general direction was noted. All photographs are located in Addendum A.

The BLM-LFO defines LRP areas as sites characterized by highly sensitive soils and/or erosive soils, with physical or chemical limitations, and landforms with slopes greater than 25%. Characteristics used to identify LRP areas include soil textures with poor water holding capacity or soil textures prone to excessive wind or water erosion; soils with high levels of salts that interfere with plant growth; soils on slopes greater than 25%; soil profiles that limit water holding capacity and/or create rooting-zone limitations; and coarse fragments that limit common reclamation practices (USDI BLM 2011b). Identification of Limited Reclamation Potential (LRP) sites was based on data provided by the BLM-LFO.

Table 2: Factors Evaluated During Pre-Disturbance Site Assessment.

Description	Definition
Ecological Site Description	Ecological Site Descriptions (ESDs), as verified in the field, based on soil and plant community characteristics at the site.
NRCS Map Unit	Based on NRCS soil data and field observations of soil characteristics.
Soil Depth	Depth to paralithic or lithic material. Categories include: very shallow (less than 10 inches to bedrock), shallow (10-20 inches to bedrock), moderately deep (20-40 inches to bedrock), deep (40-60 inches to bedrock), and very deep (greater than 60 inches to bedrock).

Table 2 (Continued): Factors Evaluated During Pre-Disturbance Site Assessment.

Description	Definition
Soil Texture	General texture, of each soil horizon, based on the texture by feel method.
Soil Limiting Factor	Factors that limit how much soil the operator can salvage based on suitability of the material itself rather than equipment limitations. Those limits will either be physical or chemical in nature. Soil limiting factors include: coarse fragments, high $CaCO_3$, erosive, texture, pH, high salinity/sodicity, shallow soils (depth to paralithic or lithic material), or none.

Topsoil/Suitable Subsoil Salvage Depth	Recommended topsoil/suitable subsoil salvage based on soil depth, soil texture, and soil limiting factors.
Soil Movement	Presence of and extent of wind or water erosion including sheet erosion, rills, gullies, pedestalled plants, wind scoured areas, or slope washes.
Soil Amendments	Recommended amendments to add to the replaced soil, prior to reclamation, based on pre-disturbance soil limiting factors.
Plant Community	Plant community that most represent the ESD based on ocular estimation of the dominant plant species.
Dominant Plant Species	Dominant plant species within each observed ESD or plant community, based on ocular estimation.
Noxious and Invasive Plant Species	Observation and documentation of Wyoming state designated noxious weeds and Natrona and Freemont County declared weeds and weeds of concern.
Threatened, Endangered, and Special Status Plant Species	Observation and documentation of individuals, populations, or suitable habitat of U.S. Fish and Wildlife Service Threatened and Endangered and Bureau of Land Management Lander Field Office Sensitive plant species.
Reclamation/Stabilization Category	The potential for erosion hazard and reclamation potential of each site. Categories are based on the plant community, topsoil/suitable subsoil salvage depth, slope, aspect, and soil limiting factors.

Ecological Site Description

The following ESDs are located within the disturbance area according to field verification of NRCS ESD. NRCS ESD boundaries are provided on the Site Specific Reclamation Plan map; however, based on field observations the NRCS boundaries are not accurate for the scale of this analysis. Therefore, appropriate plant communities based on ESD descriptions indicate the field verified boundaries and are outlined in the following ESDs.

Loamy 10-14" P re cipi tation Zone Hi gh P lains S outheast

This ESD occurs in an upland position on relatively flat to moderately sloping land on all exposures. Slopes vary from 1-30%. The soils of this site are deep to moderately deep and well drained with textures ranging from loams to very fine sandy loams (Brazee 2008a). This ESD is represented on the Site Specific Reclamation Map as vegetation communities BS/MG and RW/NT as describe in the vegetation section.

Shallow Loamy 10-14 " P recipi tation Zone Hi gh P lains S outheast

This ESD occurs in an upland position on south and west facing slopes, but may be found on all slopes and positions. Slopes vary from 1-45%. The soils of this site are well drained shallow soils over all types of bedrock except igneous and volcanic. Textures range from very fine sandy loams to clay loams (Brazee 2008b). This ESD is represented on the Site Specific Reclamation Map as vegetation communities BW/RW and LP as describe in the vegetation section.

Saline Subirrigated 10-1 4" P recipi tation Zone Hi gh P lains S outheast

This ESD occurs on nearly level land along perennial or intermittent streams, near seeps, sloughs, or springs. It is also found on broad, low lake terraces, lake plains, or on alluvial bottoms, and poorly-drained bottomlands adjacent to stream channels. These areas receive additional run-in water from higher sites and from a fluctuating water table, well within the root zone. Slopes vary from 1-10%, but are mostly less than 3%. Soils of this site are mostly deep and somewhat poorly drained. Textures are loamy, sometimes stratified, with a seasonal high water table depth of one to three feet. The soils and soil water have high enough salinity to restrict plant establishment and growth. Mottling or gleying may occur within 40 inches of the surface (Brazee 2008c). This ESD is represented on the Site Specific Reclamation Map as vegetation community AS/BW as describe in the vegetation section.

Subirrigated 10-14" P re c ipi tation Zone Hi gh P lains S outheast

This ESD occurs on level to nearly level land along perennial or intermittent streams near seeps, springs, and sloughs. Slopes vary from 1-10%. The soils of this site are deep and formed from alluvium. The soils have water tables below the surface for all of the growing season. The water table is non-saline and non-alkaline. The soils are loamy with a seasonal high water table depth of about one to three feet. Mottling or gleying may occur within 40 inches of the surface. Water may be present at the surface from run-in, but only for short periods of time (Brazee 2008d). This ESD is represented on the Site Specific Reclamation Map as vegetation community WW/KB as describe in the vegetation section.

Wetland 10-14" P recipi ta ti on Zone Hi gh P lains S outheast

This ESD occurs on level or gently sloping bottomlands, near springs, seeps, and sloughs, on nearly level to slightly depressed areas with poor surface drainage. Slopes vary from 1-6%. This site consists of moderately deep organic and deep loamy or silty soils with a seasonal high water table at or near the surface. Subsoils are usually mottled or gleyed (Brazee 2008e). This ESD is represented on the Site Specific Reclamation Map as vegetation community WET.

Soils

Pre-Disturbance Site Assessment Methodology

A hand held probe was used to view the top six to 12 inches of the soil profile. Soil texture, soil limiting factors, soil depth, and topsoil/suitable subsoil salvage depth were determined by the information collected from the probe. This information was then compared to the NRCS soil mapping and available ESD information. Soil texture was determined using the texture by feel method (Norton and Strom 2011), and calcium carbonate content was determined by visually observing the chemical reactions after application of a 10% HCl solution. Soil movement was assessed by visually observing indicators of soil erosion, including but not limited to: sheet

erosion, rills, gullies, and pedestalled plants.

Pre-Disturbance Site Assessment Results

Soil Series

The following NRCS soil map units are located within the disturbance area according to NRCS soil data and field verification (USDA NRCS 1997) (Table 3).

Table 3. NRCS Map Unit Symbols, Map Unit Descriptions, and Associated 10-14" Precipitation Zone High Plains Southeast Ecological Site Descriptions of the Soil Series Present within the $GUCO_2$ Disturbance Area (USDA NRCS 1997).

Map Unit Symbol	Map Unit Description	Associated ESD
104	Alcova - Stunner, 3-15% slopes	Loamy
110	Aquic Ustifluvents, saline, 0-3% slopes	Saline Subirrigated
129	Boettcher - Pinelli - Worfman loams, 3-15% slopes	Loamy
137	Brownsto - Lupinto complex loams, 6-40% slopes	Shallow Loamy
184	Forelle - Diamondville complex, 3-15 % slopes	Loamy
217	Lupinto - Alcova complex, 3-30% slopes	Loamy

Soil series within the disturbance area are shallow to very deep (USDA NRCS 1997) (Table 4). Based on the pre-disturbance site assessment soil surface textures are predominantly loam. Clay loam, sandy loam, clay, sandy clay loam, and silty clay loam surface textures were also observed. Most soil series are well drained and have formed in alluvium and slopewash alluvium derived from various sources (USDA NRCS 1997).

Table 4. Depth, Surface Textural Classes, Drainage Classes, Landform Associations, and Parent Material of the Soil Series Present within the $GUCO_2$ Disturbance Area (USDA NRCS 1997).

Series	Depth	Surface Textural Class	Drainage Class	Landform	Parent Material
Alvoca	Very Deep	Fine sandy loam	Well Drained	Terraces and alluvial fans	Alluvium derived from various sources
Aquic Ustifluvents	Very Deep	Loam	Somewhat poorly drained	Flood plains and in basins	Alluvium derived from various sources
Boettcher	Moderately deep	Loam	Well Drained	Hills	Slopewash, alluvium and residumm derived from sandstone and shale
Brownsto	Very Deep	Cobbly loam	Somewhat excessively drained	Ridges and Hills	Alluvium and colluvium derived from various sources
Diamandville	Moderately	Fine sandy	Well Drained	Hillsides	Slopewash

	deep	loam			alluvium and residumm derived from sandstone, siltstone and shale
Forelle	Very Deep	Loam	Well Drained	Plateaus, fan terraces, foot slopes and alluvial fans	Alluvium derived from various sources
Lupinto	Very Deep - Deep	Gravelly loam	Well Drained	Alluvial fans, terraces, ridges, hills, and foot slopes of terrace breaks	Alluvium derived from various sources
Pinelli	Very Deep	Loam	Well Drained	Alluvial fans, plateaus, and foot slopes	Alluvium derived from various sources
Stunner	Very Deep	Sandy loam	Well Drained	Terraces and plateaus	Alluvium derived from various sources
Worfman	Shallow	Loam	Well Drained	Ridge crests, dip slopes and hills	Residumm and slopewash alluvium derived from sandstone, siltstone and shale

Hydric Soils

Hydric soils are defined by the National Committee for Hydric Soils as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register 1994). No soils series found within the project area are considered as hydric by the Natrona County NRCS; however, hydric soils were identified during wetland delineation field work and were located mainly in drainage bottoms and flood plains. NRCS Map Unit 185-Tisworth sandy loam, 0-5% slopes is found near the project area and may contain the minor inclusion of the hydric Typic Fluvaquents series on floodplains. The Typic Fluvaquent series is hydric criteria code 4 which means that the soil is frequently flooded for long durations or very long durations during the growing season. It meets hydric flooding criteria but does not meet saturation or ponding criteria.

The majority of soil series found within the project area are in Hydrologic Soil Group B (Table 5). Soils in this group have moderately low runoff potential when thoroughly wet and water transmission through the soil is unimpeded (USDA NRCS 1997).

Table 5. NRCS Hydrologic Soil Groups of the Soil Series Present within the $GUCO_2$ Disturbance Area (USDA NRCS 1997).

Series	Hydrologic Soil Group
Alvoca	B
Aquic Ustifluvents	N/A
Boettcher	C
Brownsto	B
Diamandville	C
Forelle	B
Lupinto	B
Pinelli	C
Stunner	B

Soil Limiting Factors

Based on the pre-disturbance site assessment, physical and/or chemical soil limiting factors within the disturbance area include coarse fragments, high erosion potential, shallow soils, high salinity/sodicity, and high calcium carbonate content. Generally, coarse fragments are a soil limiting factor throughout the disturbance area within Shallow Loamy and Loamy ESDs, but were less common or at lesser density within the Loamy ESD. Pedestalled plants indicating high erosion potential were primarily located in the Shallow Loamy ESD. Steep slopes in both the Shallow Loamy and Loamy ESDs are at risk for high erosion potential during construction activities. Surface horizon texture also indicates the majority of the disturbance area is susceptible to compaction as sandy loam, loam, and sandy clay loam soils compact more easily than other textures (USDA NRCS 2001a). Visual observation of rock outcrops indicating shallow soils were primarily occurred within the Shallow Loamy ESD, but were also observed in the Loamy ESD. High salinity/sodicity potential was only observed within the Saline Subirrigated ESD and within the Loamy ESD surrounding the Saline Subirrigated ESD. The NRCS soil map unit within the Saline Subirrigated ESD is Aquic Ustifluvent a soil series that has excess salts or high sodium concentrations. Calcium carbonate content issues were observed in both the Loamy and Shallow Loamy ESDs.

The NRCS rating for the construction of roads is moderate to severe which means soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possible increased maintenance are required (USDA NRCS 1997) (Table 6). Soils are generally limited for road construction by slope, flooding, frost action, shrink-swell, low strength, depth to rock, and large stones. Source of roadfill is generally rated as poor and is limited by wetness, depth to rock, shrink-swell, low strength, thin layer, slope, and large stones. These soils may have layers of suitable material, but the material is less than 3 feet thick (USDA NRCS 1997). The shallow excavation rating includes trenches dug for the proposed CO_2 pipeline and holes dug for the power line poles. Most soil series found within the disturbance area are rated as severe and are limited by cutbank caving, wetness, depth to rock, high clay content, slope, and large stones. The ratings are based on soil properties, site features, and observed performance of the soils (USDA NRCS 1997).

Soil Movement and Erosion Potential

Soil series within the disturbance area generally have moderate surface runoff, and moderate water and wind erosion hazard (Table 7). The primary indicator of soil movement observed during the pre-disturbance site assessment was pedestalled plants within the Loamy and Shallow Loamy ESDs. Rills, gullies, and sheet erosion were not observed.

Table 6. Ratings and Limitations for Road Construction, Shallow Excavation, Source of Roadfill, and Source of Topsoil of the Soil Series Present within the $GUCO_2$ Disturbance Area (USDA NRCS 1997).

Series	Roads	Limitation	Source of Roadfill	Limitation	Shallow Excavation	Limitation	Source of Topsoil	Limitation
Alvoca	Slight/ Moderate	Slope	Good	N/A	Severe	Cutbanks Cave	Poor	Small stones - Area reclaim
Aquic Ustifluvents	Severe	Flooding - Frost action	Fair	Wetness	Severe	Wetness	Good*	N/A*
Boettcher	Severe	Shrink swell - Low strength	Poor	Depth to rock- Shrink swell - Low strength	Moderate	Depth to rock - Too clayey	Poor	Too clayey - Small stones
Brownsto	Severe	Slope	Poor	Slope	Severe	Slope	Poor	Small stones - Area reclaim - Slope
Diamandville	Severe	Low strength	Poor	Depth to rock - Low strength	Moderate	Depth to rock - Slope	Fair	Depth to rock - Too clayey - Small stones
Forelle	Moderate	Frost action	Good	N/A	Slight	N/A	Fair	Too clayey
Lupinto	Moderate/ Severe	Slope	Good/ Fair	Depth to rock - Thin layer - Slope	Moderate/ Severe	Slope	Poor	Small stones - Area reclaim - Slope
Pinelli	Severe	Shrink swell - Low strength	Poor	Low strength	Moderate	Too clayey	Poor	Too clayey
Stunner	Moderate	Low strength - Slope	Good	N/A	Severe	Cutbanks Cave	Fair	Small stones - Area reclaim - Slope
Worfman	Moderate		Poor	Depth to rock	Severe	Depth to rock	Poor	Depth to rock - Small stones

* NRCS does not account for the saline modifer. According to the 110 - Aquic Ustifluvents, saline, 0-3% slopes soil map unit, most uses are limited by the wetness, flooding, salinity, and alkalinity.

Table 7: Surface Runoff and Wind and Water Erosion Potential Hazards of the Soil Series Present within the $GUCO_2$ Disturbance Area (USDA NRCS 1997).

Series	Surface Runoff	Water Erosion	Wind Erosion
Alvoca	Medium	Moderate	Severe
Aquic Ustifluvents	Slow	Slight	N/A
Boettcher	Medium	Moderate	Moderate
Brownsto	Rapid	Severe	Slight
Diamandville	Medium	Moderate	Severe
Forelle	Slow - Medium	Slight - Moderate	Moderate
Lupinto	Rapid	Severe	Slight
Pinelli	Slow	Slight	Moderate
Stunner	Medium	Moderate	Moderate
Worfman	Rapid	Severe	Moderate

Topsoil/Suitable Subsoil Salvage Depths

The NRCS rating for the suitability of soil series within the disturbance area as a source of topsoil is generally rated as poor and is limited by small stones, slope, high clay content, depth to rock, excess salt, excess sodium and reclamation difficulty (USDA NRCS 1997) (Table 6). Topsoil/Suitable subsoil depths within the disturbance area were determined based on NRCS data and field observations. Topsoil/suitable subsoil salvage depths were generally 1-2 inches for the Shallow Loamy and Saline Subirrigated ESD, 2-6 inches for the Loamy ESD, 6 inches or greater for the Subirrigated ESD (Table 8). The approximate 7 acres of previously reclaimed land within the disturbance are was determined to have 1-2 inches of suitable salvageable material. Disturbed areas, totaling approximately 36 acres were determined to have no suitable salvage material available.

Table 8: Topsoil/Suitable Subsoil Salvage Depths by ESD.

ESD (Map Units)	Plant Community	Topsoil/Suitable Subsoil Salvage Depth	Acres
Loamy (104, 129, 184, 217)	Big Sagebrush/Mixed Grass	1-2”	21.6
		2-6”	54.6
		6”+	0.3
	Rhizomatous Wheatgrass/Needle-and-thread	2-6”	2.3
		6”+	1.7
Shallow Loamy (137)	Bluebunch Wheatgrass/Rhizomatous	1-2”	66.0
		2-6”	45.7
	Limber Pine	1-2”	4.2
Saline Subirrigated	Alkali Sacaton/Basin Wildrye	1-2”	16.7
Subirrigated	Western Wheatgrass/Kentucky	6”+	1.1
Reclaimed	N/A	1-2”	7.1
Disturbed	N/A	0”	36.2

Limited Reclamation Potential

The following NRCS soil map units are considered LRP based on BLM-LFO data:

Map Unit 110 – Aquic Ustifluvents, saline, 0-3% slopes and
Map Unit 137 -Brownsto - Lupinto complex loams, 6-40% slopes.

NRCS map unit 110 is located in the NW ¼ of Section 19, T33N R85W and the SE ¼ of Section 18, T33N R85W. NRCS map unit 137 is located throughout the disturbance area. There are approximately 148 acres of LRP within the disturbance area based on BLM-LFO LRP data. However, based on field observations, LRP areas are estimated to be 132 acres and are represented on the Site Specific Reclamation Map by the AS/BW and BW/RW designations that indicate Saline Subirrigated and Shallow Loamy ESDs, respectively. The Saline Subirrigated ESD is associated with NRCS map unit 110 and the Shallow Loamy ESD is associated with NRCS map unit 137.

Vegetation

Pre-Disturbance Site Assessment Methodology

Plant communities were determined based on ESD and ocular estimation of dominant vegetation species. Dominant and sub-dominant plant species encountered in all plant communities were recorded (Appendix A). Abundance of these species was not quantitatively determined.

Potential habitat and species surveys for U.S. Fish and Wildlife Service (USFWS) threatened and endangered (T&E) and BLM-LFO designated sensitive plant species were conducted during the pre-disturbance site assessment. Potential habitat and/or individuals or populations of T&E or BLM-LFO designated sensitive plant species were recorded, photographed, and marked by GPS points.

Pre-Disturbance Site Assessment Results

The proposed $GUCO_2$ project area is located in the Western Range and Irrigated Land Resource Region within the Central Desertic Basins and Plateaus Major Land Resource Area (MLRA 34A) (USDA NRCS 2006). MLRA 34A is primarily located in the Wyoming Basin Province of the Rocky Mountain System. The majority of MLRA 34A is characterized by a semi-desert grass-shrub zone. Average annual precipitation within this zone is 8 to 16 inches (USDA NRCS 2006). Elevation within the proposed project area generally ranges from approximately 6,210 to 7,370 feet above sea level.

Based on plant community descriptions for the 10-14" Precipitation Zone High Plains Southeast ESD (Brazee 2008 a-e) and field observations, uplands within the proposed disturbance area of the $GUCO_2$ project area are dominated by sagebrush shrublands primarily composed of Big Sagebrush/Mid-Grass plant community and sagebrush grasslands composed of Bluebunch Wheatgrass/Rhizomatous Wheatgrass plant community (Table 9). Grasslands composed of a

Rhizomatous Wheatgrass/Needle-and-thread plant community are less common and interspersed throughout the sagebrush shrublands and grasslands. Saline lowlands are comprised of Alkali Sacaton/Basin Wildrye plant communities. Non-saline drainages and lowlands are dominated by Western Wheatgrass/Kentucky Bluegrass or wetland plant communities. Limber Pine is common on the southern hills of the GUCO$_2$ project area, but occurrence is limited within the proposed disturbance area.

Big Sagebrush/Mid-Grass Plant Community

The Big Sagebrush/Mid-Grass plant community is found on Loamy ecological sites primarily on level plains, slopes, and along drainage edges with shallow to moderately deep soils in the western portion of the proposed disturbance area. Big sagebrush (*Artemisia tridentata*) dominates the site. The understory is composed primarily of western wheatgrass (*Elymus smithii*), needle-and-thread (*Hesperostipa comata*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*) prairie junegrass (*Koeleria macrantha*), Sandberg bluegrass (*Poa secunda*), and threadleaf sedge (*Carex filifolia*). Other shrub species include birdfoot sagebrush (*Artemisia pedatifida*), green rabbitbrush (*Chrysothamnus viscidiflorus*), and rubber rabbitbrush (*Ericameria nauseosa*). Total ground cover for this plant community is typically 80-90% (Brazee 2008a).

Bluebunch Wheatgrass/Rhizomatous Wheatgrass Plant Community

The Bluebunch Wheatgrass/Rhizomatous Wheatgrass plant community is found on Shallow Loamy ecological sites on rolling slopes or rough, broken topography with shallow soils primarily in the eastern portion of the proposed disturbance area. Dominant grasses within this community include bluebunch wheatgrass (*Elymus spicata*), western wheatgrass, blue grama, threadleaf sedge, and Sandberg bluegrass. Big sagebrush, birdfoot sagebrush, and green rabbitbrush are common. Total ground cover for this plant community is typically 40-60% (Brazee 2008b).

Rhizomatous Wheatgrass/Needle-and-thread Plant Community

The Rhizomatous Wheatgrass/Needle-and-thread plant community is found on Loamy ecological sites on nearly level to gentle slopes with moderately deep soils in isolated locations in the western portion of the disturbance area. This site is dominated by western wheatgrass, needle-and-thread, bluebunch wheatgrass, green needlegrass, prairie junegrass, blue grama, and Sandberg bluegrass. Shrub cover within this community is less than 25% and composed primarily of big sagebrush and rubber rabbitbrush. Total ground cover for this plant community is typically 80-90% (Brazee 2008a).

Alkali Sacaton/Basin Wildrye Plant Community

The Alkali Sacaton/Basin Wildrye plant community is found on Saline Subirrigated ecological sites located primarily in the southwestern portion of the proposed overhead electric and CO_2 pipeline corridor and access road. Common plant species within the community include alkali sacaton (*Sporobolus airoides*), Sandberg bluegrass, Nuttall's alkaligrass (*Puccinellia*

nuttalliana), western wheatgrass, tufted hairgrass (*Deschampsia caespitosa*), bluejoint reedgrass (*Calamagrostis canadensi*s), and Baltic rush (*Juncus balticus*). Basin wildrye (*Elymus cinereus*) was absent in this community within the proposed disturbance area. Shrubs are a minor component of this plant community and consist of big sagebrush and rubber rabbitbrush. Total ground cover for this plant community is typically 80-90% (Brazee 2008c).

Western Wheatgrass/Kentucky Bluegrass Plant Community

The Western Wheatgrass/Kentucky Bluegrass plant community is found on Subirrigated ecological sites within ephemeral drainages with moderately deep to deep soils throughout the proposed disturbance area. Western wheatgrass, Kentucky bluegrass (*Poa pratensis*), and green needlegrass dominate. Low growing sedges and forbs are common. Silver sagebrush (*Artemisia cana*), big sagebrush, and rubber rabbit brush are present. Total ground cover for this plant community is typically greater than 95% (Brazee 2008d).

Limber Pine Plant Community

The Limber Pine plant community is isolated primarily to the steeper slopes located in the southern portion of the project area; however, isolated stands are located throughout the project area and within the proposed disturbance area on Very Shallow and Shallow Loamy ecological sites. The canopy of this community is dominated by limber pine (*Pinus flexilis*). The understory is dominated by low growing shrubs and grasses. Shrub species include birdfoot sagebrush, common snowberry (*Symphocicarpus albus*), and big sagebrush. Western wheatgrass is the dominant grass species. Total ground cover for this plant community is typically 60-80%.

Table 9: Plant Community Acreages, by ESD.

ESD	Plant Community	Acres
Loamy	Big Sagebrush/Mixed Grass	76.5
	Rhizomatous Wheatgrass/Needle-and-thread	4.1
Shallow Loamy	Bluebunch Wheatgrass/Rhizomatous Wheatgrass	111.6
	Limber Pine	4.2
Saline Subirrigated	Alkali Sacaton/Basin Wildrye	16.7
Subirrigated	Western Wheatgrass/Kentucky Bluegrass	1.1
Previously	N/A	7.1
Disturbed	N/A	36.2

Threatened, Endangered, and Special Status Plant Species

Blowout Penstemon (*Penstemon haydenii*)

Habitat suitability for blowout penstemon, within the proposed disturbance area, was evaluated based on the presence of the following characteristics: eolian sand deposits or sand deposits greater than three feet in depth, fine sandy textured soils absent of rocks and coarse fragments, wind or gravity erosion versus water erosion, slopes greater than 25%, slope elevation changes of 60 to 120 feet, vegetation cover of less than 40%, and associated plant species. Based on NRCS

soil data, soils derived from eolian sources or deep sandy soils were not present within the $GUCO_2$ proposed project area. No individuals or populations of blowout penstemon were found during field surveys and based on the lack of suitable habitat characteristics; local habitat was confirmed unsuitable for blowout penstemon. A data request from the Wyoming Natural Diversity Database (WYNND) indicates there have been no known occurrences of blowout penstemon within or near the proposed project area (WYNDD 2011).

Ute ladies'-tresses (*Spiranthes diluvialis*)

Habitat suitability for Ute ladies'-tresses, within the proposed disturbance area, was evaluated based on the presence of the following characteristics: late season perennial water source, associated vegetation species, sandy or loamy textured soils, gradual transitions between uplands and water bodies or drainages, vegetation density between 75% and 90%, vegetation height less than 18 inches, non-alkaline soils. Based on field evaluations during the appropriate timeframe, late season perennial water sources were found present within the proposed disturbance area. However, where late season perennial water sources were present, associated vegetation species, appropriate soil textures, gradual transitions, vegetation cover and density, and non-alkaline soils were not present or not present in sufficient combination to provide suitable habitat. No individuals or populations of Ute ladies'-tresses were found during field surveys, and based on the lack of suitable habitat characteristics, local habitat was confirmed unsuitable for Ute ladies'-tresses. A data request from the WYNND indicates there have been no known occurrences of Ute ladies'-tresses within or near the proposed project area (WYNDD 2011).

BLM-LFO Sensitive Plant Species

Of the eleven BLM LFO sensitive species (USDI BLM 2010), two sensitive plant species were determined to have potential habitat or were present within or in close proximity to the proposed disturbance area: Rocky Mountain twinpod (*Physaria saximontana* var. *saximontana*) and limber pine (Table 10).

Rocky mountain twinpod

Rocky Mountain twinpod is found on sparsely vegetated rocky slopes of limestone, sandstone or clay (BLM 2010). This habitat was very limited within the proposed project area (0.6 acres); only occurring at one location between the proposed CO_2 pipeline corridor and access road in the NW ¼ SW ¼ of Sec. 17, T32N R85W. A *Physaria* spp. was found at this location; however, due to the timing of the survey (after the flowering period), the plant was not identified beyond genus. This species has not been previously documented within or near the proposed project area (WYNDD 2010).

Limber pine

Limber pine occurs at timberline and lower elevations with sagebrush, usually on western slopes and isolated on eastern slopes of the Rocky Mountains (BLM 2010). Populations of this species were present within the proposed disturbance and project areas, covering approximately 90.9

acres of the project area. Of these 90.9 acres, approximately 86.7 acres occur outside of the proposed disturbance area. Isolated stands within the proposed disturbance area occur in the SE ¼ SW ¼ Sec. 15, T32N R85W; SE ¼ NE ¼ of Sec. 21, T32N R85W; and SW ¼ NE ¼, NW ¼ NW ¼, and SW ¼ NW ¼ of Sec. 22, T32N R85W encompassing approximately 4.16 acres (based on expanded disturbance boundaries). A small isolated stand of five mid-sized trees and approximately five saplings is also present between the proposed CO_2 pipeline corridor and access road in NW ¼ SW ¼ of Sec. 17, T32N R85W near the proposed 230kV distribution line. Results of the WYNDD data request did not include information for limber pine occurrences within the proposed project area (WYNDD 2011).

Table 10: BLM Sensitive Plant Species List for the Lander Field Office.

Common Name	Scientific Name	Preferred Habitat	Potential Habitat Present within Proposed Project Area	Likely to Occur
Meadow pussytoes	*Antennaria arcuta*	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands	No	No
Porter's sagebrush	*Artemisia porteri*	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes	No	No
Dubois milkvetch	*Astragalus gilviflorus* var. *purpureus*	Barren shale, badlands, limestone, and redbed slopes and ridges	No	No
Cedar rim thistle	*Cirsium aridum*	Barren, chalky hills, gravelly slopes, and fine textured, sandy-shaley draws	No	No
Owl Creek miner's candle	*Cryptantha subcapitata*	Sandy-gravelly slopes and desert ridges on sandstones of the Wind River	No	No
Fremont bladderpod	*Lesquerella fremontii*	Rocky limestone slopes and ridges	No	No
Beaver rim phlox	*Phlox pungens*	Sparsely vegetated slopes on sandstone, siltstone, or limestone substances	No	No
Rocky Mountain twinpod	*Physaria saximontana* var. *saximontana*	Sparsely vegetated rocky slopes of limestone, sandstone, or clay	Yes	Unknown

Table 10 (Continued): BLM Sensitive Plant Species List for the Lander Field Office.

Common Name	Scientific Name	Preferred Habitat	Potential Habitat Present within Proposed Project Area	Likely to Occur
Limber pine	*Pinus flexilis*	Timberline and at lower elevation with sagebrush	Yes	Yes
Persistent sepal yellowcress	*Rorippa calycina*	Riverbanks and shorelines, usually on sandy soils near high-water line	No	No
Barneby's clover	*Trifolium barnebyi*	Ledges, crevices, and seams on reddish-cream Nugget Sandstone	No	No

Weed Inventory

Pre-Disturbance Site Assessment Methodology

Surveys for Wyoming State Designated Noxious Weeds, Natrona and Fremont County Declared Weeds, and Natrona and Fremont County Weeds of Concern were conducted within the $GUCO_2$ (Wyoming Weed and Pest Council 2010a, 2010b, and Fremont County Weed and Pest 2011). Survey areas included current and proposed disturbance areas. Surveyed weed species observed during the weed inventory were GPS located or marked on aerial imagery maps. Refer to Appendix B for a list of species included in the survey efforts.

Pre-Disturbance Site Assessment Results

Three Wyoming State Designated Noxious Weeds were observed: diffuse knapweed (*Centaurea diffusa*), spotted knapweed (*Centaurea maculosa*), and Canada thistle (*Cirsium arvense*). Six Natrona County Declared Weeds were observed: showy milkweed (*Asclepias speciosa*), cheatgrass (*Bromus tectorum*), wild licorice (*Glycyrrhiza lepidota*) (also listed as Wyoming Weed of Concern), curlycup gumweed (*Grindelia squarrosa*), halogeton (*Halogeton glomeratus*), and foxtail barley (*Hordeum jubatum*). Occurrences, of these species, were typically within and along existing disturbances; however, observations also occurred within native areas proposed for disturbance. Observed species were typically found as isolated individuals or small populations. Refer to the Weed Management Plan for the $GUCO_2$ project for locations of weed species observed within the proposed project area.

Wetlands

Pre-Disturbance Site Assessment Methodology

Wetland surveys were conducted in accordance with the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0). All other waters of the

United States (OWUS) were also assessed in conjunction with the wetland surveys. The routine wetland delineation approach with onsite inspection was utilized, and the survey was conducted by pedestrian reconnaissance and review of orthophotography maps.

Cabin Creek and the tributaries to Cabin Creek and Soap Creek were evaluated using pedestrian reconnaissance. The remaining small drainages, draws, and stock ponds affected by the proposed disturbances were evaluated based on combination of pedestrian reconnaissance and review of orthophotography mapping.

Identification of potential wetlands was based on visual assessment of vegetation and hydrology indicators, as well as intrusive soil sampling to determine the presence of wetland criteria indicators. United States Army Corps of Engineers (USACE) Wetland Determination Data Forms-Arid West Region (Version 2.0), were utilized for each observation point. Hydrology and soils were evaluated whenever a plant community met hydrophytic vegetation parameters based on the Dominance Test and Prevalence Index (as defined by the USACE Arid West Regional Supplement), or whenever indicators suggested the potential presence of a seasonal wetland under normal circumstances.

NRCS soil mapping for Natrona County, Wyoming were reviewed for general soils information. Potential wetlands (WoUS) and OWUS were initially identified via review of USFWS digital National Wetland Inventory (NWI) mapping. No flow data, stream gauge information or historical information of flow was reviewed or gathered for the purposes of wetland determination.

Wetland indicator categories were identified for each dominant plant species noted through use of the National List of Vascular Plant Species that Occur in Wetlands, 1988 National Summary. Region 9 (Northwest) indicator categories were utilized for the project area. Field sample locations and resulting wetland boundaries were recorded with a hand-held Garmin GPSmap 60Cx GPS unit or a Garmin III Plus GPS unit in NAD 1927 Wyoming State Plane east FIPS 4901 feet.

Pre-Disturbance Site Assessment Results

Total acreage of wetlands within the disturbance area is approximately 2.10 acres (Table 11). Dominant vegetation species include; Nebraska sedge, Baltic rush, common threesquare (*Schoenoplectus pungens*), and common spikerush (*Eleocharis palustris*). Field observations indicated that there was not the presence of wetlands at the proposed CO2 injector well pad locations. These areas were dominated by upland vegetation and hydric soils were not present. Refer to Appendix C and the Site Specific Reclamation Map for wetland locations.

Table 11: Total Wetland Acreages Affected by Disturbance Activities.

Pipeline	Road	Over Head Power	Total
1.50	0.03	0.57	2.10

Approximately 0.14 acres are classified as Palustrine Emergent, seasonally flooded (PEMC) wetlands, and approximately 1.97 acres are classified as Palustrine Emergent, saturated (PEMB) wetlands (Cowardin 1978) (Table 12). These wetlands were located within intermittent and ephemeral drainages or either natural or manmade open water. Hydrology for most wetlands within the disturbance area is dependent upon spring runoff and precipitation. However, the hydrology of some wetlands located within the disturbance area, is potentially maintained by seeps or is groundwater fed. Although the majority of the wetlands were found along and within existing drainage bottoms, the wetlands generally were not continuous along the entire length of the drainages.

Table 12: Total Wetland Acreages and Total Linear Feet of OWUS within the Disturbance Area.

PEMC	PEMB	OWUS
0.14 Acres	1.97	1252.64

The road placement located in the NW ¼ of section 19, T33N R85W was not surveyed during the 2011 fieldwork. The alignment of this road segment was altered after fieldwork was conducted and field conditions prohibited any additional surveying to be carried out at this time. The majority of the road placement follows an existing two-track; however, there are two seceding sections that differ from the existing route. These two segments are located on potential wetlands based on aerial photography, proximately to historical NWI mapping, and field observations. Additional fieldwork on this road segment may be conducted at the USACE's request.

Reclamation Potential, Mitigation Measures for Soil Limiting Factors, and Erosion Control Practices

Reclamation Potential

Reclamation potential was determined utilizing the data collected during the pre-disturbance site assessment as outlined in Table 13 as well NRCS ESD and soil data. Each ESD and/or NRCS Map Unit was designated as having low, fair, or good reclamation potential based upon the dominate plant community, topsoil/suitable subsoil salvage depth, soil limiting factors, and LRP designation.

Table 13: Reclamation Potential Based on Pre-Disturbance Site Assessment Data

Reclamation Potential	Low or Limited	Fair	Good
Topsoil/Suitable Subsoil Salvage Depth	1-2"	2-6"	6"+
Slope	Steep (>25%)	Moderately Steep (6-24%)	Relatively Flat (0-5%)

Aspect	South	West	North or East
Soil Texture	Sandy or Clay	Loam or Silt	Loam
Soil Limiting Factors	High Salinity/ Sodicity, pH, High % Coarse Fragments,	Moderate % Coarse Fragments, $CaCO_3$ content	None
Wind and Water Erosion Potential	Severe	Moderate	Slight
Success without Mitigation Measures	Low	Fair	Good
Success with Mitigation Measures	Fair	Good	Good
Suggested Reclamation and Stabilization Practices	Seed, Velocity Controls, and Soil Stabilization/ Hydro-Mulch/Erosion Control Blankets	Seed, Straw Mulch, Velocity Controls, and Soil Stabilization Products	Seed, Straw Mulch, and Velocity Controls as necessary dependent of slope

All areas designated as Shallow Loamy or Saline Subirrigated are indicated by BW/RW, LP, or AS/BW vegetation community labels on the Site Specific Reclamation Map and are designated as LPR based on the BLM-LFO (Table 14). Subirrigated ESD areas designated as WW/KB on the Site Specific Reclamation Map have good reclamation potential. Loamy ESD areas designated as BS/MG and RW/NT on the Site Specific Reclamation Map have low to good reclamation potential depending on topsoil/suitable subsoil salvage depths. Previously reclaimed areas have low reclamation potential and are designated on the Site Specific Reclamation Map as RECA. Disturbed areas, indicated as D on Site Specific Reclamation Map, have low reclamation potential. Wetlands, indicated by WET on the Site Specific Reclamation Map were not assigned reclamation potential as these areas will be minimally disturbed during the construction process.

Table 14: Reclamation Potential Classification.

ESD	Soil Map Unit	Plant Community	Topsoil/Suitable Subsoil		
			1-2”	2-6”	6”+
Loamy	104, 129, 184, 217	BS/MG or RW/NT	Low	Fair	Good
Shallow Loamy	137	BW/RW or LP	Limited	Limited	N/A
Saline Subirrigated	110	AS/BW	Limited	N/A	N/A
Subirrigated	Map Unit	WW/KB	N/A	N/A	Good
Previously Reclaimed	Map Unit	N/A	Low	N/A	N/A

Reclamation potential of these areas will remain at their designated reclamation potential without incorporation of mitigation measures other than seeding. However, with the addition of the recommended mitigation measures, based on the soil limiting factors, the reclamation potential rating can increase one step, i.e., low and limited reclamation potential areas can achieve fair

reclamation success with the incorporation of the following mitigation measures and erosion control practices.

Mitigation Measures for Soil Limiting Factors

Due to the presence of shallow soils and high coarse fragment content in the Shallow Loamy ESD and high salinity/sodicity potential in the Saline Subirrigated ESD, appropriate equipment will be utilized during the topsoil/suitable subsoil salvage process to ensure the appropriate amount of material is removed and salvaged. Mixing of suitable and undesirable material will be avoided. Gypsum application is recommended to mitigate potentially high salinity/sodium within the Saline Subirrigated ESD and portions of the Loamy ESD directly adjacent to the Saline Subirrigated ESD. Species within the recommended reclamation seed mix are adapted to coarse or droughty soils; however, weed free straw mulch or a similar product should also be applied to the soil surface to increase soil moisture retention the success of reclamation seeding practices. Straw mulch additions will increase surface organic matter; however, organic soil amendments, such as Biosol/Sustane, are recommended to increase soil fertility within the areas designated as LRP, previously reclaimed areas, and disturbed areas. Appropriate erosion control measures will be implemented to reduce wind and water erosion potential in all ESDS. Refer to Table 15 for a tabular presentation of mitigation measures for soil limiting factors.

Table 15: Mitigation Measures for Soil Limiting Factors

Soil Limiting Factor	Mitigation Measure
$CaCO_3$ (strong to violent reaction with HCl)	Use of seeded species adapted to soils with high lime content or salt tolerant species.
Coarse Fragments/Droughty	Weed free straw mulch addition to increase soil moisture retention and use of seeded species adapted to coarse soils.
Erosive	Stabilize erosive material with the use of the appropriate erosion control practices.
High Clay Content	Reduce soil compaction caused by construction activities prior to seeding with ripping or similar techniques based on the degree of compaction. Weed free straw mulch addition to increase soil moisture retention and increase organic matter content of the soil.
High Sand Content	Addition of soil organic amendments to increase soil fertility, use of seeded species adapted to coarse soils, and erosion control practices to reduce wind and water erosion.
Low Organic Matter Content	Straw mulch to increase soil organic matter at the surface and use of soil organic amendment (Biosol/Sustane) to increase soil fertility.
pH (<5.5 or >8.4)	Addition of soil chemical amendments - Gypsum for high pH associated with sodium and lime for low pH.
Salinity	Use of seeded species adapted to soils with high salt content.

Sodium (high pH or >10 dS/m)	Addition of soil chemical amendments - Gypsum.
Shallow (depth to bedrock is < 20 inches)	Use of appropriate equipment and extreme care during the topsoil/suitable subsoil salvage process to avoid mixing of suitable and undesirable material.

2.0 SURFACE DISTURBING ACTIVITIES

Management of Waste Materials

Waste management for this area is addressed in the Master Surface Use Plan, Surface Use Plan of Operations, or Waste Management Plan for this project area.

Subsurface Integrity, Surface and Ground Water Protection

Rat holes and/or mouse holes will be backfilled and compacted from bottom to top immediately upon release of the completion rig from the drilling location to ensure surface integrity. Drill cuttings and mud, including any drilling additives utilized in the mud system, will remain in the reserve pit until dry or until fluids have been removed and disposed of properly. Reserve pits will be designed to prevent the collection of surface runoff and will be constructed entirely in cut on the uphill side of the well location. Reserve pit will be lined with reinforced synthetic liner (plastic/vinyl) with a permeability less than or equal to 10^{-7} cm/second and will be chemically compatible with all substances which may be put into the pit. Pit liners will be installed with sufficient bedding (either straw or dirt) to cover any rocks, will overlap the pit walls, extend under the mud tanks, and be covered with dirt and/or rocks to hold it in place. No material that could puncture the liners s (i.e., trash, scrap pipe, etc.) will be disposed of in the reserve pit.

The reserve pit will not be "squeezed", "crowded", or "cut" until dry and typically will be backfilled within 180 days after first production, unless weather or wildlife stipulations preclude such activities. If the reserve pit does not dry, alternate methods of drying, such as removal of fluids or other treatment will be developed. When the pit is backfilled, cuttings and drilling mud will be covered with a minimum depth of three feet of suitable material, prior to reclamation.

Containment structures sufficiently impervious to prevent unwanted discharge will be utilized, as necessary. Types of containment structures may include containment dikes or walls, or drip pans. A containment dike will be constructed completely around those production facilities designed to hold fluids (i.e., production tanks, produced water tanks and/or heater/treater). These dikes will be constructed of compacted subsoil, be impervious, hold 110% of the capacity of the largest tank, and be independent of the back cut. Topsoil or coarse spoil material would not be used for the construction of containment dikes.

Pits will be reclaimed to a safe and stable condition and restored to a condition that blends with the rest of the reclaimed well pad area. To prevent contamination of surface water or ground water, pits will not be constructed in areas of shallow groundwater or natural water courses. Pits

will be properly constructed to prevent leaks. Synthetic pit liners will be buried on site. A minimum of three feet of suitable material will be placed over the buried pit liner, prior to reclamation. When other materials such as bentonite or clay are used, liners will be treated to prevent reemergence to the surface or to prevent long-term successful re-vegetation. Unsuitable soil material will be slightly mounded over the pit to account for subsidence and positive surface drainage.

Management of Topsoil/Suitable Subsoil and Undesirable Subsoil

Salvage of topsoil and suitable subsoil is an important component of the reclamation process. Topsoil is the most fertile portion of the soil profile as it contains the most organic matter. Suitable subsoil can provide additional plant growth medium that is adequate from chemical and/or physical characteristics. Its salvage and use is essential since actual topsoil depth is limited in arid/semi-arid environments. Disturbance will be limited, wherever possible, to minimize disturbance of the soil resource.

Topsoil/suitable subsoil will be handled separately from unsuitable subsoil. Depth of topsoil/suitable subsoil to be removed from this site is typically one to six inches. During topsoil/subsoil removal, extreme care will be taken to prevent the mixing of soil from different ESDs to avoid mixing of productive and less productive soils types. Contractors will be briefed and/or trained to carry out the engineering design for this site, including removal of topsoil/suitable subsoil of varying depths. Where possible, EP will use brush-hogging to facilitate topsoil/suitable subsoil removal by reducing vegetation growth that would limit or hinder salvage by equipment. All limber pine or other trees within the construction disturbance boundary will be cut prior to topsoil removal.

Topsoil/suitable subsoil will be removed as prescribed on the Site Specific Reclamation Map and clearly segregated from undesirable subsoil and paralithic or lithic material during construction. Topsoil/suitable subsoil stockpiles will be no deeper than 13 feet. Slopes will not exceed 5:1 to allow for seeding, if necessary, and to minimize erosion. Topsoil/suitable subsoil salvage piles will have signs designating the material as “topsoil” for easy identification. At a minimum, topsoil/suitable subsoil piles will be separated by three feet from undesirable material to prevent contamination of the topsoil/suitable subsoil material and provide enough space for the movement of equipment between piles. If the work area allows, topsoil will be segregated from suitable subsoil, each pile will be treated in the same manner described above for “topsoil” piles.

To minimize the surface disturbance, only equipment that is appropriate to the scope and scale of the work will be used. Access to construction work will be suspended when excessive rutting or resource damage will occur, and construction activities will not occur when soils are frozen. All soil material (i.e., topsoil/suitable subsoil and undesirable subsoil) disturbed will be placed in an area where it can be retrieved and where the material does not impede watershed and drainage flows.

Topsoil/suitable subsoil will not be stockpiled for longer than 10 months, unless wildlife stipulations preclude topsoil/suitable subsoil replacement within this timeframe. In general, topsoil stockpiles will be protected from water and wind erosion within 30 days of construction completion. Topsoil/suitable subsoil stockpiles are anticipated to be small, short-term stockpiles. Due to the anticipated size of the new stockpiles, the side slopes of the stockpiles will not be significant and, therefore, will not be seeded unless the soil is stored longer than one growing season. Ditches or berms will be constructed around the stockpiles to prevent soil loss during high-intensity rain events. In the event the 30 day time frame cannot be met at a given site, this will be communicated with and approved by the BLM-LFO AO before being implemented and further measures will be conducted to stabilize stockpiled topsoil/suitable subsoil, if necessary. Measures will be taken to mitigate prevailing wind erosion, water erosion, sloughing due to gravity, and temperature impacts during stockpiling to ensure topsoil/suitable subsoil stabilization and ultimate reclamation success at disturbed sites. Topsoil/suitable subsoil may be stockpiled for longer than 10 months if wildlife stipulations limit the amount of activity that can occur at the site. In this event, topsoil/suitable subsoil stop piles will be seeded with annual ryegrass (*Lolium multiflorum*) at the rate of 10 lbs/acre.

If disturbance occurs within a wetland, approximately 12 inches of topsoil/suitable subsoil will be salvaged. Salvaged topsoil/suitable subsoil will be stored within the wetland to prevent mixing of wetland and upland soils. Only tracked equipment will be used to remove topsoil/suitable subsoil from wetland areas. Topsoil/suitable subsoil will not be stored for more than 30 days.

Re-establishment of Slope and Surface Stability and Topographic Diversity

Disturbed areas not required for ongoing production will be reconstructed to approximate the original contours that are consistent with the land use plan leaving a safe work area for well maintenance. Disturbance of previously reclaimed areas may be required, during final reclamation, to recontour the remaining disturbance area to approximately the original contours or consistent with the land use plan. Geomorphic stability and topographic diversity of the reclaimed topography will be maximized with recontouring techniques appropriate to the site, based on pre-disturbance characteristics. No highwalls, cut slopes and/or topographic depression will be left, unless otherwise approved by the BLM-LFO AO.

Soil compaction is addressed in section 3.0 Site Preparation and Seeding – Site Preparation of this document.

Re-establishment of Visual Composition

The reclaimed landscape features will blend into the adjacent undisturbed area, to the extent possible, and conform to the land use plan. Scenic quality of the area will not be degraded in the long term. The recommended seed mix for this area was based on pre-disturbance site assessment observations and qualitative vegetation data collection. Recommended seeding rates

compliment pre-disturbance plant community composition; in addition, native species should encroach into the reclaimed area to increase visual composition similarity between disturbed and undisturbed plant communities.

Erosion Control Practices

Soil erosion and sediment controls will be implemented as soon as practical and safe to do so during the construction phase of the project. Soil stabilization will be completed within 30 days from the start of construction unless otherwise identified as such to the BLM-LFO AO. This includes the salvaging and storage of topsoil/suitable subsoil during construction and replacement of such topsoil/suitable subsoil during reconstruction.

When determining the need and type of erosion controls and stabilization methods, EP will use the criteria outlined in the BLM Gold Book or the Wyoming Department of Environmental Quality (WDEQ) storm water standards.

Due to the flat to moderately steep slopes (0-20%) and wind and water erosion potential at this site, the following velocity controls/sediment filtration devices are recommended.

Slope breakers including straw wattles or fiber rolls are generally utilized on roadside ditches and ditch turn outs, as well as on roadsides, well pads or corridor slopes, as a means to reduce the slope length, redistribute any concentrated flow, reduce the velocity of flow, and hold seed in place so vegetation can become permanently established. On 4:1 slopes, wattles should be placed approximately 40 feet apart along the contour with a slight downward angle at the end of each row to prevent ponding. Wattles should be installed in shallow trenches dug two to five inches deep.

Surface roughening scarifies the ground surface to increase soil moisture retention and avoid smooth, hard-packed surfaces which decrease water retention, and accelerate surface runoff. Disking or other scarifying techniques can be utilized. Equipment tracking can be used to create furrows or benches across the grade contours. This is generally completed on slopes of 2:1 or less.

Weed free straw mulch can be used to provide erosion control and promote germination on recently seeded areas. Properly anchored straw mulch simulates a root system providing wind and surface erosion control by stabilizing the soil. Germination is enhanced through increased soil moisture retention.

Soil stabilization polymers (e.g., PAM12, Flexterra FGM, or CONWED 1000) are generally utilized to control erosion and promote site stabilization in areas that are highly susceptible to erosion.

Vegetative buffers, such as grasses and shrubs, diversion ditches, or earthen berms are generally utilized to control sheet and rill erosion, trap sediment, distribute water flow over a broader area, and divert run-off from undisturbed areas. These methods can be used to divert water from work areas, as well as, reclaimed areas.

Snow fences may be used to prevent erosion of soils by wind prior to vegetation establishment and to increase snow capture.

Berms may be used as a run-on control above disturbed areas.

Straw bale barriers may be used to surround stockpiles or as a perimeter control below disturbed areas.

Erosion control, jute, or excelsior matting will be used on steeper slopes to prevent soil loss by stabilizing and protecting disturbed soil from raindrop impact and surface erosion, increase infiltration, decrease compaction and soil crusting, and conserve soil moisture.

Silt fences may be placed between the disturbed and reclaimed areas and small drainages.

Water bars will be constructed on the reclaimed portions of the producing well location at least one foot deep, on the contour, with approximately two feet of drop per 100 feet of water bar to ensure drainage, and extended into established vegetation. All water bars will be constructed with the berm on the downhill side to prevent soft material from silting in the trench. The initial waterbar will be constructed at the backslope with a subsequent waterbar constructed at the top of the fill slope.

Sediment traps will be installed below the fill slope of constructed well pads. Sediment traps will be maintained until the fill slope has been reduced and re-seeded.

Installed culverts may be rock armored and sediment filtration devices will be used to reduce the velocity of flow.

Slash barriers (utilizing the cut limber pine trees) may be used as a filter berm on revegetated areas along steep slopes within this community, within constructed drainages, or as perimeter control below disturbed areas and will be installed according to similar erosion control measures.

Guidance for drainage features such as culverts and wing ditches will be completed in accordance with BLM Manual 9113 – Roads and the Gold Book, Chapter 4 – Construction and Maintenance.

Reconstruction and Stabilization of Water Courses and Drainage Features

Drainage features and water courses will be avoided to the maximum extent possible. However, if disturbed, drainages will be reclaimed in a manner that maintains the drainage pattern, profile, and dimension to approximate the natural features found in nearby naturally functioning basins and to reconstruct and stabilize stream channels, drainages, and impoundments to exhibit similar hydrologic characteristics found in stable naturally functioning systems (USDI BLM 2009). Wetlands within drainages or water courses will be bored under on the pipeline and avoided by power line construction. Wetland disturbances associated with road construction are small and will be minimized to the extent possible.

3.0 SITE PREPARATION AND SEEDING

Site Preparation

Seedbed preparation will be conducted, whenever possible, when soil conditions are appropriate, i.e., a weak ball can be formed from soil two to three inches below the surface (Strom et al. 2010) and immediately prior to seeding to avoid off-site loss of replaced soil. Areas determined to have high levels of soil compaction, based on soil testing or visual observation (USDA NRCS 2001) will be ripped or chisel plowed, dependent on the level of soil compaction, prior to or in conjunction with seedbed preparation. Ripping will only be necessary in areas where topsoil/suitable subsoil has been removed and the undesirable subsoil has been severely compacted (i.e., water infiltration and holding attributes of the soil have been significantly reduced). In these cases, the area should be ripped 12-24 inches prior to respreading topsoil/suitable subsoil. Areas with moderate soil compaction will require chisel plowing to a depth of 10-24 inches and areas with minor soil compaction will require disking to a depth of 6-12 inches. These treatments will relieve unsuitable subsoil compaction to promote the downward growth of new seedlings roots, increase root penetration, and increase water infiltration. Sandy or silty textured soils will not be ripped due to potentially detrimental effects to soil structure and is unnecessary.

After the area site has been initially prepared and recontoured, the topsoil/suitable subsoil will be respread in a manner similar to the original vertical profile and additional tillage practices may be necessary (i.e., chisel plowing and disking). If topsoil and suitable subsoil are stockpiled separately (based on work area allowances), suitable subsoil will be replaced prior to the replacement of topsoil. Additional tillage practices will be done to a depth that will not incorporate underlying material that could potentially degrade respread topsoil/suitable subsoil (generally no more than 4-6 inches). Areas should be chisel plowed or disked parallel to the contour of the land to reduce erosion potential. Finish tillage with a cultipacker, roller harrow, spring tooth harrow, or clod buster should be conducted after plowing or disking to develop a firm seedbed. If a no-till range drill is used, finish tillage will not be necessary since the press wheels of the no-till drill firm the seedbed directly over the seed. Leaving the surface rough after disking/plowing or roughening of the surface with scarification techniques also provide an initial deterrent to soil erosion by wind and water, enhance water infiltration, and capture snow. Ideal seedbeds should have clods no greater than two inches in diameter and a 170 pound person should leave a footprint no deeper than ½ inch. (Strom et al. 2010)

Pre-Seeding Soil Analysis

Pre-seeding soil analysis may be utilized to ensure suitable surface and subsurface physical, chemical, and biological properties are present to support the long term establishment and viability of a desired plant community (USDI BLM 2009). Soil sampling would be conducted, after topsoil/suitable subsoil replacement and prior to seeding. The addition and incorporation of soil amendments would be based on results of the soil analysis. Methods for incorporation of

soil amendments into the respread topsoil/suitable subsoil would be provided to the BLM-LFO AO.

Seeding

The short-term goal of seeding is to re-vegetate and stabilize the disturbed site. The long-term goal is to establish species composition, diversity, structure, and total ground cover appropriate for the desired plant community (USDI BLM 2009), ecological site, or current soil characteristics. Seeding should result in a self-sustaining plant community that meets both short and long term goals. Where appropriate, critical resource value will be enhanced by augmenting plant community composition, diversity, and/or structure (USDI BLM 2009).

Seeding will take place the first appropriate season following topsoil/suitable subsoil replacement. Seeding between October 15 and April 15 is the most effective throughout Wyoming because late winter/early spring is the most reliable period for moist soil conditions (Strom et al. 2010). In general, fall seeding (between September 15 and when the frost line is deeper than four to six inches) in central Wyoming has been more successful than spring seeding (when the frost has left the ground but prior to June 1). EP will seed conduct fall seeding where possible. If necessary spring seeding will be conducted after the frost has left the ground and prior to May 15. In order to remain compliant with wildlife timing stipulations, seeding dates may be adjusted from the optimal timing stated above.

Due to the relatively flat slopes, drill seeding with a no-till drill is recommended for this site. Drill seeding is recommended for most grasses and large-seeded shrubs and forbs that need to be planted at least ¼ inch deep and where the seedbed is fairly smooth and flat. Drill seeding is preferred for soil to seed contact, positive depth control, proper seeding rate (once calibrated), and minimum amount of seed usage. Broadcast seeders are recommended for very small, fluffy, or uneven seeds that need to be planted 1/16 to 1/8 inches deep. Modern range drills may be capable of drill and broadcast seeding (i.e., Brillion).

Seed Mix and Rate of Seeding

The following seed mixes and rate of seeding is only recommended, due availability of seed or changes in soil quality due to salvage, the seed mix and rate of seeding may change. Any changes to the following seed mix and/or seeding rates will be submitted for approval by the BLM-LFO AO as an amendment and/or revision to this document, prior to seeding.

Wherever possible, seed will be certified weed free or "blue tag. Seed that is over six months from the last test for germination and viability on the seed tag will not be used. Source of each seed species will be locally adapted based on the overall climate in the area, and site and ecological setting, as well as, genetically-appropriate (USDI BLM 2009).

The drill seeding rate for the recommended Shallow Loamy/Loamy seed mix is suggested at approximately 10 PLS lbs/acre (Table 16), and the Saline Subirrigated seed mix is suggested at

approximately 14 PLS lbs/acre (Table 17), based on recommendations from Granite Seed Company. Although drill seeding is the preferred method of seeding for this site, if the seed is broadcasted, then this seeding rate should be doubled. Refer to Tables 18-19 for the recommended seed mix and seeding rate for drill seeding.

Table 16: Shallow Loamy/Loamy Seed Mix.

Common Name	Scientific Name	PLS lbs/acre
Western wheatgrass	*Elymus smithii*	3.00
Bluebunch wheatgrass	*Elymus spicata* ssp. *spicata*	2.00
Needle-and-thread	*Hesperostipa comate* ssp. *comata*	2.00
Prairie junegrass	*Koeleria macrantha*	0.15
Green needlegrass	*Nassella viridula*	1.00
Sandberg bluegrass	*Poa secunda* ssp. *sandbergii*	0.25
Blue grama	*Bouteloua gracilis*	0.25
Western yarrow	*Achillea millefolium* var. *occidentalis*	0.10
Hairy false golden aster	*Chrysopsis villosa*	0.10
Silverleaf lupine	*Lupinus argenteus*	1.00
Scarlet globemallow	*Sphaeralcea coccinea*	0.10
Wyoming big sagebrush	*Artemisia tridentata* ssp. *wyomingesis*	0.10
	Total	10.05

Table 17: Saline Subirrigated Seed Mix.

Common Name	Scientific Name	PLS lbs/acre
Great basin wildrye	*Leymus cinereus*	4.00
Alkali sacaton	*Sporobolus airoides*	0.50
Western wheatgrass	*Elymus smithii*	4.00
Bluebunch wheatgrass	*Elymus spicata* ssp. *spicata*	3.50
Prairie junegrass	*Koeleria macrantha*	0.25
Tufted hairgrass	*Deschampsia cespitosa*	0.50
Sandberg bluegrass	*Poa secunda* ssp. *sandbergii*	0.50
Little bluestem	*Schizachyrium scoparium*	1.00
	Total	14.25

As no disturbance will occur within 500 feet of wetlands, re-seeding within wetlands will not occur. Subirrigated seed mixes were not developed as this ESD was most commonly present along wetland edges, it is assumed that this ESD and associated plant communities will not be affected by the disturbance and therefore not require re-seeding. Limber pine seedlings are available for purchase, and will be acquired if necessary for final reclamation. Limber pine will not be re-seeding during interim reclamation.

Seedling Protection

Appropriate measures will be implemented after seeding to increase seeding establishment. Due to the textures of the topsoil/suitable subsoil salvage material and moderate to severe wind erosion potential, a soil stabilization product is recommended to stabilize the potentially erosive material. Weed free straw mulch application, recommended to mitigate coarse fragments/soils, will provide temporary protection from erosion by holding the seed and replaced topsoil/suitable subsoil in place, as well as, increase soil moisture retention, and moderate soil temperatures providing conditions conducive to plant establishment. Roughening of the soil surface during seed bed preparation will also increase soil moisture retention by capturing moisture and slowing water and wind erosion. If necessary, additional erosion control measures will be implemented to ensure the establishment of a self-sustaining plant community after disturbance. Additional measures may include velocity controls, snow fence, or erosion control matting. The site will only be fenced off, if livestock or wildlife grazing impede establishment of the plant community.

4.0 MANAGEMENT OF INVASIVE SPECIES

Post Construction Management and Reporting

Weed species, including state designated noxious weeds as well as Fremont and Natrona County declared weeds and weeds of concern were mapped as indicated above.

Annual monitoring results, pesticide application records, and pesticide use reports will be filed in accordance with the BLM-LFO requirements as stated in the Weed Management Plan. Unpredicted weed issues, that may arise during the reclamation process, not covered under the current Weed Management Plan will be addressed through an amendment and/or revision the either the Weed Management Plan or this document. Any changes will be submitted for approval by the BLM-LFO AO, prior to implementation.

5.0 MONITORING PLAN

The purpose of monitoring is to assess and ensure re-vegetation is progressing toward final reclamation success criteria. As this project crosses four ESDs and six plant communities, six reference areas will be established for purposes of determining successful interim and final reclamation. These reference areas will be determined by EP and the BLM-LFO AO prior to initiation of construction. Each reference area will be located adjacent to the disturbance and be representative of the disturbed area with regard to aspect, soils, vegetation, and ESD.

Qualitative data will be collected as part of the WDEQ Storm Water Pollution Prevention Plan (SWPPP) and may be used to supplement reclamation monitoring that would be required by the BLM-LFO. During construction, qualified personnel will inspect disturbed areas, control measures, and locations where vehicles enter or exit the site, at least once every 14 calendar days

and within 24 hours of any precipitation and/or snow melt even with exceeds 0.5 inches. Inspection reports will determine if erosion practices are functioning properly or if erosion control devices are in need of repair. Corrective action will be taken to repair and correct deficiencies recorded by inspectors. EP will keep a record of all inspections completed for the $GUCO_2$ SWPPP reports. Inspection reports will be available for review at the EP office.

Following construction completion, but prior to return of the project area to "stabilized" conditions, reclamation and erosion control monitoring will be completed monthly by qualified personnel. Inspection reports will determine if erosion controls are functioning properly of if erosion control devices are in need of repair and if reclamation is successful. Corrective action will be taken to repair and correct deficiencies recorded by inspectors. Inspection reports will be available for review at the EP office. Both qualitative and quantitative methods will be used to monitor the revegetation success of the project until it is deemed "stabilized". A site will be considered "stabilized" when the area has uniform perennial vegetation cover that is 70% or greater than the adjacent background cover (Sahl 2006).

Quantitative vegetation monitoring will be conducted annually, during the second growing season, in conjunction with or in addition to monthly SWPPP monitoring. Annual monitoring will be conducted during the growing season (May 15-August 31) to provide the most accurate vegetation data. Sampling will occur within a two week time frame each year, based on the date of the first year of monitoring. Sampling dates will be submitted within an annual report to the BLM-LFO (the annual report). Monitoring methodology will be in accordance with a BLM approved monitoring protocol (Refer to Appendix D for recommended methodology). Monitoring methodology will be submitted within the annual report. Quantitative basal cover data collected will compare disturbed area to adjacent reference areas. At a minimum cover data will be reported as percent grasses, forbs, shrubs, invasive species, noxious weeds, bare ground, litter, rock, as well as, total vegetation cover and total ground. Quantitative data will be collected for soil movement/erosion and grazing. Photo reference points will be established and photos will be submitted within the annual report.

The following criteria, according to Appendix D – Reclamation Objectives and Standards of the LFO Resource Management Plan (USDI BLM LFO 2011b), must be met to attain reclamation success:

Percent Ground Cover

- 90% of the Erosion Indicator as listed on the NRCS ESD Reference Sheet

Plant Species Composition

- At least 75% of the total plant species cover must be major grasses, forbs, and shrubs for the desired ESD plant community or BLM-LFO authorized seed mix
- At least 5% of the total plant species cover must be woody plants for the desired ESD plant community

- At least 5% of the total plant species cover must be forbs for the desired ESD plant community
- No greater than 15% of the total reclaimed area will be composed of declared or invasive weed species
- No greater than 35% of a 500 square foot contiguous reclaimed area will be composed of declared or invasive weed species
- No state of federal designated noxious weeds present

Site Stability, Erosion Potential, and other Variables

- Meet NRCS Reference Sheet Indicators for the desired ESD with the following exceptions:
  - Soil surface structure and soil organic matter content
  - Average percent of liter cover and depth
  - Expected annual production

All reclamation monitoring data will be tracked in a geo-spatially referenced database. This database will contain both reclamation data and surface disturbance data (feature class). Feature classes will be updated as disturbance occurs. Refer to Table 18 for a list of common reclamation database attributes. The annual report will be submitted to BLM-LFO annually, no later than December 31 of each year after one full growing season following seeding; the database will be submitted upon request by the BLM-LFO. The following will be addressed in the annual report:

10 requirements of the Wyoming Reclamation Policy

Requirements of the BLM-LFO RMP reclamation objectives and standards

Requirements of the Onshore Oil and Gas Orders

Identify if BLM-LFO RMP reclamation objectives and standards are likely to be achieved in the near future without additional actions

Identify actions that have been or will be taken to meet the BLM-LFO RMP reclamation objectives and standards

Initial disturbance acreages

Successful interim reclamation acreages

Successful final reclamation acreages

After final reclamation has met the standards for successful reclamation, pertinent reclamation data will be presented to the BLM-LFO AO for further review. EP will then file a final abandonment notice and request that the bond be released from the location.

Table 18: List of Common Geo-database Features.

Location Information	Seeding Information (cont.)
Project Name	Seed Mix
Reporting Year	Seeding Date
Project Type	Seeding Method
WYW#	Copy of Certified Seed Tag
API #	Seeding Rate
Township	Seeded Area
Range	Interseeding or Reseeding Date
Section(s)	General Reclamation Information
QtrQtr	Erosion Control Measures
Coordinate System	Mitigation Measures
Surface Ownership	Methods for Livestock Exclusion
Mineral Ownership	Weed Information
Pre-Disturbance Information	PUP Number
Site Assessment Date	Contractor Information
Ecological Site Description	Treatment Date
Sampling Method	Species Treated
% Grasses	Method of Treatment
% Forbs	Chemical Used
% Shrubs	Application Rate
% Succulents	Area Treated
% Invasive Species	Monitoring Information
% Noxious Weeds	Contractor Information
% Total Vegetation	Type of Reclamation
% Litter	Monitoring Date
% Rock	Monitoring Method
% Cryptograms	Growing Season
% Total Ground Cover	% Grasses
% Bare Ground	% Forbs
Construction Information	% Shrubs
Contractor Information	% Succulents
Construction Start Date	% Invasive Species
Construction Completion Date	% Noxious Weeds
Disturbance Area	% Total Vegetation
Earthwork Information	% Litter
Contractor Information	% Rock
Earthwork Completion Date	% Cryptograms
Soil Preparation Ripping Depth	% Total Ground Cover
Reclaimed Area	% Bare Ground
Seeding Information	Erosion Features
Contractor Information	Grazing
Seedbed Preparation Methods	Reclamation Successful
Soil Amendments	General Comments

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APPENDIX A

Pre-Disturbance Site Assessment List of Plant Species Observed

Scientific Name	Common Name	ESD/Plant Community						
		Loamy		Shallow Loamy		Saline Subirrigated	Subirrigated	Wetland
		BS/MG	RW/NT	BW/RW	LP	AS/BW	WW/KB	WET
Native Annual Grasses								
Muhlenbergia filiformis	Pullup muhly					X	X	X
Introduced Annual Grasses								
Bromus japonicus	Japanese brome						X	X
Native Cool Season Perennial Grasses								
Achnatherum hymenoides	Indian ricegrass						X	X
Calamagrostis canadensis	Bluejoint					X	X	X
Elymus lanceolatus	Thickspike wheatgrass	X					X	X
Elymus smithii	Western wheatgrass	X	X	X	X	X	X	X
Elymus spicatus	Bluebunch wheatgrass	X		X	X	X	X	X
Glyceria striata	Fowl mannagrass						X	X
Hesperostipa comata	Needle-and-thread	X	X	X			X	
Koeleria macrantha	Prairie junegrass	X	X	X	X	X	X	X
Muhlenbergia asperifolia	Alkali muhly					X		
Nassella viridula	Green needlegrass	X	X	X			X	X
Phalaris arundinacea	Reed canarygrass						X	X
Poa juncifolia	Alkali bluegrass						X	X
Poa secunda	Sandberg bluegrass	X	X	X	X	X	X	X
Puccinellia nuttalliana	Alkaligrass					X		
Native Warm Season Perennial Grasses								
Bouteloua gracilis	Blue grama	X		X	X			
Deschampsia cespitosa	Tufted hairgrass					X		
Distichlis stricta	Inland saltgrass							
Schizachyrium scoparium	Little bluestem					X		
Spartina pectinata	Prairie cordgrass					X		X
Sporobolus airoides	Alkali sacaton	X					X	X

Scientific Name	Common Name	ESD/Plant Community						
		Loamy		Shallow Loamy		Saline Subirrigated	Subirrigated	Wetland
		BS/MG	RW/NT	BW/RW	LP	AS/BW	WW/KB	WET
Introduced Perennial Grasses								
Agropyron cristatum	Crested wheatgrass						X	X
Agrostis stolonifera	Carpet bent					X	X	X
Bromus inermis	Smooth brome						X	X
Phleum pratense	Timothy					X	X	X
Poa pratensis	Kentucky bluegrass					X	X	X
Native Grass-likes								
Carex filifolia	Threadleaf sedge	X	X	X	X	X		
Carex nebrascensis	Nebraska sedge					X	X	X
Carex praegracilis	Silver sedge					X	X	X
Carex scirpoidea	Northern singlespike sedge					X		X
Eleocharis palustris	Common spikerush					X	X	X
Juncus balticus	Baltic rush					X	X	X
Juncus torreyi	Torrey rush							X
Schoenoplectus acutus	Hardstem bulrush							X
Schoenoplectus americanus	Chairmakers rush							X
Schoenoplectus pungens	Common threesquare							X
Schoenoplectus sp.	Rush					X		
Schoenoplectus tabernaemontani	Softstem bulrush							X
Introduced Annual Forbs								
Camelina microcarpa	Littleseed falseflax							
Chenopodium glaucum	Oakleaf goosefoot					X		X
Polygonum aviculare	Prostrate knotweed							
Polygonum persicaria	Spotted ladysthumb						X	X

Scientific Name	Common Name	ESD/Plant Community						
		Loamy		Shallow Loamy		Saline Subirrigated	Subirrigated	Wetland
		BS/MG	RW/NT	BW/RW	LP	AS/BW	WW/KB	WET
Native Perennial Forbs								
Achillea millefolium	Western yarrow	X	X	X			X	X
Allium textile	Textile onion	X						
Antennaria corymbosa	Flat-top pussytoes						X	X
Antennaria microphylla	Littleleaf pussytoes	X	X	X	X	X	X	X
Astragalus drummondii	Drummond's milkvetch	X	X			X		
Cirsium undulatum	Wavyleaf thistle	X		X				
Equisetum arvense	Field horsetail							X
Equisetum laevigatum	Smooth horsetail					X	X	X
Eremogone hookeri	Hooker sandwort	X		X	X	X		
Gaura coccinea	Scarlet gaura	X						
Heterotheca villosa	Hairy golden aster	X						
Lupinus argenteus	Silvery lupine	X		X	X			
Maianthemum stellatum	Starry false lily of the valley							X
Mentha arvensis	Wild mint						X	X
Oxytropis campestris	Field locoweed							X
Oxytropis sp.	Locoweed	X						
Penstemon sp.	Penstemon	X		X				
Phlox andicola	Prairie phlox	X		X				
Phlox hoodii	Hoods phlox	X	X	X				
Physaria sp.	Twinpod				X			
Plantago eriopoda	Redwool plantain					X	X	X
Potentilla anserina	Silverweed cinquefoil					X		X
Rumex salicifolius	Willowleaf dock					X		X
Sphaeralcea coccinea	Scarlet globemallow	X						
Symphyotrichum falcatum	White prairie aster	X				X		X

Scientific Name	Common Name	ESD/Plant Community						
		Loamy		Shallow Loamy		Saline Subirrigated	Subirrigated	Wetland
		BS/MG	RW/NT	BW/RW	LP	AS/BW	WW/KB	WET
Native Perennial Forbs (continued)								
Thermopsis rhombifolia	Golden banner	X	X	X	X		X	
Trifolium sp.	Clover						X	X
Urtica dioica	Stinging nettle							
Viola macloskeyi	Small white violet							X
Introduced Perennial Forbs								
Mentha spicata	Spearmint							X
Taraxacum officinale	Common dandelion							
Native Sub-Shrubs								
Artemisia frigida	Fringed sagewort	X	X	X				
Artemisia pedatifida	Birdfoot sagebrush	X	X	X	X	X	X	
Gutierrezia sarothrae	Broom snakeweed	X		X				
Juniperus horizontalis	Creeping juniper							X
Krascheninnikovia lanata	Winterfat	X						
Yucca glauca	Yucca				X			
Native Full Shrubs								
Artimisia cana	Silver sagebrush						X	X
Artemisia tridentata	Big sagebrush	X	X	X	X	X	X	
Chrysothamnus viscidiflorus	Green rabbitbrush	X	X	X		X	X	X
Ericameria nauseosa	Rubber rabbitbrush	X	X	X				
Ribes cereum	Western red currant							X
Rosa woodsii	Woods rose						X	X
Sarcobatus vermiculatus	Greasewood							
Symphocicarpus albus	Common snowberry				X			

Scientific Name	Common Name	ESD/Plant Community						
		Loamy		Shallow Loamy		Saline Subirrigated	Subirrigated	Wetland
		BS/MG	RW/NT	BW/RW	LP	AS/BW	WW/KB	WET
Native Trees								
Juniperus virginiana	Eastern red cedar				X			
Juniperus scopulorum	Rocky Mountain juniper							X
Pinus flexilis	Limber pine				X			
Salix amygdaloides	Peachleaf willow							X
Native Succulents								
Opuntia polyacantha	Plains pricklypear	X		X				
Noxious and Invasive Weeds								
Asclepias speciosa	Showy milkweed	X						
Bromus tectorum	Cheatgrass				X	X	X	X
Centaurea diffusa	Diffuse knapweed							
Centaurea macrocephala	Bighead knapweed							
Cirsium arvense	Canada thistle	X	X				X	X
Glycyrrhiza lepidota	Wild licorice	X						
Grindelia squarrosa	Curlycup gumweed		X		X	X	X	X
Halogeton glomeratus	Halogeton							
Hordeum jubatum	Foxtail barley	X			X	X	X	X

APPENDIX B

Pre-Disturbance Site Assessment Survey List of Weed Species

Scientific Name	Common Name	Status
Agropyron repens	Quackgrass	WY Noxious
Arctium minus	Common burdock	WY Noxious
Carduus acanthoides	Plumeless thistle	WY Noxious
Cardaria draba	Hoary cress (White top)	WY Noxious
Carduus nutans	Musk thistle	WY Noxious
Cardaria pubescens	Hoary cress (White top)	WY Noxious
Centaurea diffusa	Diffuse knapweed	WY Noxious
Centaurea maculosa	Spotted knapweed	WY Noxious
Centaurea repens	Russian knapweed	WY Noxious
Chrysanthemum leucanthemum	Ox-eye daisy	WY Noxious
Cirsium arvense	Canada thistle	WY Noxious
Convolvulus arvensis	Field bindweed	WY Noxious
Cynoglossum officinale	Houndstongue	WY Noxious
Elaeagnus angustifolia	Russian olive	WY Noxious
Euphorbia esula	Leafy spurge	WY Noxious
Franseria discolor	Skeletonleaf bursage	WY Noxious
Hypericum perforatum	Common St. Johnswort	WY Noxious
Isatis tinctoria	Dyers woad	WY Noxious
Lepidium latifolium	Perennial pepperweed	WY Noxious
Linaria dalmatica	Dalmatian toadflax	WY Noxious
Linaria vulgaris	Yellow toadflax	WY Noxious
Lythrum salicaria	Purple loosestrife	WY Noxious
Onopordum acanthium	Scotch thistle	WY Noxious
Sonchus arvensis	Perennial sowthistle	WY Noxious
Tamarix spp.	Saltcedar	WY Noxious
Tanacetum vulgare	Common tansy	WY Noxious
Euphorbia myrsinites	Myrtle spurge	Natrona County Weed of Concern
Rumex crispus	Curly dock	Natrona County Weed of Concern
Xanthium strumarium	Common cocklebur	Natrona County Weed of Concern
Asclepias speciosa	Showy Milkweed	Natrona County Declared
Bromus tectorum	Cheatgrass	Natrona County Declared
Centaurea solstitialis	Yellow starthistle	Natrona County Declared
Grindelia squarrosa	Curlycup gumweed	Natrona County Declared
Halogeton glomeratus	Halogeton	Natrona County Declared
Hordeum jubatum	Foxtail barley	Natrona County Declared
Medicago lupulina	Black medic	Natrona County Declared
Solanum rostratum	Buffalobur	Natrona County Declared
Glycyrrhiza lepidota	Wild licorice	Fremont County Weed of Concern, Natrona County Declared

Scientific Name	Common Name	Status
Hyoscyamus niger	Black henbane	Fremont County Weed of Concern, Natrona County Declared
Tribulus terrestris	Puncturevine	Fremont County Weed of Concern, Natrona County Declared
Artemisia absinthium	Absinth wormwood	Fremont County Weed of Concern
Bassia sieveriana	Russian thistle	Fremont County Weed of Concern
Cirsium vulgare	Bull thistle	Fremont County Weed of Concern
Polygonum cuspidatum	Japanese knotweed	Fremont County Weed of Concern
Potentilla recta	Sulphur cinquefoil	Fremont County Weed of Concern
Sonchus arvensis	Marsh sowthistle	Fremont County Weed of Concern
Verbascum thapsus	Common mullein	Fremont County Weed of Concern
Sphaerophysa salsula	Swainsonpea	Fremont County Declared

APPENDIX C

Pre-Disturbance Site Assessment Wetland Location

Drainage	Sample Point (SP) ID/Map ID*	Legal Description	2010/2011 Delineation Designation	Cowardin Classification	Acreage of Cowardin Classification	Comments	Jurisdictional Recommendation
Tributary to Poison Spider Creek	W1	Section 21 T32N R85W	Wetland	PEMC	0.06	---	Jurisdictional
Tributary to Poison Spider Creek	W2	Section 21 T32N R85W	Wetland	PEMC	0.07	---	Jurisdictional
Tributary to Poison Spider Creek	W3	Section 15 T32N R85W	Wetland	PEMC	0.36	---	Jurisdictional
Tributary to Poison Spider Creek	W4	Section 16 T32N R85W	Wetland	PEMC	0.20	---	Jurisdictional
Tributary to Poison Spider Creek	W5	Section 16 T32N R85W	Wetland	PEMC	0.06	---	Jurisdictional
Tributary to Poison Spider Creek	W6	Section 27 T32N R85W	Wetland	PEMB	0.14	---	Jurisdictional
Tributary to Poison Spider Creek	W7	Section 27 T32N R85W	Wetland	PEMC	0.05	---	Jurisdictional
Tributary to Poison Spider Creek	W8	Section 22 T32N R85W	Wetland	PEMC	0.21	---	Jurisdictional
Tributary to Poison Spider Creek	W9	Section 22 T32N R85W	Wetland	PEMC	0.19	---	Jurisdictional
Tributary to Cabin Creek	W10	Section 19 T32N R85W	---	---	---	---	---
Tributary to Cabin Creek	W11	Section 19 T32N R85W	Wetland	PEMC	0.13	---	Jurisdictional
Tributary to Cabin Creek	W12	Section 19 T32N R85W	Wetland	PEMC	0.01	---	Jurisdictional
Tributary to Cabin Creek	W13	Section 19 T32N R85W	Wetland	PEMC	0.05	---	Jurisdictional

Drainage	Sample Point (SP)	Legal Description	2010/2011 Delineation	Cowardin Classification	Acreage of Cowardin	Comments	Jurisdictional Recommendation
Tributary to Cabin Creek	W14	Section 19 T32N R85W	Wetland	PEMC	0.12	---	Jurisdictional
Tributary to Cabin Creek	W15	Section 18 T32N R85W	OWUS	---		---	---
Tributary to Cabin Creek	W16	Section 18 T32N R85E	---	---	---	---	---
Tributary to Cabin Creek	W17	Section 17 T32N R85W	---	---	---	---	---
Tributary to Poison Spider Creek	W18	Section 16 T32N R85W	Wetland	PEMC	0.20	---	Jurisdictional
Tributary to Poison Spider Creek	W19	Section 16 T32N R85E	---	---	---	---	---
Tributary to Poison Spider Creek	W20	Section 16 T32N R85W	Wetland	PEMC	0.07	---	Jurisdictional
Tributary to Poison Spider Creek	W21	Section 16 T32N R85W	Wetland	PEMC	0.14	---	Jurisdictional
Tributary to Poison Spider Creek	W22	Section 16 T32N R85W	Wetland	PEMC	0.04	---	Jurisdictional
Tributary to Poison Spider Creek	W23	Section 27 T32N R85W	OWUS	---		---	---
Tributary to Poison Spider Creek	W24	Section 26 T32N R85W	OWUS	---		---	---
Tributary to Poison Spider Creek	W25	Section 15 T32N R85W	---	---	---	---	---
Tributary to Poison Spider Creek	W26	Section 22 T32N R85W	---	---	---	---	---

APPENDIX D

Vegetation Monitoring Methodology

Protocol for Vegetation Sampling

A point-intercept vegetation monitoring method will be utilized to collect quantified pre-disturbance baseline and reclamation monitoring vegetation data.

Data will be collected at 50 or 100 sample points on selected well pads and 0.5 mile Right-of-Way (ROW) segments. Professional judgment will be used to determine the number of sample points required to provide a representative sample.

Using a sighting device points are collected at 0.5 or 1 meter intervals along a 50 meter transect.

- The number of transects, transect start points, and transect orientation will be determined in the field and will provide a representative sample of the entire disturbance or reclaimed area.
- Points will be collected from at least one 50-meter transect in each ESD within the disturbance or reclaimed area at non-linear features or at 0.5 mile intervals within in each ESD for linear features.

At each point, canopy and basal cover "hits" will be recorded.

- Canopy cover is determined by the first species or life form intersected by the sighting device (above ground plant or ground cover material if not above ground canopy cover exists).
- At the same point, basal cover is determined by following the sight to the ground surface and recording what life form or species is intersected.

Canopy and basal cover categories include: grass, forb, shrub, weed, noxious weed, bare ground, litter, rock, and cryptograms (Wyoming Rangeland Monitoring Guide 2008).

- Litter includes all non-living organic material and fecal matter, does not include standing dead vegetation from the current year's growth.
- Rock includes both rock (> 2 inches at the intermediate axis) and gravel (< 2 inches at the intermediate axis)
- Cryptogram can be recorded as algae, moss, lichen, or fungi.
- Refer to Appendix B for a list of weed species.

The point-intercept method is repeated in the adjacent undisturbed area (reference area).

Point data will be used to calculate total or percent cover values for: total vegetation cover, vegetation cover by lifeform, ground cover, litter, bare ground, rock, or cryptogram cover values

- Total vegetation cover: percent of the ground surface which is covered by vegetation growth produced during the current growing season. Vegetation cover data will be recorded by species.
- Total ground cover: sum of the cover values for total vegetation, total cryptograms, total litter, and total rock.
- Points collected on the 50 meter point-intercept transects contribute 2% of the total cover value on 50 point transects and 1% of the total cover value on 100 point transects.

Species Diversity

- All vegetation species observed within the pre-disturbance area or reclaimed area not "hit" during the survey are recorded.

- A summary table of species will be provided. Species will be listed by ESD and life form whenever possible.
- This summary can be used for comparative analysis.

State and County listed noxious weed species and ocular estimation of their cover will be recorded, photographed, and GPS located.

One photograph will be taken of each transect.

General notes will be recorded

- Proper functioning properly of erosion control devices
- Signs of erosion: rills, gullies, gullies, pedestalled plants
- Grazing conditions

Appendix C: Grieve Unit CO_2 EOR Project CO_2 Example Application for Permit to Drill and Master Surface Use Plan of Operations

Form 3160-3
(August 2007)

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-015814

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☑ Oil Well ☐ Gas Well ☐ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #55

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address 123 West 1st Street, Suite 550
Casper, WY 82601

3b. Phone No. *(include area code)*
307-265-3326

10. Field and Pool, or Exploratory
Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface 1768' FNL, 2067' FEL (SWNE), Section 27, T32N, R85W
At proposed prod. zone 247' FNL, 1199' FEL (NENE), Section 27, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 27, T32N, R85W

14. Distance in miles and direction from nearest town or post office*
Approximately 19 miles south of Powder River, Wyoming

12. County or Parish
Natrona

13. State
WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)
247'

16. No. of acres in lease
640

17. Spacing Unit dedicated to this well
40 acres

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.
≈1250'

19. Proposed Depth
7000'

20. BLM/BIA Bond No. on file
800346757

21. Elevations (Show whether DF, KDB, RT, GL, etc.)
7322' GL

22. Approximate date work will start*
02/01/2012

23. Estimated duration
20 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No. 1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature 

Name *(Printed/Typed)*
Ralph Schulte

Date
4/8/2011

Title
Engineering Manager, Elk Petroleum

Approved by *(Signature)*

Name *(Printed/Typed)*

Date

Title

Office

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)

Form 3160-3
(August 2007)

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-015814

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☑ Oil Well ☐ Gas Well ☐ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #55

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address 123 West 1st Street, Suite 550
Casper, WY 82601

3b. Phone No. *(include area code)*
307-265-3326

10. Field and Pool, or Exploratory
Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*

At surface 1768' FNL, 2067' FEL (SWNE), Section 27, T32N, R85W

At proposed prod. zone 247' FNL, 1199' FEL (NENE), Section 27, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 27, T32N, R85W

14. Distance in miles and direction from nearest town or post office*
Approximately 19 miles south of Powder River, Wyoming

12. County or Parish
Natrona

13. State
WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)
247'

16. No. of acres in lease
640

17. Spacing Unit dedicated to this well
40 acres

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.
≈1250'

19. Proposed Depth
7000'

20. BLM/BIA Bond No. on file
800346757

21. Elevations (Show whether DF, KDB, RT, GL, etc.)
7322' GL

22. Approximate date work will start*
02/01/2012

23. Estimated duration
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24. Attachments

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4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature

Name *(Printed/Typed)*
Ralph Schulte

Date
6/8/2011

Title
Engineering Manager, Elk Petroleum

Approved by *(Signature)*

Name *(Printed/Typed)*

Date

Title

Office

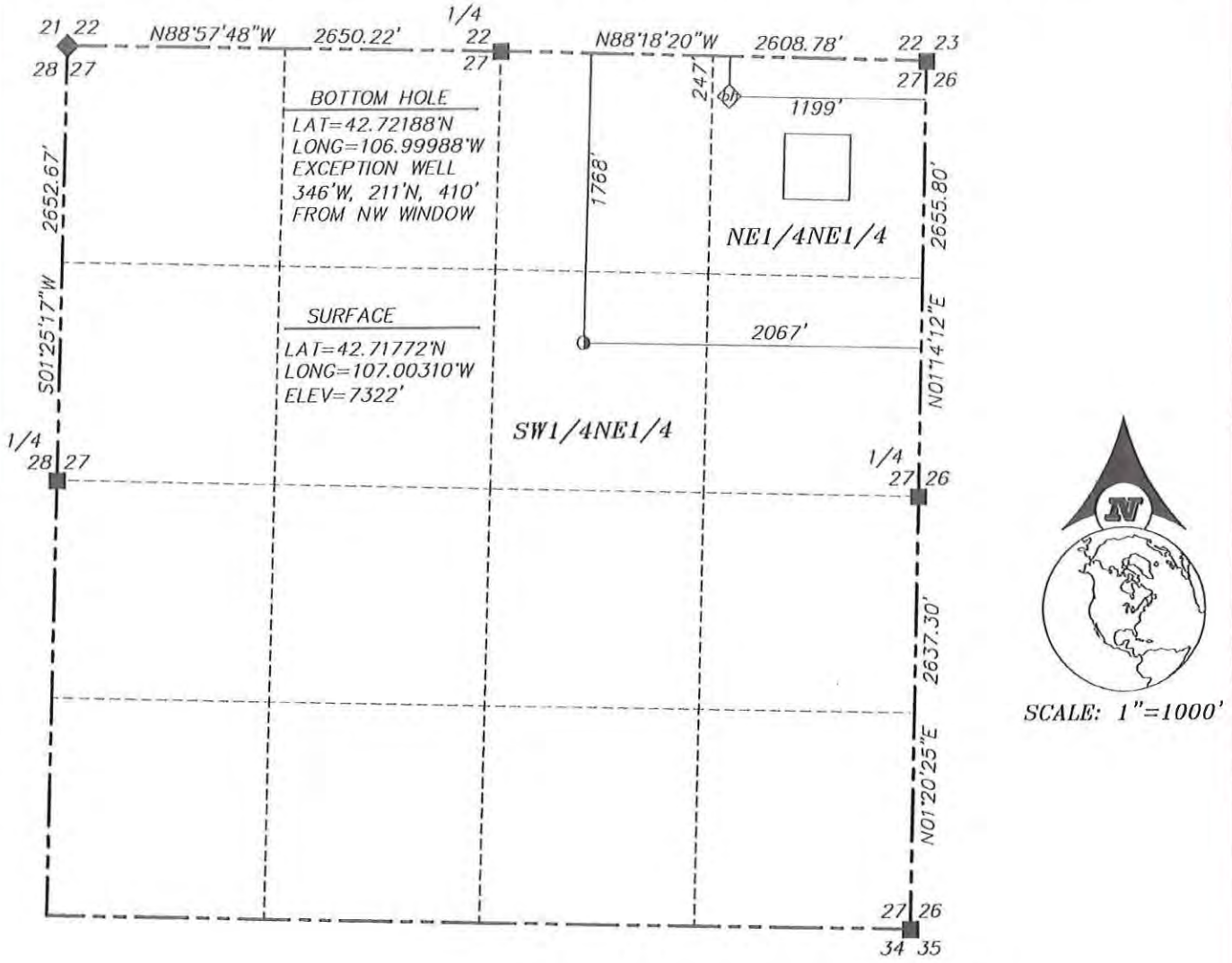
Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)

SECTION 27, T. 32 N., R. 85 W., 6TH P.M., NATRONA COUNTY, WYOMING



LEGEND

- WELL STAKE
- BOTTOM HOLE LOCATION
- SET MARKED STONE
- STONE MOUND
- SECTION LINE
- INTERIOR SECTION LINE

I, THONE STEWART, A DULY REGISTERED LAND SURVEYOR IN THE STATE OF WYOMING, DO HEREBY STATE, BASED ON MY KNOWLEDGE AND INFORMATION, THE ABOVE PLAT IS A VALID REPRESENTATION OF A SURVEY MADE BY ME, OR UNDER MY DIRECT SUPERVISION.

THE SURFACE WELL STAKE IS:
1788' FROM NORTH LINE
2067' FROM EAST LINE.
THE PROPOSED BOTTOM HOLE LOCATION IS NOT LOCATED WITHIN THE SPACING WINDOW AND IS:
247' FROM NORTH LINE
1199' FROM EAST LINE.
DISTANCES ARE PERPENDICULAR TO SECTION LINE.

Professional Land Surveyor
THONE STEWART
5369
Thone Stewart
Date: June 3, 2011
WYOMING

BASIS TABLE

BEARINGS ARE BASED ON UTM ZONE 13. DISTANCES ARE US Feet ADJUSTED TO SURFACE USING THE COMBINED SCALE FACTOR OF 1.0003770695. ELEVATIONS ARE UNGRADED GROUND (NAVD88) BASED ON CORS POINT CASPER AND GEOID03. Lats. AND Longs. ARE NAD83.

PLAT SHOWING DRILLING LOCATION
GRIEVE UNIT #55
(OIL PRODUCTION WELL)

PRESTFELDT SURVEYING
PO BOX 3082
SHERIDAN, WY 82801
307-672-7415
FAX 674-5000

JN: 25004
DF: EPIC/328527
JUNE, 2011
TGO: T2005004 ElkHorseCreek

ELK PETROLEUM, INC.
Lease #WW-WYW-015814, Grieve #55
NE¼,NE ¼, Section 27, T32N, R85W
Natrona County, Wyoming

DRILLING PROGNOSIS

1.ESTIMATED TOPS OF IMPORTANT GEOLOGIC MARKERS

Parkman	636'	Carlile Sh	5607'	Thermopolis	6855'
Phayles	1229'	2nd Frontier	6047'		
Shannon	3372'	Mowry Shale	6495'		
Niobrara	5263'	Muddy SS	6798'		
Total Depth	7000'				

2.ESTIMATED DEPTHS OF ANTICIPATED WATER, OIL, GAS OR MINERAL FORMATIONS

A. Tops: Muddy 6798' Oil/Gas – Primary Objective

Any usable water zones encountered will be adequately protected and reported. All usable water zones, potential hydrocarbon zones, and valuable mineral zones will be isolated.

B.Directional Directional tools are anticipated for this well.

Azimuth	29.7°	See Attached Plan & Vertical Section View
Build Rate	.55°/100 ft	
Inclination	33.5° at total depth	

3. PRESSURE CONTROL EQUIPMENT- Schematic Attached

A. Type: Eleven (11) Inch Double Gate Hydraulic BOP with Eleven (11) Inch Well Head.

The Blow-Out Preventer will be equipped as follows:

1. One (1) blind ram (above).
2. One (1) pipe ram (below).
3. Kill line (2-inch minimum).
4. One (1) kill line valve (2-inch minimum)
5. One (1) choke line valve.
6. Two (2) adjustable chokes (2-inch minimum).
7. Upper kelly cock valve with handle available.
8. Full opening internal blowout preventer or drill pipe safety valve able to fit all connections.
9. 2-inch (minimum) choke line.
10. Fill-up line above the uppermost preventer.
11. Rotating Head on top of stack, if desired

B. Pressure Rating: 2,000 psi

C. Testing Procedure:

At a minimum, the BOP, choke manifold, and related equipment will be pressure tested to the approved working pressure of the BOP stack (if isolated from the surface casing by a test plug) or to 70% of the internal yield strength of the surface casing (if the BOP is not isolated from the casing by a test plug).

Pressure will be maintained for a period of at least 10 minutes or until the requirements of the test are met, whichever is longer. At a minimum, the above pressure test will be performed:

I. When the BOP is initially installed;
2. Whenever any seal subject to test pressure is broken;
3. Following related repairs; and
4. At thirty (30) day intervals.

In addition to the above, the pipe and blind rams will be activated each trip, but not more than once each day. All BOP drills and tests will be recorded in the IADC driller's log.

D. Choke Manifold Equipment:

All choke lines will be straight lines unless turns use tee blocks or are targeted with running tees, and will be anchored to prevent whip and vibration.

E. Accumulator:

The accumulator will have sufficient capacity to close all BOP's and retain 200 psi above precharge. Nitrogen bottles which meet the manufacturer's specifications will be used as the backup to the required independent power source. The accumulator precharge pressure test will be conducted prior to connecting the closing unit to the BOP stack and at least once every six (6) months thereafter. The accumulator pressure will be corrected if the measured precharge pressure is found to be above or below the maximum or minimum limits specified in *Onshore Oil and Gas Order Number 2.*

A manual locking device (i.e., hand wheels) or automatic locking device will be installed on all systems of 2M or greater. A valve will be installed in the closing line as close as possible to the annular preventer to act as a locking device. This valve will be maintained in the open position and will be closed only when the power source for the accumulator system is inoperative.

F. Miscellaneous Information:

The Blow-Out Preventer and related pressure control equipment will be installed, tested and maintained in compliance with the specifications in and requirements of *Onshore Oil & Gas Order Number 2.*

The choke manifold and BOP extension rods with hand wheels will be located outside the rig sub-structure. The hydraulic BOP closing unit will be located at least twenty-five (25) feet from the well head but readily accessible to the driller. Exact locations and configurations of the hydraulic BOP closing unit will depend upon the particular rig contracted to drill this hole.

A flare line will be installed after the choke manifold, extending 125 feet (minimum) from the center of the drill hole to a separate flare pit, if necessary or required by the Authorized Officer, Bureau of Land Management.

4. THE PROPOSED CASING AND CEMENTING PROGRAM

A. Casing Program: All New

Hole Size.	Casing Size	Wt./Ft	Grade	Joint	Depth Set
20"	16"	Conductor			60'
12.250"	9.625"	36.0#	J-55	ST&C	0- 1000'
8.5"	7.00"	26#	J-55	LT&C	0- 88'
8.5"	7.00"	23#	J-55	LT&C	88'- 5000'
8.5"	7.00"	26#	J-55	LT&C	5000'- 7000'

The surface casing will have one (1) centralizer in the middle of the first joint, on the 2nd collar, and then every third collar thereafter to the conductor pipe.

The production casing will have a DV tool at approximately 1,175 ft above the shoe for a two stage cement job.

Casing string(s) will be pressure tested to 0.22 psi/foot of casing string length or 1500 psi, whichever is greater (not to exceed 70% of the internal yield strength of the casing), after cementing and prior to drilling out from under the casing shoe.

B. Cementing Program:

Surface Casing — Set with approximately 170 sx Light Premium Lead with additives (yield=2.28 cu ft/sk) and 205 sx Premium Class G Tail cement with additives (yield = 1.15 cu ft/sk), circulated back to surface with 100% excess. Top of Cement (TOC) at surface.

Production Casing

Stage 1: Set with approximately 75 sx 50/50 Poz Lead with additives (yield=1.51 cu ft/sk) and 175 sks Premium Class G Tail cement with additives (yield = 1.15 cu ft/sk).

Stage 2: Set with approximately 385 sx 50/50 Poz Lead with additives (yield=1.51 cu ft/sk) and 50 sks Premium Class G Tail cement with additives (yield = 1.15 cu ft/sk).

Top of Cement (TOC) estimated at 3850 assuming a 10 inch hole above stage tool.

The above cement volumes are approximate. Actual cement volumes may vary due to variations in the actual hole gauge and will be determined by running a caliper log on the drilled hole.

All waiting on cement (WOC) times will be adequate to achieve a minimum of 500 psi compressive strength at the casing shoe prior to drilling out.

5. MUD PROGRAM- Visual Monitoring

Interval	Mud Type	Weight, ppg	Viscosity, sec/qt	Fluid Loss cc/30 min
0- 1000'	Native Mud	8.4-8.8	26-38	No Control
1000'- 4600'	Gel/Chemical	8.4- 8.6	28-38	8-10
4600'- 7000'	Gel/Chemical	8.6- 8.9	34-50	6-8
Logs		8.9- 9.0	50-60	6-8

Sufficient mud material(s) to maintain mud properties, control lost circulation and contain a blowout will be available at the well site during drilling operations.

6. EVALUATION PROGRAM

Logs AIT/Density/Neutron - from 7000' to surface casing
GR-Sonic from 7000' to surface casing

DST's None anticipated.

Cores None anticipated.

* Pull Gamma Ray Log Back to Surface

The evaluation program may change at the discretion of the well site geologist, with prior approval from the Authorized Officer, Lander Field Office, Bureau of Land Management.

Stimulation : No stimulation or frac treatment has been formulated for this test at this time. The drill site, as approved, will be of sufficient size to accommodate all completion activities.

Whether the well is completed as a dry hole or as a producer, *Well Completion and Recompletion Report and Log* (form #3160-4) will be submitted to the Lander Field Office not later than thirty (30) days after the completion of the well or after completion of operations being performed, in accordance with 43 CFR 3164.

Two (2) copies of all Logs, core descriptions, core analyses, well test data, geologic summaries, sample description, and all other surveys or data obtained and compiled during the drilling, workover, and/or completion operations, will be filed with form #3160-4. Samples (cuttings, fluids, and/or gases) will be submitted when requested by the Authorized Officer, Lander Field Office, Bureau of Land Management, P.O. Box 589, Lander, Wyoming 82520-0589, Telephone (307) 332-8400.

7. ABNORMAL CONDITIONS

No abnormal temperatures or pressures are anticipated. No H2S has been encountered in or known to exist from previous wells drilled to similar depths in the general area.

Maximum anticipated bottom hole pressure equals approximately 1000 psi (calculated at 0.50 psi/foot) and maximum anticipated surface pressure equals approximately 560 psi (bottom hole pressure minus the pressure of a partially evacuated hole calculated at 0.22 psi/foot). Pressure calculated at 2000 ft in depth. Muddy reservoir pressure is known to be approximately 800 psi at 6500 ft.

8. ANTICIPATED STARTING DATES AND NOTIFICATION OF OPERATIONS

A. Anticipated Starting Dates:

Anticipated Commencement Date	: June 1, 2012
Drilling Days	: Approximately 20 Days
Completion Days	: Approximately 10 Days

B. Notification of Operations:

Bureau of Land Management
Lander Field Office
1335 Main Street
Lander, Wyoming 82520
Phone: 307-332-8400

Contact Title	Contact Name	Office Telephone
Petroleum Engineer	Stephen Coursey	307-332-8400
Petroleum Engineering Technician	Darci Nation	307-332-8421
Petroleum Engineering Technician	Laura Lozier	307-332-8400
Natural Resource Specialist	Chris Krassin*	307-332-8452

* **Primary Contact**

C. General Conditions of Approval:
*

1. All lease and/or unit operations are to be conducted in such a manner to ensure full compliance with the applicable laws, regulations (43 CFR, Part 3160), Onshore Orders, Notices to Lessees, and the approved plan of operations.

2. The spud date will be reported orally to the Lander Field Office ***24 Hours Prior to Spudding***, unless otherwise required in the site specific conditions of approval.

3. All wells, whether drilling, producing, suspended or abandoned shall be identified in accordance with 43 CFR 3162.6. There shall be a sign or marker with the name of the operator, the lease serial number, the well number and the surveyed description of the well.

4. No well abandonment operations will be commenced without the prior approval of the Authorized Officer. In the case of newly-drilled dry holes or failures, and in emergency situations, oral approval will be obtained from the Field Office Petroleum Engineer. A *Notice of Intention to Abandon* (form #3160-5) will be filed with the Authorized Officer within fifteen (15) days following the granting of oral approval to plug and abandon.

5. Upon completion of approved plugging, a regulation marker will be erected in accordance with 43 CFR 3162.6 The following information will be permanently placed on the marker with a plate, cap, or beaded-on with a welding torch: Company Name, Well Name and Number, Location by Quarter/Quarter, Section, Township, Range, and the Federal Lease Number.

6. A *Subsequent Report of Abandonment* (form #3160-5) will be submitted within thirty (30) days following the actual plugging of the well bore. This

report will indicate where plugs were placed and the current status of surface restoration operations. If surface restoration has not been completed at that time, a follow-up report on form #3160-5 will be filed when all surface restoration work has been completed and the location is considered ready for final inspection.

7. Not later than the 5th business day after any well begins production on which royalty is due anywhere on a lease site or allocated to a lease site, or resumes production in the case of a well which has been off production for more than ninety (90) days, the operator shall notify the Authorized Officer by letter or sundry notice, of the date on which such production has begun or resumed. The notification shall provide at a minimum, the following informational items:

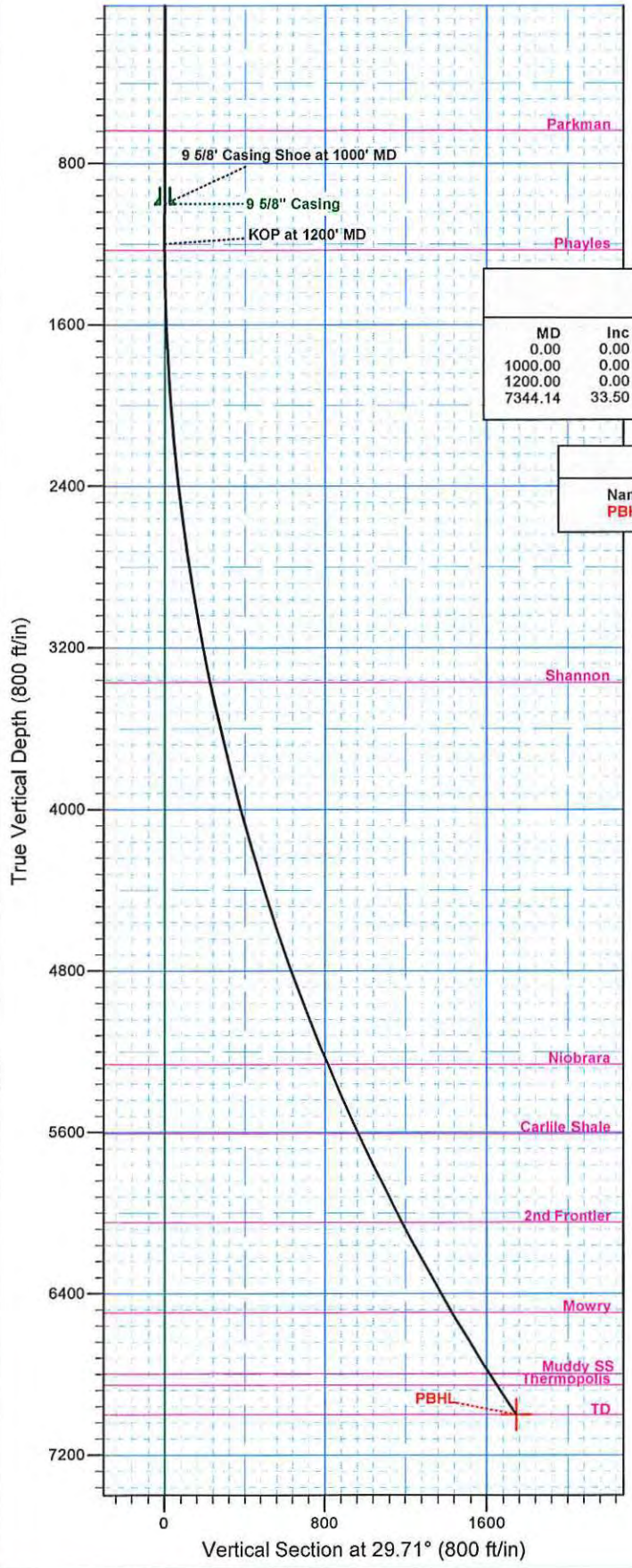
   a. Operator name, address, and telephone number.
   b. Well name and number.
   c. Well location *"¼, ¼,* Section, Township, Range, P.M.".
   d. Date well was placed in a producing status.
   e. The nature of the wells production (i.e.: crude oil casing gas, or natural gas and entrained liquid hydrocarbons).
   f. The OCS, Federal or Indian lease prefix and number on which the well is located. Otherwise, the non-federal or non-Indian land category (i.e. state or private).
   g. As appropriate, the communitization agreement number, the unit agreement name, number and participating area name.

8. Within sixty (60) days following construction of a new tank battery, a site facility diagram of the battery showing actual conditions and piping must be submitted to the Authorized Officer. Facility diagrams shall be filed within sixty (60) days after existing facilities are modified. For complete information as to what is required on these diagrams, please refer to 43 CFR 3162.7-4(d).

9. Pursuant *to Onshore Oil & Gas Order Number 1,* lessees and operators have the responsibility to see that their exploration, development, production, and construction operations are conducted in such a manner which conforms with applicable federal laws and regulations and with state and local laws and regulations to the extent that such state and local laws are applicable to operations on federal and Indian lands.

Elk Petroleum

PROFESSIONAL DIRECTIONAL LTD
EXPERIENCE ENHANCES PERFORMANCE



Project: Natrona County, WY
Site: Grieve Unit T32N-R85W
Well: Grieve Unit 55
Wellbore: Original Hole
Plan: Plan 2
Rig: TBD

SECTION DETAILS
Plan 2

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1000.00	0.00	0.00	1000.00	0.00	0.00	0.00	0.00	0.00	
1200.00	0.00	0.00	1200.00	0.00	0.00	0.00	0.00	0.00	
7344.14	33.50	29.71	7000.00	1516.09	865.25	0.55	29.71	1745.62	PBHL

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
PBHL	7000.00	1516.09	865.25	42° 43' 18.768 N	106° 59' 59.568 W

Surface Location:
SHL 1768' FNL & 2067' FEL Sec 27-T32N-R85W

US State Plane 1983
Wyoming East Central Zone
Elevation: 7322' GL + 15' KB @ 7337.00ft (TBD)

Northing	Easting	Latittude	Longitude
1136319.35	1401078.76	42° 43' 3.792 N	107° 0' 11.160 W

To convert a Magnetic Direction to a True Direction, Add 10.15° East

Magnetic Model: IGRF2010 Date: 26-May-12
Azimuths & Coordinates to True North

ELK PETROLEUM

Created By: Bob Hays Date: 13:45, February 16 2012

ISSUE	BLM REVIEW
REV.	A
REV. DATE	3 JUNE 2011
BY	LWB - P.E.
APPROVED	

CLIENT: ELK PETROLEUM
PROJECT NAME: GRIEVE UNIT CO2
PROJECT No.: 40-0238
DRAWING NAME.: GRIEVE UNIT 54 & 55 WELL
WELL PAD: GRIEVE UNIT # 54 & 55
LOCATION: SEE NOTES BELOW FOR LOCAITON INFROMATION
LAT./LONG.: SEE NOTES BELOW FOR LAT / LON OF EACH WELL
COUNTY, STATE.: NATRONA COUNTY, WYOMING

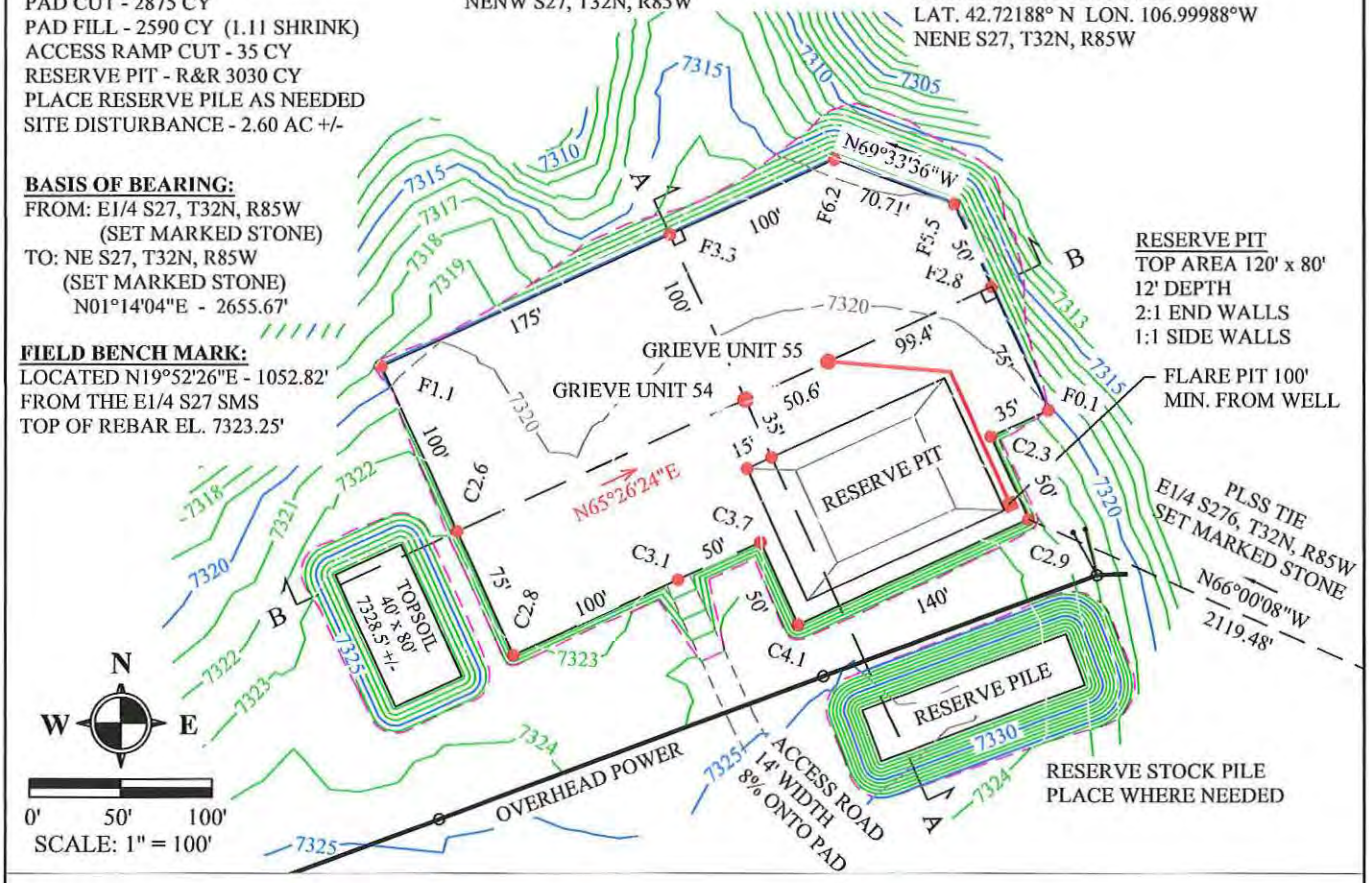
DIRT WORK:
PAD @ EL. 7320.3 (FLAT)
REMOVE 4" DEPTH TOPSOIL:
TOPSOIL UNDER PAD 905 CY
TOPSOIL UNDER RESERVE PILE 145 CY
TOTAL TOPSOIL 1050 CY
PAD CUT - 2875 CY
PAD FILL - 2590 CY (1.11 SHRINK)
ACCESS RAMP CUT - 35 CY
RESERVE PIT - R&R 3030 CY
PLACE RESERVE PILE AS NEEDED
SITE DISTURBANCE - 2.60 AC +/-

BASIS OF BEARING:
FROM: E1/4 S27, T32N, R85W
(SET MARKED STONE)
TO: NE S27, T32N, R85W
(SET MARKED STONE)
N01°14'04"E - 2655.67'

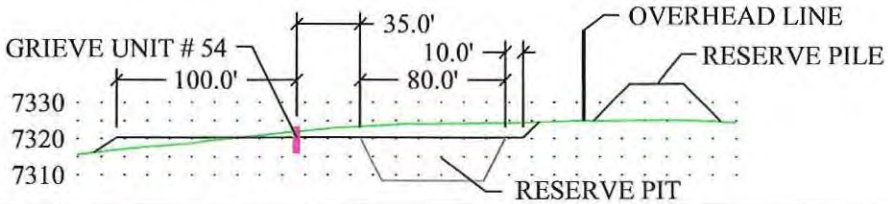
FIELD BENCH MARK:
LOCATED N19°52'26"E - 1052.82'
FROM THE E1/4 S27 SMS
TOP OF REBAR EL. 7323.25'

GRIEVE UNIT # 54 CO2 INJECTION WELL
SURFACE LOCATION- GROUND EL. 7322'
LAT. 42.71766° N LON. 107.00327°W (NAD83)
SWNE S27, T32N, R85W
BOTTOM HOLE LOCATION:
LAT. 42.71990° N LON. 107.00791°W
NENW S27, T32N, R85W

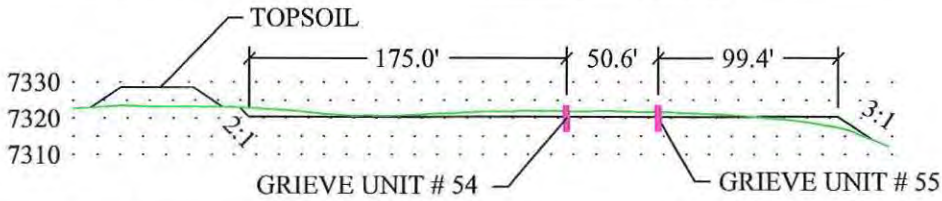
GRIEVE UNIT # 55 OIL PRODUCTION WELL
SURFACE LOCATION - GROUND EL. 7322'
LAT. 42.71772° N LON. 107.00310°W
SWNE S27, T32N, R85W
BOTTOM HOLE LOCATION:
LAT. 42.72188° N LON. 106.99988°W
NENE S27, T32N, R85W



SECTION A-A:
SCALE AS SHOWN
PAD @ EL. 7320.3 (FLAT)
PAD CUT SLOPES 2H:1V
PAD FILL SLOPES 3H:1V
TOPSOIL SLOPES 3H:1V

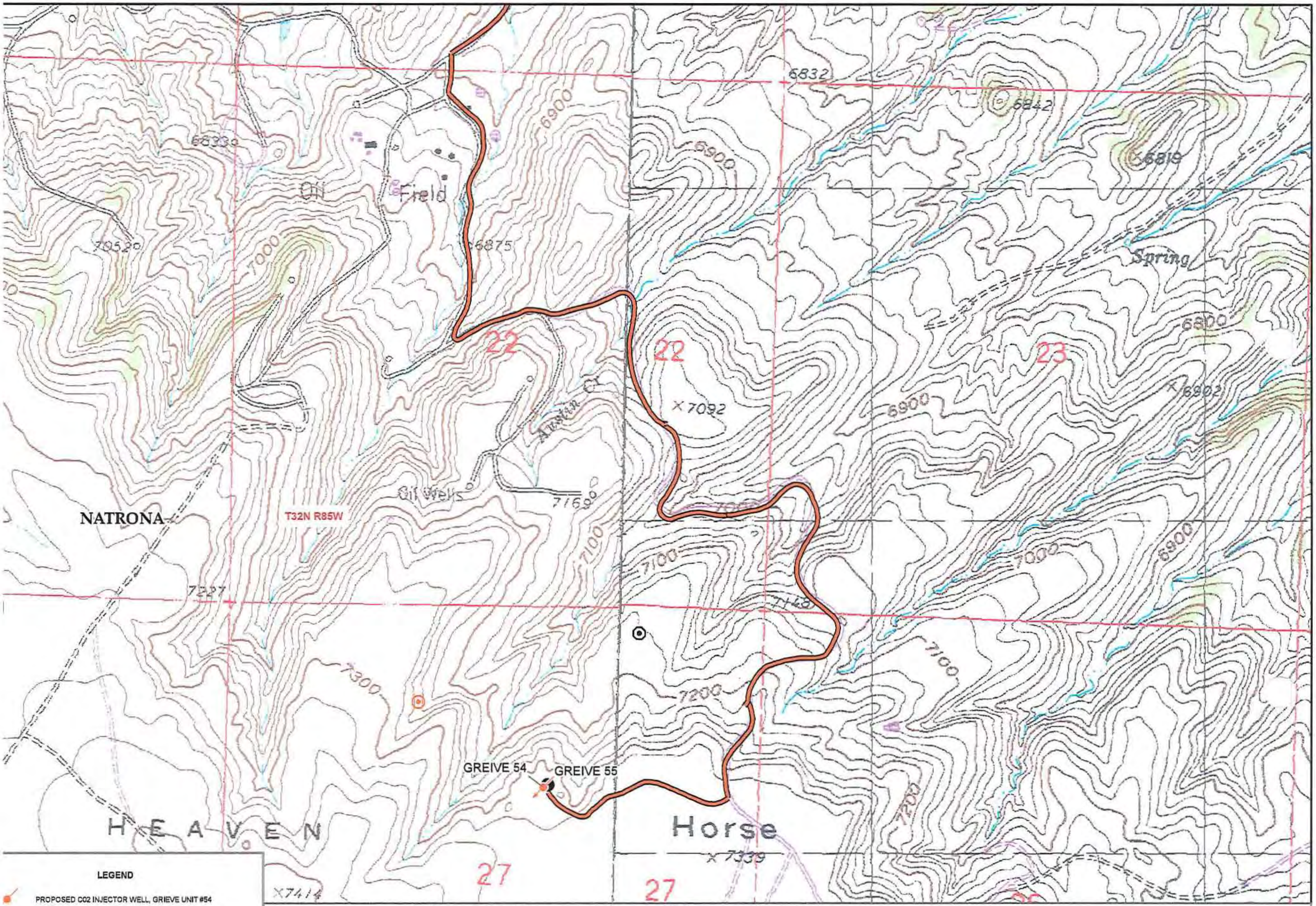


SECTION B-B:
SCALE AS SHOWN



1082 East Brundage Lane - Sheridan, Wyoming USA - 307-672-8090 - www.1epic.com

Z:\Site\ELK_PETROLEUM\CAD\Cut & Fill\GRIEVE UNIT 54_55 WELL\dwg\---



LEGEND

- PROPOSED C02 INJECTOR WELL, GRIEVE UNIT #54
- PROPOSED BOTTOM HOLE CO2 LOCATION, GRIEVE UNIT #54
- PROPOSED OIL PRODUCER, GRIEVE UNIT #55
- PROPOSED BOTTOM HOLE OIL LOCATION, GRIEVE UNIT #55
- ACCESS ROAD TO GRIEVE #54 AND #55

THE DATA CONTAINED ON THIS WORK PRODUCT IS DERIVED FROM DIFFERENT SOURCES THAT MAY HAVE USED DIFFERENT GEO-REFERENCE PROJECTIONS. EPIC HAS MADE ADJUSTMENT TO DATA WHEN NECESSARY FOR CLARIFICATION AND HAS NOT PERFORMED LAND SURVEY OR TITLE WORK TO VERIFY ACCURACY

THIS MAP DOCUMENT HAS NOT BEEN PUBLISHED BUT RATHER HAS BEEN PREPARED BY EPIC FOR USE BY THE CLIENT NAMED IN THE TITLE BLOCK SOLELY IN RESPECT OF THE CONSTRUCTION, OPERATION AND MAINTENANCE OF THE FACILITY NAMED IN THE TITLE BLOCK AND SHALL NOT BE USED FOR ANY OTHER PURPOSE OR FURNISHED TO ANY OTHER PARTY WITHOUT THE EXPRESS CONSENT OF EPIC.

DATE	REFERENCE DOCUMENTS	REV NO	REVISIONS	BY	DATE
JUNE11	EPIC Z-SITE\ELK_PETROLEUM				
JUNE11	ELK PETROLEUM				
APRIL11	NATRONA COUNTY GIS				
APRIL11	TAYLOR ENVIRONMENTAL CONSULTING LLC				
APRIL11	OGA INC				
APRIL11	BLM				
JUNE09	WYO DOT	A	ISSUED FOR APPROVAL	TKD	JUNE11

1 inch = 1,250 feet

0 0.05 0.1 0.2

Miles

Epic The Natural Resource

FROM PROJECT CONCEPTION TO OPERATING REALITY

N W E S

ELK PETROLEUM

123 WEST 1ST STREET, SUITE 550
CASPER, WY 82601

GRIEVE UNIT CO2
ACCESS TO GRIEVE #54 AND #55

PROJECT	MAP	SCALE	DATE	REVISION
40-0238	EP-1303	1:15,000	07 JUNE 11	A

Revised August 2011

ELK PETROLEUM, INC.
Grieve Unit (WYW109538X)
CO_2 Enhanced Oil Recovery Project
T32N, R85W
Natrona County, Wyoming

MULTI-POINT MASTER PLAN OF DEVELOPMENT

Description of Area

The Grieve Unit lies within the Gas Hills Management Unit of the Lander Field Office (LFO) of the Bureau of Land Management. The Unit comprises 2280 acres of State, Fee and Federal lands located in Sections 15, 16, 21, 22, 23, 26, 27, 34 and 35, T-32N-R85W of Natrona County, Wyoming. A breakdown of surface and subsurface ownership is provided in Table 1.

Proposed Action

In order to implement the proposed Grieve Unit CO_2 ($GUCO_2$) enhanced oil recovery (EOR) operations Elk Petroleum would need to drill 8 additional federal wells from four new well locations in the Unit. This Master Plan of Development (MDP) is provided as an alternative to developing a Surface Use Plan of Operations for each well individually. The wells covered by this MPD are listed in Table 2.

Table 1 - Surface and Subsurface Ownership within the Grieve Unit

	State	Fee	Federal	Total
Mineral Ownership	280	240	1760	2280
Surface Ownership	200	320	1760	2280

Table 2 – Grieve Unit Proposed Well Locations (all are located in T32N-R85W, Natrona County)

Well Name	Surface Location	Bottom Hole Location	Well Type
Grieve Unit #53*	SWSE Sec. 16	NWNE Sec. 21	CO_2/H_2O Injection
Grieve Unit #54*	SWNE Sec. 27	NENW Sec. 27	CO_2/H_2O Injection
Grieve Unit #55*	SWNE Sec. 27	NENE Sec. 27	Oil Production
Grieve Unit #56	SESW Sec. 15	Fee surface and minerals	CO_2/H_2O Injection
Grieve Unit #57*	SWNE Sec. 22	SENE Sec. 22	CO_2/H_2O Injection
Grieve Unit #58*	NENW Sec. 26	SWSW Sec. 23	CO_2/H_2O Injection
Grieve Unit #59 *	NENW Sec. 26	SENW Sec. 26	CO_2/H_2O Injection
Grieve Unit #60*	SWNE Sec. 22	NWNE Sec. 22	CO_2/H_2O Injection

Grieve Unit #61*	SWSE Sec. 16	NWNE Sec. 21	Oil Production
Grieve Unit #62	NWSE Sec. 16	State surface and minerals	CO_2/H_2O Injection
* shared surface locations			

1) **EXISTING ROADS-** Refer to Maps "A" and "B" and well specific Maps "C."

   a) Each of the four proposed well sites and eight wells are staked as indicated on the well specific cut and fill diagrams.

   b) To reach the field and well locations from the city of Casper, Wyoming take either Poison Spider or Zero Road to Poison Spider School. Continue westerly 9.4 miles to the end of the pavement and a split in the road. Stay left at the split on Natrona County Road 201 for 7.6 miles to the next Y. Stay left continuing on NC 201 for another 5.4 miles to the Elk Petroleum sign. Turn left at the sign onto NC 320. At 6.5 miles stay right and continue another 1.1 miles to the Elk Petroleum Main Office sign. Stay left and continue another 0.5 miles to the next Y. Stay right and continue another 0.1 miles to the "cross". Turn left to the large compressor building (central facility). Refer to each well specific Access Road map for well specific directions refer to Maps A, B and C.

   c) Access roads within a one (1) mile radius- refer to Map B.

   d) The existing roads will be maintained in the same or better condition as existed prior to the commencement of operations and said maintenance will continue until final abandonment and reclamation of each well location.

2) **NEW OR RECONSTRUCTED ACCESS ROADS**

Some amount of new road construction will be required for access to all the proposed Grieve Unit wells with the exception of #54 and 55 which share an existing reclaimed well location. Refer to the individual well maps for new access road detail.

   a) Width- fourteen (14) foot running surface with a sixteen (16) foot subgrade crowned and ditched for both drilling and completion operations.

   b) **Construction standard:** The proposed access roads will be constructed in accordance with roading guidelines established for oil & gas exploration and development activities as referenced in the joint BLM/USFS publication: Surface Operating Standards for Oil and Gas Exploration and Development, Fourth Edition and/or BLM Manual Section 9113 concerning road construction standards on projects subject to federal jurisdiction.

      The access roads will be designed and constructed to meet the standards of the anticipated traffic flow and all-weather requirements. Construction will include ditching, draining, graveling, crowning, and capping the roadbed as necessary to provide a well constructed and safe roadway.

Approximately six (6) inches of topsoil will be stripped from any new access road route prior to performing any further construction activities thereon.

If soils along the access road routes are dry during road construction, water will be applied to the road surface to facilitate soil compaction and minimize soil loss as a result of wind erosion.

c) **Maximum grade:** Ten (10) percent or less.

d) **Turnouts:** We do not anticipate the need for turnouts on/along the short segments of proposed access roads.

e) **Drainage design:** Access roads will be upgraded and maintained as necessary to prevent soil erosion and accommodate all-weather traffic. Roads will be crowned and ditched with water turnouts installed as necessary to provide for proper drainage along the access road route.

f) **Culverts, cuts and fills:** Culverts will be installed on/along the access road route as necessary or required by the Authorized Officer, Bureau of Land Management in accordance with roading guidelines contained in the joint BLM/USFS publication: Surface Operating Standards for Oil and Gas Exploration and Development, Fourth Edition and/or BLM Manual Section 9113 concerning road construction standards on projects subject to federal jurisdiction.

There are no major cuts and/or fills on/along the proposed access road routes.

g) **Surfacing material**: Access roads will be surfaced to an average minimum depth (after compaction) of four (4) inches with two (2) inch minus pit run gravel or crushed rock purchased from a local contractor having a permitted source of materials within the general area, if and/or as required by the Authorized Officer, Bureau of Land Management.

h) **Gates, cattle guards or fence cuts:** No gates, cattle guards or fence cuts will be required on/along the proposed access road right-of-way. Existing cattle guards will be cleaned and re-set as necessary prior to the commencement of construction and drilling operations on the proposed wells.

i) **Road maintenance:** During both the drilling and production phases of operations, the road surfaces and shoulders will be kept in a safe and useable condition and will be maintained in accordance with the original construction standards.

All drainage ditches and culverts will be kept clear and free-flowing, and will also be maintained in accordance with the original construction standards.

The access road rights-of-way will be kept free of trash during all operations.

3) LOCATION OF EXISTING WELLS WITHIN A ONE-MILE RADIUS

Location of Existing Wells in the Grieve Unit and Within a one – mile radius

	Well Label	TWNSHP	RANGE	SECTION	QTR-QTR
Water Wells	UNIT 6	32N	85W	16	SE-SE
Abandoned Wells					
	GRIEVE UNIT 39	32N	85W	15	SW-SW
	8-A MORTON 8A	32N	85W	22	NE-NW
	FOREST-BURNS 17-2	32N	85W	17	NW-NE
	17-1 GRIEVE UNIT 45	32N	85W	17	NE-SE
	GOVT 1-34	32N	85W	34	NW-NE
	GOVT 1-35	32N	85W	35	SW-SW
	GOVT 34	32N	85W	26	SW-SE
	GOVT-21-3 UNIT 40	32N	85W	21	SE-NW
	GRIEVE 42	32N	85W	27	NE-SW
	Grieve Shallow 31-21	32N	85W	21	NW-NE
	STATE 1	32N	85W	36	NW-NW
	UNIT 14	32N	85W	16	SE-SW
	UNIT 15	32N	85W	22	NE-SE
	UNIT 24	32N	85W	35	NE-NW
	GRIEVE MORTON-8	32N	85W	22	NE-NW
Temporarily Abandoned					
	GRIEVE 48	32N	85W	27	SW-NE
	GRIEVE UNIT 12	32N	85W	21	SE-NE
	GRIEVE W-015815 23	32N	85W	26	SE-SW
	GRIEVE 0-12931 16	32N	85W	16	NE-SE
	GRIEVE 18	32N	85W	22	SE-SE
	GRIEVE 20	32N	85W	27	NE-NE
	GRIEVE 6A	32N	85W	16	SE-SE
	GRIEVE UNIT 2	32N	85W	22	NW-NW
	GRIEVE UNIT 21	32N	85W	26	SW-NW
	GRIEVE UNIT 22	32N	85W	26	NW-SW
	GRIEVE UNIT 29	32N	85W	26	NE-SW
	GRIEVE UNIT 31	32N	85W	26	SE-NW
	GRIEVE UNIT 32	32N	85W	26	NE-NW
	GRIEVE UNIT 4	32N	85W	22	NW-SE
	GRIEVE UNIT 41	32N	85W	22	NE-NW
	GRIEVE UNIT 43	32N	85W	22	SW-NE
	GRIEVE UNIT 5	32N	85W	22	SW-SE
	GRIEVE UNIT 7	32N	85W	22	SW-NW
	GRIEVE W-015815 10	32N	85W	22	NE-SW

Location of Existing Wells in the Grieve Unit and Within a one – mile radius

	GRIEVE W-015815 19	32N	85W	26	NW-NW
	GRIEVE W-015824 44	32N	85W	22	NW-SE
	W-015815 GRIEVE UNIT	32N	85W	22	SE-SW
Disposal Wells					
Drilling Wells					
Producing Wells					
	GRIEVE UNIT 9	32N	85W	21	NE-NE
Shut-in Wells					
	GRIEVE 30	32N	85W	27	NE-SE
	GRIEVE UNIT 50	32N	85W	27	NW-SE
	GRIEVE UNIT 51	32N	85W	21	SE-SE
	GRIEVE 49	32N	85W	27	SW-NE
	GRIEVE UNIT 11	32N	85W	16	SW-SE
	GRIEVE UNIT 17	32N	85W	16	NW-SE
	MUSTANG 1	32N	85W	27	SW-NW
	GRIEVE UNIT 39A	32N	85W	15	SW-SW
Injection Wells					
	MORTON 1-22-1	32N	85W	22	SE-NW
Monitoring Wells					

4) LOCATION OF EXISTING AND/OR PROPOSED FACILITIES OWNED BY ELK PETROLEUM, INC. WITHIN A ONE (1) MILE RADIUS

a) Existing Facilities

i) Tank batteries: NENW Section 22 T32N R85W
ii) Production facilities: NENW Section 22 T32N R85W
iii) Oil gathering lines: Throughout the field, connecting the wells to central tank battery.
iv) Gas gathering lines: None known.

b) New Facilities Contemplated

All production facilities will be located at the central facility located in the NENW Section 22 T32N R85W. A CO_2 header and metering station will be placed in conjunction with infield CO_2 distribution, and located in SENE Section 27, as provided in the Sundry Notice for infield gathering and distribution systems.

c) In the event a production (emergency) pit is required on a location, it will be fenced "sheep-tight" with woven wire mesh having two (2) top strands of barbed wire held in place by metal side posts and wooden comer "H" braces in order to protect both

livestock and wildlife. Please refer to Item 9F for additional information concerning these fencing specifications.

d) During drilling and subsequent operations, all equipment and vehicles will be confined to the access roads and any additional areas that may be specified in the approved Application for Permit to Drill.

e) Reclamation of disturbed areas no longer needed for operations will be accomplished by grading, leveling and seeding as recommended in a project specific Reclamation Plan and approved by the Authorized Officer, Bureau of Land Management.

5) LOCATION AND TYPE OF WATER SUPPLY

a) Water needed for drilling operations will be produced water from the Muddy formation.

b) Water for cementing purposes will either be hauled from fresh water sources in Casper or taken from the existing water well and reservoir owned and operated by Elk Petroleum, Inc. within the Grieve Unit. The existing water well is the Grieve Unit #6 located in the NE Section 15-T32N-R85W, State of Wyoming Permit Number PI3567P.

c) Water will be hauled via tank truck over existing roads from the point of diversion to the proposed Grieve well locations. No additional new construction will be required on/along the proposed water haul routes and no off-lease federal lands will be crossed on/along the proposed water haul routes.

d) Elk Petroleum, Inc. has no plans to drill additional water wells for the proposed Grieve CO_2 EOR project.

6) CONSTRUCTION MATERIALS

a) Any construction materials (gravel) that may be required for surfacing of drilling pads and access roads will be obtained from a private contractor having a previously approved source of materials within the general area. Please refer to Item 2g for additional information regarding the need for surfacing materials in conjunction with operations in the Grieve Unit.

b) No construction materials will be taken from federal or Indian lands without prior approval from the appropriate Surface Management Agency.

c) No new access roads for transportation of these construction materials will be required.

7) METHODS OF HANDLING WASTE

a) **Cuttings:** The drilled cuttings will be deposited in the reserve pit.

b) **Drilling fluids:** Any drilling additives utilized in the mud system will be contained in the reserve pit. The reserve pits will be designed to prevent the collection of surface runoff and will be constructed entirely in cut on the uphill side of the well locations.

c) **Produced fluids:** Liquid hydrocarbons produced during completion operations will be placed in test tanks on the location. Produced water will be placed in the reserve pits for a period not to exceed ninety (90) days after initial production. During this ninety (90) day period, in accordance with Onshore Oil & Gas Order Number 7, an application for approval of a permanent disposal method and location, along with the required water analysis, shall be submitted to the Authorized Officer for review and approval.

Any spills of oil, gas, salt water or any other potentially hazardous substance will be cleaned up and immediately removed to an appropriate, approved disposal site.

d) **Sewage:** Portable, self-contained chemical toilets will be provided for human waste disposal. Upon completion of operations, or as required, the toilet holding tanks will be pumped and the contents thereof disposed of in an approved sewage disposal facility. Sewage disposal will be in strict accordance with Wyoming Department of Environmental Quality (DEQ) rules and regulations regarding sewage treatment and disposal.

e) **Garbage and other waste material:** All garbage and non-flammable solid waste materials will be contained in a self contained, portable dumpster or trash cage. Upon completion of operations, or as needed, the accumulated trash will be hauled off-site to a Wyoming DEQ approved sanitary landfill. Used motor oil (change oil) will be placed in closed containers and disposed of at an authorized disposal site.

No trash will be placed in the reserve pit.

f) Immediately after removal of the drilling rig, all debris and other waste materials not contained in the trash cage will be cleaned up and removed from the well locations. No potentially adverse materials or substances will be left on the location.

Any open pits will be fenced during the drilling operation and said fencing will be maintained until such time as the pits have been backfilled.

g) **Hazardous Materials:** Elk Petroleum, Inc. maintains a file, per 29 CFR 1910.1200 (g) containing current Material Safety Data Sheets (MSDS) for all chemicals, compounds, and/or substances which are used during the course of construction, drilling, completion, and production operations for this project. Hazardous materials which may be found at the site include drilling mud and cementing products which are primarily inhalation hazards, fuels (flammable and/or combustible), materials that may be necessary for well completion/stimulation activities, such as flammable or combustible substances and acids/gels (corrosives).

The opportunity for Superfund Amendments and Reauthorization Act (SARA) listed Extremely Hazardous Substances (EHS) at the site is generally limited to proprietary treating chemicals. All hazardous and Extremely Hazardous Substances and commercial preparation will be handled in an appropriate manner to minimize the potential for leaks or spills to the environment.

8) ANCILLARY FACILITIES

None anticipated.

9) LAYOUT

a) Figure 1, of each attached well specific data package, shows the drill site layout as staked. Cross sections have been drafted to visualize the planned cuts and fills across each proposed well location (Figure 2).

A minimum of six (6) inches of topsoil will be stripped from each location (including areas of cut, fill, and/or subsoil storage) and stockpiled for future reclamation of the well site. Please refer to Figure # 1 of each well specific well package for the location of the topsoil and subsoil stockpiles.

b) A typical rig layout diagram is attached to this MDP. No permanent living facilities are planned in the Grieve Unit project area; however, there could be up to a maximum of two (2) trailers on each drilling location during drilling operations. These trailers would serve as both offices and housing for the mud logger, geologist and toolpusher.

c) All equipment and vehicles will be confined to those areas identified on the well specific cur and fill and layout diagrams included in this MDP package (e.g., access road, well pad, spoil and topsoil storage areas).

d) No production facilities are anticipated outside the central facility in the NENW Section 22; refer to Item 4b for additional information in this regard.

e) Reserve pits will be lined with a reinforced synthetic liner in order to prevent drilling water loss through seepage. The liner will have a permeability less than or equal to 1×10^{-7} cm/sec, will be chemically compatible with all substances which may be put into the pit; the liner will be installed so that it will not leak. Liners made of any man-made synthetic material will be of sufficient strength and thickness to withstand normal installation and pit use.

Pit liners will be installed with sufficient bedding (either straw or dirt) to cover any rocks, will overlap the pit walls, extend under the mud tanks, and be covered with dirt and/or rocks to hold it in place.

No trash, scrap pipe, etc. that could puncture the liners will be disposed of in the reserve pit.

f) Prior to the commencement of drilling operations, reserve pits will be fenced "sheep tight" on three (3) sides according to the following minimum standards:

i) 32-inch net wire shall be used with two (2) strands of barbed wire on top of (above) the net wire.
ii) The net wire shall be no more than four (4) inches above the ground. The first strand of barbed wire shall be approximately three (3) inches above the net wire. Total height of the fence shall be at least forty-two (42) inches.
iii) Corner posts shall be cemented and/or braced in such a manner to keep the fence tight at all times.
iv) Standard steel, wood, or pipe posts shall be used between the corner braces. The maximum distance between any two (2) posts shall be no greater than sixteen (16) feet.
v) All wire shall be stretched, by using a stretching device, before it is attached to the corner posts.

The fourth (4^{th}) side of the reserve pit will be fenced immediately upon removal of the drilling rig and the fencing will be maintained until the pit is backfilled.

g) Any hydrocarbons on the pit will be removed as soon as possible after drilling operations are completed.

10) PLANS FOR SURFACE RECLAMATION

a) Rat and mouse holes will be backfilled and compacted from bottom to top immediately upon release of the completion rig from the drilling locations.

b) If any oil accumulates on the pits and is not immediately removed after operations cease, the pit containing oil or other adverse substance(s) will be flagged overhead or covered with wire mesh to protect migrating waterfowl. According to Wyoming Oil and Gas Conservation Commission regulations, oil must not be allowed to accumulate in reserve pits.

c) **Producing Operations:**

i) Backfilling, leveling and re-contouring are planned as soon as possible after cessation of drilling and completion operations. Waste and spoil materials will be disposed of immediately upon cessation of drilling and completion activities.
ii) For production, the fill slopes will be reduced from a 1.5: 1 slope to a 3:1 slope and the cut slopes will be reduced from a 2:1 slope to a 3:1 slope by pushing the fill material back up into the cut.
iii) Waterbars will be constructed on the reclaimed portions of the producing well location at least one foot deep, on the contour, with approximately two feet of drop per 100 feet of waterbar to ensure drainage, and extended into established vegetation. All waterbars will be constructed with the berm on the downhill side to prevent soft material from silting in the trench. The initial waterbar will be

constructed at the top of the backslope with a subsequent waterbar constructed at the top of the fill slope.

iv) Upon completion of backfilling, leveling and re-contouring, all disturbed surfaces (access road and well pad areas) will be scarified to a depth of one (1) foot and the stockpiled topsoil will be evenly redistributed to a depth of six (6) inches over the reclaimed area(s).

v) Prior to commencement of seeding operations, the seedbed will be prepared by disking on the contour to a depth of four (4) to six (6) inches, leaving no depressions that would trap water or form ponds.

All disturbed surfaces (including the access road, gathering or CO_2 distribution lines and well pad areas) will be reseeded using the following seed mixture (or a different mixture to be recommended in the project Reclamation Plan and approved by the Authorized Officer, Bureau of Land Management):

Species	Pounds PLS/Acre *
Streambank wheatgrass	3.0
Thickspike wheatgrass	3.0
Western wheatgrass	4.0
Green needlegrass	2.0
Smooth brome	2.0
Bottlebrush squirreltail	2.0
Winterfat	1.0
* Pounds of Pure Live Seed per Acre	

vi) Seed will be drilled on the contour with a seed drill equipped with a depth regulator in order to ensure even depths of planting. Seed will be planted between one-quarter (1/4) to one-half (1/2) inches deep.

vii) Fall seeding will be completed after September 15th and prior to ground frost. If applicable, spring seeding will be completed after the frost has left the ground and prior to May 15th. The seeding will be repeated until a satisfactory stand, as determined defined in the project Reclamation Plan and approved by the Authorized Officer, is achieved. The first evaluation of growth will be made following the completion of the first growing season.

viii) Re-seeding activities are considered best in the fall of the year the well is drilled, unless requested otherwise by the Authorized Officer, Bureau of Land Management.

ix) All soil material that will be stockpiled for ten (10) months or longer will be signed and stabilized with vegetation. These soil stockpiles will be seeded with annual ryegrass (*Lolium multiflorum*) at a rate of ten pounds per acre.

d) Abandoned Well Location:

i) Upon final abandonment of each well location, gravel will be removed from the access road surface and well location (as directed by either the Authorized Officer,

Bureau of Land Management), water diversion installed as needed, and both the access road and well location restored to approximately the original ground contour(s) by pushing the fill material back into the cut and up over the backslope.

ii) Prior to commencement of reseeding activities on/along the reclaimed well location and access road route, waterbars are to be constructed at least one (1) foot deep, on the contour with approximately two (2) feet of drop per 100 feet of waterbar to ensure drainage, and extended into established vegetation. All waterbars will be constructed with the berm on the downhill side to prevent the soft material from silting in the trench.

The initial waterbar should be constructed at the top of the backslope with subsequent waterbars installed in accordance with the general spacing guidelines presented below:

%Slope	Spacing Interval (feet)
2% or <	200'
2% - 4%	100'
4% - 5%	75'
5% or >	50'

iii) Prior to commencement of seeding operations, the seedbed will be prepared by disking on the contour to a depth of four (4) to six (6) inches. No depressions will be left that would trap water or form ponds. All disturbed surfaces (including the access road and well pad areas) will be reseeded as recommended in Item #10 C v-viii, above.

11) SURFACE OWNERSHIP

The well location and proposed access road route are situated on surface estate owned by the United States of America and administered in trust by:

Field Manager
Lander Field Office
Bureau of Land Management
1335 Main Street
Lander, Wyoming 82520
Telephone: 307-332-8400

Portions of some access roads and/or locations needed for drilling and operations for the eight proposed federal wells are located on private or state lands. None of the proposed wells are located on split estate; ownership is indicated on Map B.

List all Land Owners by Name, phone number and address:

State Of Wyoming
Office of State Lands and Investments
122 W. 25th St, 3rd Floor West
Cheyenne, WY 82002
307-777-7331

Mark Murphy
Murphy Ranch
35520 Oregon Trail
Casper, WY
307-266-1320

Western Star Ag Resources
Attn: Jack Vanier
P.O. Box 1393
Salina, KS 67403-1393
785-823-3794

Elk Petroleum, Inc. certifies they have either provided a copy of this Surface Use Plan of Operations to each affected land owner or made a good faith effort to provide documentation to the affected surface owners.

12) OTHER INFORMATION

a) General Description of the Project Area:

The project area is situated on the northern flank of the Rattlesnake Range and more specifically in a topographic area locally known as "Horse Heaven". This is an upland area that is generally west of Burnt Wagon Draw, southeast of Cabin Creek, southwest of Austin Creek, east of Buffalo Head, northeast of Keester Basin, east/southeast of Garfield Peak, south of Poison Spider Creek, and generally west of the city of Casper, Wyoming. This area is classified as a "High Plains Steppe" (cold desert) and is characterized by gently to moderately undulating uplands dissected by numerous dendritically patterned ephemeral tributaries of Poison Spider Creek including Austin and Cabin Creeks.

Local flora consists primarily of western wheatgrass, prairie junegrass, needle-and- thread grass, Indian ricegrass, threadleaf sedge, and sagebrush with both juniper and limber pine at the higher elevations and on north facing slopes. Local fauna consists primarily of mule deer, antelope, coyotes, badgers, skunks, rabbits, raptors, and various smaller vertebrate and invertebrate species.

There are no known threatened or endangered species (currently listed) that would be directly affected by implementation of operations in the Grieve Unit.

b) Surface Use Activities:

The primary surface use is for livestock grazing.

c) Proximity of Water, Occupied Dwellings, Archaeological, Historical or Cultural Sites:

i) The closest source of semi-permanent water is Austin Creek, which is located approximately to the east/northeast of the Grieve Unit.

ii) The closest occupied dwellings are located at the Diamond Ring Livestock Company ranch headquarters located approximately in the SESW of Section 13-T33N-R84W.

iii) Elk Petroleum, Inc. will be responsible for informing all persons associated with this project that they will be subject to prosecution for damaging, altering, excavating or removing any archaeological, historical, or vertebrate fossil objects or site(s).

If archaeological, historical or vertebrate fossil materials are discovered, Elk Petroleum, Inc. will suspend all operations that further disturb such materials and immediately contact the Authorized Officer. Operations will not resume until written authorization to proceed is issued by the Authorized Officer.

Within five (5) working days the Authorized Officer will evaluate the discovery and inform Elk Petroleum, Inc. of actions that will be necessary to prevent loss of significant cultural or scientific value.

Elk Petroleum, Inc. will be responsible for the cost of any mitigation required by the Authorized Officer. The Authorized Officer will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the Authorized Officer that the required mitigation has been completed, Elk Petroleum, Inc. will be allowed to resume operations.

d) Additional Requirements for Operations on Lands Administered by the Bureau of Land Management:

i) Elk Petroleum, Inc. will be responsible for weed control on disturbed areas within the exterior limits of this permit and will consult with the Authorized Officer and/or local authorities for acceptable weed control measures.

A "Pesticide Use Proposal" (Form #WY-04-9222-1) and pesticide labels will be submitted by Elk Petroleum, Inc. to the Authorized Officer no later than December 1st for use during the following spring/summer period.

ii) A Wyoming Department of Environmental Water Quality Department (WDEQ/WQD) Storm Water Pollution Protection Plan (SWPPP) will be prepared for all construction activity anticipated in conjunction with the Grieve Unit CO_2 EOR project. SWPPP

best management practices implemented in compliance with that Plan will be maintained until that particular portion of the disturbance is stabilized and released from the SWPPP by the WDQ.

13) LESSEE'S OR OPERATOR'S REPRESENTATIVE AND CERTIFICATION

Representative

Ralph Schulte, Engineering Manager
Elk Petroleum, Inc.
123 W. 1st, Suite 550
Casper, Wyoming 82602
Telephone: 307-265-3326

Certification

All lease and/or unit operations will be conducted in such a manner that full compliance is made with all applicable laws, regulations, Onshore Oil & Gas Orders, the approved plan of operations, and any applicable Notice to Lessees.

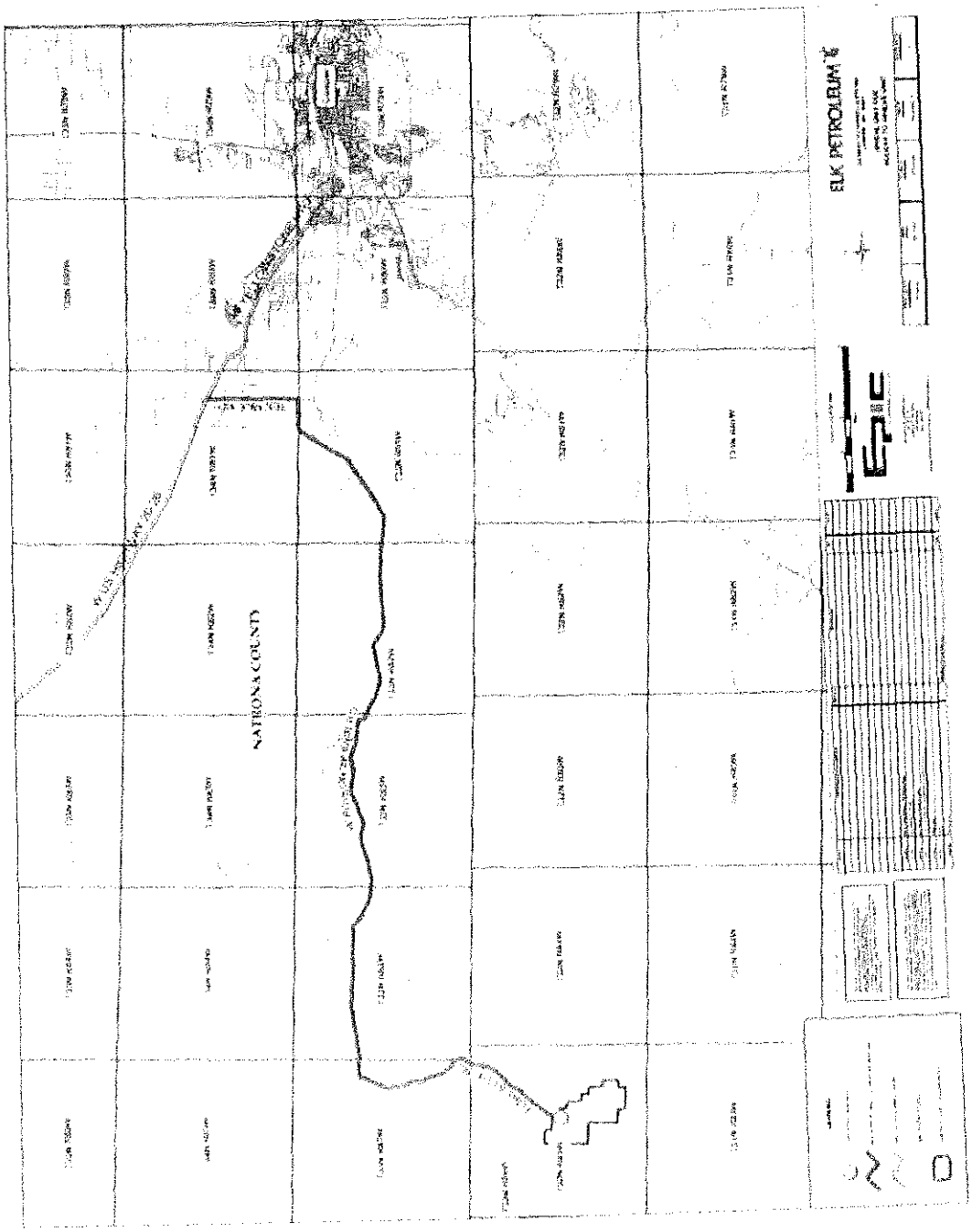
Elk Petroleum, Inc. will be fully responsible for the actions of their subcontractors. A copy of these conditions will be furnished to the field representative(s) to ensure compliance. The dirt contractor will be provided with a copy of the Surface Use Plan from the approved Application for Permit to Drill.

This drilling permit will be valid for a period of two (2) years from the date of approval. After permit termination, a new application will be filed for approval for any future operations.

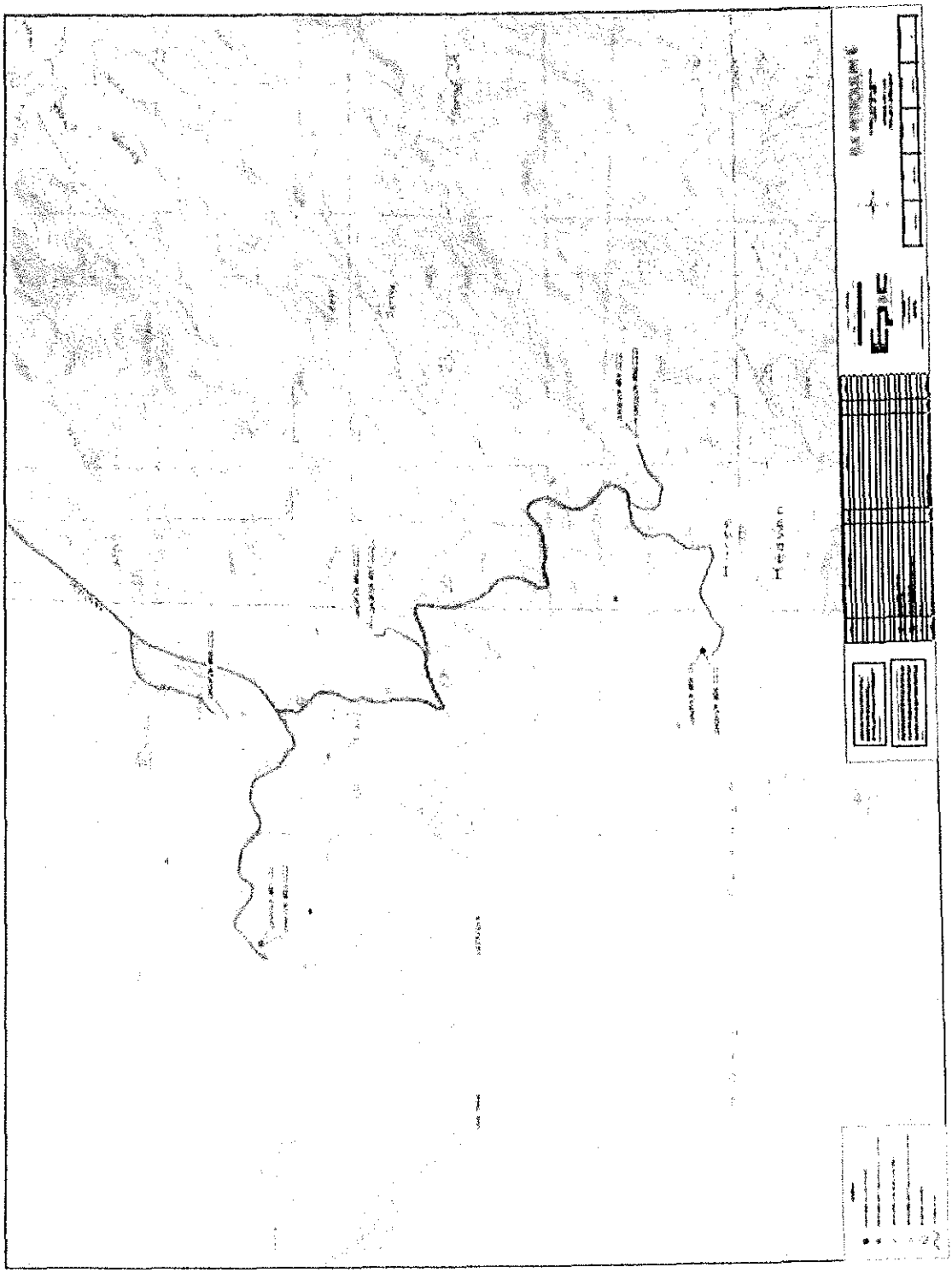
I hereby certify that I, or persons under my direct supervision, have inspected the proposed drill site and access route; that I am familiar with the conditions which currently exist; that the statements made in this plan are, to the best of my knowledge, true and correct; and that the work associated with the operations proposed herein will be performed by Elk Petroleum, Inc., their contractors and subcontractors in conformity with this plan and the terms and conditions under which it is approved. This statement is subject to the provisions of 18 U.S.C. 1001 for the filing of a false statement.

Executed this 16 day of August, 2011. Name: Ralph Schulte
Position Title: Engineering Manager

Map A: Map providing Direction to Grieve Unit from Casper, Wyoming



Map B: Well Locations and Access for Proposed Grieve Unit Wells



Appendix D: BLM Instruction Memorandum No. WY-2012-007, Management of Oil and Gas Exploration and Production Pits

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82009-1828

IN REPLY REFER TO:
3160 (921Bargsten) **P**

November 15, 2011

EMS Transmission: 11/16/2011
Instruction Memorandum No. WY-2012-007
Expires 09/30/2013

To: District Managers

From: Deputy State Director, Minerals and Lands

Subject: Management of Oil and Gas Exploration and Production Pits

Program Area: Fluid Minerals, Hazardous Materials

Purpose: This Instruction Memorandum (IM) will provide the minimum standards for management of pits authorized by the Bureau of Land Management (BLM) on Federal/Indian oil and gas leases for exploration & production (E&P) activities, with the exception of coalbed natural gas produced water impoundments. Pits covered by this IM include (but are not limited to): reserve, completion, flare, oil-base mud, drill cuttings, emergency, workover, and production pits.

Policy/Action: The BLM has the authority to regulate environmental aspects of oil and gas activities associated with exploration, development, and production of oil and gas deposits from Federal and Indian leases (43 CFR 3162.5-1 and 25 CFR 225.4). This policy provides minimum standards for pit management and is organized by phase of operations.

Pits associated with oil and gas activities have substantial variation for their purpose(s), contents, and potential environmental and health effects. In the absence of site-specific information, E&P pits should be considered to contain potentially hazardous wastes harmful to human health; in all cases, BLM personnel shall follow the BLM's Site Entry Policy (Washington Office (WO) IM No. 2002-138) when working near E&P pits. Where necessary and appropriate, the BLM may require the operator to submit information about the nature, quantity, and hazards posed by chemicals and materials used at facilities located on Federal oil and gas leases.[1]

Operators may be obligated to obtain permit approvals from the State of Wyoming and/or other Federal and local agencies. It is the responsibility of the operator to ensure that all necessary permits are obtained. Where other Federal or State permitting and/or regulations are applicable, the guidance and standards in this policy do not supersede or replace those requirements.

Field Offices are instructed to consider and evaluate the standards in this policy when approving actions on Federal oil and gas leases or BLM-administered surface estate that pertain to construction, use, maintenance, closure, and reclamation of oil and gas exploration & production pits. When considering an alternative or modification of a proponent's proposed action, the Field Office must ensure that

[1] In accordance with 43 CFR 3100.4(b), the BLM will keep data and information confidential that is submitted by the operator and that is marked as confidential or proprietary, to the extent allowed by law and regulation. These data and information may be necessary to consider in our compliance with the National Environmental Policy Act (NEPA). See WY IB No. 1997-011, "Hazardous Materials Management/NEPA/Oil and Gas Developments."

alternatives and modifications are appropriately analyzed and disclosed under the National Environmental Policy Act (NEPA),[2] are reasonable, and are consistent with existing lease rights. The BLM's authority to consider and/or apply reasonable restrictions to Federal oil and gas lease operations is described in WO Information Bulletin (IB) No. 2007-119.[3]

A pick-list of sample Conditions of Approval (COAs) is attached to this document (Attachment 1). These COAs provide a standardized list of protection measures and requirements consistent with this policy. The BLM should encourage operators to incorporate the appropriate protection measures and requirements into their surface use plans. If necessary, appropriate and reasonable COAs may be attached to authorizations processed by the BLM.[4]

1. Use of enclosed tanks and closed loop or semi-closed loop systems is environmentally preferable to the use of open pits and is to be encouraged by the BLM. Open production pits are to be strongly discouraged. Closed tanks and systems minimize waste, entry by wildlife, fugitive emissions that affect air quality, and reduce the risk of soil and groundwater contamination. In addition, the use of tanks instead of pits expedites the ability to complete interim reclamation. Costs may be reduced with the use of tanks, particularly when the pit requires solidification or netting.

2. Siting and construction of pits

   Wherever possible, the BLM should seek to avoid approving pits located in sensitive areas or other locations that have heightened potential to result in adverse impacts to human health or the environment.

   a. Within sensitive areas,[5] the BLM will require that an alternative to reserve, completion, and open production pits (see Sections 2(f) and (g), below) be used. Exceptions may only be granted in rare cases with sufficient justification (e.g., when sufficient protections are described in a design submitted for prior BLM approval) and after detailed NEPA analysis. When exceptions to this policy are granted, the BLM will consider more stringent operation, closure, and monitoring standards.

   b. Pit construction and design criteria

      i. Wherever possible, all pits shall be located entirely in cut material; where not possible, pits shall be located at least 50 percent in cut, and shall include at least a 2 foot keyway trench for construction of the dike in their design. This dike shall be compacted in 6 inch lifts.
      ii. All pits shall be designed to allow at least 3 feet of fill over the top of pit contents upon closure, and allow for the re-establishment of the approximate original contour upon final reclamation.
      iii. The design of all pits shall provide adequate storage capacity to maintain at least 2 feet freeboard; pits that will hold fluids must include a permanent marker designating the point at which 2 feet of freeboard remains in the pit. If the pit is lined, the permanent marker must not impair liner integrity.

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[2] For example, see BLM Handbook H-1790-1 ("National Environmental Policy Act Handbook") Page 81 (Section 8.3.6)
[3] WO IB No. 2007-119 ("Existing Surface Management Authority for Oil and Gas Leases")
[4] See Onshore Oil and Gas Order Part III.F.a.3.
[5] Definitions of this and other important terms in this policy are provided in Attachment 2

iv. Pads and pits shall be sited and designed to divert offsite run-on around the pit. Run-on water may be diverted around the pit by sloping the pad or constructing diversion ditches or berms above and/or below the pad cut slope.
v. Pit walls must be sloped so that the stability of the pit wall is not compromised; generally pit walls will not exceed a 1:1 slope.
vi. All pits shall be fenced on four sides upon construction, or as otherwise specified by the BLM. Minimum standards for fencing are provided in the BLM-USFS publication "The Gold Book"[6] and H-1741-1 ("Fencing").
vii. Re-entering a closed or reclaimed pit is prohibited unless the following protection measures are in place:
    1. Disturbed pit contents are removed and transported to an authorized commercial disposal or treatment facility, or
    2. Disturbed pit contents are protected on-site by
        a. Placing all excavated material on an impervious, secured liner contained within an adequate berm,
        b. Preventing wind or water erosion of excavated materials
        c. Testing previous pit contents to determine potential hazards, and
        d. Replacing all excavated pit contents upon cessation of operations.
        If wastes are released during re-entry of a previously closed pit, the operator risks causing a release of materials that may no longer be Resource Conservation and Recovery Act (RCRA) E&P exempt.[7]

c. Water quality protection measures

i. All pits shall be lined (using a synthetic liner or clay liner) with the exception of flare pits; situations where only fresh water, cement, and nontoxic or nonhazardous muds and additives are being used for drilling, completion, and plugging activities; and pits for pneumatic (air) drilling.
ii. Synthetic liners must have a thickness of at least 12 mil. Synthetic liner material must be compatible with the pit contents, and resistant to weathering, sunlight, and puncturing or tearing. Seams of liners shall be overlapped and welded in accordance with manufacturer's requirements. The BLM may require bedding material under the liner be amended or compacted to ensure that the liner is not punctured during installation or use.
iii. Clay liners must be compacted to a depth of at least 6 inches and having a hydraulic conductivity of no more than 1×10^{-7} cm/sec.
iv. Liners must be bedded upon a suitable substrate that is level, free of organic material, and without rocks or materials that could puncture the liner.
v. Leak detection for pits may be required by the BLM (1) if site-specific analysis determines that pit contents have potential to adversely affect nearby surface and groundwater sources or (2) as required by Onshore Oil and Gas Order No. 7. Requirements for leak detection are provided in Onshore Oil and Gas Order No. 7.

[6] Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, 2007 (4th Edition), or most current edition
[7] See WY IB No. 1994-349 ("Oil and Gas Exemptions Under RCRA and CERCLA") for more information about RCRA-exempt wastes.

d. Number and type of pits

i. Wherever feasible, pit management should allow for the recycling and reuse of fluids and in accordance with the transporting requirements of this policy. This may require, for example, that drilling fluids are removed from a pit prior to the flow-back of completion fluids to that pit, where applicable.
ii. Considering other aspects of this policy (see Section 3(d)), the BLM may require consolidated or separate reserve/completion pits in the design of a drilling location.
iii. When a proposal includes the use of oil-base muds, a lined drill cuttings pit that is separate from the reserve pit must be used to store oil-base mud cuttings.

e. Pit centralization

i. Where feasible, centralized reserve and completion pits are encouraged. However, the mixing of wastes from non-Federal and Federal leases is prohibited unless the wastes are being disposed of or treated at an authorized commercial disposal or treatment facility. The provisions of this section do not apply to reserve and completion pits servicing multiple-well pads, or wells with completion zones in both Federal and non-Federal leases.

f. Alternatives to reserve, completion, and production pits

i. As previously mentioned in Section 2(a), alternatives to reserve, completion, and production pits are required when operations are proposed in sensitive areas. Using these alternatives in nonsensitive areas is to be encouraged by the BLM, but should consider the potential tradeoffs to their use (such as increased disturbance areas to accommodate storage tanks, and the final disposition of wastes generated). Alternatives include:
    1. Closed-loop drilling
    2. Semi-closed loop drilling
    3. Completion flowback to temporary storage tanks

g. Preferred alternatives to open production pits

i. Below-grade enclosed tanks for storage of produced fluids may be allowed if designed to the following standards:
    1. For single-walled tanks, the sides must be available for periodic inspection and leak detection must be employed.
    2. For double-walled tanks, the interstitial space must be periodically monitored such that a leak would be detected prior to release from the tank.
    3. All below-grade tanks must include a monitoring and reporting plan to ensure that leaks are promptly discovered and reported to the BLM.
    4. Open-bottom sub-grade structures are prohibited.
    5. Below-grade tanks are prohibited in sensitive areas.
ii. Above-grade tanks for storage of produced fluids must adhere to the following standards:
    1. Secondary containment storage around the tanks for spill control must be capable of holding at least 110 percent of the volume of the largest tank inside the containment area.
    2. The containment system must be capable of containing the wastes or product such that the material will not escape the containment system prior to cleanup.
    3. Secondary containment structures shall be protected from livestock, wildlife, and human activities. This may be accomplished by fencing, graveling over earthen berms, expanded metal or grate covers, etc.

h. Monitoring, inspection, and enforcement

i. The BLM will require the operator to regularly inspect pit liners to ensure that the liner has been properly installed and remains intact throughout operations.
ii. Where present, secondary containment of above-ground storage facilities should be inspected, at minimum, during the first interim reclamation (IR) inspection.[8]

3. Management of pits during drilling and production operations

a. Where necessary to protect public health and safety, or to prevent adverse environmental impacts resulting from access to a pit by wildlife, migratory birds, domestic animals, or members of the general public, the BLM will require operators to install fencing and/or other deterrents necessary to preclude access to pits.
i. Fencing on one side of the pit may be temporarily laid down or removed during active drilling, completion, or workover operations. All four sides shall be fenced upon release of the rig or equipment for those activities.
ii. Other deterrents to preclude pit access may include screening and/or netting. Flagging is not considered an effective deterrent. The BLM will require that the operator ensure pit access is precluded; the BLM generally should avoid prescribing specific deterrents to the operator, but should notify the operator that failure to adequately preclude access may result in violations and/or penalties (e.g., the Migratory Bird Treaty Act provides for up to $15,000 in fines and up to 6 months in jail, per count).
iii. As described elsewhere in this policy (Section 3(h)), pits containing oil or hazardous substances must sufficiently preclude entry by wildlife, livestock, and members of the general public. Onshore Oil and Gas Order No. 7 requires that all pits under purview of the Order be secured to prevent entry by livestock, wildlife, and unauthorized personnel (III.E.1.c).

b. Only wastes that qualify for the E&P exemption under RCRA can be disposed of on-lease, and only when permitted by the BLM. All non-exempted wastes must be removed from the lease facility and recycled or disposed of in accordance with applicable Federal, State, and local rules and regulations. Unused/excess product or materials must be removed from lease facilities, and cannot be disposed of on BLM-administered surface estate.

c. Use of oil-base muds

i. The mixing of oil-base mud cuttings and water-base mud cuttings is prohibited.
ii. All oil-base mud cuttings pits shall be lined in accordance with requirements above (Section 2(c)).
iii. Pits used for the disposal of oil-base muds and cuttings must be solidified in accordance with the Wyoming Oil and Gas Conservation Commission (WOGCC) rules and Section 4(e)(ii) of this policy.
iv. The use of a closed-loop system is required when using oil-base muds.
v. The BLM will require the operator to provide the BLM a contingency plan for response to accidental discharge of oil-base mud or cuttings to the reserve pit.

d. Dependent upon the chemical constituents of materials used in completion and workover operations, the BLM may require that a separate completions pit or temporary storage tank(s) be

[8] A tool to measure and evaluate secondary containment berm dimensions is available at http://web.wy.blm.gov/921/surfaceprotection/toolbox/index.htm

used for materials flowed back from downhole. Flowback of fluids other than fresh and/or produced water to the reserve pit is prohibited in sensitive areas (in those rare instances when an exception is granted to Section 2(a)).

e. Transfers of E&P wastes from Federal oil and gas leases

   i. To BLM-administered surface estate
      1. To encourage and promote waste minimization, operators may propose plans for managing and transporting E&P waste through beneficial use, reuse, and recycling by submitting a waste management plan for approval through a Sundry Notice or Right-of-Way. Such plans shall describe, at minimum, the type(s) of waste, origin and final disposition of the waste, the proposed use and/or treatment of the waste, the transportation route, and shall include a copy of any certification or authorization required by other laws and regulations.
   ii. To non-Federal lands
      1. Transport of wastes to a non-Federal location is only allowed when wastes are transported to an authorized commercial disposal or treatment facility, and only with the BLM's prior written approval.

f. Recycling and reuse of wastes generated on E&P locations

   i. Treatment of wastes (e.g., fracture stimulation fluids, drilling fluids, drilling solids, produced water, etc.) must be authorized in writing by the BLM, and the operator must obtain permits required by other Federal, State, or local government agencies prior to treatment.
   ii. Produced water must be tested prior to use for dust abatement and authorized in writing by the BLM prior to application. A copy of any applicable State of Wyoming permits and test results (showing radionuclides, trace elements, metals, salinity, pH, cations, and anions) must be provided to the BLM.
   iii. Recycling and reuse of wastes must comply with the transfer policy in this IM (Section 3(e)).

g. Emergency operations

   i. Permanent Emergency Pits
      1. Standards for permanent emergency pits are provided in Onshore Oil and Gas Order No. 7. Alternatives to permanent pits should be considered whenever possible, such as tanks.
   ii. Temporary emergency pits
      1. The BLM will require operators to verbally notify the BLM within 24 hours of the construction and use of temporary emergency pits, and provide the BLM the anticipated timeline for the pit's use.
      2. Following emergency operations, the BLM shall require the operator to provide a summary of the event by Sundry Notice (including NTL-3A notifications, if necessary), and actions taken by the operator. This Sundry Notice must be submitted to the BLM no later than 15 days following the emergency actions. The summary should include identification of wastes generated and disposed of into the emergency pits. Disposal of wastes generated by emergency operations must be in accordance with State, local, and Federal rules and regulations, and described in the summary report. A procedure to close and reclaim the emergency pit must be submitted for approval to the BLM.

h. Monitoring, inspection, and enforcement

i. Oil or other hazardous substances in pits. The regulations at 43 CFR 3162.7-1(b) state that produced oil is not permitted to go into a pit without the approval of the authorized officer. In addition, Onshore Oil and Gas Order No. 7 requires that pits be kept reasonably free from surface accumulation of liquid hydrocarbons that would retard evaporation (III.F.8).
   1. The BLM will require that operators remove oil found in pits as soon as possible, but no later than 48 hours from discovery. Any accumulation of oil in a pit shall be promptly removed.
   2. The BLM will require that operators take measures to minimize or preclude recurring releases of oil into the pits.
   3. The BLM will require that operators also ensure effective deterrence is present to preclude entry by wildlife, livestock, and the public whenever oil or other hazardous substances are present in pits.

ii. The BLM has the authority to require testing and reporting of pit contents on Federal oil and gas leases to ensure regulatory compliance. When testing is necessary, fluid minerals staff should work with their Hazardous Materials Coordinator to stipulate requirements for the operator. Pit testing guidance is provided in Attachment 3 (Pit Contents Testing Guidance).

iii. The BLM will require that the operator regularly monitor and inspect liners for integrity. The BLM may require that a pit be closed if the liner integrity is compromised, or may order the pit capacity reduced so that the operator can repair the liner.

iv. The BLM will require the operator to monitor and evaluate the effectiveness of fencing and any other required deterrents to animals and humans. The BLM will immediately notify the U.S. Fish and Wildlife Service if a dead or injured bird is found in a pit, if the operator fails to provide such notification. The BLM will require operators to notify the BLM if wildlife (other than insects and other invertebrates), or any livestock are discovered in a pit.

v. If illegal trespass dumping of waste into pits is found, the BLM will immediately contact the BLM Law Enforcement Officer. Such wastes must be removed from the pits by the responsible party or operator and brought to an authorized commercial disposal facility.

vi. If freeboard is exceeded, the BLM will require the operator to lower the pit volume to provide acceptable freeboard.

vii. Notification of any releases from pits must be provided to the BLM, including adherence to applicable NTL-3A requirements.

4. Closure and reclamation of pits

a. Fluid removal from pits

i. Squeezing of pits is prohibited; however, it is acceptable to remove standing fluids and cut in clean spoils, provided:
   1. Pit contents remain in the pit and liner integrity is maintained,
   2. The closed pit is sufficient to provide adequate surface stability and prevent settling of the pit, and
   3. The transport of fluids complies with Section 3(e) of this policy.

ii. Any measurable quantity of oil must be removed from the pit prior to closure; the burning of hydrocarbons is prohibited.

iii. The roadspreading or landfarming of wastes requires prior written approval by the BLM. The BLM will also require testing of the wastes prior to distribution. If roadspreading or

landfarming of wastes is proposed on split-estate over a Federal oil and gas lease, the operator must provide the surface landowner's written approval to the BLM prior to authorization.

b. Muds, cuttings, cement, and synthetic pit liners (if present) must be covered by a minimum of 3 feet of fill. Transport of these materials off-site must comply with Section 3(e) of this policy.

   i. Oil-base muds and cuttings must be solidified in accordance with Section 4(e)(ii) of this policy.

c. In accordance with Onshore Oil and Gas Order No. 7, wastes generated during emergency operations shall be emptied from temporary emergency pits and the liquids disposed of in accordance with applicable State and/or Federal regulations within 48 hours following its use, unless such time is extended by the authorized officer.

d. Wastes not exempt under RCRA are prohibited from entering pits. Synthetic liners must be cut to the level of pit solids before backfilling unless the liner is to be folded over to encapsulate the pit contents. Portions of the liner cut away must be disposed of in accordance with applicable local and/or State regulations.

e. The use of mechanical treatments, solidification, or stabilization requires prior written approval by the BLM.

   i. When using sprinklers or misters to hasten pit evaporation, the BLM will require that operators ensure pit contents are not deposited outside the pool area of the pit.
   ii. The BLM will require prior written approval of pit solidification by the BLM and WOGCC, use of a WOGCC-approved pit treatment company, and a copy of the pit closure report.
   iii. The use of fly-ash to absorb free standing liquids (which may results in the addition of heavy metals to the waste) is highly discouraged. If the use of fly-ash is determined necessary and appropriate, however, the BLM will require that the pit be capped with bentonite.

f. When closure of pits located in sensitive areas is proposed, the BLM will require that the pit contents be tested prior to closure. Unless otherwise required by the State or Environmental Protection Agency (EPA), the BLM will use the Oil Contaminated Soil Remediation Ranking System (OCSRRS) or other acceptable method to determine clean-up criteria for spills and/or pit contents in sensitive areas (see IM No. WY-2009-021). The operator will be required to meet the standards determined by the State, EPA, or BLM, and may be required to remove and dispose of the pit contents at an authorized commercial disposal facility. Attachment 4 (Radioactive Wastes) provides information and guidance about pit management, including closure, for pits that are known or suspected to contain radioactive materials.

g. Timing of pit closure

   i. Requiring an operator to provide prior verbal or written notification for pit closure is a recommended practice for all BLM Field Offices.
   ii. Reserve pits must be closed as soon as practical but no later than 6 months after the last well serviced by the pit is spud or completed (whichever is most appropriate for the circumstances and type of drilling activities); variances from closure timing requirements in this policy (shorter or longer timeframes) are allowed with sufficient justification and prior written approval by the BLM.

iii. Completion and flare pits will be closed as soon as practical, but no later than 6 months from the end of completion operations.
iv. Temporary emergency pits require prior approval by the BLM for closure. Temporary emergency pits must be closed as soon as practical, but no longer than 6 months from the end of emergency operations or unless otherwise required by the BLM.
v. Production pits will be closed as soon as practical, but no later than 6 months from the date of final production, or unless otherwise required by the BLM.

h. Testing requirements for pit closures, when mandated by the BLM

i. Testing is required prior to road spreading and landfarming of wastes.
ii. Testing may be required by the BLM prior to closure of emergency pits, depending upon the contents discharged to the pit.
iii. Production pits will be tested in accordance with the guidance provided in Attachment 3.
iv. Testing of reserve pits prior to closure may be required by the BLM, and is required for instances where pit closures occur in sensitive areas, locations where the pit was unlined or the liner integrity was compromised, at single pits that service multiple wells, or where illegal dumping is suspected.

i. Reclamation requirements

i. Reclamation of the disturbed surface must comply with the BLM Wyoming Reclamation Policy, and other site-specific requirements. Reclamation activities must protect the integrity of the liner, when present, unless the pit is solidified in accordance with this policy.

j. Bioremediation

i. Onsite bioremediation of suitable wastes is encouraged wherever feasible and practical. Refer to WO IM No. 1999-061 and WY IM No. 2009-021.

k. Monitoring, inspection, and enforcement

i. The BLM will require operators to frequently inspect sprinklers/misters while in operation to ensure proper operation and to prevent drift of fluids outside of the pit's pool area. More rigorous protection measures should be in place, or operations temporarily suspended, when wind speeds are high.
ii. The BLM will require the operator to inspect the liner throughout the course of operations, and during closure, to ensure that liner integrity is not compromised.
iii. The BLM may elect to be present during sampling or testing of pits. The BLM will require the operator to notify the BLM at least 72 hours in advance of sampling to provide the BLM opportunity to be present.
iv. If non-RCRA exempt waste is found in a pits, all waste in the pit must be removed and transported to an authorized commercial disposal or treatment facility.
v. When liner integrity is compromised in production pits, the BLM may require that the operator determine the extent of contamination/infiltration below the liner.

Timeframe: Effective immediately.

Budget Impact: No overall budget impact.

Background: Current BLM handbooks, manuals, policy and guidance address the management of fluid minerals exploration and production wastes in a general manner. This policy seeks to provide consistent minimum standards for acceptable permitting, operation, and closure of pits, without unduly limiting the ability of Field Offices to tailor their authorizations and decisions to circumstances unique to their office or an individual situation.

Manual/Handbook Sections Affected: None.

Coordination: This IM was coordinated among the Exploration & Production Pit Management Policy Team (Attachment 5), all district and field offices in Wyoming, and the U.S. Fish and Wildlife Service.

Contacts: Travis Bargsten (Physical Scientist, WY-921), 307-775-6197; Ken Henke (Hazardous Materials Coordinator, WY-932), 307-775-6041.

Signed by:
Larry Claypool
Deputy State Director,
Minerals and Lands

Authenticated by:
Sherry Dixon
Secretary

5 Attachments
- 1 – Examples of Waste Management Conditions of Approval (4 pp)
- 2 – E&P Waste Management Definitions (5 pp)
- 3 – Pit Contents Testing Guidance (2 pp)
- 4 – Radioactive Wastes (2 pp)
- 5 – Exploration & Production Pit Management Policy Team Members (1 pp)

Distribution

Director (310), 20 M Street, SE	1 (w/atchs)
Field Managers	1 (w/atchs)
CF	2 (w/atchs)

Attachment 1 – Examples of Conditions of Approval for Permit Authorizations

Pit Construction

1. All construction of the well pad, flare pit, reserve pit, roads, flowlines, production facilities and all associated infrastructure on Federal lands shall be monitored onsite by a licensed professional engineer ***or*** designated qualified inspector (to be identified at the time of construction notification) who will serve as the Operator's Compliance Coordinator to ensure construction meets the BLM-approved plans.

2. If groundwater or bedrock is encountered upon construction of the pad or pits, or upon drilling and completing shallow holes for surface conductor, rat/mouse holes, cathodic protection well, or a water supply well, the Operator must immediately notify the BLM Authorized Officer (AO) before proceeding.

3. Reserve pits will be adequately fenced during and after drilling operations until the pit is reclaimed so as to effectively keep out wildlife and livestock. Adequate fencing, in lieu of more stringent requirements by the surface owner, is defined as follows:

    a. Construction materials will consist of steel and/or wood posts. Three or four strand wire (smooth or barbed) fence or hog panel (16 foot length by 50 inch height) must be used with connectors such as fence staples, quick-connect clips, hog rings, hose clamps, twisted wire, etc. Electric fences will not be allowed.
    b. Construction standards: Posts shall be firmly set in ground. If wire is used, it must be taut and evenly spaced, from ground level to top wire, to effectively keep out animals. Hog panels must be tied securely into posts and one another using fence staples, clamps, etc. Fence must be at least 2 feet from edge of pit. Three sides must be fenced before beginning drilling, the fourth side fenced immediately upon completion of drilling and prior to rig release. Fence must be left up and maintained in adequate condition until pit is closed.
    c. If the pit is constructed and left open for more than one week prior to arrival of the drilling rig, the pit shall be fenced on all four sides. One side will then be temporarily laid down or removed for the duration of drilling operations, to be re-built upon removal of the drilling rig.

4. The flare pit is to be constructed/oriented so that the flare does not ignite the reserve pit liner and large enough so that the blowdown from the flare does not escape the flare pit.

5. The reserve pit will be lined with an impermeable liner having permeability less than 1×10^{-7} cm/sec and at least 12 mil thick. The liner will be installed so that it will not leak and will be chemically compatible with all substances that may be put in the pit. Liners made of any synthetic material will be of sufficient strength and thickness to withstand normal installation and pit use. In gravelly or rocky soils, a suitable bedding material such as sand or felt will be used prior to installing the liner. The liner must be installed no more than one month prior to commencing drilling activities.

6. A permanent marker shall be installed in the reserve and/or completion pit (either on the liner or using some other means that does not impair the integrity of the liner) that identifies the level at which 2 feet of freeboard remains in the pit.

Reserve or Completion Pit Operations

1. Only those wastes that qualify as exempt, under the Resource Conservation and Recovery Act (RCRA), Oil and Gas Exemption, may be disposed of in the reserve pit. Generally, oil or gas wastes are exempt if they (1) have been sent down hole and then returned to the surface during oil/gas operations involving exploration, development, or production, or (2) have been generated during the removal of produced water or other contaminants from the oil/gas production stream.

2. Flaring of gas into the reserve or completion pits will not be allowed.

3. All pits shall be kept free of trash and accumulations of liquid hydrocarbons. Any evidence of RCRA non-exempt wastes present in the reserve pit will result in the BLM Authorized Officer requiring specific testing and closure procedures.

4. All pits are required to maintain 2 feet of freeboard. If operations cause fluid levels in pits to rise (or threaten to) above the required freeboard, immediate notification shall be provided to the Authorized Officer with concurrent steps taken to cease the introduction of additional fluids, until alternative containment methods can be approved.

5. For the protection of livestock and wildlife, all pits and open cellars shall be fenced on all sides, and with corner bracing, immediately upon construction. Pits will be adequately fenced during and after drilling operations until pits are reclaimed so as to effectively keep out wildlife and livestock. Approved netting (in accordance with the requirements, below) is required over any pit that contains or is identified as containing hydrocarbons or RCRA-exempt hazardous substances as determined by observation or testing. Netting requirements:

    a. Maximum netting mesh spacing is 1 ½-inch on any side.
    b. Netting shall be suspended at least 4 feet above the pit contents.
    c. A rigid structure made of steel and cable (at no more than 7 foot intervals across the pit) shall be used.
    d. Netting shall be secured at the ground surface around the entire pit to prevent wildlife entry at the netting edges.
    e. The operator shall conduct frequent monitoring of the netting and maintenance (as required) to ensure continued function of the netting.
    f. Drying and/or removal of oil and/or hazardous substances from the pit will eliminate the need to maintain netting of the pit.

6. Oil is not permitted to be discharged into pits without prior written approval of the BLM Authorized Officer. Any oil that is inadvertently put into the reserve pit during operations prior to the time of pit closure will be immediately (within 48 hours) removed by the operator.

7. All waste, other than human waste and drilling fluids, will be contained in a portable trash cage. This waste will be transported to an authorized commercial waste disposal or treatment facility immediately upon completion of drilling operations. No trash or empty containers will be placed in the reserve pit or buried on location. All disposal of human and solid waste will comply with applicable State and local laws and regulations.

8. Produced fluids (including, but not limited to, produced water, frac fluid, and oil), while testing the well will be flowed back to an adequately-sized flowback tank (or tanks). Any oil will be skimmed and transferred to production tanks. Sand and produced fluids other than oil will be transferred to the reserve pit until such time as the gas production is conveyed to the pipeline.

9. Pit liners shall be inspected by the operator during operations (including pit closure), to ensure that the liner remains intact throughout operations.

Oil-Base Mud Operations

1. Mud hoses will be new or like new with hydraulically crimped on hose ends, and no king nipples or hose clamps will be allowed.

2. All oil-base mud drilling operations shall be completed through a closed mud system and all oil-base mud shall be contained in the closed system.

3. The closed drilling system shall be equipped with appropriate drip pans, liners and catchments under probable leak sources as needed to prevent the oil-base drilling mud and cuttings from reaching the reserve pit and/or ground surface of the drill pad.

4. Any cuttings dropped or mud spilled shall be immediately cleaned up and placed in the approved containment device. All spills in excess of one barrel outside the containment devices will be reported to the BLM within 8 hours.

5. The operator shall exercise extreme caution to avoid discharging oil-base drilling mud into the reserve pit. Should an event occur where it is necessary for oil-base mud to be discharged to the reserve pit, the Operator shall immediately initiate the following actions:

    a. The reserve pit shall be secured to prevent birds and other wildlife from getting into the oil-contaminated cuttings, fluids, and mud.

b. The Operator shall submit a plan to the BLM Field Office describing how the contaminated pit will be managed (i.e., will the contaminated material/fluids be treated in place, and if so by what method; or will the contaminants be removed to an authorized commercial disposal or treatment facility).
c. Submit a Sundry Notice describing how the oil contaminated drill cuttings will be treated to ensure the oil stays contained in the cuttings and where the cuttings will ultimately be stored (i.e., buried in the flare pit, buried in a separate on-location pit, or removed and transported to an authorized commercial disposal or treatment facility). Any on-location disposal sites for the oil-contaminated drill cuttings shall be lined with a 12 mil or thicker impervious liner compatible with oil. A liner meeting this specification shall also be placed under any temporary storage area for the oil contaminated cuttings.

6. Prior to skidding or moving the drill rig to another well or well pad, the pumps, pump lines and tanks shall be cleaned to ensure that no oil-base mud is in the system during surface drilling operations of the new well.

7. Install and maintain siphons, catchments, and absorbent pads to keep hydrocarbons produced by the drill rig from entering the reserve pit. Ensure that hydrocarbons and contaminated pads are disposed of in accordance with applicable State and Federal requirements.

Pit Closure and Reclamation

1. Pits are to be dried within 6 months from the date the well is spud or the date of well completion and prior to any backfilling. Mechanical trenching or squeezing of pit fluids and cuttings is prohibited. Drying by any means other than natural (air) evaporation requires prior approval from the BLM. Pit solids shall be buried at least 3 feet below re-countoured grade. Soils that are moisture laden and saturated, partially or completely frozen shall not be used for backfill or cover. The pit area may require mounding to allow for settling. Before backfilling, synthetic liner portions remaining above the “mud line” shall be cut off as close to the top of the mud surface as possible and disposed of at an authorized commercial waste disposal facility. The pit bottom and remaining liner shall not be trenched, cut, punctured or perforated. Installation and operation of any sprinklers, pumps, and related equipment shall ensure that water spray or mist does not drift outside of pit boundaries.

2. The burning of hydrocarbons and/or other wastes within pits is prohibited.

Mechanical Evaporation of Pits

1. The operator shall monitor operations to mechanically evaporate pits frequently, at least once every 2 hours, and must ensure that operations and conditions do not result in pit contents being deposited outside of the pool area of the pit.

Attachment 2 – Definitions

- Authorized commercial disposal or treatment facility:

  A commercial disposal or treatment facility permitted by the Environmental Protection Agency (EPA) or state environmental quality agency that is authorized to accept exploration and production wastes.

- Below-grade storage tank

  A storage tank having at least 20 percent of the volume of the tank located below the grade of the surrounding area.

- Blowdown/flare pit:

  A pit constructed to contain fluids discharged from the emptying or depressurizing of a vessel or pipeline.

- Centralized pit:

  A pit centrally located to accept wastes from multiple sources in a field.

- Closed-loop drilling:

  A method of drilling whereby a rig's mud-and-solids-control system efficiently recycles the circulated mud used during the drilling process while at the same time preventing these fluids from coming into contact with native soils by eliminating the need for a reserve pit. This system uses a combination of solids control equipment (e.g., shale shakers, flow line cleaners, desanders, desilters, mud cleaners, centrifuges, agitators, and necessary pumps and piping) incorporated in a series on the rig's steel mud tanks, or as a self-contained unit that continually separates entrained drilling solids within the mud for continued use. In addition to removing solids from the mud, wastewater may also be chemically treated to remove fine solids and reused or disposed off in an environmentally safe manner. The only waste discarded as part of the operations is moist, drilled-up rock materials that may be disposed of off-site. A closed-loop mud system does not necessarily include the use of a small cuttings pit (which would constitute a "semi-closed loop drilling system").

- Completion fluids:

  Low-solids fluid or drilling mud used when a well is being completed. It is selected not only for its ability to control formation pressure, but also for the properties that minimize formation damage.

- Completion/re-completion pit:

  A pit used to hold completion fluids and small amounts of co-produced water or hydrocarbons that are flowed back from the well during completion operations.

- Drilling mud:

  A special mixture of clay, water, and chemical additives pumped downhole through the drillpipe and drill bit. The mud cools the rapidly rotating bit; lubricates the drillpipe as it turns in the wellbore; carries rock cuttings to the surface; and serves as a plaster to prevent the wall of the borehole from crumbling or collapsing. Drilling mud also provides the weight or hydrostatic head to prevent extraneous fluids from entering the wellbore and to control downhole pressures that may be encountered.

- Emergency operations:

  Operations to prevent adverse consequences arising from situations which pose an immediate danger to public health, safety, or welfare and/or the environment.

- Emergency pit:

  A pit constructed to contain any products generated from emergency well operations (temporary) or a pit designed to collect the discharge from accidental releases (permanent).

- Ephemeral drainage:

  A watercourse that flows only in direct response to precipitation, and whose channel is above the water table at all times.

- Exploration and Production (E&P) Wastes:

  Those wastes associated with operations to locate or remove oil or gas from the ground or to remove impurities from such substances and which are uniquely associated with and intrinsic to oil and gas exploration, development, or production operations.

- Fracture stimulation fluids:

  A fluid, slurry, or foam that carries proppant material (sand grains or other small material) in suspension downhole under very high pressure to fracture and prop open the small cracks and fissures made in the producing formation by the intense pressure. After the proppant material (sand grains or microscopic beads) is in place, the pumping of the fluids is discontinued, allowing the fluid to drain out of the formation, leaving the proppant behind to hold open the small cracks.

- Freeboard:

  The vertical distance between the top of the pit wall at its point of lowest elevation and the level of the pit contents.

- Fresh water:

  Fresh water means water containing not more than 1,000 ppm of total dissolved solids, provided that such water does not contain objectionable levels of any constituent that is toxic to animal, plant or aquatic life, unless otherwise specified in applicable notices or orders.

- Intermittent drainage:

  A watercourse that is below the local water table for at least some part of the year, and obtains its flow from both surface runoff and ground water discharge.

- Lined pit:

  An excavated and/or bermed area that is lined with natural or synthetic material that will prevent seepage.

- Oil-base mud:

  Drilling mud whose liquid component is oil rather than (or in addition to) water, which is the most common fluid used to mix with the various clays to make drilling mud. Oil-base muds are used in very deep wells where the bottom-hole temperatures preclude the use of water-base muds. Also, oil-base muds are often used when drilling through clay or salt formations. Clay formations have a tendency to absorb the water from water-base muds and swell to the extent that the drillpipe becomes stuck. Salt has the tendency to dissolve in the water and change the properties of the mud, to the point of being ineffective.

- Perennial drainage:

  A watercourse that flows continuously. Perennial streams are generally associated with a water table in the localities through which they flow.

- Production pit:

  A pit constructed to hold water or hydrocarbons accumulated from well production.

- Reserve pit:

  An excavation connected to the working mud pits of a drilling well to hold excess or reserve drilling mud; a standby pit containing already mixed drilling mud for use when extra mud is needed.

- RCRA-exempt E&P wastes:

  Exploration and Production wastes that are exempt from Resource Conservation and Recovery Act (RCRA), Subtitle C regulations. The RCRA Subtitle C exemption, however, does not preclude E&P wastes from control under state regulations, under RCRA Subtitle D solid waste regulations, or other Federal regulations.

- Roadspreading:

  A process whereby RCRA-exempt exploration and production wastes that exhibit properties similar to commercial road oils, mixes, dust suppressants, or road compaction or de-icing materials are applied to or incorporated into a roadbed. Examples of such wastes include drilling fluids, produced water and produced water-contaminated soils, waste crude oil, sludges, and oil-contaminated soils.

- Sensitive Areas:

  Those locations and areas that are:

  → Within 500' of perennial or intermittent surface waters/springs and wetlands
  → Within 10-year perennial watercourse floodplains
  → Within ¼-mi. of public drinking water supply wells or uptakes and domestic water wells
  → Within ¼-mi. of residences, schools, hospitals, or other structures where people are known to congregate
  → Within BLM-designated recreation sites and Wilderness Study Areas
  → Areas where the depth to groundwater is ≤20' from the bottom of the pit
  → Within an identified Groundwater Recharge Area

  Waivers, additions, or exceptions to these criteria may be allowed only in limited circumstances when supported through NEPA analysis and affirmed by the BLM Authorized Officer.

- Squeezing of pits:

  The mechanical manipulation of pit contents that contain standing fluids.

- Solidification of pit contents:

  Solidification refers to techniques that encapsulate the waste in a monolithic solid of high structural integrity. The encapsulation may be of fine waste particles (microencapsulation) or of a large block or container of wastes (macroencapsulation). Solidification does not necessarily involve a chemical interaction between the wastes and the solidifying reagents

but may mechanically bind the waste into the monolith. Contaminant migration is restricted by vastly decreasing the surface area exposed to leaching and/or by isolating the wastes within an impervious capsule.

- Stabilization of pit contents:

  Stabilization refers to those techniques that reduce the hazard potential of a waste by converting the contaminants into their least soluble, mobile, or toxic form. The physical nature and handling characteristics of the waste are not necessarily changed by stabilization.

- Tankbottoms:

  The unmerchantable accumulation of hydrocarbon material and other substances that settle naturally to the bottom of producing lease tanks and/or pipeline storage tanks after a period of being treated chemically (i.e., surfactants) and/or mechanically (i.e., separator, treater, heater treaters, etc.). Tank bottoms may consist of a combination of several elements including, but not limited to, heavy hydrocarbons, paraffin, basic sediment and water, and emulsions.

- Workover pit:

  A pit constructed to hold fluids resulting from any downhole remedial operation in an existing oil or gas well that is designed to sustain, restore or increase the production rate or ultimate recovery in a geologic interval currently completed or producing. Workover pits may contain, but are not limited to containing, fluids and materials from: acidizing, reperforating, fracture treating, sand/paraffin removal, casing repair, squeeze cementing, or setting of bridge plugs to isolate water productive zones from oil or gas productive zones, or any combination thereof.

Attachment 3 – Pit Contents Testing Guidance

A. The purpose of these guidelines is to provide guidance to BLM field offices directing the collection and analysis of soil and sludge samples by operators and taken from pits used in association with oil and gas well drilling and production. Additional information and guidance is available from the WOGCC ("Soil and Sludge Sample Guide" and "Guideline for Closure of Unlined Production Pits") and the EPA (SW-846 – the official compendium of analytical and sampling methods).

1. Testing Parameters:

   a. Contaminant sample testing must be conducted for the following constituents:
      - Total Petroleum Hydrocarbons (TPH) (refer to WY IM No.2009-021 for target concentrations)
      - pH (Target values 6.5 to 9.0)

   b. Salinity (Target concentrations – 4 mmhos/cm Electical Conductivity (EC), 15 percent Exchangeable Sodium Percentage (ESP) or 12 Sodium Adsorption Ratio (SAR) maximum). The BLM Authorized Officer may also require other testing on a case-by-case basis, if additional wellbore fluids such as spent acid or hydraulic fracturing waste are present or if there is evidence or suspicion that pits may be contaminated with non-RCRA exempt hazardous waste. Unauthorized RCRA components would include discarded drums, containers, aerosol cans, buckets, hydrocarbon or chemical sheen, or other physical evidence. Other criteria could include proximity to sensitive areas, shallow water table or questionable baseline contaminant test results.

2. Sampling and testing shall be subject to the following procedures and standards:

   a. A composite grab sample will be taken from each pit by the operator's contractor or trained personnel according to EPA approved sampling and testing standards and methods. A "composite grab sample" is defined as soil samples taken from different locations within the pit and combined into a single sample. The samples may be collected using a backhoe, drill rig, hand auger, shovel, or other means. The composite shall be comprised of soil samples from a minimum of four locations within the pit. Additional sample points may be required dependent on impoundment size and type. A stainless steel probe or hand auger is generally used to remove the soil sample from different depths (0 to 24 inches) of the pit. The soil samples, taken from each location in the pit, are combined into a single composite grab sample. At the discretion of the authorized officer, the sampling depth may be increased if there is suspicion that the pit contents have infiltrated over 24 inches or there are sensitive receptors nearby, such as shallow groundwater table or riparian areas.

   b. Dependent on the size of the pit, more than one composite sample may be required. The rule of thumb is one composite sample for every 400 cubic yards of petroleum contaminated soil or sludge to be removed.

c. An accurate, written chain-of-custody shall be kept and submitted to the BLM Authorized Officer with the test results.
   - The operator shall supply the BLM Authorized Officer with copies of all laboratory test results as soon as they are available.

Attachment 4 – Radioactive Wastes

Origin

There are two general categories of radioactive wastes that are associated with oil and gas drilling; naturally occurring radioactive material and radioactive tracers.

Naturally occurring radioactive materials (NORM) are derived from subsurface formations that also contain oil and gas. NORM that becomes concentrated in the form of scale can be found in separators, pipes, tubing, and other oilfield equipment. The most common isotopes of radium most often associated with barite scale are radium-226 and radium-228. The half life of radium-225 is 1,600 years and for radium-228, 5.8 years.

Radioactive tracers are radioactive isotopes injected into a well to allow observation of fluid or gas movements by means of a radioactive-tracer survey. *Tracer studies* involve a single well and use an electronic well logging tool. *Field flood or enhanced oil and gas recovery studies* involve multiple wells with one or more radioactive isotopes being injected and multiple oil or gas samples containing radioactive material collected from each of the wells to determine the direction and rate of flow through a formation. *Labeled frac sands* have radioactive isotopes that are chemically bonded to glass and/or resin beads and are injected into a single well. Frac sand operations require the use of an electronic well logging tool to assess the amount of radioactive isotope remaining in the underground reservoir formation. Normally, radioactive tracer materials are recycled and not disposed of in a reserve or production pit.

Impacts

The two main isotopes associated with NORM, Radium-226 and radium-228, are generally not an exposure risk to humans because they accumulate inside pipe and other equipment on production sites that are open to the public. Additionally, the pipe and equipment is usually sufficient to shield anyone nearby from radioactive exposure.

Radioactive tracer material normally has a short half life (less than 120 days) and has both internal and external exposure hazards to humans. Disposable gloves and clothing will provide a barrier to protect users from exposure.

Regulatory Authority

The use of radioactive tracers requires licensing by the Nuclear Regulatory Commission. Radioactive tracer waste is considered a low level radioactive waste as defined by the Low-level Radioactive Waste Policy Amendments Act of 1985. This act gave the states responsibility for the disposal of their low-level radioactive waste.

A memorandum of understanding between the Wyoming Department of Environmental Quality and the Wyoming Oil and Gas Conservation Commission (WOGCC), grants WOGCC authority to regulate the disposal of salt water (produced water), nonpotable water, drilling fluids and other oilfield wastes which are uniquely associated with exploration and production operations. Since radioactive tracers and NORM are considered oilfield waste, WOGCC is the designated agency that regulates their disposal in Wyoming.

Disposal Actions

For each radioactive waste disposal action, the WOGCC reviews the operator's disposal plan and, if the authorized, provides specific guidance for the disposal method. The BLM should receive the operator's disposal request and the subsequent disposal report. Currently, the WOGCC is requiring all radioactive tracer waste to be solidified in place at the site it was generated. Scale from NORM waste may also be solidified on location with the possible requirement of signing and/or fencing of the location. If NORM scale from piping, tubing, or other equipment is not removed, the WOGCC recommends the disposal of equipment at a licensed facility authorized to accept low level radioactive waste.

Attachment 5 – Exploration & Production Pit Management Policy Team Members

Jim Albano, Branch Chief – Fluid Minerals, Montana State Office
Travis Bargsten, Physical Scientist, Wyoming State Office
Bryce Barlan, Natural Resource Specialist, Washington Office
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Appendix E: WEED MANAGEMENT PLAN

FOR THE

GRIEVE UNIT CO_2 ENHANCED OIL RECOVERY PROJECT

WEED MANAGEMENT PLAN

FOR THE

GRIEVE UNIT CO_2 ENHANCED OIL RECOVERY PROJECT

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April 3, 2012

TABLE OF CONTENTS

LIST OF ACRONYMS

Act	Wyoming Weed and Pest Control Act
AOR	Authorized Officer Representative
APD	Application Permit to Drill
ATV	All Terrain Vehicle
BKS	BKS Environmental Associates, Inc.
BLM	Bureau of Land Management
CC	Compliance Coordinator
COA	Conditions of Approval
EP	Elk Petroleum, Inc.
ESD	Ecological Site Description
$GUCO_2$	Grieve Unit CO_2 Enhanced Oil Recovery
LFO	Lander Field Office
LRMP	Lander Resource Management Plan
NAIPM	North American Invasive Plant Mapping
NAWMA	North American Weed Management Association
PAR	Pesticide Application Records
POD	Plan of Development
PUP	Pesticide Use Proposal
PUR	Pesticide Use Report
SSRP	Site Specific Reclamation Plan
WMC	Weed Management Contractor
WMP	Weed Management Plan
WMS	Weed Management Supervisor

1.0 INTRODUCTION

Elk Petroleum, Inc. (Elk) proposes to implement enhanced crude oil recovery from the Cretaceous Muddy "Grieve Sand" within the Grieve Unit using miscible CO_2 flood with water injection to assist with reservoir re-pressurization. In order to implement the proposed project Elk will modify the existing Grieve Unit infrastructure as outlined in Chapter 2 of the Environmental Assessment. The Grieve Unit CO_2 Enhanced Oil Recovery ($GUCO_2$) project area is approximately 2,300 acres and is located southwest of Casper, Wyoming, within all or portions of: Sections 5, 6, 8, 9, 15, 16, 17, 18, 19, 21, 22, 26, and 27, T32N R85W; Section 1, T32N R86W; Section 31, T33N R85W; Sections 15, 16, 21, 22, 23, 26, 27, 34, and 35, T32N R85W.

The proposed $GUCO_2$ project area is located in the Western Range and Irrigated Land Resource Region within the Central Desertic Basins and Plateaus Major Land Resource Area (MLRA 34A) (NRCS 2006). MLRA 34A is primarily located in the Wyoming Basin Province of the Rocky Mountain System. The majority of MLRA 34A is characterized by a semi-desert grass-shrub zone. Average annual precipitation within this zone is 8 to 16 inches (NRCS 2006). Elevation within the proposed project area generally ranges from approximately 6,210 to 7,370 feet above sea level.

Based on plant community descriptions for the 10-14" Precipitation Zone High Plains Southeast Ecological Site Descriptions (ESD) (Brazee 2008 a-g) and field observations, uplands within the proposed disturbance area of the $GUCO_2$ project area are dominated by sagebrush shrublands primarily composed of Big Sagebrush/Mid-Grass plant community and sagebrush grasslands composed of Bluebunch Wheatgrass/Rhizomatous Wheatgrass plant community. Grasslands composed of a Rhizomatous Wheatgrass/Needle-and-thread plant community are less common and interspersed throughout the sagebrush shrublands and grasslands. Saline lowlands are composed of Alkali Sacaton/Basin Wildrye plant communities. Non-saline drainages and lowlands are dominated by a Western Wheatgrass/Kentucky Bluegrass plant community. Limber Pine is also present within the project area. Based on Bureau of Land Management-Lander Field Office (BLM-LFO) disturbance data, approximately 10 percent of the project area has been previously disturbed.

This Weed Management Plan (WMP) will be reviewed and updated, if necessary, with Pesticide Use Proposals (PUPs) for approval annually. This plan will be updated as necessary, specifically after the project area has been seeded and annual monitoring has begun.

2.0 LAND USE PLANNING

The Lander Draft Resource Management Plan (LDRMP) for the Lander Field Office Planning Area (BLM 2011) proposes the following management objectives with respect to land use planning decisions for invasive species management:

1) Maintain adequate baseline information, inventory, and monitoring, regarding the extent and control of invasive species to make informed decisions, evaluate effectiveness of management actions, and assess progress toward goals to improve invasive species management. Develop a prevention and early detection program.

2) Coordinate with adjoining jurisdictions in management and control of invasive nonnative species (INNS) across jurisdictional and political boundaries.
3) Include provisions for INNS management in all BLM-funded or authorized actions.

3.0 DEFINITIONS

Designated Noxious Weed: These are "weeds, seeds, or other plant parts that are considered detrimental, destructive, injurious or poisonous, either by virtue of their direct effect or as carriers of diseases or parasites that exist within this state, and are on the designated list". The designated list is a list of weeds and pests that are "designated by joint resolution of the Wyoming Board of Agriculture and the Wyoming Weed and Pest Council". The Wyoming Weed and Pest Control Act (Act) provides information on the State of Wyoming Weed and Pest Districts and the Wyoming designated and prohibited noxious weed species list. The Act currently includes 25 weed species and can be accessed at www.wyoweed.org/documents.html. Per this Act, weed control is the responsibility of the landowner or the owner of the right-of-way or easement (WWP 1973 and US 1999).

The 2011 Wyoming Designated Noxious Weeds and Prohibited Noxious Weeds List include the 25 species listed below:

1) Field bindweed (*Convolvulus arvensis* L.)
2) Canada thistle (*Cirsium arvense* L.)
3) Leafy spurge (*Euphorbia esula* L.)
4) Perennial sowthistle (*Sonchus arvensis* L.)
5) Quackgrass (*Agropyron repens* (L.) Beauv.)
6) Hoary cress (whitetop) (*Cardaria draba* & *Cardaria pubescens* (L.) Desv.)
7) Perennial pepperweed (giant whitetop) (*Lepidium latifolium* L.)
8) Ox-eye daisy (*Chrysanthemum leucanthemum* L.)
9) Skeletonleaf bursage (*Franseria discolor* Nutt.)
10) Russian knapweed (*Centaurea repens* L.)
11) Yellow toadflax (*Linaria vulgaris* L.)
12) Dalmatian toadflax (*Linaria dalmatica* (L.) Mill.)
13) Scotch thistle (*Onopordum acanthium* L.)
14) Musk thistle (*Carduus nutans* L.)
15) Common burdock (*Arctium minus* (Hill) Bernh.)
16) Plumeless thistle (*Carduus acanthoides* L.)
17) Dyers woad (*Isatis tinctoria* L.)
18) Houndstongue (*Cynoglossum officinale* L.)
19) Spotted knapweed (*Centaurea maculosa* Lam.)
20) Diffuse knapweed (*Centaurea diffusa* Lam.)
21) Purple loosestrife (*Lythrum salicaria* L.)
22) Saltcedar (*Tamarix* spp.)
23) Common St. Johnswort (*Hypericum perforatum*)
24) Common tansy (*Tanacetum vulgare*)
25) Russian olive (*Elaeagnus angustifolia* L.)

Declared Weed: This is "any plant which the Wyoming Board of Agriculture and the Wyoming Weed and Pest Council have found, either by virtue of its direct effect, or as a carrier of disease or parasites, to be detrimental to the general welfare of persons residing within a district" (i.e., county weed and pest control district) (WWP 1973).

The 2011 Declared Weed List for Fremont County (Wyoming Weed and Pest 2011) includes the species listed below:

1) Swainsonpea (*Sphaerophysa salsula* (Pallas) DC.)

The 2011 Declared Weed List for Natrona County (Wyoming Weed and Pest 2011) includes the 11 species listed below:

1) Black henbane (*Hyoscyamus niger* L.)
2) Buffalobur (*Solanum rostratum* Dunal)
3) Curlycup gumweed (*Grindelia squarrosa* (Pursh) Dunal)
4) Foxtail barley (*Hordeum jubatum* L.)
5) Halogeton (*Halogeton glomeratus* (M. Bieb.) C.A. Mey.)
6) Puncturevine (*Tribulus terrestris* L.)
7) Showy milkweed (*Asclepias speciosa* Torr.)
8) Wild licorice (*Glycyrrhiza lepidota* Pursh)
9) Cheatgrass (downy brome) (*Bromus tectorum* L.)
10) Yellow starthistle (*Centaurea solstitialis*)
11) Black medic (*Medicago lupulina*)

Weed of Concern: Refers to any plant that is typically not native to the county or region and which under the right conditions can be invasive.

The Weeds of Concern List for Fremont County (Fremont County Weed and Pest 2011) includes the 10 species listed below:

1) Absinth wormwood (*Artemisia absinthium*)
2) Russian thistle (*Bassia sieveriana*)
3) Bull thistle (*Cirsium vulgare*)
4) Wild licorice (*Glycyrrhiza lepidota*)
5) Black henbane (*Hyoscyamus niger* L.)
6) Japanese knotweed (*Polygonum cuspidatum*)
7) Sulphur cinquefoil (*Potentilla recta*)
8) Marsh sowthistle (*Sonchus arvensis*)
9) Puncturevine (*Tribulus terrestris* L.)
10) Common mullein (*Verbascum thapsus*)

The Weeds of Concern List for Natrona County (Natrona County Weed and Pest 2010) includes the three species listed below:

1) Myrtle spurge (*Euphorbia myrsinites*)

2) Curly dock (*Rumex crispus*)
3) Common cocklebur (*Xanthium strumarium)*

Invasive Weed: Refers to a "species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health"0 (US 1999). Invasive weeds include not only weeds of concern, but designated noxious weeds, declared weeds, and other plants that are not native to this country

4.0 PURPOSE AND NEED

Elk is committed to inventorying, monitoring, and treating of weeds associated with the $GUCO_2$ project. The purposes of this WMP are as follows:

1) Prescribe methods to treat existing weed infestations.
2) Prevent introduction and spread of infestations during construction.
3) Monitor and treat infestations after construction is complete.
4) Control expansion of existing noxious weed populations from within the $GUCO_2$ project area and from adjacent lands, over the life of the $GUCO_2$ project.
5) Manage and control weeds where growth could increase fire hazard, cause excessive snow drifting in undesirable locations, or hinder successful reclamation of disturbed areas.

5.0 PRE-ASSESSMENT INVASIVE WEED INVENTORY

BKS Environmental Associates, Inc. conducted a pre-assessment weed inventory for the $GUCO_2$ project on August 2, 2011. The weed inventory was conducted to determine if any state designated noxious weeds, Fremont and Natrona County declared weeds, Fremont and Natrona County weeds of concern, or potentially invasive introduced plant species (based on professional judgment) were present. Any occurrences of state designated noxious weeds, Fremont and Natrona County declared weeds, Fremont and Natrona County weeds of concern, or potentially invasive introduced plant species were photographed, marked by GPS points, and marked on aerial imagery maps. General percent cover of each occurrence was recorded. However, if only a few individuals (1% or less of total cover value for project area) of potentially invasive introduced plant species were observed, only general locations were recorded.

Four state designated noxious weeds were observed within the $GUCO_2$ project area: musk thistle, diffuse knapweed, spotted knapweed, and Canada thistle. Five Natrona County declared weeds were observed within the $GUCO_2$ project area: showy milkweed, cheatgrass, wild licorice (also a Fremont County weed of concern), curlycup gumweed, and foxtail barley. Halogeton, a Natrona County declared weed, was not observed within the project area, but in close proximity. Occurrences of these species were typically within and along existing disturbances; however, observations also occurred within native areas proposed for disturbance.
Observed species were typically found as isolated individuals or small populations. However, cheatgrass and curlycup gumweed were prevalent along existing access roads within the project area. Curlycup gumweed was also prevalent along existing roadways within the disturbance boundary, outside of the project area. Wild licorice and foxtail barley were common, and showy

milkweed was present in areas where water was present or soils were moist. Isolated individuals and small populations of diffuse knapweed, spotted knapweed, and Canada thistle were present near wetlands. Refer to Addendum 1 for a map of weed locations within the $GUCO_2$ project area.

6.0 WEED MANAGEMENT

6.1 General Weed Management

An integrated weed management strategy will be employed by Elk throughout the construction and operation of the $GUCO_2$ project. All factors of the weed population will be taken into consideration when deciding on a management action; these factors include species, location, size of the population, soils, and landscape position. The integrated approach will use one or more of the following methods:

Education

- A significant part of weed management is educating people working on the $GUCO_2$ project.
- Weed identification handbooks will be made available to all $GUCO_2$ field personnel, including construction workers. The weed identification handbooks are free at the Wyoming Department of Agriculture, Wyoming Weed and Pest Control Districts, and the University of Wyoming.
- All $GUCO_2$ project personnel (including maintenance and operations) will be trained to recognize and document new or spreading weed populations.

Cultural

- Disturbance will be minimized to limit the opportunities for weed infestations to colonize.
- Disturbed areas will be immediately re-seeded with BLM approved seed mixes containing certified weed-free seed (blue tags).
- If mulch is used, it will be certified weed-free.
- Equipment and vehicles will be inspected before entering and leaving the $GUCO_2$ Project area and, if necessary, cleaned of any plant material or soil that may spread weed seeds.
- Use of domestic grazing animals may be used as a cultural control method.

Physical

- Mowing may be used the first season after re-seeding before weeds have set seed to limit their spread.
- On smaller and new weed infestations, hand pulling or digging may be used for removal. Removed vegetation will be bagged to minimize dispersal of vegetative parts and seeds and disposed of properly.

Biological

- Biological control agents, including domestic grazing animals, may be utilized for weed control, with species, management requirements, and desired results being considered.
- Before releasing any biological control agents onto BLM lands a Biological Control Agent Release Proposal will be obtained by Elk.

Chemical

- Herbicides have been found to be very effective in controlling weeds. Selected herbicides will be BLM approved and appropriate for the target species. Application will only occur on locations approved for use, and application rates will adherence to all label instructions to control the target species.
- Herbicides will only be applied by a commercially licensed pesticide applicator.
- Elk will acquire a Pesticide Use Permit (PUP) from the LFO BLM for all pesticide applications on BLM land.
- PUPs will be submitted along with pesticide labels to the Authorized Officer by December 1st for use the following spring/summer season.
- Adjuvants approved for use on BLM land may be added to the pesticide tank mix to improve the effectiveness of the herbicide, promote better contact with the plant surface, and reduce drift.

6.2 Target Species Management

The following species descriptions are from the Wyoming Weed and Pest Council Weed Handbook. Integrated management techniques are derived from a variety of sources: The Nature Conservancy (2011), Beck, K.G. (2008), Schultz (2003), Natrona County Weed and Pest (2010), Natural Resource Conservation Service (2011), Stevens County Noxious Weed Control Board (2010), Pavek, D. (1992), Fremont County Weed and Pest (2012), Wilson and Randall (2005), and Winston and Schwartzlander (2011). Integrated management chemical control agents are based on the 2006-2007 Weed Management Handbook from Cooperative Extension Services (Dewey et al. 2006).

Diffuse knapweed

Diffuse knapweed is a short lived perennial, biennial, or occasionally an annual that spreads by seed. A rosette is established the first year and a flowering stalk the second year. Stems are diffusely branched and rough to the touch; growing 1 to 2 feet tall. Flowering heads are numerous and narrow. Flowers are white to rose in color, sometimes purplish. Leaves are greenish grey and covered with fine hair. Seeds are oblong, dark brown or grey with longitudinal lines.

Management Objective: Containment

Integrated Management

- Chemical: Picloram, 2,4-D, Dicamba, and Curtail are all effective control agents.

- Biological: Banded knapweed gall fly (*Urphaora affinis*), UV knapweed seedhead fly (*Urophora quadrifasciata*), green knapweed clearwing fly (*Terellia virens*), knapweed peacock fly (*Chaetoreellia acrolophi*), knapweed seedhead moth (*Metzneria paucipunctella*), lesser knapweed flower weevil (*Larinus minutes*), blunt knapweed flower weevil (*Larinus obtusus*), broad-nosed knapweed seedhead weevil (*Bangasternus fausti*), sulphur knapweed root moth (*Agapeta zoegana*), brown-winged knapweed root moth (*Pterolonche inspersa*), gray-winged knapweed root moth (*Pelochrista medullana*), knapweed root weevil (*Cyphocleonus achates*), and bronze knapweed root borer (*Sphenoptera jugoslavica*) are approved, effective biocontrol agents.
- Cultural: Seeding desirable perennial grasses and forbs will provide competition with the knapweed; irrigation can increase the effectiveness of seeding. Grazing management can help decrease populations.
- Physical/Mechanical: Hand pulling or digging can be effective on small populations, especially if the entire root system is removed.

Spotted knapweed

Spotted knapweed is a biennial or short-lived perennial that grows up to 3 feet tall and spreads by seed. Rosette formed the first year with a flowering stalk elongating the second year. Stems are erect with slender wiry bracts and are covered with fine hair. Flowering heads are mostly on branch tips, solitary, up to one inch in diameter, and pink to purple in color, rarely white, with black tipped seed head bracts. Leaves are long and divided below the branches and short and narrow above; covered with fine hairs. Seeds are brownish, 1/8 inch long, notched on one side of the base, and have short tufts of bristles at the tip.

Management Objective: Containment

Integrated Management

- Chemical: Picloram, 2,4-D, Dicamba, and Curtail are all effective control agents.
- Biological: Banded knapweed gall fly (*Urphaora affinis*), UV knapweed seedhead fly (*Urophora quadrifasciata*), green knapweed clearwing fly (*Terellia virens*), knapweed peacock fly (*Chaetoreellia acrolophi*), knapweed seedhead moth (*Metzneria paucipunctella*), lesser knapweed flower weevil (*Larinus minutes*), blunt knapweed flower weevil (*Larinus obtusus*), broad-nosed knapweed seedhead weevil (*Bangasternus fausti*), sulphur knapweed root moth (*Agapeta zoegana*), brown-winged knapweed root moth (*Pterolonche inspersa*), gray-winged knapweed root moth (*Pelochrista medullana*), knapweed root weevil (*Cyphocleonus achates*), and bronze knapweed root borer (*Sphenoptera jugoslavica*) are approved, effective biocontrol agents.
- Cultural: Seeding desirable perennial grasses and forbs will provide competition with the knapweed; irrigation can increase the effectiveness of seeding. Grazing management can help decrease populations.
- Physical/Mechanical: Small patches can be controlled by hand pulling or digging.

Canada thistle

Canada thistle is a colony forming perennial that reproduces from seed and creeping rootstalks, and can grow up to 4 feet tall. Leaves vary from light to dark green, oblong or lance shaped with deeply grooved spiny toothed margins. Flowers form in small bristly clusters that are light lavender to deep rose purple. Seeds are smooth, light to dark brown, tipped with a cupped conical point, and are approximately 1/8 inch long.

Management Objective: Containment

Integrated Management

- Chemical: 2,4-D, Picloram, Dicamba, and Curtail are all effective control agents.
- Biological: Canada thistle stem weevil (*Ceutorhynchus litura)*, musk thistle crown weevil (*Trichosirocalus horridus*), and Canada thistle stem gall fly (*Urophora cardui*) are all approved, effective biocontrol agents.
- Cultural: Increased competition from desirable plants is effective, proper management of perennial grasses helps greatly.
- Physical/Mechanical: Hand pulling is not effective. Repeated cultivation is successful if conducted every 3 to 4 weeks.

Showy milkweed

Showy milkweed is a perennial, 2 to 5 feet tall, reproducing by seeds and underground rootstocks. Leaves are opposite, oval-shaped, prominently veined, 4 to 7 inches long, and covered with fine, soft hairs. The plant has a grayish-green color and grows erect. All foliage parts exude a milky latex sap when cut. Flowers are arranged in umbels at the top of the plant and are purplish-pink. Reddish-brown flat seeds are borne in 3 to 5 inch spindle-shaped pods. Each seed bears a tuft of hairs allowing seeds to be spread by wind.

Management Objective: Containment

Integrated Management

- Chemical: Picloram and Dicamba are effective control agents.
- Biological: No known biological control agent.
- Cultural: Seeding desired perennials can help to reduce populations.
- Physical/Mechanical: Cultivation, pulling, and digging can result in increased population size because each root segment left behind can generate a new plant; therefore, it is not a recommended treatment option.

Cheatgrass

Cheatgrass is an annual growing 4 to 30 inches tall and reproducing by seed. Leaf sheaths and flat blades are densely covered with soft hairs. Inflorescence is dense, slender, usually drooping, 1-sided 2-6 inches long. Spikelets are nodding, slender 3/8 to 3/4 inches ling. Awns are 3/8 to 5/8 inch long, usually purplish at maturity.

Management Objective: Containment

Integrated Management

- Chemical: Imazapic and Glyphosate are effective control agents.
- Biological: No known biological control agents.
- Cultural: Seeding of competitive perennials is recommended. Repeated early and late season grazing can reduce populations.
- Physical/Mechanical: Mowing is not recommended for control. Hand pulling before seed-set would be effective on small populations if repeated for several years.

Wild licorice

Wild licorice is a perennial that grows 1 to 3 feet tall and reproduces by seed or deep spreading roots. This plant grows erect in patches or clumps in moist areas. Leaves are alternate, compound with 11-19 lance shaped leaflets. Stems are simple or erect branches toward the top. Flowers are green-white to white in color, pea-type in clusters on a long stem. Seeds are bean shaped, 1/8 inch long, reddish brown, smooth and dull, contained in a bur-like seed pod to 3/4 inch long, covered with stout, hooked prickles.

Management Objective: Containment

Integrated Management

- Chemical: Picloram, Dicamba, and Redeem R&P are all effective control agents.
- Biological: Bruchid beetle (*Acanthosclides aureoles*) is a known seed predator.
- Cultural: Livestock grazing early in the growth of the plants can reduce plant vigor.
- Physical/Mechanical: Hand pulling and digging can be effective on smaller populations.

Curlycup gumweed

Curlycup gumweed is a biennial or short-lived perennial that reproduces by seed and grows 1 to 3 feet tall. The roots are fibrous; leaves alternate, 1 to 3 inches long, with saw toothed margins. Leaves are gland-dotted and exude a sticky material. Flowers are bright yellow, 1 inch in diameter, borne singly on the end of the branches. Curved bracts surrounding the flower also secrete a sticky substance which gives the plant its name. Seeds are oblong, cream colored, four-angled and deeply ridged.

Management Objective: Containment

Integrated Management

- Chemical: Metsulfuron, 2,4-D, Picloram, and Grazon P&D are all effective control agents.
- Biological: No known biological control agent.
- Cultural: Planting competitive grasses or cover crops.

- Physical/Mechanical: Hand pulling can be effective for small populations. Repeated mowing is not effective as the plant generally does not re-grow tall enough to be affected.

Halogeton

Halogeton is an annual ranging in height from a few to over 18 inches. Main stems branch from the base, spreading at first, and then becoming erect. Plants are blue-green in the spring and early summer, turning red to yellow by late summer. Leaves are small, fleshy, and nearly tubular, ending abruptly, tipped with a delicate needle-like spine. Plants resemble Russian thistle in early stages but can be distinguished by leaf shape, and by the presence of minute cottony hairs in the leaf axils.

Management Objective: Containment

Integrated Management

- Chemical: Metsulfuron, 2,4-D, and Imazapic are all effective control agents.
- Biological: No known biological control agents.
- Cultural: Seeding of immigrant kochia (*Kochia prostrata*) and crested wheatgrass (*Agropyron cristatum*) have been shown to decrease halogeton populations.
- Physical/Mechanical: Tillage is an effective method when combined with immediate seeding of perennials. Cutting or digging the plant before seed production can be effective on smaller populations.

Foxtail barley

Foxtail barley is a perennial that grows 1 to 2 feet tall and reproduces by seed. Plants produce a pale green bushy like spike. Leaf blades are 1/8 to 1/4 inch wide; the sheaths may vary from smooth to densely hairy. At maturity the heads break into 7-awned clusters, spikelets are one flowered awns 1 to 2 ½ inches long.

Management Objective: Containment

Integrated Management

- Chemical: Imazapic and Glyphosate are effective control agents.
- Biological: No known biological control agents.
- Cultural: Seeding with fast growing forage will help reduce population density.
- Physical/Mechanical: Mowing before seed set can be effective at reducing populations.

Musk thistle

Musk thistle is a biennial or winter annual that grows erect up to 7 feet tall and reproduces only by seed. Rosette forms the first year with a flowering stem forming the second year. Leaves are dark green with a light midrib, hairless, with long sharp spines. Flowers are solitary, 1 ½ to 3 inches in diameter, and deep rose to violet to purple in color. Roots are fleshy taproots that are

hollow near the ground surface. Seeds can be produced in excess of 20,000 per plant with 90% of the seeds being viable. Seeds may germinate after 10 years in the soil.

Management Objective: Containment

Integrated Management

- Chemical: Escort, Grazon P&D, and Tordon are all effective control agents on rosette stage.
- Biological: Thistle stem hover fly (*Cheilosia corydon*), musk thistle leaf beetle (*Pslliodes chalmomera*), musk thistle crown weevil (*Trichosirocalus horridus*), and musk thistle seed head fly (*Urophora solstitialis*) are approved, effective biocontrol agents.
- Cultural: Increased competition from desirable plants is effective proper management of perennial grasses helps greatly.
- Physical/Mechanical: Digging and pulling is effective when most of the tap root is removed.

7.0 TIMING OF MANAGEMENT

Weed management will occur in three phases: pre-construction, during construction, and post construction. Weed infestations can occur and/or be discovered in each phase. The pre-construction phase details the weed inventory prior to construction activities and aids in determining if new weed populations were brought into the area due to construction activities. Post construction monitoring will take place during yearly reclamation monitoring to determine if the weed populations are under control or if treatment is required.

7.1 Pre-Construction

All vehicles should be cleaned before entering the $GUCO_2$ project area during all inventories as a preventative measure. The pre-construction weed inventory was conducted in August 2011 and found musk thistle, diffuse knapweed, spotted knapweed, Canada thistle, showy milkweed, cheatgrass, wild licorice, curlycup gumweed, , and foxtail barley were all present in the project area. Halogeton was found outside the project area. Cleaning of vehicles and equipment should be conducted to keep the species from establishing in the project area.

Elk will conduct pre-construction spraying in the $GUCO_2$ project area for species listed above according to pesticide label directions. The pre-construction spraying may decrease the spread of designated and declared weeds and weeds of concern once construction crews are on site. Elk will need to notify the BLM-LFO and submit a PUP and pesticide labels before completing this action.

7.2 During Construction

To ensure protection of the $GUCO_2$ project area from introduction of invasive weeds and to ensure weed control, the following items will be implemented:

1) To the best available, gravel and mineral materials transported to the $GUCO_2$ project area will be weed free.
2) Construction equipment and vehicles are required to be certified weed free when arriving on the project. This will be verified through inspection of equipment and vehicles from all accessible points, including use of mirrors as necessary. Inspections will be conducted by the Compliance Coordinator (CC) (consultant for Elk) acting on behalf of the BLM.
3) The extent of vegetation or soil disturbance will be limited to the minimum required to safely perform construction activities as designed. This will be established in the APD, flagged/marked on-the-ground, and enforced by the CC.
4) Disturbed areas not needed as work areas/road surfaces, such as road ditches, will be reclaimed/re-seeded within six months of initial disturbance. This timeframe will be dependent on the presence of wildlife stipulations.
5) Certified weed free seed (blue tag seed) will be used during reclamation of disturbed areas within the project area. The seed mix to be will be recommended by the BLM-LFO.
6) Hay, straw, or other material used as mulch within the project area will be weed free.

7.3 Post-Construction

Weed inventory/monitoring will continue post-construction and will follow the guidelines presented in Section 6. Mapping of weed populations within the $GUCO_2$ project area will continue into off-project areas if the weed population extends off the site and is a direct result of the project. Elk will treat infestations of weeds that occur within the $GUCO_2$ project area and weeds in the adjacent undisturbed area, if these are a direct result of the $GUCO_2$ project.

To ensure protecting of the $GUCO_2$ project area from the spread of weeds during maintenance and operations, the access roads will be surveyed for weeds as stated in Section 9.1.

8.0 MONITORING AND RECORD KEEPING

Elk will collect and maintain all records pertaining to the control and management of weeds within the $GUCO_2$ project area. This includes, but is not limited to, the following: inventories, treatments, monitoring, and re-infestation trends as related to frequency of re-occurrence in specific areas, and the rate of spread of existing infestations. The reports will be written and submitted annually. Elk or its contractor will provide these reports to BLM-LFO Authorized Officer Representative (AOR).

8.1 Monitoring

This section provides for monitoring of the $GUCO_2$ project area for noxious and invasive weeds. Monitoring by Elk or an approved contractor will commence the first growing season after the disturbed areas in the $GUCO_2$ project area have been seeded and yearly thereafter, in order to track vegetation trends and weed presence/absence. For example, if the area was seeded in the fall, then monitoring will start in the spring/summer of the following year. If the area was seeded in the spring, then monitoring will start in the summer.

Each year, during interim reclamation monitoring of the $GUCO_2$ project area, a weed inventory will be conducted. Inventories will be in accordance with protocols contained in the North American Invasive Plant Mapping Standards (NAWMA 2002). The findings will be provided in the interim reclamation report submitted to the Bureau of Land Management-Lander Field Office (BLM-LFO) by Elk or contractor for Elk by December 31 of each year. All monitoring forms will be included in an appendix of the interim reclamation report and can be directly input into the BLM-LFO GIS geodatabase as necessary. An Excel file will be provided to the BLM-LFO for inventory reporting and treatment tracking. Weed locations will be in a shapefile and in UTM Zone 13, NAD 83, meters. All invasive weed inventory data will be provided to the BLM-LFO annually. Surveys, as well as monitoring, will continue throughout the life of the $GUCO_2$ project. The intent of post-construction inspections is not only to identify and inventory new infestations, but also to maintain control of weeds before seed is set and dispersed. Elk will also inspect for invasive weed populations which extend off the Grieve Unit CO2 EOR project if the weed population is a direct result of the project.

8.2 Report Submittal

There are three types of reports to be submitted annually—the Annual Report (as part of the interim reclamation monitoring report), pesticide application records (PAR), and pesticide use reports (PUR).

8.3 Annual Report

Elk will submit an annual Reclamation Monitoring Report to the BLM-LFO AOR. Weed inventory information is a part of the annual reporting requirements for the $GUCO_2$ project. Included are percent cover of invasive weeds and the species present, as well as listing of the following: weed treatment contractor, contractor license number and expiration date, date(s) treated, and methods of treatments applied (chemical, biological, mechanical).

8.4 Pesticide Application Records

These records will be filled out within 24 hours of each herbicide application. Completed forms will be submitted to the LFO WMS at the end of each month. The following information will be recorded on each form: date and time of herbicide application; herbicides, adjuvant, and surfactants used; rates applied; weather and site conditions, and monitoring comments on the site.

8.5 Pesticide Use Report

A summary report of all application activity, the Pesticide Use Report (PUR), will be submitted at the end of the treatment season, along with the final months' PARs. PARs are due monthly to the AO/Weed Coordinator at the BLM-LFO for each month that pesticides are applied on BLM lands. A PUR can be submitted with each month's PARs summarizing each month's herbicide usage (preferred BLM method), in lieu of submitting one annual summary at the end of the season. The weed control contractor will be responsible for filling out these reports and

submitting them to Elk or to the BLM-LFO on Elk's behalf. This report will include herbicide usage by trade names, rates, species treated, and acres treated.

9.0 FEDERAL LAWS, REGULATIONS, AND POLICIES AFFECTING BLM WEED CONTROL

1) Federal Land Policy and Management Act of 1976, as amended.
2) Public Rangelands Improvement Act of 1978.
3) Carlson-Foley Act of 1968.
4) Federal Noxious Weed Act of 1974, as amended by Sec. 15 - Management of Undesirable Plants on Federal Lands, 1990.
5) Final Environmental Impact Statement for Vegetation Treatments on BLM Lands in 17 Western States, 2007.
6) Wyoming Weed and Pest Control Act 1973.
7) Executive Order 13112 (Invasive Species), signed on February 3, 1999.
8) Departmental Manual 517.
9) Departmental Manual 609.
10) BLM Manual 9011 and Handbook H-9011-1.
11) BLM Manual 9014.
13) BLM Manual 9015.

10.0 REFERENCES

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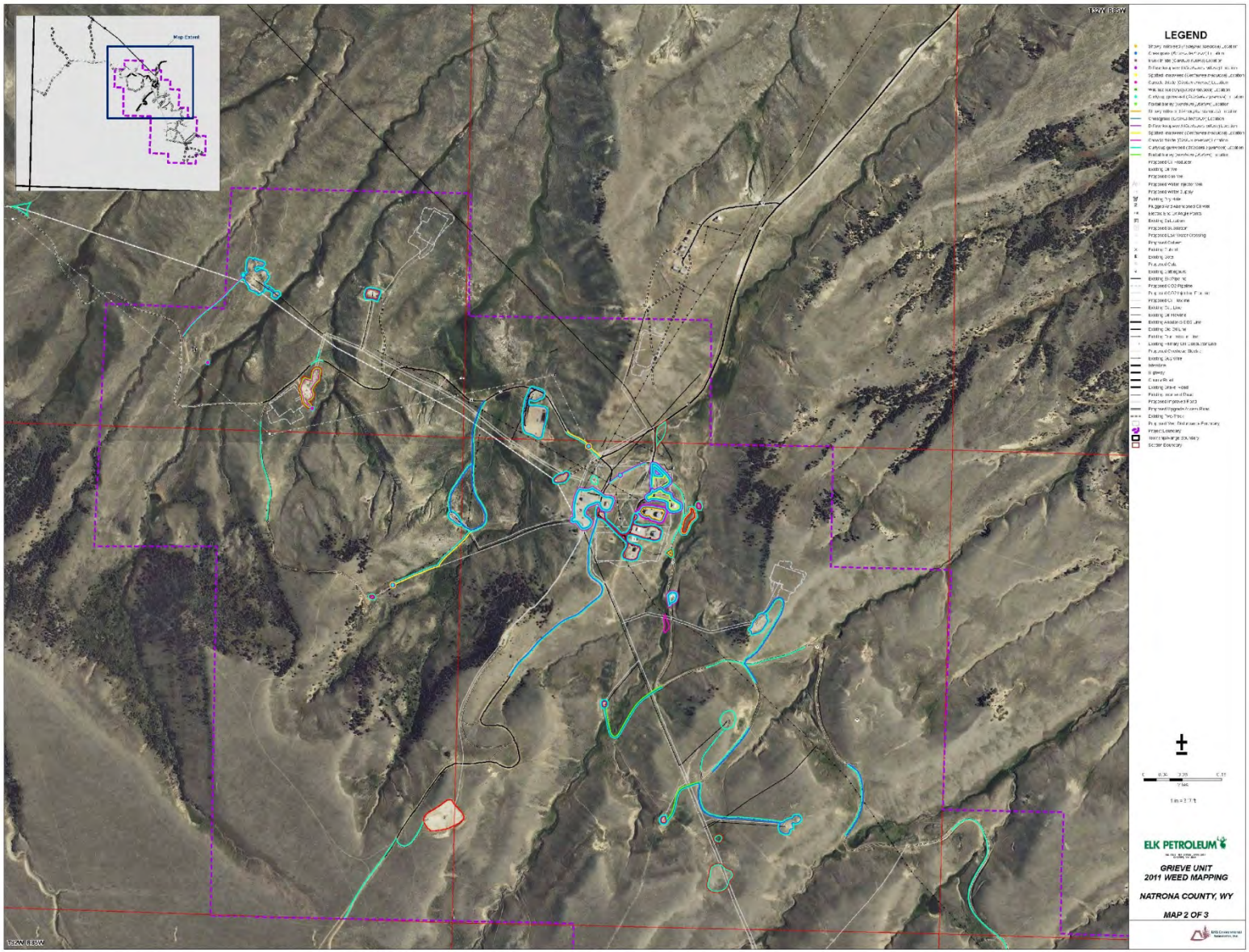
LEGEND
ELK PETROLEUM
GRIEVE UNIT
2011 WEED MAPPING
NATRONA COUNTY, WY
MAP 1 OF 3


LEGEND
ELK PETROLEUM
GRIEVE UNIT
2011 WEED MAPPING
NATRONA COUNTY, WY
MAP 2 OF 3

LEGEND
ELK PETROLEUM
GRIEVE UNIT
2011 WEED MAPPING
NATRONA COUNTY, WY
MAP 3 OF 3

Appendix F: Resource Clearances

Cost code: 1311 EJ		**Project Leader: Krassin**	**NEPA Number: WY-050-EA11-108**
	Brief project description : Construct, drill, maintain and operator the Grieve Unit CO_2 Enhanced Recovery Project		
	Lease number:	**Unit name: Grieve Unit**	**Unit number: WYW109538X**
	County: Fremont	**Legal: T. 32N, R. 85W**	
	Conformity with RMP & EISs? Consistent with lease rights in a high potential oil and gas area.		External scoping needed? no
	Purpose and Need and Proposed Action – yes; EA		Priority: High
	T&E Clearance- Received	Cultural clearance? received	NEPA clearance?
	Resource/use	**Specialist**	**Signature**
	Air resources/Climate	Krassin	
	Geology/Cave-Karst	~~n/a~~ Jon Sunderland	
	Soil/Water	Krassin	
	Minerals	Krassin	
	Fire and Fuels	n/a	
	Vegetation	Krassin	
	Riparian areas	n/a	
	Weeds	Krassin	
	Wild horses	n/a	
	Wildlife/Special Status	T. Vosberg	Tim Vosberg 7/24/12
	Cultural	K. Bryan	Craig Bromley 7/26/2012
	Visual Resources	J. Oakleaf	07/26/12
	Realty	L. Rinker	07/25/2012
	Livestock Grazing	J. Mott	Judi Mott
	Recreation	J. Oakleaf	07/26/12
	Trails and Travel Management	n/a	07/26/12
	Special Designations	n/a	
	Social/Economic/EJ	Krassin	
	Health and Safety)	Krassin	
	Assistant Field Manager	Jon Kaminsky	

DEPARTMENT OF INTERIOR
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LANDER FIELD OFFICE

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050-2012-016
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050-2012-018
050-2012-020
050-2012-132
050-2012-147
050-2012-148

TO: Land/Minerals Examiners

FROM: Karina Bryan, Archeologist

DATE: July 23, 2012

SUBJECT: Results of a Cultural Resource Inventory for **Elk Petroleum, Inc.** (Case No. **WYW-015814, WYW-015815, WYW-015824, WYW-016008, WYW-168210**)

In May to October of 2011 and April and June of 2012, **Western Archaeological Services** conducted Class III inventories of the proposed **Grieve Unit Enhanced Oil Recovery Project (APDs and Sundries except Grieve Unit #57/60 Well Pad), Natrona County, Wyoming** (Report Nos. **050-2012-016, 050-2012-017, 050-2012-018, 050-2012-020, 050-2012-132, 050-2012-147, 050-2012-148**). Two prehistoric cairn sites, 48NA4949 and 48NA4950, were found and following tribal consultation were determined eligible. The Northern Arapaho and Eastern Shoshone tribes requested a small relocation of the Grieve Unit 57/60 well pad to avoid site 48NA4950 and temporary construction fencing to protect the site. There is a potential for buried cultural materials to be present at the western end of the project area.

Legal Description: **T32N R85W Section 5, 6, 8, 9, 15-19, 21-23, 26, 27**

Quad(s): **McCleary Reservoir, Horse Creek Springs, Eightmile Draw 7.5'**

Cultural resources found? No / / Yes /**X**/, #'s: **IR's 1-13 (isolated prehistoric artifacts); 48NA5, 48NA257, 48NA1011, 48NA4940, 48NA4941, 48NA4942, 48NA4943, 48NA4947, 48NA4949, 48NA4950 (prehistoric camp sites, stone circles, and cairns); 48NA3052 (historic Alcova to Copper Mountain Transmission Line); 48NA4946 (historic cabins); 48NA4948 (historic telephone line)**

N.R. Eligible resources found? No / / Yes /**X**/, #'s: **48NA5, 48NA257, 48NA4940(?), 48NA4943(?), 48NA4949, 48NA4950**

N.R. Eligible resources affected? No /**X**[1]/ Yes / /, #'s: _____

[1] Karina Bryan accompanied Northern Arapaho elders to the project area on October 28, 2011, and Eastern Shoshone elders to the area on November 2, 2011. Both tribes requested a small relocation of the Grieve Unit 57/60 well pad and temporary construction fencing to protect site 48NA4950. Both tribes felt the proposed project already had a sufficient avoidance distance for site 48NA4949. The four other eligible or potentially eligible sites are outside the area of potential effect for this project.

SHPO Concurrence with above granted?
Not necessary /**X**/ No / / Yes / /, SHPO Ref. #:_____

Cultural clearance recommended? No / / Yes, with stipulations /**X**/

Recommended Stipulations:

1. **CULTURAL AND PALEONTOLOGICAL RESOURCES STIPULATION**. Any cultural and/or paleontological resource (historic or prehistoric site or object or fossil) discovered by the holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the authorized officer. Holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer. An evaluation of the discovery will be made by the authorized officer to determine appropriate actions to prevent the loss of significant cultural or scientific values. The holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures shall be made by the authorized officer after consulting with the holder.

Field Archeologist, Lander

Field Manager, Lander

DEPARTMENT OF INTERIOR
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LANDER FIELD OFFICE

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050-2012-016
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TO: Land/Minerals Examiners

FROM: Karina Bryan, Archeologist

DATE: July 23, 2012

SUBJECT: Results of a Cultural Resource Inventory for **Elk Petroleum, Inc.** (Case No. **WYW-015814, WYW-015815, WYW-015824, WYW-016008, WYW-168210**)

In May to October of 2011 and April and June of 2012, **Western Archaeological Services** conducted Class III inventories of the proposed **Grieve Unit Enhanced Oil Recovery Project (Grieve Unit #57/60 Well Pad), Natrona County, Wyoming** (Report Nos. **050-2012-016, 050-2012-017, 050-2012-018, 050-2012-020, 050-2012-132, 050-2012-147, 050-2012-148**). Two prehistoric cairn sites, 48NA4949 and 48NA4950, were found and following tribal consultation were determined eligible. The Northern Arapaho and Eastern Shoshone tribes requested a small relocation of the Grieve Unit 57/60 well pad to avoid site 48NA4950 and temporary construction fencing to protect the site. There is a potential for buried cultural materials to be present at the western end of the project area.

Legal Description: **T32N R85W Section 5, 6, 8, 9, 15-19, 21-23, 26, 27**

Quad(s): **McCleary Reservoir, Horse Creek Springs, Eightmile Draw 7.5'**

Cultural resources found? No / / Yes /**X**/, #'s: **IR's 1-13 (isolated prehistoric artifacts); 48NA5, 48NA257, 48NA1011, 48NA4940, 48NA4941, 48NA4942, 48NA4943, 48NA4947, 48NA4949, 48NA4950 (prehistoric camp sites, stone circles, and cairns); 48NA3052 (historic Alcova to Copper Mountain Transmission Line); 48NA4946 (historic cabins); 48NA4948 (historic telephone line)**

N.R. Eligible resources found? No / / Yes /**X**/, #'s: **48NA5, 48NA257, 48NA4940(?), 48NA4943(?), 48NA4949, 48NA4950**

N.R. Eligible resources affected? No /**X**[1]/ Yes / /, #'s: _____

[1] Karina Bryan accompanied Northern Arapaho elders to the project area on October 28, 2011, and Eastern Shoshone elders to the area on November 2, 2011. Both tribes requested a small relocation of the Grieve Unit 57/60 well pad and temporary construction fencing to protect site 48NA4950. Both tribes felt the proposed project already had a sufficient avoidance distance for site 48NA4949. The four other eligible or potentially eligible sites are outside the area of potential effect for this project.

SHPO Concurrence with above granted?
Not necessary /**X**/ No / / Yes / /, SHPO Ref. #:_____

Cultural clearance recommended? No / / Yes, with stipulations /**X**/

Recommended Stipulations:

1. **CULTURAL RESOURCES, SITE AVOIDANCE**. The holder shall adhere to the proposed well pad relocation delineated in the field within the following legal locations:

   T.32N., R.85W., Sections 22 N½SW¼NE¼, S½NW¼NE¼ (Grieve Unit 57/60 well pad)

   Violation of this stipulation may result in the holder being subject to the penalties and actions contained in the 43CFR7 Regulations, which are on file at all BLM offices.

2. **CULTURAL RESOURCES, SITE AVOIDANCE**. Prior to any surface disturbing activities, the holder shall install temporary protective fencing along the north and east edges of the well pad within the following legal locations:

   T.32N., R.85W., Section 22 N½SW¼NE¼, S½NW¼NE¼ (Grieve Unit 57/60 well pad)

   Prior to installation, locations and types of fencing shall be determined by the authorized officer after consulting with the holder. The fencing shall be left in place until all work under this authorization is completed. Violation of this stipulation may result in the holder being subject to the penalties and actions contained in the 43CFR7 Regulations, which are on file at all BLM offices.

3. **CULTURAL AND PALEONTOLOGICAL RESOURCES STIPULATION**. Any cultural and/or paleontological resource (historic or prehistoric site or object or fossil) discovered by the holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the authorized officer. Holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer. An evaluation of the discovery will be made by the authorized officer to determine appropriate actions to prevent the loss of significant cultural or scientific values. The holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures shall be made by the authorized officer after consulting with the holder.

Kevin M. Bryan
Field Archeologist, Lander

Field Manager, Lander

DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
LANDER FIELD OFFICE

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050-2012-148

TO: Land/Minerals Examiners

FROM: Karina Bryan, Archeologist

DATE: July 23, 2012

SUBJECT: Results of a Cultural Resource Inventory for **Elk Petroleum, Inc.** (Case No. **WYW-015814, WYW-015815, WYW-015824, WYW-016008, WYW-168210**)

In May to October of 2011 and April and June of 2012, **Western Archaeological Services** conducted Class III inventories of the proposed **Grieve Unit Enhanced Oil Recovery Project (ROWs), Natrona County, Wyoming** (Report Nos. **050-2012-016, 050-2012-017, 050-2012-018, 050-2012-020, 050-2012-132, 050-2012-147, 050-2012-148**). Two prehistoric cairn sites, 48NA4949 and 48NA4950, were found and following tribal consultation were determined eligible. The Northern Arapaho and Eastern Shoshone tribes requested a small relocation of the Grieve Unit 57/60 well pad to avoid site 48NA4950 and temporary construction fencing to protect the site. There is a potential for buried cultural materials to be present at the western end of the project area.

Legal Description: **T32N R85W Section 5, 6, 8, 9, 15-19, 21-23, 26, 27**

Quad(s): **McCleary Reservoir, Horse Creek Springs, Eightmile Draw 7.5'**

Cultural resources found? No / / Yes /**X**/, #'s: **IR's 1-13 (isolated prehistoric artifacts); 48NA5, 48NA257, 48NA1011, 48NA4940, 48NA4941, 48NA4942, 48NA4943, 48NA4947, 48NA4949, 48NA4950 (prehistoric camp sites, stone circles, and cairns); 48NA3052 (historic Alcova to Copper Mountain Transmission Line); 48NA4946 (historic cabins); 48NA4948 (historic telephone line)**

N.R. Eligible resources found? No / / Yes /**X**/, #'s: **48NA5, 48NA257, 48NA4940(?), 48NA4943(?), 48NA4949, 48NA4950**

N.R. Eligible resources affected? No /**X**[1]/ Yes / /, #'s: _____

[1] Karina Bryan accompanied Northern Arapaho elders to the project area on October 28, 2011, and Eastern Shoshone elders to the area on November 2, 2011. Both tribes requested a small relocation of the Grieve Unit 57/60 well pad and temporary construction fencing to protect site 48NA4950. Both tribes felt the proposed project already had a sufficient avoidance distance for site 48NA4949. The four other eligible or potentially eligible sites are outside the area of potential effect for this project.

SHPO Concurrence with above granted?
Not necessary /**X**/ No / / Yes / /, SHPO Ref. #:_____

Cultural clearance recommended? No / / Yes, with stipulations /**X**/

Recommended Stipulations:

1. **CULTURAL RESOURCES, MONITORING/TRENCH INSPECTION**. The holder of this authorization shall provide an archeologist, with a current BLM Cultural Resources Use Permit, to monitor ground clearing operations and inspect the open pipeline trench at the following locations:

   T.32N., R.85W., Section 19 All (access roads, powerlines, pipeline, and Buffalo Head Switchyard)

   Blade Monitoring: The archeologist shall notify the authorized officer prior to beginning blade monitoring. Construction methods shall be utilized which will allow the identification of cultural resources without endangering the personnel monitoring the construction activities. The archeologist shall specify the depths of cuts made by earth-moving equipment, and the holder must comply with the archeologist's requirements. Monitoring shall continue until work is completed or until strata that could possibly contain cultural resources will no longer be disturbed. If potentially significant cultural resources are identified, and the archeologist determines that further operations will affect the resource, the holder shall suspend all activities in the vicinity of such a discovery until notified to proceed by the authorized officer. The authorized officer will evaluate, or will have evaluated, such discoveries in accordance with the ***Blading Monitor and Open Trench Inspection Discovery Plan for the Grieve Unit CO_2 Powerline, Powerline Access Roads, and CO_2 Pipeline Alternate Route 2***. The decision as to the appropriate measures to mitigate adverse effects to significant cultural resources shall be made by the authorized officer after consulting with the holder.

   Open Trench Inspection. Open trench inspection shall take place before soil, lines, or other material are placed in the trench.

   The archeologist shall notify the authorized officer prior to beginning the open pipeline trench inspection. Soil stratigraphy shall be recorded whether or not cultural resources are discovered. If cultural resources are discovered in the trench, the authorized officer will evaluate, or will have evaluated, such discoveries in accordance with the ***Blading Monitor and Open Trench Inspection Discovery Plan for the Grieve Unit CO_2 Powerline, Powerline Access Roads, and CO_2 Pipeline Alternate Route 2***. The decision as to the appropriate measures to mitigate adverse effects to significant cultural resources shall be made by the authorized officer after consulting with the holder.

   Treatment of cultural resources discovered: Excavations, methods, analysis, results, and report write-up shall follow guidelines as outlined in the ***Blading Monitor and Open Trench Inspection Discovery Plan for the Grieve Unit CO_2 Powerline, Powerline Access Roads, and CO_2 Pipeline Alternate Route 2***.

   The holder shall be responsible for the cost of monitoring, inspections, any investigations necessary for the evaluation of discoveries, and for any mitigative measures.

   Within 5 working days, the holder shall notify BLM of the date construction is completed.

   A report of all archeological activities, including descriptions of soil stratigraphy, shall be submitted to the authorized officer within 30 days of completion of the field work. **If the report is not completed within 30 days of the end of construction, the archaeologist shall notify BLM of the preliminary results in writing or via email, reason for the delay, and estimated report completion date.** If the report is authorized as preliminary, a final report shall be submitted to the authorized officer within 6 months of completion of field work.

2. **CULTURAL AND PALEONTOLOGICAL RESOURCES STIPULATION**. Any cultural and/or paleontological resource (historic or prehistoric site or object or fossil) discovered by the holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the authorized officer. Holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer. An evaluation of the discovery will be made by the authorized officer to determine appropriate actions to prevent the loss of significant cultural or scientific values. The holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures shall be made by the authorized officer after consulting with the holder.

Kara M. Bryan
Field Archeologist, Lander

Field Manager, Lander

Application Date: 06/13/2011
Lease/Permit Number: State (surface hole location) WYW 051824 (bottom hole location)
Project Name: Grieve Unit Well #53

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF LAND MANAGEMENT
WILDLIFE CLEARANCE EVALUATION AND CONSULTATION FORM
LANDER FIELD OFFICE

To: Wildlife Biologist
From: Melanie Leavenworth, Legal Assistant
Subject: Request for Wildlife Clearance and Evaluation

Company Name and/or Project Name: Elk Petroleum, Inc.
Legal Location: T. 32 N., R. 85 W., 6th P.M., Sec. 16, SWSE (bottom hole location: T. 32 N., R. 85 W., 6th P.M., Sec. 21, NWNE) (See attached request and map)
Description of Proposed Action: APD to drill C02 Injection well, associated pipelines & access roads. Surface hole location is STATE, Bottom hole location is BLM.
Quad: Horse Creek Springs
Stips: None

Response: Data Review and Determination of Impact on Wildlife Habitat and Threatened or Endangered Species
To: Initiating Officer

This memo will become an appendix to the Environmental Documentation for this project. This proposal and relative data have been analyzed as to the impact of the proposed action.

**Coordination with Wyoming Game and Fish Department (IS) (IS NOT) recommended. Coordination may be needed due to unusual or excessive negative effects on big game, sage-grouse, riparian areas, fisheries, other priority species or potentially controversial actions.

Threatened, Endangered, and Proposed Species Clearance Form

ENDANGERED, THREATENED, OR PROPOSED SPECIES	HABITAT DESCRIPTION	PROJECT EFFECT CALL	CONSULTATION REQUIRED	JUSTIFICATION FOR EFFECTS DETERMINATION
Canada lynx (Threatened)	Coniferous forests with abundant snowshoe hare populations.	NE	Yes | (No)	X No suitable habitat present
Black-footed ferret (Endangered) c White-tailed Prairie Dog	Large prairie dog complexes	NE	Yes | (No)	X Area not suitable for reintroduction efforts c No habitat present or action is within a block cleared area c Within prairie dog town; not block-cleared; survey required
Grizzly Bear (Threatened)	Extensive forest cover interspersed with grasslands and meadows.	NE	Yes | (No)	X No suitable habitat present
Blowout Penstemon (Endangered)	Active sand dunes	NE	Yes | (No)	X No suitable habitat present c Suitable habitat present; survey required or presence assumed
Ute ladies'-tresses (Threatened)	Seasonally moist soils and wet meadows of drainages below 7,000 feet	NE	Yes | (No)	X No suitable habitat present c Suitable habitat present; survey required or presence assumed
Desert yellowhead (Threatened)	Barren slopes and ridges on outcrops of white silty clay or Miocene sandstones of the Split Rock Formation.	NE	Yes | (No)	X No suitable habitat present

Critical Habitat for the Desert yellowhead	Only one known location in the Beaver Rim area of southern Fremont County.	NE	Yes | No	C Not in critical habitat for desert yellowhead.
Platte River Water Depletions (5 listed species and designated critical habitat)	Downstream riparian and riverine habitat of the Platte River System Whooping Crane – Endangered Interior Least Tern – Endangered Piping Plover – Threatened Pallid Sturgeon – Endangered Western Prairie Fringed Orchid –Threatened Critical Habitat for: Whooping Crane Piping Plover	NE	Yes | No	C Action will not deplete water from the Platte River System C Action will cause depletion to the Platte River system; consultation required C See comments for further restrictions and water source
Gray wolf (Non-essential, experimental population)	Habitats with abundant ungulate prey, secluded (i.e. forested) denning and rendezvous sites, and low levels of human activity.	NE	Yes | No	C No suitable habitat present. Project not in recovery area. No established populations in project area. C Project in suitable habitat; consultation required.
Mountain Plover, (Proposed)	Habitats characterized by large areas of flat shortgrass prairie or very low shrubs with a prevalence of bare ground. Presence of prairie dog towns is a common characteristic of occupied plover nesting habitats.		Yes | No	C No suitable habitat present. C Project in suitable habitat.

**Project effect determinations for T&E species are: no effect (NE); may affect (MA); not likely to adversely affect (NLAA); likely to adversely affect (LAA); Likely to jeopardize population (LJ): or not likely to jeopardize population (NLJ). Project effect determinations for candidate species are: will not contribute to the need to list (WNC); will contribute to the need to list (WC).

**Initiation of (FORMAL) (INFORMAL) consultation with U. S. Fish and Wildlife Service (IS) (IS NOT) necessary.

Sarah Heeg-NRS — 6/30/2011

Wildlife Biologist — Date

BLM Consultation Letter Sent	FWS Consultation Letter Reply	Wildlife Biologist Initial
Date:	Date:	

SEO Letter Sent	SEO Letter Reply	Wildlife Biologist Initial
Date:	Date:	

WILDLIFE / RESOURCE CONCERN	HABITAT	DESIGNATED OR SUITABLE HABITAT	COA STIPULATION APPLIES	COA STIPULATION TIMING RESTRICTION
Sage Grouse Lek (Core Area)	Avoid disturbance or occupancy within 0.6 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.6 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat.	Yes | No	Yes | No	March 1 – July 15 No surface Disturbance!
Sage Grouse Core	PIAA required and completed	Yes | No		
Sage Grouse Lek (non-Core Area)	Avoid disturbance or occupancy within 0.25 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.25 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (non-Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat within mapped habitat important for connectivity or within 2 miles of any occupied or undetermined lek.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Winter Habitat	Surface disturbing and/or disruptive activities are prohibited or restricted in mapped or modeled winter habitats/concentration areas that support Core Area populations.	Yes | No	Yes | No	Nov 15 – March 1
Raptors (General)	Avoid surface disturbance or occupancy within a 0.75 mile buffer of raptor nests.	Yes | No	Yes | No	Feb 1 – July 31 Or until young have fledged.
Bald Eagle	Lakes, rivers and other large water bodies suitable for foraging with large trees for nesting and roosting	Yes | No	Yes | No	c No nest, roost, or feeding concentrations present. c Nest within 1 mile: Apply NSO Buffer c Roost within 1 mile: NSO and timing restrict. Nov 1 – Mar 31 c Other restrictions apply, see comments
Mountain Plover	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable Mountain Plover nesting habitat.	Yes | No	Yes | No	April 10 – July 10
Big Game Crucial Winter Range And Elk Winter Range	Delineated by WGFD/BLM	Yes | No	Yes | No	Nov 15 - April 30
Big Game Parturition Areas	Delineated by WGFD/BLM	Yes | No	Yes | No	May 1 - June 30
Riparian Areas	Move Project > 500 feet from perennial streams/live water	Yes | No	Yes | No	Riparian Areas

COMMENTS:

Date of Field Visit: 6/15/2011

Photos Attached: YES or NO

Sarah Heeg-NRS 6/30/2011

Wildlife Biologist (DATE)

BLM SENSITIVE SPECIES	HABITAT	POTENTIAL HABITAT	COA /TLS/ STIPULATION APPLIES	COA /TLS/ STIPULATION
BIRDS OF PREY:				
Northern Goshawk	Conifer and deciduous forests	Yes | No	Yes | No	
Ferruginous Hawk	Basin – prairie shrub, grassland, rock outcrops	Yes | No	Yes | No	
Burrowing Owl	Grasslands, basin-prairie shrub	Yes | No	Yes | No	
Peregrine Falcon	Tall Cliffs	Yes | No	Yes | No	
BATS:				
Long-eared Myotis	Conifer and deciduous forest, caves and mines	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Spotted Bat	Cliffs over perennial water, basin-prairie shrub	Yes | No	Yes | No	See comments for additional restrictions
Townsend's Big-eared Bat	Forests, basin-prairie shrub, caves and mines	Yes | No	Yes | No	
PRAIRE DOGS:				Avoid burrows and colonies where possible
White-tailed	Basin prairie shrub, grasslands	Yes | No	Yes | No	See comments for additional restrictions
GRASSLAND OBLIGATES:				Avoid habitat where possible and minimize disturbance
Swift Fox	Grasslands	Yes | No	Yes | No	
Long-billed Curlew	Grasslands, plains, foothills, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
SAGEBRUSH OBLIGATE BIRDS:				
Sage Thrasher	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Loggerhead Shrike	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	See comments for additional restrictions
Sage Sparrow	Basin prairie shrub, mountain foothill shrub	Yes | No	Yes | No	
Brewer's Sparrow	Basin-prairie shrub	Yes | No	Yes | No	
Pygmy Rabbit	Basin-prairie and riparian shrub	Yes | No	Yes | No	
RIPARIAN/WETLAND OBLIGATES:				
Yellow-billed Cuckoo	Open woodlands, streamside willow and alder groves	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
White-faced Ibis	Marshes, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
Trumpeter Swan	Lakes, ponds, rivers	Yes | No	Yes | No	
Northern Leopard Frog	Beaver ponds, permanent water in plains and foothills	Yes | No	Yes | No	
Great Basin spadefoot	Spring seeps, permanent and temporary waters	Yes | No	Yes | No	
Boreal toad (Northern Rocky Mtn.	Pond margins, wet meadows, riparian areas.	Yes | No	Yes | No	

population)				
Spotted frog	Ponds, sloughs, small streams	Yes | No	Yes | No	
Yellowstone cutthroat trout	Yellowstone drainage, small mountain streams and large rivers	Yes | No	Yes | No	
PLANTS:				
Meadow Pussytoes	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4,950' – 7,900'	Yes | No	Yes | No	
Porter's Sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes Elevation: 5,300 – 6,500 feet	Yes | No	Yes | No	
Dubois Milkvetch	Barren shale, badlands, limestone, and redbed slopes and ridges 6,900' – 8,800"	Yes | No	Yes | No	
Limber Pine	Timberline and at lower elevation with sagebrush. Associated species are Rocky Mountain lodgepole pine, Engelmann spruce, whitebark pine, Rocky Mountain Douglas-fir, subalpine fir, Rocky Mountain juniper, Mountain Mahogany, and common juniper.	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Cedar Rim Thistle	Barren, chalky hills, gravelly slopes and fine-textured, sandy/shaley draws 6,700' – 7,200'	Yes | No	Yes | No	See comments for additional restrictions
Owl Creek Miner's	Sandy-gravelly slopes on sandstone of the Wind River Formation 4,700' – 6,000'	Yes | No	Yes | No	
Fremont Bladderpod	Rocky limestone slopes and ridges 7,000' – 9,000'	Yes | No	Yes | No	
Beaver Rim Phlox	Sparsely vegetated slopes on sandstone, siltstone, or limestone substrates 6,000' – 7,4000'	Yes | No	Yes | No	
Rocky Mountain Twinpod	Sparsely vegetated, rocky slopes of limestone, sandstone or clay 5,600' – 8,300'	Yes | No	Yes | No	
Persistent Sepal Yellowcress	Riverbanks and shorelines, usually on sandy soils near high water line.	Yes | No	Yes | No	
Shoshonea	Shallow, stony calcareous soils of exposed limestone outcrops, ridgetops, and talus slopes 5,900' – 9,200'	Yes | No	Yes | No	
Barneby's Clover	Ledges, crevices and seams on reddish-cream Nugget Sandstone outcrops 5,600' – 6,700'	Yes | No	Yes | No	

COMMENTS:

Wildlife Biologist: Sarah Hegg 6/30/20
-NRS

LANDER FIELD OFFICE

Form 3160-3
(August 2007)

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-015824 (Bottomhole)

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☐ Oil Well ☐ Gas Well ☑ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #53

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address 123 West 1st Street, Suite 550
Casper, WY 82601

3b. Phone No. *(include area code)*
307-265-3326

10. Field and Pool, or Exploratory
Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface 105' FSL, 1945' FEL (SWSE), Section 16, T32N, R85W
At proposed prod. zone 355' FNL, 2301' FEL (NWNE), Section 21, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 16, T32N, R85W (Surface)

14. Distance in miles and direction from nearest town or post office*
Approximately 19 miles south of Powder River, Wyoming

12. County or Parish
Natrona

13. State
WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) 355'

16. No. of acres in lease
600

17. Spacing Unit dedicated to this well
40 acres

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. ≈210'

19. Proposed Depth
6550'

20. BLM/BIA Bond No. on file
800346757

21. Elevations (Show whether DF, KDB, RT, GL, etc.)
6814' GL

22. Approximate date work will start*
02/01/2012

23. Estimated duration
20 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature [signature] Name *(Printed Typed)* Ralph Schulte Date 6/8/2011

Title
Engineering Manager, Elk Petroleum

Approved by *(Signature)* Name *(Printed Typed)* Date

Title Office

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

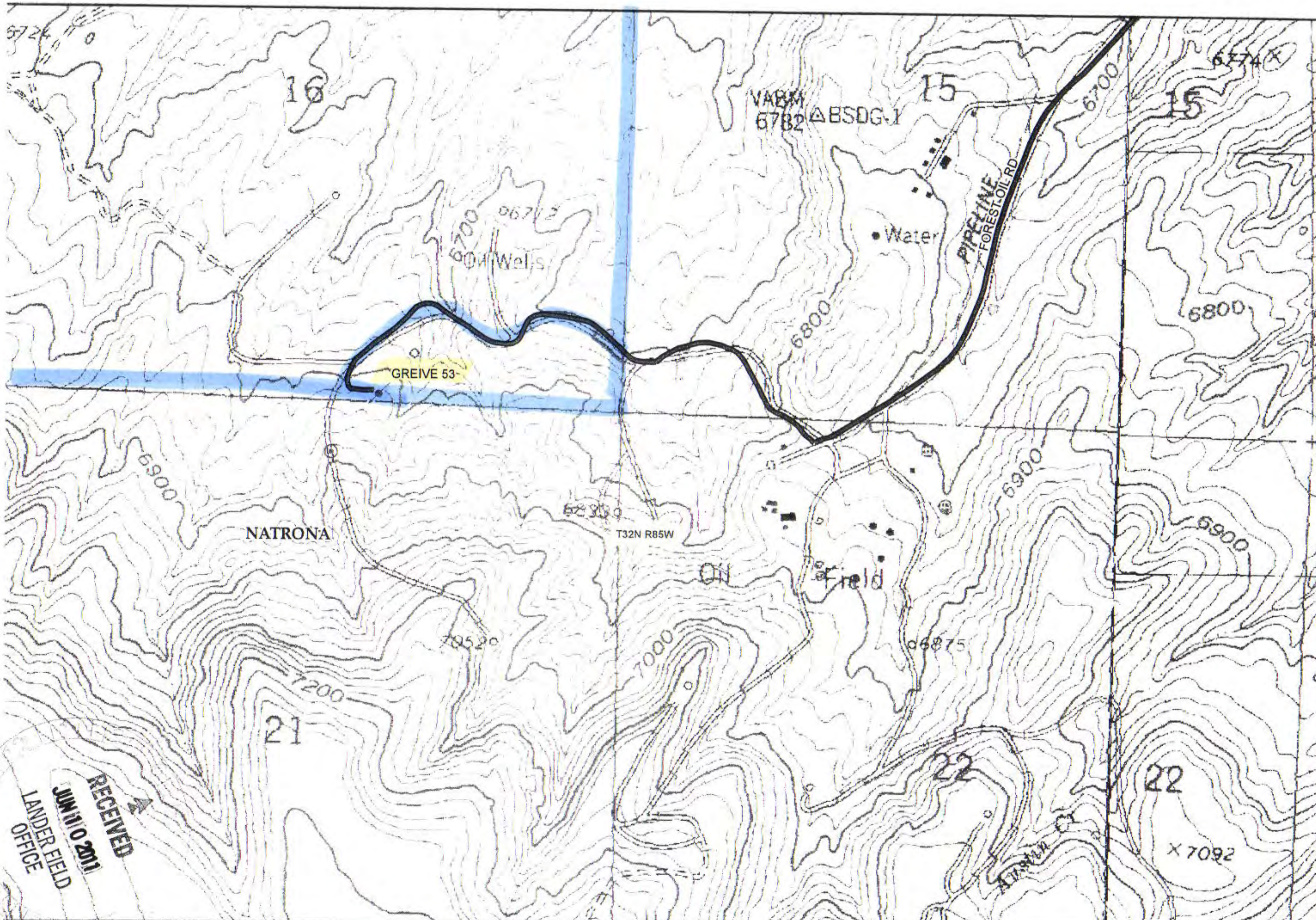
Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)

RECEIVED
JUN 10 2011
LANDER FIELD OFFICE

Posted 6/10/11



LEGEND

- PROPOSED C02 INJECTOR WELL, GRIEVE UNIT #53
- PROPOSED BOTTOM HOLE CO2 LOCATION, GRIEVE UNIT #53
- ACCESS ROAD TO GRIEVE #53 WELL

DATE	REFERENCE DOCUMENTS	REV NO	REVISIONS	BY	DATE
JUNE11	EPIC Z:SITE/ELK PETROLEUM				
JUNE11	ELK PETROLEUM				
APRIL11	NATRONA COUNTY GIS				
APRIL11	TAYLOR ENVIRONMENTAL CONSULTING LLC				
APRIL11	GGA INC				
APRIL11	BLM				
JUNE09	WYO DOT	A	ISSUED FOR APPROVAL	TED	JUNE11

1 inch = 1,000 feet

0 0.05 0.1 0.2 Miles

Epic The Natural Resource

FROM PROJECT CONCEPTION TO OPERATING REALITY

N W E S

ELK PETROLEUM

123 WEST 1ST STREET, SUITE 550
CASPER, WY 82601

GRIEVE UNIT CO2
ACCESS TO GRIEVE #53

PROJECT	MAP	SCALE	DATE	REVISION
40-0238	EP-1302	1:12,000	07 JUNE 11	A

Application Date: **06/14/2011**
Lease/Permit Number: **WYW-015814**
Project Name: **Grieve Unit Well #54**

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF LAND MANAGEMENT
WILDLIFE CLEARANCE EVALUATION AND CONSULTATION FORM
LANDER FIELD OFFICE

To: Wildlife Biologist
From: Melanie Leavenworth, Legal Assistant
Subject: Request for Wildlife Clearance and Evaluation

Company Name and/or Project Name: Elk Petroleum, Inc.
Legal Location: T. 32 N., R. 85 W., 6th P.M., Sec. 27, SWNE (See attached request and map)
Description of Proposed Action: APD to drill C02 injection well, access roads and pipelines.
Quad: Horse Creek Springs
Stips: None

Response: Data Review and Determination of Impact on Wildlife Habitat and Threatened or Endangered Species
To: Initiating Officer

This memo will become an appendix to the Environmental Documentation for this project. This proposal and relative data have been analyzed as to the impact of the proposed action.

**Coordination with Wyoming Game and Fish Department (IS) (IS NOT) recommended. Coordination may be needed due to unusual or excessive negative effects on big game, sage-grouse, riparian areas, fisheries, other priority species or potentially controversial actions.

Threatened, Endangered, and Proposed Species Clearance Form

ENDANGERED, THREATENED, OR PROPOSED SPECIES	HABITAT DESCRIPTION	PROJECT EFFECT CALL	CONSULTATION REQUIRED	JUSTIFICATION FOR EFFECTS DETERMINATION
Canada lynx (Threatened)	Coniferous forests with abundant snowshoe hare populations.	NE	Yes | (No)	☒ No suitable habitat present
Black-footed ferret (Endangered)	Large prairie dog complexes ☐ White-tailed Prairie Dog	NE	Yes | (No)	☒ Area not suitable for reintroduction efforts ☐ No habitat present or action is within a block cleared area ☐ Within prairie dog town; not block-cleared; survey required
Grizzly Bear (Threatened)	Extensive forest cover interspersed with grasslands and meadows.	NE	Yes | (No)	☒ No suitable habitat present
Blowout Penstemon (Endangered)	Active sand dunes	NE	Yes | (No)	☒ No suitable habitat present ☐ Suitable habitat present; survey required or presence assumed
Ute ladies'-tresses (Threatened)	Seasonally moist soils and wet meadows of drainages below 7,000 feet	NE	Yes | (No)	☒ No suitable habitat present ☐ Suitable habitat present; survey required or presence assumed
Desert yellowhead (Threatened)	Barren slopes and ridges on outcrops of white silty clay or Miocene sandstones of the Split Rock Formation.	NE	Yes | (No)	☒ No suitable habitat present

Critical Habitat for the Desert yellowhead	Only one known location in the Beaver Rim area of southern Fremont County.	NE	Yes | No	☒ Not in critical habitat for desert yellowhead.
Platte River Water Depletions (5 listed species and designated critical habitat)	Downstream riparian and riverine habitat of the Platte River System Whooping Crane – Endangered Interior Least Tern – Endangered Piping Plover – Threatened Pallid Sturgeon – Endangered Western Prairie Fringed Orchid –Threatened Critical Habitat for: Whooping Crane Piping Plover	NE	Yes | No	☒ Action will not deplete water from the Platte River System ☐ Action will cause depletion to the Platte River system; consultation required ☐ See comments for further restrictions and water source
Gray wolf (Non-essential, experimental population)	Habitats with abundant ungulate prey, secluded (i.e. forested) denning and rendezvous sites, and low levels of human activity.	NE	Yes | No	☒ No suitable habitat present. Project not in recovery area. No established populations in project area. ☐ Project in suitable habitat; consultation required.
Mountain Plover, (Proposed)	Habitats characterized by large areas of flat shortgrass prairie or very low shrubs with a prevalence of bare ground. Presence of prairie dog towns is a common characteristic of occupied plover nesting habitats.		Yes I No	☐ No suitable habitat present. ☐ Project in suitable habitat.

**Project effect determinations for T&E species are: no effect (NE); may affect (MA); not likely to adversely affect (NLAA); likely to adversely affect (LAA); Likely to jeopardize population (LJ): or not likely to jeopardize population (NLJ). Project effect determinations for candidate species are: will not contribute to the need to list (WNC); will contribute to the need to list (WC).

**Initiation of (FORMAL) (INFORMAL) consultation with U. S. Fish and Wildlife Service (IS) (IS NOT) necessary.

Sarah Heeg -NRS — 6/30/2011

Wildlife Biologist — Date

BLM Consultation Letter Sent	FWS Consultation Letter Reply	Wildlife Biologist Initial
Date:	Date:	

SEO Letter Sent	SEO Letter Reply	Wildlife Biologist Initial
Date:	Date:	

WILDLIFE / RESOURCE CONCERN	HABITAT	DESIGNATED OR SUITABLE HABITAT	COA STIPULATION APPLIES	COA STIPULATION TIMING RESTRICTION
Sage Grouse Lek (Core Area)	Avoid disturbance or occupancy within 0.6 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.6 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Core	PIAA required and completed	Yes | No		
Sage Grouse Lek (non-Core Area)	Avoid disturbance or occupancy within 0.25 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.25 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (non-Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat within mapped habitat important for connectivity or within 2 miles of any occupied or undetermined lek.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Winter Habitat	Surface disturbing and/or disruptive activities are prohibited or restricted in mapped or modeled winter habitats/concentration areas that support Core Area populations.	Yes | No	Yes | No	Nov 15 – March 1
Raptors (General)	Avoid surface disturbance or occupancy within a 0.75 mile buffer of raptor nests.	Yes | No	Yes | No	Feb 1 – July 31 Or until young have fledged.
Bald Eagle	Lakes, rivers and other large water bodies suitable for foraging with large trees for nesting and roosting	Yes | No	Yes | No	☒ No nest, roost, or feeding concentrations present. ☐ Nest within 1 mile: Apply NSO Buffer ☐ Roost within 1 mile: NSO and timing restrict. Nov 1 – Mar 31 ☐ Other restrictions apply, see comments
Mountain Plover	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable Mountain Plover nesting habitat.	Yes | No	Yes | No	April 10 – July 10
Big Game Crucial Winter Range And Elk Winter Range	Delineated by WGFD/BLM	Yes | No	Yes | No	Nov 15 - April 30
Big Game Parturition Areas	Delineated by WGFD/BLM	Yes | No	Yes | No	May 1 - June 30
Riparian Areas	Move Project > 500 feet from perennial streams/live water	Yes | No	Yes | No	Riparian Areas

COMMENTS: ~~PIAA~~ required Sage Grouse Stip applies March 1 – July 15th

Date of Field Visit: 6/15/2011

Photos Attached: YES or NO

Sarah Heeg - NRS 6/30/2011
Wildlife Biologist (DATE)

BLM SENSITIVE SPECIES	HABITAT	POTENTIAL HABITAT	COA /TLS/ STIPULATION APPLIES	COA /TLS/ STIPULATION
BIRDS OF PREY:				
Northern Goshawk	Conifer and deciduous forests	Yes | No	Yes | No	
Ferruginous Hawk	Basin – prairie shrub, grassland, rock outcrops	Yes | No	Yes | No	
Burrowing Owl	Grasslands, basin-prairie shrub	Yes | No	Yes | No	
Peregrine Falcon	Tall Cliffs	Yes | No	Yes | No	
BATS:				
Long-eared Myotis	Conifer and deciduous forest, caves and mines	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Spotted Bat	Cliffs over perennial water, basin-prairie shrub	Yes | No	Yes | No	See comments for additional restrictions
Townsend's Big-eared Bat	Forests, basin-prairie shrub, caves and mines	Yes | No	Yes | No	
PRAIRE DOGS:				Avoid burrows and colonies where possible
White-tailed	Basin prairie shrub, grasslands	Yes | No	Yes | No	See comments for additional restrictions
GRASSLAND OBLIGATES:				Avoid habitat where possible and minimize disturbance
Swift Fox	Grasslands	Yes | No	Yes | No	
Long-billed Curlew	Grasslands, plains, foothills, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
SAGEBRUSH OBLIGATE BIRDS:				
Sage Thrasher	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Loggerhead Shrike	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	See comments for additional restrictions
Sage Sparrow	Basin prairie shrub, mountain foothill shrub	Yes | No	Yes | No	
Brewer's Sparrow	Basin-prairie shrub	Yes | No	Yes | No	
Pygmy Rabbit	Basin-prairie and riparian shrub	Yes | No	Yes | No	
RIPARIAN/WETLAND OBLIGATES:				
Yellow-billed Cuckoo	Open woodlands, streamside willow and alder groves	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
White-faced Ibis	Marshes, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
Trumpeter Swan	Lakes, ponds, rivers	Yes | No	Yes | No	
Northern Leopard Frog	Beaver ponds, permanent water in plains and foothills	Yes | No	Yes | No	
Great Basin spadefoot	Spring seeps, permanent and temporary waters	Yes | No	Yes | No	
Boreal toad (Northern Rocky Mtn.	Pond margins, wet meadows, riparian areas.	Yes | No	Yes | No	

population)				
Spotted frog	Ponds, sloughs, small streams	Yes | No	Yes | No	
Yellowstone cutthroat trout	Yellowstone drainage, small mountain streams and large rivers	Yes | No	Yes | No	
PLANTS:				
Meadow Pussytoes	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4,950' – 7,900'	Yes | No	Yes | No	
Porter's Sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes Elevation: 5,300 – 6,500 feet	Yes | No	Yes | No	
Dubois Milkvetch	Barren shale, badlands, limestone, and redbed slopes and ridges 6,900' – 8,800"	Yes | No	Yes | No	
Limber Pine	Timberline and at lower elevation with sagebrush. Associated species are Rocky Mountain lodgepole pine, Engelmann spruce, whitebark pine, Rocky Mountain Douglas-fir, subalpine fir, Rocky Mountain juniper, Mountain Mahogany, and common juniper.	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Cedar Rim Thistle	Barren, chalky hills, gravelly slopes and fine-textured, sandy/shaley draws 6,700' – 7,200'	Yes | No	Yes | No	See comments for additional restrictions
Owl Creek Miner's	Sandy-gravelly slopes on sandstone of the Wind River Formation 4,700' – 6,000'	Yes | No	Yes | No	
Fremont Bladderpod	Rocky limestone slopes and ridges 7,000' – 9,000'	Yes | No	Yes | No	
Beaver Rim Phlox	Sparsely vegetated slopes on sand-stone, siltstone, or limestone substrates 6,000' – 7,4000'	Yes | No	Yes | No	
Rocky Mountain Twinpod	Sparsely vegetated, rocky slopes of limestone, sandstone or clay 5,600' – 8,300'	Yes | No	Yes | No	
Persistent Sepal Yellowcress	Riverbanks and shorelines, usually on sandy soils near high water line.	Yes | No	Yes | No	
Shoshonea	Shallow, stony calcareous soils of exposed limestone outcrops, ridgetops, and talus slopes 5,900' – 9,200'	Yes | No	Yes | No	
Barneby's Clover	Ledges, crevices and seams on reddish-cream Nugget Sandstone outcrops 5,600' – 6,700'	Yes | No	Yes | No	

COMMENTS: Avoid habitat disturbance in Sagebrush & riparian habitat whenever possible

Wildlife Biologist: Sarah Heeg - NRS

6/30/2011

LANDER FIELD OFFICE

Form 3160-3
(August 2007)

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-015813 (Bottomhole)

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☐ Oil Well ☐ Gas Well ☑ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #54

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address 123 West 1st Street, Suite 550
Casper, WY 82601

3b. Phone No. *(include area code)*
307-265-3326

10. Field and Pool, or Exploratory
Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface 1790' FNL, 2112' FEL (SWNE), Section 27, T32N, R85W
At proposed prod. zone 972' FNL, 1903' FWL (NENW), Section 27, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 27, T32N, R85W

14. Distance in miles and direction from nearest town or post office*
Approximately 19 miles south of Powder River, Wyoming

12. County or Parish
Natrona

13. State
WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)	16. No. of acres in lease	17. Spacing Unit dedicated to this well
972'	640	40 acres
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.	**19. Proposed Depth**	**20. BLM/BIA Bond No. on file**
≈1870'	7130'	800346757
21. Elevations (Show whether DF, KDB, RT, GL, etc.)	**22. Approximate date work will start***	**23. Estimated duration**
7322' GL	02/01/2012	20 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature	Name *(Printed Typed)*	Date
	Ralph Schulte	6/8/2011

Title
Engineering Manager, Elk Petroleum

Approved by *(Signature)*	Name *(Printed Typed)*	Date
Title	**Office**	

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

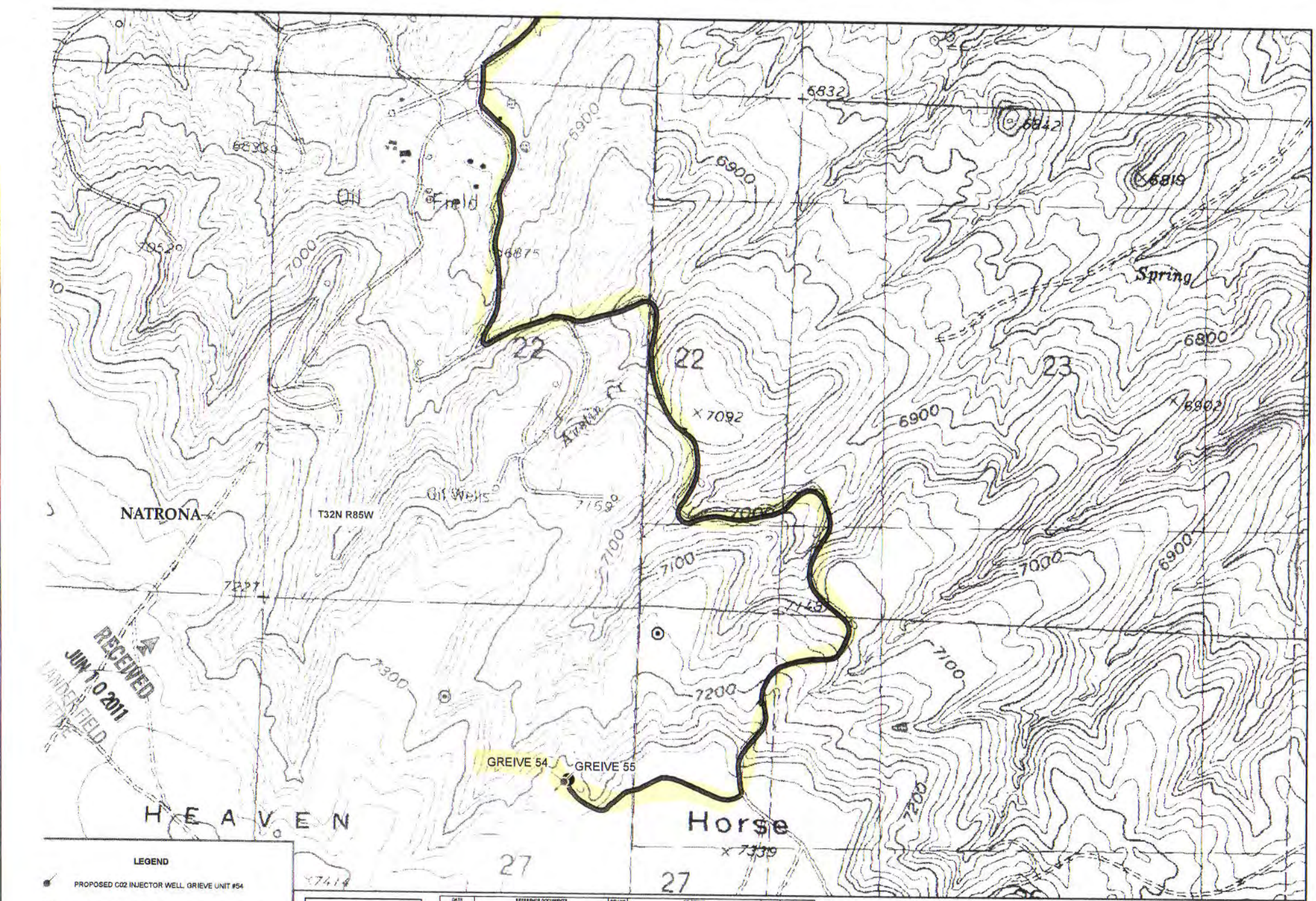
Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)

RECEIVED
JUN 10 2011
LANDER FIELD OFFICE

Posted 6/10/11



LEGEND

- PROPOSED CO2 INJECTOR WELL, GRIEVE UNIT #54
- PROPOSED BOTTOM HOLE CO2 LOCATION, GRIEVE UNIT #54
- PROPOSED OIL PRODUCER, GRIEVE UNIT #55
- PROPOSED BOTTOM HOLE OIL LOCATION, GRIEVE UNIT #55
- ACCESS ROAD TO GRIEVE #54 AND #55

THE DATA CONTAINED ON THIS WORK PRODUCT IS DERIVED FROM DIFFERENT SOURCES THAT MAY HAVE USED DIFFERENT DATUMS AND PROJECTIONS. EPIC HAS RECEIVED CONSENT TO DATA WHERE NECESSARY FOR CLARIFICATION AND HAS NOT PERFORMED LAND SURVEY OR TITLE WORK TO VERIFY ACCURACY

THIS MAP DOCUMENT HAS NOT BEEN PUBLISHED BUT RATHER HAS BEEN PREPARED BY EPIC FOR USE BY THE CLIENT NAMED IN THE TITLE BLOCK SOLELY IN RESPECT TO THE PROJECT. ANY UNAUTHORIZED DISTRIBUTION AND MAINTENANCE OF THE RESULTS NAMED IN THE TITLE BLOCK AND SHALL NOT BE USED FOR ANY OTHER PURPOSE OR FURNISHED TO ANY OTHER PARTY WITHOUT THE EXPRESS CONSENT OF EPIC.

DATE	REFERENCE DOCUMENTS	REV NO	REVISIONS	BY	DATE
JUNE11	EPIC / BTERIAL PETROLEUM				
JUNE11	ELK PETROLEUM				
APR11	NATRONA COUNTY GIS				
APR11	TAYLOR ENVIRONMENTAL CONSULTING LLC				
APR11	USGA INC				
APR11	BLM				
JUNE09	WYO 307	A	ISSUED FOR APPROVAL	TED	JUNE11

1 Inch = 1,250 feet

0 0.05 0.1 0.2 Miles

Epic The Natural Resource

FROM PROJECT CONCEPTION TO OPERATING REALITY

N W E S

ELK PETROLEUM

123 WEST 1ST STREET, SUITE 550
CASPER, WY 82601

GRIEVE UNIT CO2
ACCESS TO GRIEVE #54 AND #55

PROJECT	MAP	SCALE	DATE	REVISION
40-0238	EP-1303	1:15,000	07 JUNE 11	A

Application Date: 06/13/2011
Lease/Permit Number: WYW 051814
Project Name: Grieve Unit Well #55

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF LAND MANAGEMENT
WILDLIFE CLEARANCE EVALUATION AND CONSULTATION FORM
LANDER FIELD OFFICE

To: Wildlife Biologist
From: Melanie Leavenworth, Legal Assistant
Subject: Request for Wildlife Clearance and Evaluation

Company Name and/or Project Name: Elk Petroleum, Inc.
Legal Location: T. 32 N., R. 85 W., 6th P.M., Sec. 27, SWNE (See attached request and map)
Description of Proposed Action: APD to drill Oil well, associated pipelines & access roads.
Quad: Horse Creek Springs
Stips: None

Response: Data Review and Determination of Impact on Wildlife Habitat and Threatened or Endangered Species
To: Initiating Officer

This memo will become an appendix to the Environmental Documentation for this project. This proposal and relative data have been analyzed as to the impact of the proposed action.

**Coordination with Wyoming Game and Fish Department (IS) (IS NOT) recommended. Coordination may be needed due to unusual or excessive negative effects on big game, sage-grouse, riparian areas, fisheries, other priority species or potentially controversial actions.

Threatened, Endangered, and Proposed Species Clearance Form

ENDANGERED, THREATENED, OR PROPOSED SPECIES	HABITAT DESCRIPTION	PROJECT EFFECT CALL	CONSULTATION REQUIRED	JUSTIFICATION FOR EFFECTS DETERMINATION
Canada lynx (Threatened)	Coniferous forests with abundant snowshoe hare populations.	NE	Yes | (No)	c (X) No suitable habitat present
Black-footed ferret (Endangered)	Large prairie dog complexes c White-tailed Prairie Dog	NE	Yes | (No)	c (X) Area not suitable for reintroduction efforts c No habitat present or action is within a block cleared area c Within prairie dog town; not block-cleared; survey required
Grizzly Bear (Threatened)	Extensive forest cover interspersed with grasslands and meadows.	NE	Yes | (No)	c (X) No suitable habitat present
Blowout Penstemon (Endangered)	Active sand dunes	NE	Yes | (No)	c (X) No suitable habitat present c Suitable habitat present; survey required or presence assumed
Ute ladies'-tresses (Threatened)	Seasonally moist soils and wet meadows of drainages below 7,000 feet	NE	Yes | (No)	c (X) No suitable habitat present c Suitable habitat present; survey required or presence assumed
Desert yellowhead (Threatened)	Barren slopes and ridges on outcrops of white silty clay or Miocene sandstones of the Split Rock Formation.	NE	Yes | (No)	c (X) No suitable habitat present
Critical Habitat for	Only one known location in the Beaver Rim	NE	Yes (No)	c (X) Not in critical habitat for desert

the Desert yellowhead	area of southern Fremont County.			yellowhead.
Platte River Water Depletions (5 listed species and designated critical habitat)	Downstream riparian and riverine habitat of the Platte River System Whooping Crane – Endangered Interior Least Tern – Endangered Piping Plover – Threatened Pallid Sturgeon – Endangered Western Prairie Fringed Orchid –Threatened Critical Habitat for: Whooping Crane Piping Plover	NE	Yes | No	C Action will not deplete water from the Platte River System C Action will cause depletion to the Platte River system; consultation required C See comments for further restrictions and water source
Gray wolf (Non-essential, experimental population)	Habitats with abundant ungulate prey, secluded (i.e. forested) denning and rendezvous sites, and low levels of human activity.	NE	Yes | No	C No suitable habitat present. Project not in recovery area. No established populations in project area. C Project in suitable habitat; consultation required.
Mountain Plover, (Proposed)	Habitats characterized by large areas of flat shortgrass prairie or very low shrubs with a prevalence of bare ground. Presence of prairie dog towns is a common characteristic of occupied plover nesting habitats.		Yes I No	C No suitable habitat present. C Project in suitable habitat.

**Project effect determinations for T&E species are: no effect (NE); may affect (MA); not likely to adversely affect (NLAA); likely to adversely affect (LAA); Likely to jeopardize population (LJ): or not likely to jeopardize population (NLJ). Project effect determinations for candidate species are: will not contribute to the need to list (WNC); will contribute to the need to list (WC).

**Initiation of (FORMAL) (INFORMAL) consultation with U. S. Fish and Wildlife Service (IS) (IS NOT) necessary.

Sarah Heeg -NRS — 6/30/2011

Wildlife Biologist — Date

BLM Consultation Letter Sent	FWS Consultation Letter Reply	Wildlife Biologist Initial
Date:	Date:	

SEO Letter Sent	SEO Letter Reply	Wildlife Biologist Initial
Date:	Date:	

WILDLIFE / RESOURCE CONCERN	HABITAT	DESIGNATED OR SUITABLE HABITAT	COA STIPULATION APPLIES	COA STIPULATION TIMING RESTRICTION
Sage Grouse Lek (Core Area)	Avoid disturbance or occupancy within 0.6 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.6 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Core	PIAA required and completed	Yes | No		
Sage Grouse Lek (non-Core Area)	Avoid disturbance or occupancy within 0.25 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.25 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (non-Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat within mapped habitat important for connectivity or within 2 miles of any occupied or undetermined lek.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Winter Habitat	Surface disturbing and/or disruptive activities are prohibited or restricted in mapped or modeled winter habitats/concentration areas that support Core Area populations.	Yes | No	Yes | No	Nov 15 – March 1
Raptors (General)	Avoid surface disturbance or occupancy within a 0.75 mile buffer of raptor nests.	Yes | No	Yes | No	Feb 1 – July 31 Or until young have fledged.
Bald Eagle	Lakes, rivers and other large water bodies suitable for foraging with large trees for nesting and roosting	Yes | No	Yes | No	C No nest, roost, or feeding concentrations present. C Nest within 1 mile: Apply NSO Buffer C Roost within 1 mile: NSO and timing restrict. Nov 1 – Mar 31 C Other restrictions apply, see comments
Mountain Plover	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable Mountain Plover nesting habitat.	Yes | No	Yes | No	April 10 – July 10
Big Game Crucial Winter Range And Elk Winter Range	Delineated by WGFD/BLM	Yes | No	Yes | No	Nov 15 - April 30
Big Game Parturition Areas	Delineated by WGFD/BLM	Yes | No	Yes | No	May 1 - June 30
Riparian Areas	Move Project > 500 feet from perennial streams/live water	Yes | No	Yes | No	Riparian Areas

COMMENTS: PIAA required Sage Grouse Stip applies March 1 - July 15th

Date of Field Visit: 6/15/2011

Photos Attached: YES or (NO)

Sarah Heeg - NRS 6/30/2011

Wildlife Biologist (DATE)

BLM SENSITIVE SPECIES	HABITAT	POTENTIAL HABITAT	COA /TLS/ STIPULATION APPLIES	COA /TLS/ STIPULATION
BIRDS OF PREY:				
Northern Goshawk	Conifer and deciduous forests	Yes | No	Yes | No	
Ferruginous Hawk	Basin – prairie shrub, grassland, rock outcrops	Yes | No	Yes | No	
Burrowing Owl	Grasslands, basin-prairie shrub	Yes | No	Yes | No	
Peregrine Falcon	Tall Cliffs	Yes | No	Yes | No	
BATS:				
Long-eared Myotis	Conifer and deciduous forest, caves and mines	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Spotted Bat	Cliffs over perennial water, basin-prairie shrub	Yes | No	Yes | No	See comments for additional restrictions
Townsend's Big-eared Bat	Forests, basin-prairie shrub, caves and mines	Yes | No	Yes | No	
PRAIRE DOGS:				Avoid burrows and colonies where possible
White-tailed	Basin prairie shrub, grasslands	Yes | No	Yes | No	See comments for additional restrictions
GRASSLAND OBLIGATES:				
Swift Fox	Grasslands	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Long-billed Curlew	Grasslands, plains, foothills, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
SAGEBRUSH OBLIGATE BIRDS:				
Sage Thrasher	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance See comments for additional restrictions
Loggerhead Shrike	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	
Sage Sparrow	Basin prairie shrub, mountain foothill shrub	Yes | No	Yes | No	
Brewer's Sparrow	Basin-prairie shrub	Yes | No	Yes | No	
Pygmy Rabbit	Basin-prairie and riparian shrub	Yes | No	Yes | No	
RIPARIAN/WETLAND OBLIGATES:				
Yellow-billed Cuckoo	Open woodlands, streamside willow and alder groves	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance See comments for additional restrictions
White-faced Ibis	Marshes, wet meadows	Yes | No	Yes | No	
Trumpeter Swan	Lakes, ponds, rivers	Yes | No	Yes | No	
Northern Leopard Frog	Beaver ponds, permanent water in plains and foothills	Yes | No	Yes | No	
Great Basin spadefoot	Spring seeps, permanent and temporary waters	Yes | No	Yes | No	
Boreal toad (Northern Rocky Mtn.	Pond margins, wet meadows, riparian areas.	Yes | No	Yes | No	

population)				
Spotted frog	Ponds, sloughs, small streams	Yes | No	Yes | No	
Yellowstone cutthroat trout	Yellowstone drainage, small mountain streams and large rivers	Yes | No	Yes | No	
PLANTS:				
Meadow Pussytoes	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4,950' – 7,900'	Yes | No	Yes | No	
Porter's Sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes Elevation: 5,300 – 6,500 feet	Yes | No	Yes | No	
Dubois Milkvetch	Barren shale, badlands, limestone, and redbed slopes and ridges 6,900' – 8,800"	Yes | No	Yes | No	
Limber Pine	Timberline and at lower elevation with sagebrush. Associated species are Rocky Mountain lodgepole pine, Engelmann spruce, whitebark pine, Rocky Mountain Douglas-fir, subalpine fir, Rocky Mountain juniper, Mountain Mahogany, and common juniper.	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Cedar Rim Thistle	Barren, chalky hills, gravelly slopes and fine-textured, sandy/shaley draws 6,700' – 7,200'	Yes | No	Yes | No	See comments for additional restrictions
Owl Creek Miner's	Sandy-gravelly slopes on sandstone of the Wind River Formation 4,700' – 6,000'	Yes | No	Yes | No	
Fremont Bladderpod	Rocky limestone slopes and ridges 7,000' – 9,000'	Yes | No	Yes | No	
Beaver Rim Phlox	Sparsely vegetated slopes on sand-stone, siltstone, or limestone substrates 6,000' – 7,4000'	Yes | No	Yes | No	
Rocky Mountain Twinpod	Sparsely vegetated, rocky slopes of limestone, sandstone or clay 5,600' – 8,300'	Yes | No	Yes | No	
Persistent Sepal Yellowcress	Riverbanks and shorelines, usually on sandy soils near high water line.	Yes | No	Yes | No	
Shoshonea	Shallow, stony calcareous soils of exposed limestone outcrops, ridgetops, and talus slopes 5,900' – 9,200'	Yes | No	Yes | No	
Barneby's Clover	Ledges, crevices and seams on reddish-cream Nugget Sandstone outcrops 5,600' – 6,700'	Yes | No	Yes | No	

COMMENTS:

Wildlife Biologist: Sarah Heeg -NRS

6/30/2011

LANDER FIELD OFFICE

Form 3160-3
(August 2007)

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-015814

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☑ Oil Well ☐ Gas Well ☐ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #55

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address 123 West 1st Street, Suite 550
Casper, WY 82601

3b. Phone No. *(include area code)*
307-265-3326

10. Field and Pool, or Exploratory
Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface 1768' FNL, 2067' FEL (SWNE), Section 27, T32N, R85W
At proposed prod. zone 247' FNL, 1199' FEL (NENE), Section 27, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 27, T32N, R85W

14. Distance in miles and direction from nearest town or post office*
Approximately 19 miles south of Powder River, Wyoming

12. County or Parish
Natrona

13. State
WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)	16. No. of acres in lease	17. Spacing Unit dedicated to this well
247'	640	40 acres

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft	19 Proposed Depth	20. BLM/BIA Bond No. on file
≈1250'	7000'	800346757

21. Elevations (Show whether DF, KDB, RT, GL, etc.)	22. Approximate date work will start*	23. Estimated duration
7322' GL	02/01/2012	20 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature	Name *(Printed Typed)*	Date
	Ralph Schulte	4/8/2011

Title
Engineering Manager, Elk Petroleum

Approved by *(Signature)*	Name *(Printed Typed)*	Date

Title	Office

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

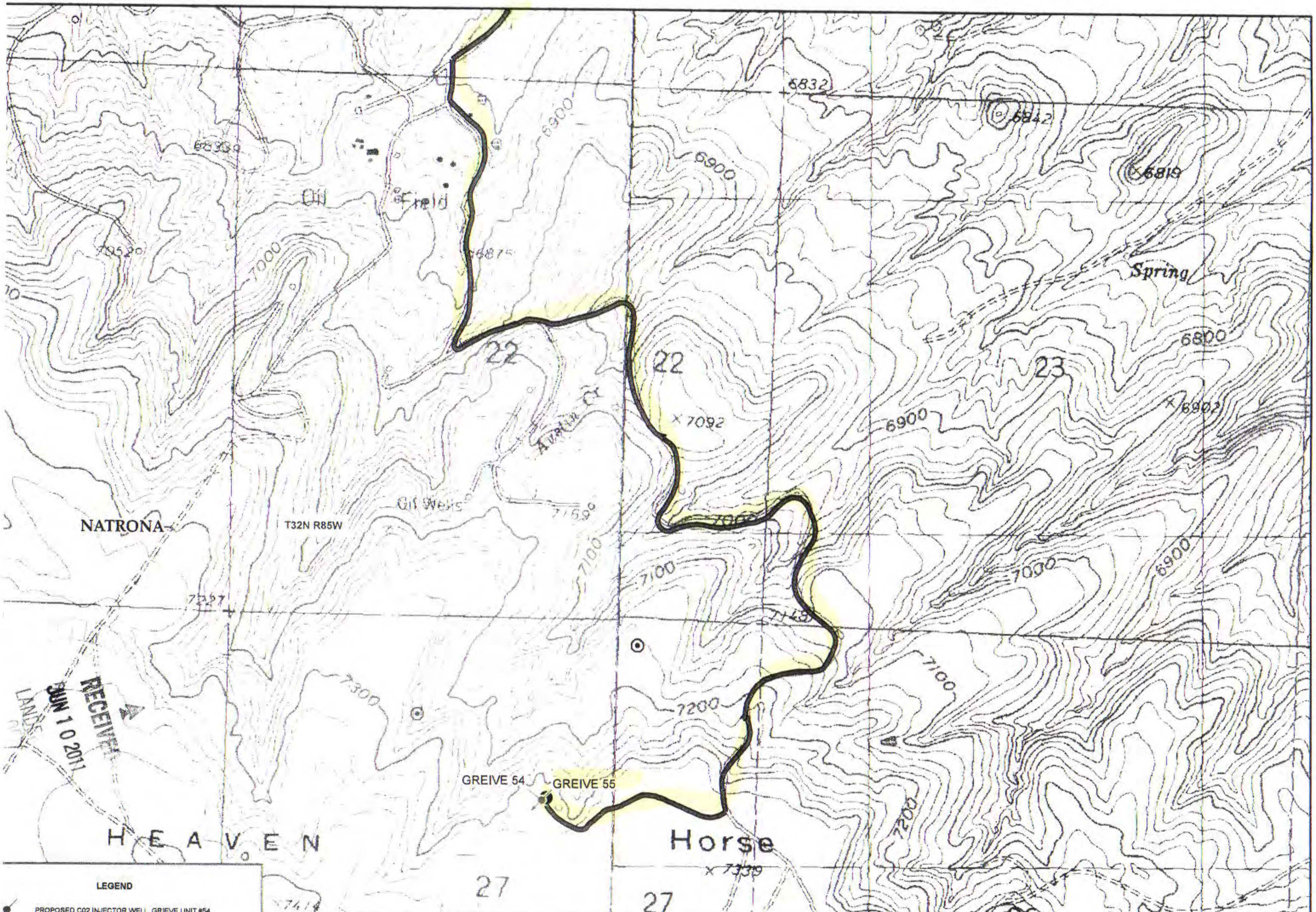
Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)

RECEIVED
JUN 10 2011
LANDER FIELD OFFICE

Posted
6/10/11



LEGEND

- PROPOSED C02 INJECTOR WELL, GRIEVE UNIT #54
- PROPOSED BOTTOM HOLE C02 LOCATION, GRIEVE UNIT #54
- PROPOSED OIL PRODUCER, GRIEVE UNIT #55
- PROPOSED BOTTOM HOLE OIL LOCATION, GRIEVE UNIT #55
- ACCESS ROAD TO GRIEVE #54 AND #55

THE DATA CONTAINED ON THIS WORK PRODUCT IS DERIVED FROM DIFFERENT SOURCES THAT MAY HAVE USED DIFFERENT GEO-REFERENCE PROJECTIONS. EPIC HAS MADE ADJUSTMENT TO DATA WHEN NECESSARY FOR CLARIFICATION AND HAS NOT PERFORMED LAND SURVEY OR TITLE WORK TO VERIFY ACCURACY.

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DATE	REFERENCE DOCUMENTS	REV NO	REVISIONS	BY	DATE
JUNE11	EPIC Z:\ITS\ELK_PETROLEUM				
JUNE11	ELK PETROLEUM				
APRIL11	NATRONA COUNTY GIS				
APRIL11	TAYLOR ENVIRONMENTAL CONSULTING LLC				
APRIL11	GGA INC				
APRIL11	BLM				
JUNE08	WYO DOT	A	ISSUED FOR APPROVAL	TKD	JUNE11

1 inch = 1,250 feet

0 0.05 0.1 0.2
Miles

Epic
The Natural Resource

FROM PROJECT CONCEPTION TO OPERATING REALITY

N
W E
S

ELK PETROLEUM

123 WEST 1ST STREET, SUITE 550
CASPER, WY 82601

GRIEVE UNIT CO2
ACCESS TO GRIEVE #54 AND #55

PROJECT	MAP	SCALE	DATE	REVISION
40-0238	EP-1303	1:15,000	07 JUNE 11	A

Application Date: **06/14/2011**
Lease/Permit Number: **WYW-015824**
Project Name: **Grieve Unit Well #57**

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF LAND MANAGEMENT
WILDLIFE CLEARANCE EVALUATION AND CONSULTATION FORM
LANDER FIELD OFFICE

To: Wildlife Biologist
From: Melanie Leavenworth, Legal Assistant
Subject: Request for Wildlife Clearance and Evaluation

Company Name and/or Project Name: Elk Petroleum, Inc.
Legal Location: T. 32 N., R. 85 W., 6th P.M., Sec. 22, NESE (See attached request and map)
Description of Proposed Action: APD to drill water injection well, access roads and pipelines.
Quad: McCleary Reservoir
Stips: None

Response: Data Review and Determination of Impact on Wildlife Habitat and Threatened or Endangered Species
To: Initiating Officer

This memo will become an appendix to the Environmental Documentation for this project. This proposal and relative data have been analyzed as to the impact of the proposed action.

**Coordination with Wyoming Game and Fish Department (IS) (IS NOT) recommended. Coordination may be needed due to unusual or excessive negative effects on big game, sage-grouse, riparian areas, fisheries, other priority species or potentially controversial actions.

Threatened, Endangered, and Proposed Species Clearance Form

ENDANGERED, THREATENED, OR PROPOSED SPECIES	HABITAT DESCRIPTION	PROJECT EFFECT CALL	CONSULTATION REQUIRED	JUSTIFICATION FOR EFFECTS DETERMINATION
Canada lynx (Threatened)	Coniferous forests with abundant snowshoe hare populations.	NE	Yes | No	☒ No suitable habitat present
Black-footed ferret (Endangered)	Large prairie dog complexes ☐ White-tailed Prairie Dog	NE	Yes | No	☒ Area not suitable for reintroduction efforts ☐ No habitat present or action is within a block cleared area ☐ Within prairie dog town; not block-cleared; survey required
Grizzly Bear (Threatened)	Extensive forest cover interspersed with grasslands and meadows.	NE	Yes | No	☒ No suitable habitat present
Blowout Penstemon (Endangered)	Active sand dunes	NE	Yes | No	☒ No suitable habitat present ☐ Suitable habitat present; survey required or presence assumed
Ute ladies'-tresses (Threatened)	Seasonally moist soils and wet meadows of drainages below 7,000 feet	NE	Yes | No	☒ No suitable habitat present ☐ Suitable habitat present; survey required or presence assumed
Desert yellowhead (Threatened)	Barren slopes and ridges on outcrops of white silty clay or Miocene sandstones of the Split Rock Formation.	NE	Yes | No	☒ No suitable habitat present

Critical Habitat for the Desert yellowhead	Only one known location in the Beaver Rim area of southern Fremont County.	NE	Yes | No	☒ Not in critical habitat for desert yellowhead.
Platte River Water Depletions (5 listed species and designated critical habitat)	Downstream riparian and riverine habitat of the Platte River System Whooping Crane – Endangered Interior Least Tern – Endangered Piping Plover – Threatened Pallid Sturgeon – Endangered Western Prairie Fringed Orchid –Threatened Critical Habitat for: Whooping Crane Piping Plover	NE	Yes | No	☒ Action will not deplete water from the Platte River System ☐ Action will cause depletion to the Platte River system; consultation required ☐ See comments for further restrictions and water source
Gray wolf (Non-essential, experimental population)	Habitats with abundant ungulate prey, secluded (i.e. forested) denning and rendezvous sites, and low levels of human activity.	NE	Yes | No	☒ No suitable habitat present. Project not in recovery area. No established populations in project area. ☐ Project in suitable habitat; consultation required.
Mountain Plover, (Proposed)	Habitats characterized by large areas of flat shortgrass prairie or very low shrubs with a prevalence of bare ground. Presence of prairie dog towns is a common characteristic of occupied plover nesting habitats.		Yes I No	☐ No suitable habitat present. ☐ Project in suitable habitat.

**Project effect determinations for T&E species are: no effect (NE); may affect (MA); not likely to adversely affect (NLAA); likely to adversely affect (LAA); Likely to jeopardize population (LJ): or not likely to jeopardize population (NLJ). Project effect determinations for candidate species are: will not contribute to the need to list (WNC); will contribute to the need to list (WC).

**Initiation of (FORMAL) (INFORMAL) consultation with U. S. Fish and Wildlife Service (IS) (IS NOT) necessary.

Sarah Heeg - NRS — Wildlife Biologist

6/30/2011 — Date

BLM Consultation Letter Sent	FWS Consultation Letter Reply	Wildlife Biologist Initial
Date:	Date:	

SEO Letter Sent	SEO Letter Reply	Wildlife Biologist Initial
Date:	Date:	

WILDLIFE / RESOURCE CONCERN	HABITAT	DESIGNATED OR SUITABLE HABITAT	COA STIPULATION APPLIES	COA STIPULATION TIMING RESTRICTION
Sage Grouse Lek (Core Area)	Avoid disturbance or occupancy within 0.6 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.6 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Core	PIAA required and completed	Yes | No		
Sage Grouse Lek (non-Core Area)	Avoid disturbance or occupancy within 0.25 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.25 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (non-Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat within mapped habitat important for connectivity or within 2 miles of any occupied or undetermined lek.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Winter Habitat	Surface disturbing and/or disruptive activities are prohibited or restricted in mapped or modeled winter habitats/concentration areas that support Core Area populations.	Yes | No	Yes | No	Nov 15 – March 1
Raptors (General)	Avoid surface disturbance or occupancy within a 0.75 mile buffer of raptor nests.	Yes | No	Yes | No	Feb 1 – July 31 Or until young have fledged.
Bald Eagle	Lakes, rivers and other large water bodies suitable for foraging with large trees for nesting and roosting	Yes | No	Yes | No	☐ No nest, roost, or feeding concentrations present. ☐ Nest within 1 mile: Apply NSO Buffer ☐ Roost within 1 mile: NSO and timing restrict. Nov 1 – Mar 31 ☐ Other restrictions apply, see comments
Mountain Plover	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable Mountain Plover nesting habitat.	Yes | No	Yes | No	April 10 – July 10
Big Game Crucial Winter Range And Elk Winter Range	Delineated by WGFD/BLM	Yes | No	Yes | No	Nov 15 - April 30
Big Game Parturition Areas	Delineated by WGFD/BLM	Yes | No	Yes | No	May 1 - June 30
Riparian Areas	Move Project > 500 feet from perennial streams/live water	Yes | No	Yes | No	Riparian Areas

COMMENTS: PIAA required
Sage Grouse STIP applies March 1 – July 15th

Date of Field Visit: 6/15/2011

Photos Attached: YES or NO

Sarah Heeg - NRS 6/30/2011

Wildlife Biologist (DATE)

BLM SENSITIVE SPECIES	HABITAT	POTENTIAL HABITAT	COA /TLS/ STIPULATION APPLIES	COA /TLS/ STIPULATION
BIRDS OF PREY:				
Northern Goshawk	Conifer and deciduous forests	Yes | No	Yes | No	
Ferruginous Hawk	Basin – prairie shrub, grassland, rock outcrops	Yes | No	Yes | No	
Burrowing Owl	Grasslands, basin-prairie shrub	Yes | No	Yes | No	
Peregrine Falcon	Tall Cliffs	Yes | No	Yes | No	
BATS:				
Long-eared Myotis	Conifer and deciduous forest, caves and mines	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Spotted Bat	Cliffs over perennial water, basin-prairie shrub	Yes | No	Yes | No	See comments for additional restrictions
Townsend's Big-eared Bat	Forests, basin-prairie shrub, caves and mines	Yes | No	Yes | No	
PRAIRE DOGS:				Avoid burrows and colonies where possible
White-tailed	Basin prairie shrub, grasslands	Yes | No	Yes | No	See comments for additional restrictions
GRASSLAND OBLIGATES:				Avoid habitat where possible and minimize disturbance
Swift Fox	Grasslands	Yes | No	Yes | No	
Long-billed Curlew	Grasslands, plains, foothills, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
SAGEBRUSH OBLIGATE BIRDS:				
Sage Thrasher	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Loggerhead Shrike	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	See comments for additional restrictions
Sage Sparrow	Basin prairie shrub, mountain foothill shrub	Yes | No	Yes | No	
Brewer's Sparrow	Basin-prairie shrub	Yes | No	Yes | No	
Pygmy Rabbit	Basin-prairie and riparian shrub	Yes | No	Yes | No	
RIPARIAN/WETLAND OBLIGATES:				
Yellow-billed Cuckoo	Open woodlands, streamside willow and alder groves	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
White-faced Ibis	Marshes, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
Trumpeter Swan	Lakes, ponds, rivers	Yes | No	Yes | No	
Northern Leopard Frog	Beaver ponds, permanent water in plains and foothills	Yes | No	Yes | No	
Great Basin spadefoot	Spring seeps, permanent and temporary waters	Yes | No	Yes | No	
Boreal toad (Northern Rocky Mtn.	Pond margins, wet meadows, riparian areas.	Yes | No	Yes | No	

population)				
Spotted frog	Ponds, sloughs, small streams	Yes | No	Yes | No	
Yellowstone cutthroat trout	Yellowstone drainage, small mountain streams and large rivers	Yes | No	Yes | No	
PLANTS:				
Meadow Pussytoes	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4,950' – 7,900'	Yes | No	Yes | No	
Porter's Sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes Elevation: 5,300 – 6,500 feet	Yes | No	Yes | No	
Dubois Milkvetch	Barren shale, badlands, limestone, and redbed slopes and ridges 6,900' – 8,800"	Yes | No	Yes | No	
Limber Pine	Timberline and at lower elevation with sagebrush. Associated species are Rocky Mountain lodgepole pine, Engelmann spruce, whitebark pine, Rocky Mountain Douglas-fir, subalpine fir, Rocky Mountain juniper, Mountain Mahogany, and common juniper.	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Cedar Rim Thistle	Barren, chalky hills, gravelly slopes and fine-textured, sandy/shaley draws 6,700' – 7,200'	Yes | No	Yes | No	See comments for additional restrictions
Owl Creek Miner's	Sandy-gravelly slopes on sandstone of the Wind River Formation 4,700' – 6,000'	Yes | No	Yes | No	
Fremont Bladderpod	Rocky limestone slopes and ridges 7,000' – 9,000'	Yes | No	Yes | No	
Beaver Rim Phlox	Sparsely vegetated slopes on sand-stone, siltstone, or limestone substrates 6,000' – 7,4000'	Yes | No	Yes | No	
Rocky Mountain Twinpod	Sparsely vegetated, rocky slopes of limestone, sandstone or clay 5,600' – 8,300'	Yes | No	Yes | No	
Persistent Sepal Yellowcress	Riverbanks and shorelines, usually on sandy soils near high water line.	Yes | No	Yes | No	
Shoshonea	Shallow, stony calcareous soils of exposed limestone outcrops, ridgetops, and talus slopes 5,900' – 9,200'	Yes | No	Yes | No	
Barneby's Clover	Ledges, crevices and seams on reddish-cream Nugget Sandstone outcrops 5,600' – 6,700'	Yes | No	Yes | No	

COMMENTS:

Wildlife Biologist: Sarah Heeg -NRS
6/30/2011

LANDER FIELD OFFICE

Form 3160-3
(August 2007)

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-016008 (Bottomhole)

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☐ Oil Well ☐ Gas Well ☑ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #57

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address 123 West 1st Street, Suite 550
Casper, WY 82601

3b. Phone No. *(include area code)*
307-265-3326

10. Field and Pool, or Exploratory
Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface 2256' FSL, 974' FEL (NESE), Section 22, T32N, R85W
At proposed prod. zone 2101' FNL, 666' FEL (SENE), Section 22, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 22, T32N, R85W, 6th PM

14. Distance in miles and direction from nearest town or post office*
Approximately 19 miles south of Powder River, Wyoming

12. County or Parish
Natrona

13. State
WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)	16. No. of acres in lease	17. Spacing Unit dedicated to this well
539'	160	40 acres

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.	19. Proposed Depth	20. BLM/BIA Bond No. on file
≈1115'	7330'	800346757

21. Elevations (Show whether DF, KDB, RT, GL, etc.)	22. Approximate date work will start*	23. Estimated duration
7088' GL	02/01/2012	20 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature	Name *(Printed Typed)*	Date
	Ralph Schulte	6/8/2011

Title
Engineering Manager, Elk Petroleum

Approved by *(Signature)*	Name *(Printed Typed)*	Date

Title	Office

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

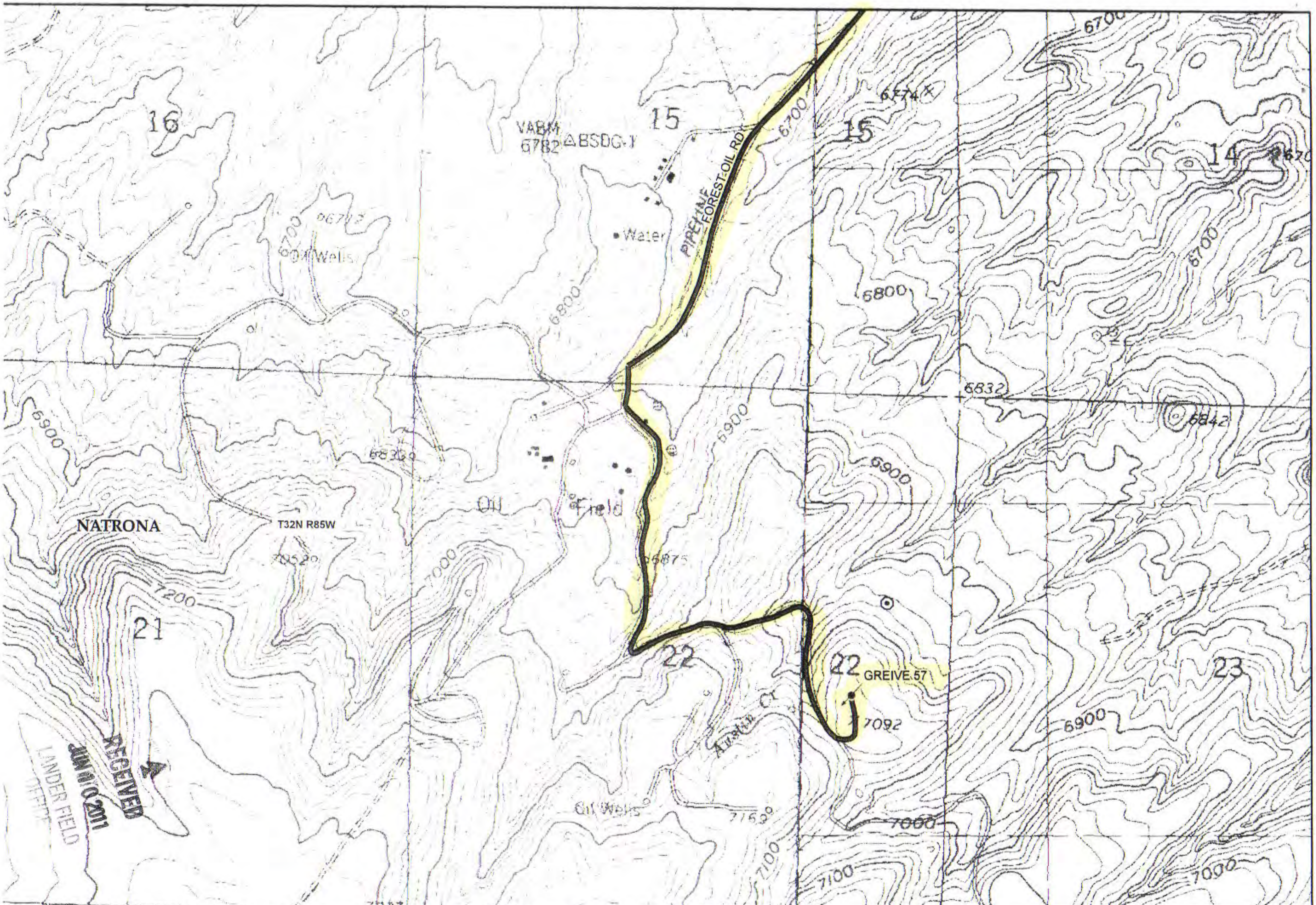
Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)

RECEIVED
JUN 10 2011
LANDER FIELD OFFICE

Posted 6/10/11



LEGEND

- PROPOSED WATER INJECTOR WELL, GRIEVE UNIT #57
- PROPOSED BOTTOM HOLE WATER LOCATION, GRIEVE UNIT #57
- ACCESS ROAD

THE DATA CONTAINED ON THIS WORK PRODUCT IS DERIVED FROM DIFFERENT SOURCES THAT MAY HAVE USED DIFFERENT GEO-REFERENCE PROJECTIONS. EPIC HAS MADE ADJUSTMENT TO DATA WHEN NECESSARY FOR CLARIFICATION AND HAS NOT PERFORMED LAND SURVEY OR TITLE WORK TO VERIFY ACCURACY.

THIS MAP DOCUMENT HAS NOT BEEN PUBLISHED BUT RATHER HAS BEEN PREPARED BY EPIC FOR USE BY THE CLIENT NAMED IN THE TITLE BLOCK SOLELY IN RESPECT OF THE CONSTRUCTION, OPERATION AND MAINTENANCE OF THE FACILITY NAMED IN THE TITLE BLOCK AND SHALL NOT BE USED FOR ANY OTHER PURPOSE OR FURNISHED TO ANY OTHER PARTY WITHOUT THE EXPRESS CONSENT OF EPIC.

DATE	REFERENCE DOCUMENTS	REV NO	REVISIONS	BY	DATE
JUNE11	EPIC Z:SITE\ELK_PETROLEUM				
JUNE11	ELK PETROLEUM				
APRIL11	NATRONA COUNTY GIS				
APRIL11	TAYLOR ENVIRONMENTAL CONSULTING LLC				
APRIL11	GGA INC				
APRIL11	BLM				
JUNE06	WYO DOT	A	ISSUED FOR APPROVAL	TKO	JUNE11

1 Inch = 1,250 feet

0 0.05 0.1 0.2
Miles

Epic
The Natural Resource

FROM PROJECT CONCEPTION TO OPERATING REALITY

N W E S

ELK PETROLEUM

123 WEST 1ST STREET, SUITE 550
CASPER, WY 82601

GRIEVE UNIT CO2
ACCESS TO GRIEVE #57

PROJECT	MAP	SCALE	DATE	REVISION
40-0238	EP-1306	1:15,000	07 JUNE 11	A

Application Date: 06/13/2011
Lease/Permit Number: WYW 051815
Project Name: Grieve Unit Well #58

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF LAND MANAGEMENT
WILDLIFE CLEARANCE EVALUATION AND CONSULTATION FORM
LANDER FIELD OFFICE

To: Wildlife Biologist
From: Melanie Leavenworth, Legal Assistant
Subject: Request for Wildlife Clearance and Evaluation

Company Name and/or Project Name: Elk Petroleum, Inc.
Legal Location: T. 32 N., R. 85 W., 6th P.M., Sec. 26, NENW (See attached request and map)
Description of Proposed Action: APD to drill Water Injection well, associated pipelines & access roads.
Quad: McCleary Reservoir
Stips: None

Response: Data Review and Determination of Impact on Wildlife Habitat and Threatened or Endangered Species
To: Initiating Officer

This memo will become an appendix to the Environmental Documentation for this project. This proposal and relative data have been analyzed as to the impact of the proposed action.

**Coordination with Wyoming Game and Fish Department (IS) (IS NOT) recommended. Coordination may be needed due to unusual or excessive negative effects on big game, sage-grouse, riparian areas, fisheries, other priority species or potentially controversial actions.

Threatened, Endangered, and Proposed Species Clearance Form

ENDANGERED, THREATENED, OR PROPOSED SPECIES	HABITAT DESCRIPTION	PROJECT EFFECT CALL	CONSULTATION REQUIRED	JUSTIFICATION FOR EFFECTS DETERMINATION
Canada lynx (Threatened)	Coniferous forests with abundant snowshoe hare populations.	NE	Yes | (No)	X No suitable habitat present
Black-footed ferret (Endangered)	Large prairie dog complexes c White-tailed Prairie Dog	NE	Yes | (No)	X Area not suitable for reintroduction efforts c No habitat present or action is within a block cleared area c Within prairie dog town; not block-cleared; survey required
Grizzly Bear (Threatened)	Extensive forest cover interspersed with grasslands and meadows.	NE	Yes | (No)	X No suitable habitat present
Blowout Penstemon (Endangered)	Active sand dunes	NE	Yes | (No)	X No suitable habitat present c Suitable habitat present; survey required or presence assumed
Ute ladies'-tresses (Threatened)	Seasonally moist soils and wet meadows of drainages below 7,000 feet	NE	Yes | (No)	X No suitable habitat present c Suitable habitat present; survey required or presence assumed
Desert yellowhead (Threatened)	Barren slopes and ridges on outcrops of white silty clay or Miocene sandstones of the Split Rock Formation.	NE	Yes | (No)	X No suitable habitat present
Critical Habitat for	Only one known location in the Beaver Rim	NE	Yes | (No)	X Not in critical habitat for desert

the Desert yellowhead	area of southern Fremont County.			yellowhead.
Platte River Water Depletions (5 listed species and designated critical habitat)	Downstream riparian and riverine habitat of the Platte River System Whooping Crane – Endangered Interior Least Tern – Endangered Piping Plover – Threatened Pallid Sturgeon – Endangered Western Prairie Fringed Orchid –Threatened Critical Habitat for: Whooping Crane Piping Plover	NE	Yes | No	c Action will not deplete water from the Platte River System c Action will cause depletion to the Platte River system; consultation required c See comments for further restrictions and water source
Gray wolf (Non-essential, experimental population)	Habitats with abundant ungulate prey, secluded (i.e. forested) denning and rendezvous sites, and low levels of human activity.	NE	Yes | No	c No suitable habitat present. Project not in recovery area. No established populations in project area. c Project in suitable habitat; consultation required.
Mountain Plover, (Proposed)	Habitats characterized by large areas of flat shortgrass prairie or very low shrubs with a prevalence of bare ground. Presence of prairie dog towns is a common characteristic of occupied plover nesting habitats.		Yes I No	c No suitable habitat present. c Project in suitable habitat.

**Project effect determinations for T&E species are: no effect (NE); may affect (MA); not likely to adversely affect (NLAA); likely to adversely affect (LAA); Likely to jeopardize population (LJ): or not likely to jeopardize population (NLJ). Project effect determinations for candidate species are: will not contribute to the need to list (WNC); will contribute to the need to list (WC).

**Initiation of (FORMAL) (INFORMAL) consultation with U. S. Fish and Wildlife Service (IS) (IS NOT) necessary.

Sarah Heeg -NRS — Wildlife Biologist

6/30/2011 — Date

BLM Consultation Letter Sent	FWS Consultation Letter Reply	Wildlife Biologist Initial
Date:	Date:	

SEO Letter Sent	SEO Letter Reply	Wildlife Biologist Initial
Date:	Date:	

WILDLIFE / RESOURCE CONCERN	HABITAT	DESIGNATED OR SUITABLE HABITAT	COA STIPULATION APPLIES	COA STIPULATION TIMING RESTRICTION
Sage Grouse Lek (Core Area)	Avoid disturbance or occupancy within 0.6 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.6 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Core	PIAA required and completed	Yes | No		
Sage Grouse Lek (non-Core Area)	Avoid disturbance or occupancy within 0.25 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.25 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (non-Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat within mapped habitat important for connectivity or within 2 miles of any occupied or undetermined lek.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Winter Habitat	Surface disturbing and/or disruptive activities are prohibited or restricted in mapped or modeled winter habitats/concentration areas that support Core Area populations.	Yes | No	Yes | No	Nov 15 – March 1
Raptors (General)	Avoid surface disturbance or occupancy within a 0.75 mile buffer of raptor nests.	Yes | No	Yes | No	Feb 1 – July 31 Or until young have fledged.
Bald Eagle	Lakes, rivers and other large water bodies suitable for foraging with large trees for nesting and roosting	Yes | No	Yes | No	c No nest, roost, or feeding concentrations present. c Nest within 1 mile: Apply NSO Buffer c Roost within 1 mile: NSO and timing restrict. Nov 1 – Mar 31 c Other restrictions apply, see comments
Mountain Plover	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable Mountain Plover nesting habitat.	Yes | No	Yes | No	April 10 – July 10
Big Game Crucial Winter Range And Elk Winter Range	Delineated by WGFD/BLM	Yes | No	Yes | No	Nov 15 - April 30
Big Game Parturition Areas	Delineated by WGFD/BLM	Yes | No	Yes | No	May 1 - June 30
Riparian Areas	Move Project > 500 feet from perennial streams/live water	Yes | No	Yes | No	Riparian Areas

COMMENTS: PIAA required Sage Grouse stip applies March 1 - July 15th

Date of Field Visit: 6/15/2011

Photos Attached: YES or NO

Sarah Heeg - NRS 6/30/2011

Wildlife Biologist (DATE)

BLM SENSITIVE SPECIES	HABITAT	POTENTIAL HABITAT	COA /TLS/ STIPULATION APPLIES	COA /TLS/ STIPULATION
BIRDS OF PREY:				
Northern Goshawk	Conifer and deciduous forests	Yes | No	Yes | No	
Ferruginous Hawk	Basin – prairie shrub, grassland, rock outcrops	Yes | No	Yes | No	
Burrowing Owl	Grasslands, basin-prairie shrub	Yes | No	Yes | No	
Peregrine Falcon	Tall Cliffs	Yes | No	Yes | No	
BATS:				
Long-eared Myotis	Conifer and deciduous forest, caves and mines	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Spotted Bat	Cliffs over perennial water, basin-prairie shrub	Yes | No	Yes | No	See comments for additional restrictions
Townsend's Big-eared Bat	Forests, basin-prairie shrub, caves and mines	Yes | No	Yes | No	
PRAIRE DOGS:				Avoid burrows and colonies where possible
White-tailed	Basin prairie shrub, grasslands	Yes | No	Yes | No	See comments for additional restrictions
GRASSLAND OBLIGATES:				
Swift Fox	Grasslands	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Long-billed Curlew	Grasslands, plains, foothills, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
SAGEBRUSH OBLIGATE BIRDS:				
Sage Thrasher	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance See comments for additional restrictions
Loggerhead Shrike	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	
Sage Sparrow	Basin prairie shrub, mountain foothill shrub	Yes | No	Yes | No	
Brewer's Sparrow	Basin-prairie shrub	Yes | No	Yes | No	
Pygmy Rabbit	Basin-prairie and riparian shrub	Yes | No	Yes | No	
RIPARIAN/WETLAND OBLIGATES:				
Yellow-billed Cuckoo	Open woodlands, streamside willow and alder groves	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance See comments for additional restrictions
White-faced Ibis	Marshes, wet meadows	Yes | No	Yes | No	
Trumpeter Swan	Lakes, ponds, rivers	Yes | No	Yes | No	
Northern Leopard Frog	Beaver ponds, permanent water in plains and foothills	Yes | No	Yes | No	
Great Basin spadefoot	Spring seeps, permanent and temporary waters	Yes | No	Yes | No	
Boreal toad (Northern Rocky Mtn.	Pond margins, wet meadows, riparian areas.	Yes | No	Yes | No	

population)				
Spotted frog	Ponds, sloughs, small streams	Yes | No	Yes | No	
Yellowstone cutthroat trout	Yellowstone drainage, small mountain streams and large rivers	Yes | No	Yes | No	
PLANTS:				
Meadow Pussytoes	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4,950' – 7,900'	Yes | No	Yes | No	
Porter's Sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes Elevation: 5,300 – 6,500 feet	Yes | No	Yes | No	
Dubois Milkvetch	Barren shale, badlands, limestone, and redbed slopes and ridges 6,900' – 8,800"	Yes | No	Yes | No	
Limber Pine	Timberline and at lower elevation with sagebrush. Associated species are Rocky Mountain lodgepole pine, Engelmann spruce, whitebark pine, Rocky Mountain Douglas-fir, subalpine fir, Rocky Mountain juniper, Mountain Mahogany, and common juniper.	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Cedar Rim Thistle	Barren, chalky hills, gravelly slopes and fine-textured, sandy/shaley draws 6,700' – 7,200'	Yes | No	Yes | No	See comments for additional restrictions
Owl Creek Miner's	Sandy-gravelly slopes on sandstone of the Wind River Formation 4,700' – 6,000'	Yes | No	Yes | No	
Fremont Bladderpod	Rocky limestone slopes and ridges 7,000' – 9,000'	Yes | No	Yes | No	
Beaver Rim Phlox	Sparsely vegetated slopes on sandstone, siltstone, or limestone substrates 6,000' – 7,4000'	Yes | No	Yes | No	
Rocky Mountain Twinpod	Sparsely vegetated, rocky slopes of limestone, sandstone or clay 5,600' – 8,300'	Yes | No	Yes | No	
Persistent Sepal Yellowcress	Riverbanks and shorelines, usually on sandy soils near high water line.	Yes | No	Yes | No	
Shoshonea	Shallow, stony calcareous soils of exposed limestone outcrops, ridgetops, and talus slopes 5,900' – 9,200'	Yes | No	Yes | No	
Barneby's Clover	Ledges, crevices and seams on reddish-cream Nugget Sandstone outcrops 5,600' – 6,700'	Yes | No	Yes | No	

COMMENTS:

Avoid habitat disturbance of sagebrush & riparian habitat whenever possible

Wildlife Biologist: Sarah Haeg-NRS

6/30/201

Form 3160-3
(August 2007)

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-015815

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☐ Oil Well ☐ Gas Well ☑ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #58

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address 123 West 1st Street, Suite 550
Casper, WY 82601

3b. Phone No. *(include area code)*
307-265-3326

10. Field and Pool, or Exploratory
Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface 565' FNL, 1589' FWL (NENW), Section 26, T32N, R85W
At proposed prod. zone 571' FNL, 2030' FWL (NENW), Section 26, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 26, T32N, R85W, 6th PM

14. Distance in miles and direction from nearest town or post office*
Approximately 19 miles south of Powder River, Wyoming

12. County or Parish
Natrona

13. State
WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)	16. No. of acres in lease	17. Spacing Unit dedicated to this well
571'	2040	40 acres

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.	19. Proposed Depth	20. BLM/BIA Bond No. on file
≈805'	7460'	800346757

21. Elevations (Show whether DF, KDB, RT, GL, etc.)	22. Approximate date work will start*	23. Estimated duration
7114' GL	02/01/2012	20 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature	Name *(Printed Typed)*	Date
	Ralph Schulte	6/8/2011

Title
Engineering Manager, Elk Petroleum

Approved by *(Signature)*	Name *(Printed Typed)*	Date

Title	Office

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

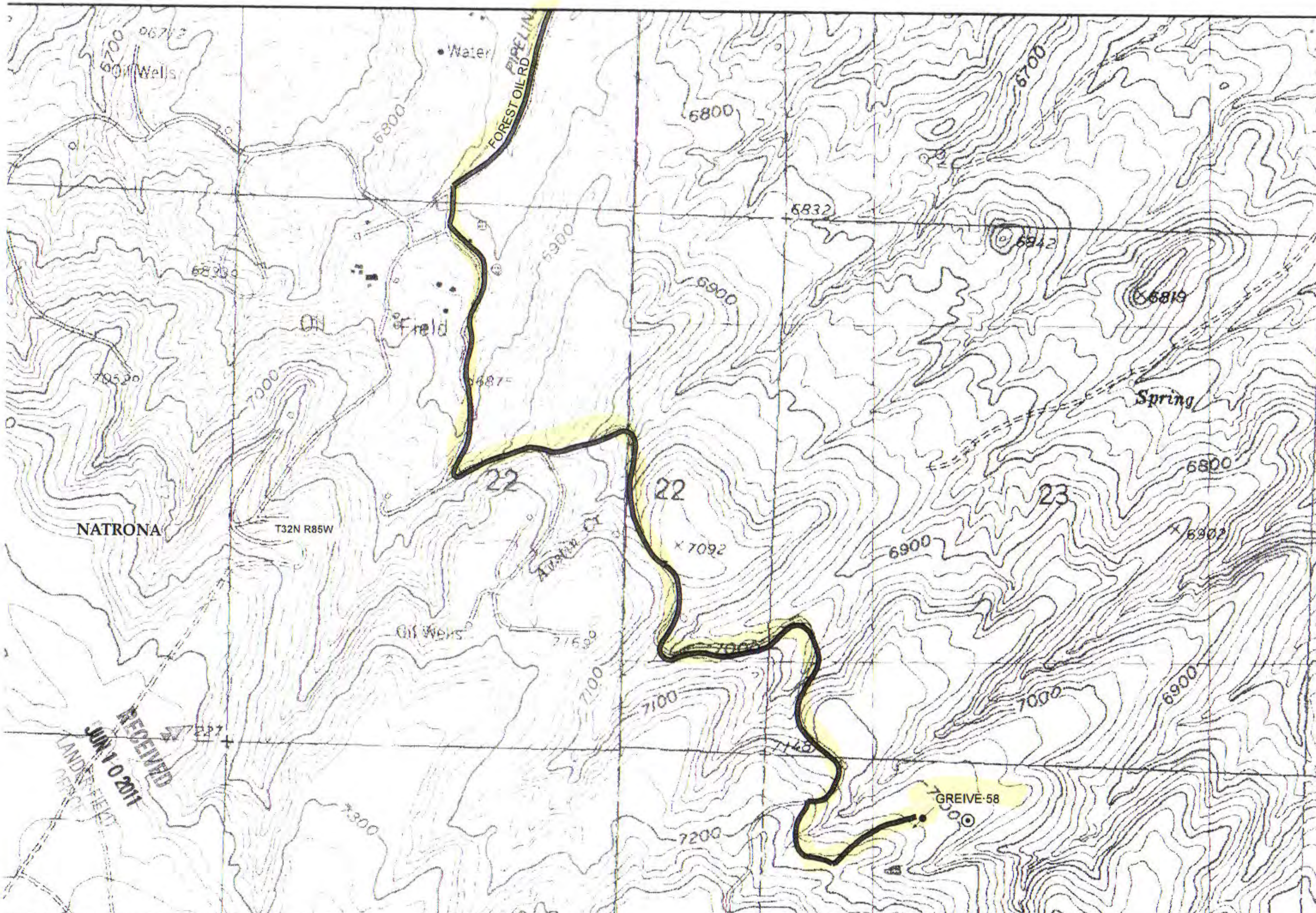
Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)

RECEIVED
JUN 10 2011
LANDER FIELD OFFICE

Posted 6/10/11



LEGEND

PROPOSED WATER INJECTOR WELL, GRIEVE UNIT #58

PROPOSED BOTTOM HOLE WATER LOCATION, GRIEVE UNIT #58

ACCESS ROAD

THE DATA CONTAINED ON THIS WORK PRODUCT IS DERIVED FROM DIFFERENT SOURCES THAT MAY HAVE USED DIFFERENT GEO-REFERENCE PROJECTIONS. EPIC HAS MADE ADJUSTMENT TO DATA WHEN NECESSARY FOR CLARIFICATION AND HAS NOT PERFORMED LAND SURVEY OR TITLE WORK TO VERIFY ACCURACY.

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DATE	REFERENCE DOCUMENTS	REV NO	REVISIONS	BY	DATE
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JUNE11	ELK PETROLEUM				
APRIL11	NATRONA COUNTY GIS				
APRIL11	TAYLOR ENVIRONMENTAL CONSULTING LLC				
APRIL11	GGA INC				
APRIL11	BLM				
JUNE09	WYO DOT	A	ISSUED FOR APPROVAL	TKD	JUNE11

1 Inch = 1,250 feet

0 0.05 0.1 0.2
Miles

EPIC
The Natural Resource

1000 EAST BRUNDAGE LANE
P.O. BOX 793
SHERIDAN, WY 82801
307-673-8080
www.1epic.com

FROM PROJECT CONCEPTION TO OPERATING REALITY

N
W E
S

ELK PETROLEUM

133 WEST 1ST STREET, SUITE 550
CASPER, WY 82601

GRIEVE UNIT CO2
ACCESS TO GRIEVE #58

PROJECT	MAP	SCALE	DATE	REVISION
40-0238	EP-1306	1:15,000	07 JUNE 11	A

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF LAND MANAGEMENT
WILDLIFE CLEARANCE EVALUATION AND CONSULTATION FORM
LANDER FIELD OFFICE

TO: Lander Field Office, Wildlife Biologist

FROM: Melanie Leavenworth, Legal Assistant

DATE: July 23, 2012

SUBJECT: Request for Wildlife Clearance and Evaluation

Lease/Permit Number: **WYW-015815, Grieve Unit Well #59**
Project or Company Name: **Elk Petroleum Inc.**
Location: **T. 32 N., R. 85 W., 6th P.M., Sec. 26, NENW**
County: **Natrona**
Project Description: **APD to drill C02 injection well, access roads & pipelines**
USGS Quadrangle: **McCleary Reservoir**
Lease Stips: **None**

Response: Data Review and Determination of Impact on Wildlife Habitat and Threatened or Endangered Species
To: Initiating Officer

This memo will become an appendix to the Environmental Documentation for this project. This proposal and relative data have been analyzed as to the impact of the proposed action.

**Coordination with Wyoming Game and Fish Department (IS) (IS NOT) recommended. Coordination may be needed due to unusual or excessive negative effects on big game, sage-grouse, riparian areas, fisheries, other priority species or potentially controversial actions.

Threatened, Endangered, and Proposed Species Clearance Form

ENDANGERED, THREATENED, OR PROPOSED SPECIES	HABITAT DESCRIPTION	PROJECT EFFECT CALL	CONSULTATION REQUIRED	JUSTIFICATION FOR EFFECTS DETERMINATION
Canada lynx (Threatened)	Coniferous forests with abundant snowshoe hare populations.	NE	Yes | (No)	X No suitable habitat present
Black-footed ferret (Endangered)	Large prairie dog complexes c White-tailed Prairie Dog	NE	Yes | (No)	X Area not suitable for reintroduction efforts c No habitat present or action is within a block cleared area c Within prairie dog town; not block-cleared; survey required
Grizzly Bear (Threatened)	Extensive forest cover interspersed with grasslands and meadows.	NE	Yes | (No)	X No suitable habitat present
Blowout Penstemon (Endangered)	Active sand dunes	NE	Yes | (No)	X No suitable habitat present c Suitable habitat present; survey required or presence assumed
Ute ladies'-tresses (Threatened)	Seasonally moist soils and wet meadows of drainages below 7,000 feet	NE	Yes | (No)	X No suitable habitat present c Suitable habitat present; survey required or presence assumed

Desert yellowhead (Threatened)	Barren slopes and ridges on outcrops of white silty clay or Miocene sandstones of the Split Rock Formation.	NE	Yes | No	X No suitable habitat present
Critical Habitat for the Desert yellowhead	Only one known location in the Beaver Rim area of southern Fremont County.	NE	Yes | No	X Not in critical habitat for Desert yellowhead.
Platte River Water Depletions (5 listed species and designated critical habitat)	Downstream riparian and riverine habitat of the Platte River System Whooping Crane – Endangered Interior Least Tern – Endangered Piping Plover – Threatened Pallid Sturgeon – Endangered Western Prairie Fringed Orchid –Threatened Critical Habitat for: Whooping Crane	NE	Yes | No	X Action will not deplete water from the Platte River System C Action will cause depletion to the Platte River system; consultation required C See comments for further restrictions and water source
Gray wolf (Non-essential, experimental population)	Habitats with abundant ungulate prey, secluded (i.e. forested) denning and rendezvous sites, and low levels of human activity.	NE	Yes | No	X No suitable habitat present. Project not in recovery area. No established populations in project area. C Project in suitable habitat; consultation required.

**Project effect determinations for T&E species are: no effect (NE); may affect (MA); not likely to adversely affect (NLAA); likely to adversely affect (LAA); Likely to jeopardize population (LJ): or not likely to jeopardize population (NLJ). Project effect determinations for candidate species are: will not contribute to the need to list (WNC); will contribute to the need to list (WC).

**Initiation of (FORMAL) (~~INFORMAL~~) consultation with U. S. Fish and Wildlife Service (IS) (IS NOT) necessary.

Sarah Klumpen - WRS 7/23/12

Wildlife Biologist Date

BLM Consultation Letter Sent	FWS Consultation Letter Reply	Wildlife Biologist Initial
Date:	Date:	

SEO Letter Sent	SEO Letter Reply	Wildlife Biologist Initial
Date:	Date:	

WILDLIFE / RESOURCE CONCERN	HABITAT	DESIGNATED OR SUITABLE HABITAT	COA STIPULATION APPLIES	COA STIPULATION TIMING RESTRICTION
Sage Grouse Lek (Core Area)	Avoid disturbance or occupancy within 0.6 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.6 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Core	PIAA required and completed	Yes | No		
Sage Grouse Lek (non-Core Area)	Avoid disturbance or occupancy within 0.25 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.25 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (non-Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat within mapped habitat important for connectivity or within 2 miles of any occupied or undetermined lek.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Winter Habitat	Surface disturbing and/or disruptive activities are prohibited or restricted in mapped or modeled winter habitats/concentration areas that support Core Area populations.	Yes | No	Yes | No	Nov 15 – March 1
Raptors (General)	Avoid surface disturbance or occupancy within a 0.75 mile buffer of raptor nests.	Yes | No	Yes | No	Feb 1 – July 31 Or until young have fledged.
Bald Eagle	Lakes, rivers and other large water bodies suitable for foraging with large trees for nesting and roosting	Yes | No	Yes | No	c No nest, roost, or feeding concentrations present. c Nest within 1 mile: Apply NSO Buffer c Roost within 1 mile: NSO and timing restrict. Nov 1 – Mar 31 c Other restrictions apply, see comments
Mountain Plover	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable Mountain Plover nesting habitat.	Yes | No	Yes | No	April 10 – July 10
Big Game Crucial Winter Range And Elk Winter Range	Delineated by WGFD/BLM	Yes | No	Yes | No	Nov 15 - April 30
Big Game Parturition Areas	Delineated by WGFD/BLM	Yes | No	Yes | No	May 1 - June 30
Riparian Areas	Move Project > 500 feet from perennial streams/live water	Yes | No	Yes | No	Riparian Areas

COMMENTS:

Date of Field Visit: 6/15/11

Photos Attached: YES or NO

Sarah Wengert - NRS 7/23/12

Wildlife Biologist (DATE)

COMMENTS:

BLM SENSITIVE SPECIES	HABITAT	POTENTIAL HABITAT	COA /TLS/ STIPULATION APPLIES	COA /TLS/ STIPULATION
BIRDS OF PREY:				
Northern Goshawk	Conifer and deciduous forests	Yes | No	Yes | No	
Ferruginous Hawk	Basin – prairie shrub, grassland, rock outcrops	Yes | No	Yes | No	
Burrowing Owl	Grasslands, basin-prairie shrub	Yes | No	Yes | No	
Peregrine Falcon	Tall Cliffs	Yes | No	Yes | No	
BATS:				
Long-eared Myotis	Conifer and deciduous forest, caves and mines	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Spotted Bat	Cliffs over perennial water, basin-prairie shrub	Yes | No	Yes | No	See comments for additional restrictions
Townsend's Big-eared Bat	Forests, basin-prairie shrub, caves and mines	Yes | No	Yes | No	
PRAIRE DOGS:				Avoid burrows and colonies where possible
White-tailed	Basin prairie shrub, grasslands	Yes | No	Yes | No	See comments for additional restrictions
GRASSLAND OBLIGATES:				Avoid habitat where possible and minimize disturbance
Swift Fox	Grasslands	Yes | No	Yes | No	
Long-billed Curlew	Grasslands, plains, foothills, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
SAGEBRUSH OBLIGATES:				
Sage Thrasher	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Loggerhead Shrike	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	See comments for additional restrictions
Sage Sparrow	Basin prairie shrub, mountain foothill shrub	Yes | No	Yes | No	
Brewer's Sparrow	Basin-prairie shrub	Yes | No	Yes | No	
Pygmy Rabbit	Basin-prairie and riparian shrub	Yes | No	Yes | No	
RIPARIAN/WETLAND OBLIGATES:				
Yellow-billed Cuckoo	Open woodlands, streamside willow and alder groves	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
White-faced Ibis	Marshes, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
Trumpeter Swan	Lakes, ponds, rivers	Yes | No	Yes | No	
Northern Leopard Frog	Beaver ponds, permanent water in plains and foothills	Yes | No	Yes | No	
Great Basin spadefoot	Spring seeps, permanent and temporary waters	Yes | No	Yes | No	

Boreal toad (Northern Rocky Mtn. population)	Pond margins, wet meadows, riparian areas.	Yes | No	Yes | No	
Spotted frog	Ponds, sloughs, small streams	Yes | No	Yes | No	
Yellowstone cutthroat trout	Yellowstone drainage, small mountain streams and large rivers	Yes | No	Yes | No	
PLANTS:				
Meadow Pussytoes	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4,950' – 7,900'	Yes | No	Yes | No	
Porter's Sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes Elevation: 5,300 – 6,500 feet	Yes | No	Yes | No	
Dubois Milkvetch	Barren shale, badlands, limestone, and redbed slopes and ridges 6,900' – 8,800"	Yes | No	Yes | No	
Limber Pine	Timberline and at lower elevation with sagebrush. Associated species are Rocky Mountain lodgepole pine, Engelmann spruce, whitebark pine, Rocky Mountain Douglas-fir, subalpine fir, Rocky Mountain juniper, Mountain Mahogany, and common juniper.	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Cedar Rim Thistle	Barren, chalky hills, gravelly slopes and fine-textured, sandy/shaley draws 6,700' – 7,200'	Yes | No	Yes | No	See comments for additional restrictions
Owl Creek Miner's	Sandy-gravelly slopes on sandstone of the Wind River Formation 4,700' – 6,000'	Yes | No	Yes | No	
Fremont Bladderpod	Rocky limestone slopes and ridges 7,000' – 9,000'	Yes | No	Yes | No	
Beaver Rim Phlox	Sparsely vegetated slopes on sand-stone, siltstone, or limestone substrates 6,000' – 7,4000'	Yes | No	Yes | No	
Rocky Mountain Twinpod	Sparsely vegetated, rocky slopes of limestone, sandstone or clay 5,600' – 8,300'	Yes | No	Yes | No	
Persistent Sepal Yellowcress	Riverbanks and shorelines, usually on sandy soils near high water line.	Yes | No	Yes | No	
Shoshonea	Shallow, stony calcareous soils of exposed limestone outcrops, ridgetops, and talus slopes 5,900' – 9,200'	Yes | No	Yes | No	
Barneby's Clover	Ledges, crevices and seams on reddish-cream Nugget Sandstone outcrops 5,600' – 6,700'	Yes | No	Yes | No	

COMMENTS:

Wildlife Biologist: Sarah Wempen-WRS 7/23/12

Form 3160-3
(August 2007)

RECEIVED
DEC 12 2011
LANDER FIELD OFFICE

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-015815

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☐ Oil Well ☐ Gas Well ☑ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #59

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address 123 West 1st Street, Suite 550
Casper, WY 82601

3b. Phone No. *(include area code)*
307-265-3326

10. Field and Pool, or Exploratory
Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface 565' FNL, 1589' FWL (NENW), Section 26, T32N, R85W
At proposed prod. zone 1859' FNL, 2156' FWL (SENW), Section 26, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 26, T32N, R85W, 6th PM

14. Distance in miles and direction from nearest town or post office*
Approximately 19 miles south of Powder River, Wyoming

12. County or Parish
Natrona

13. State
WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) 565'	16. No. of acres in lease 920	17. Spacing Unit dedicated to this well 40 acres
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. 15'	19. Proposed Depth 7600'	20. BLM/BIA Bond No. on file 800346757
21. Elevations (Show whether DF, KDB, RT, GL, etc.) 7114' GL	22. Approximate date work will start* 06/01/2012	23. Estimated duration 20 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature	Name *(Printed/Typed)*	Date
	Ralph Schulte	11/30/2011

Title
Engineering Manager, Elk Petroleum

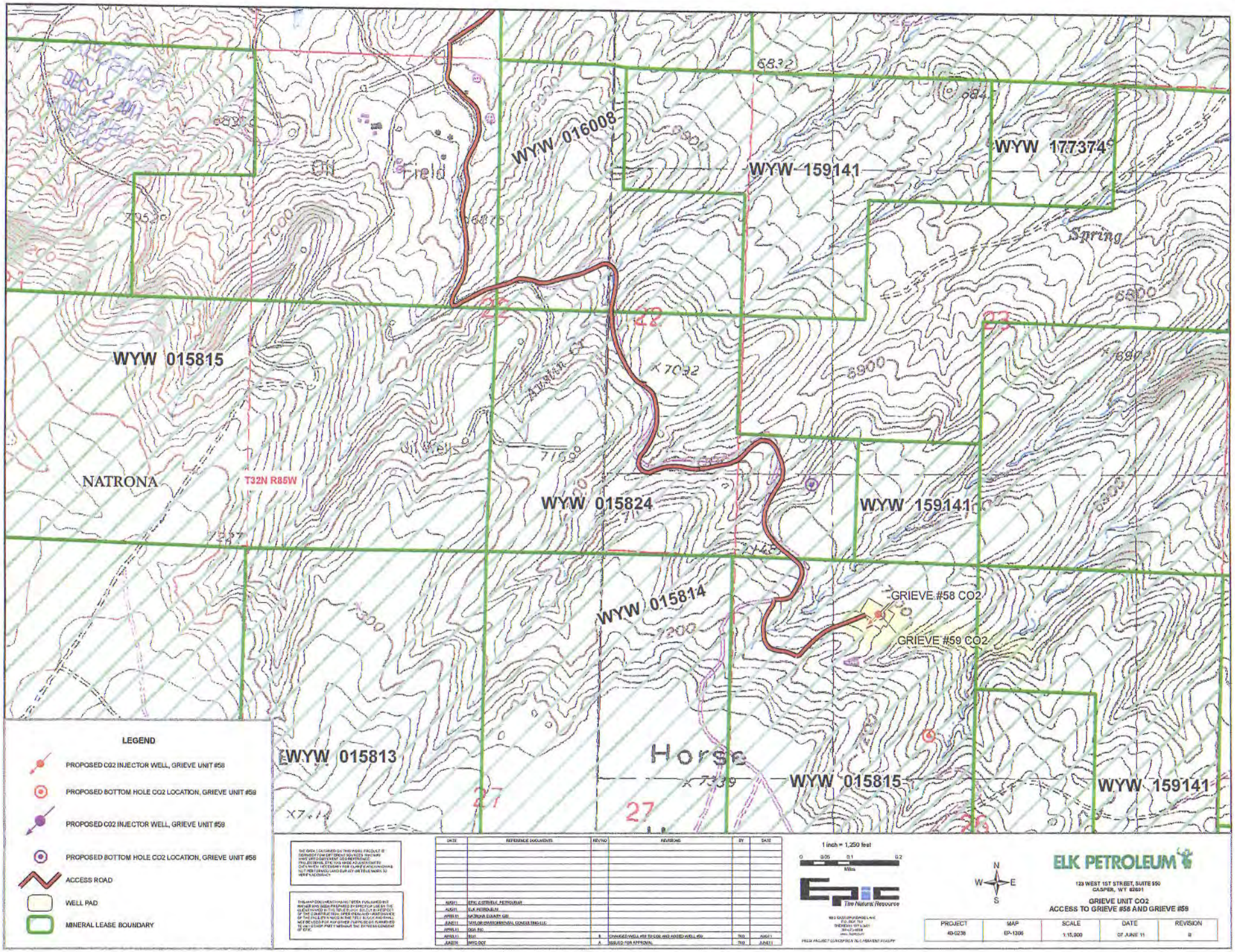
Approved by *(Signature)*	Name *(Printed/Typed)*	Date
Title	Office	

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)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WYW 159141
WYW 177374
WYW 015815
WYW 015824
WYW 159141
WYW 015814
WYW 015813
WYW 015815
WYW 159141
NATRONA
T32N R85W
Oil Field
Spring
Horse
GRIEVE #58 CO2
GRIEVE #59 CO2
LEGEND
PROPOSED CO2 INJECTOR WELL, GRIEVE UNIT #58
PROPOSED BOTTOM HOLE CO2 LOCATION, GRIEVE UNIT #59
PROPOSED CO2 INJECTOR WELL, GRIEVE UNIT #59
PROPOSED BOTTOM HOLE CO2 LOCATION, GRIEVE UNIT #58
ACCESS ROAD
WELL PAD
MINERAL LEASE BOUNDARY
1 inch = 1,250 feet
ELK PETROLEUM
123 WEST 1ST STREET, SUITE 550
CASPER, WY 82601
GRIEVE UNIT CO2
ACCESS TO GRIEVE #58 AND GRIEVE #59
PROJECT 40-0238
MAP EP-1306
SCALE 1:15,000
DATE 07 JUNE 11
REVISION B

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF LAND MANAGEMENT
WILDLIFE CLEARANCE EVALUATION AND CONSULTATION FORM
LANDER FIELD OFFICE

TO: Lander Field Office, Wildlife Biologist

FROM: Melanie Leavenworth, Legal Assistant

DATE: July 23, 2012

SUBJECT: Request for Wildlife Clearance and Evaluation

Lease/Permit Number: **WYW-016008, Grieve Unit Well #60**
Project or Company Name: **Elk Petroleum Inc.**
Location: **T. 32 N., R. 85 W., 6th P.M., Sec. 22, SWNE**
County: **Natrona**
Project Description: **APD to drill C02 injection well, access roads & pipelines**
USGS Quadrangle: **Horse Creek Springs**
Lease Stips: **None**

Response: Data Review and Determination of Impact on Wildlife Habitat and Threatened or Endangered Species
To: Initiating Officer

This memo will become an appendix to the Environmental Documentation for this project. This proposal and relative data have been analyzed as to the impact of the proposed action.

**Coordination with Wyoming Game and Fish Department (IS) (IS NOT) recommended. Coordination may be needed due to unusual or excessive negative effects on big game, sage-grouse, riparian areas, fisheries, other priority species or potentially controversial actions.

Threatened, Endangered, and Proposed Species Clearance Form

ENDANGERED, THREATENED, OR PROPOSED SPECIES	HABITAT DESCRIPTION	PROJECT EFFECT CALL	CONSULTATION REQUIRED	JUSTIFICATION FOR EFFECTS DETERMINATION
Canada lynx (Threatened)	Coniferous forests with abundant snowshoe hare populations.	NE	Yes (No)	X No suitable habitat present
Black-footed ferret (Endangered) c White-tailed Prairie Dog	Large prairie dog complexes	NE	Yes (No)	X Area not suitable for reintroduction efforts c No habitat present or action is within a block cleared area c Within prairie dog town; not block-cleared; survey required
Grizzly Bear (Threatened)	Extensive forest cover interspersed with grasslands and meadows.	NE	Yes (No)	X No suitable habitat present
Blowout Penstemon (Endangered)	Active sand dunes	NE	Yes (No)	X No suitable habitat present c Suitable habitat present; survey required or presence assumed
Ute ladies'-tresses (Threatened)	Seasonally moist soils and wet meadows of drainages below 7,000 feet	NE	Yes (No)	X No suitable habitat present c Suitable habitat present; survey required or presence assumed

Desert yellowhead (Threatened)	Barren slopes and ridges on outcrops of white silty clay or Miocene sandstones of the Split Rock Formation.	NE	Yes | No	X No suitable habitat present
Critical Habitat for the Desert yellowhead	Only one known location in the Beaver Rim area of southern Fremont County.	NE	Yes | No	X Not in critical habitat for Desert yellowhead.
Platte River Water Depletions (5 listed species and designated critical habitat)	Downstream riparian and riverine habitat of the Platte River System Whooping Crane – Endangered Interior Least Tern – Endangered Piping Plover – Threatened Pallid Sturgeon – Endangered Western Prairie Fringed Orchid –Threatened Critical Habitat for: Whooping Crane	NE	Yes | No	X Action will not deplete water from the Platte River System C Action will cause depletion to the Platte River system; consultation required C See comments for further restrictions and water source
Gray wolf (Non-essential, experimental population)	Habitats with abundant ungulate prey, secluded (i.e. forested) denning and rendezvous sites, and low levels of human activity.	NE	Yes | No	X No suitable habitat present. Project not in recovery area. No established populations in project area. C Project in suitable habitat; consultation required.

**Project effect determinations for T&E species are: no effect (NE); may affect (MA); not likely to adversely affect (NLAA); likely to adversely affect (LAA); Likely to jeopardize population (LJ): or not likely to jeopardize population (NLJ). Project effect determinations for candidate species are: will not contribute to the need to list (WNC); will contribute to the need to list (WC).

**Initiation of (FORMAL) (INFORMAL) consultation with U. S. Fish and Wildlife Service (IS) (IS NOT) necessary.

Sarah Wempen-NRS 7/23/12

Wildlife Biologist Date

BLM Consultation Letter Sent	FWS Consultation Letter Reply	Wildlife Biologist Initial
Date:	Date:	

SEO Letter Sent	SEO Letter Reply	Wildlife Biologist Initial
Date:	Date:	

WILDLIFE / RESOURCE CONCERN	HABITAT	DESIGNATED OR SUITABLE HABITAT	COA STIPULATION APPLIES	COA STIPULATION TIMING RESTRICTION
Sage Grouse Lek (Core Area)	Avoid disturbance or occupancy within 0.6 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.6 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Core	PIAA required and completed	Yes | No		
Sage Grouse Lek (non-Core Area)	Avoid disturbance or occupancy within 0.25 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.25 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (non-Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat within mapped habitat important for connectivity or within 2 miles of any occupied or undetermined lek.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Winter Habitat	Surface disturbing and/or disruptive activities are prohibited or restricted in mapped or modeled winter habitats/concentration areas that support Core Area populations.	Yes | No	Yes | No	Nov 15 – March 1
Raptors (General)	Avoid surface disturbance or occupancy within a 0.75 mile buffer of raptor nests.	Yes | No	Yes | No	Feb 1 – July 31 Or until young have fledged.
Bald Eagle	Lakes, rivers and other large water bodies suitable for foraging with large trees for nesting and roosting	Yes | No	Yes | No	C No nest, roost, or feeding concentrations present. C Nest within 1 mile: Apply NSO Buffer C Roost within 1 mile: NSO and timing restrict. Nov 1 – Mar 31 C Other restrictions apply, see comments
Mountain Plover	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable Mountain Plover nesting habitat.	Yes | No	Yes | No	April 10 – July 10
Big Game Crucial Winter Range And Elk Winter Range	Delineated by WGFD/BLM	Yes | No	Yes | No	Nov 15 - April 30
Big Game Parturition Areas	Delineated by WGFD/BLM	Yes | No	Yes | No	May 1 - June 30
Riparian Areas	Move Project > 500 feet from perennial streams/live water	Yes | No	Yes | No	Riparian Areas

COMMENTS:

Date of Field Visit: 6/15/2011

Photos Attached: YES or NO

Sarah Wempen - NRS 7/23/12

Wildlife Biologist (DATE)

COMMENTS:

BLM SENSITIVE SPECIES	HABITAT	POTENTIAL HABITAT	COA /TLS/ STIPULATION APPLIES	COA /TLS/ STIPULATION
BIRDS OF PREY:				
Northern Goshawk	Conifer and deciduous forests	Yes | No	Yes | No	
Ferruginous Hawk	Basin – prairie shrub, grassland, rock outcrops	Yes | No	Yes | No	
Burrowing Owl	Grasslands, basin-prairie shrub	Yes | No	Yes | No	
Peregrine Falcon	Tall Cliffs	Yes | No	Yes | No	
BATS:				
Long-eared Myotis	Conifer and deciduous forest, caves and mines	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Spotted Bat	Cliffs over perennial water, basin-prairie shrub	Yes | No	Yes | No	See comments for additional restrictions
Townsend's Big-eared Bat	Forests, basin-prairie shrub, caves and mines	Yes | No	Yes | No	
PRAIRE DOGS:				Avoid burrows and colonies where possible
White-tailed	Basin prairie shrub, grasslands	Yes | No	Yes | No	See comments for additional restrictions
GRASSLAND OBLIGATES:				
Swift Fox	Grasslands	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Long-billed Curlew	Grasslands, plains, foothills, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
SAGEBRUSH OBLIGATES:				
Sage Thrasher	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance See comments for additional restrictions
Loggerhead Shrike	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	
Sage Sparrow	Basin prairie shrub, mountain foothill shrub	Yes | No	Yes | No	
Brewer's Sparrow	Basin-prairie shrub	Yes | No	Yes | No	
Pygmy Rabbit	Basin-prairie and riparian shrub	Yes | No	Yes | No	
RIPARIAN/WETLAND OBLIGATES:				
Yellow-billed Cuckoo	Open woodlands, streamside willow and alder groves	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
White-faced Ibis	Marshes, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
Trumpeter Swan	Lakes, ponds, rivers	Yes | No	Yes | No	
Northern Leopard Frog	Beaver ponds, permanent water in plains and foothills	Yes | No	Yes | No	
Great Basin spadefoot	Spring seeps, permanent and temporary waters	Yes | No	Yes | No	

Boreal toad (Northern Rocky Mtn. population)	Pond margins, wet meadows, riparian areas.	Yes | No	Yes | No	
Spotted frog	Ponds, sloughs, small streams	Yes | No	Yes | No	
Yellowstone cutthroat trout	Yellowstone drainage, small mountain streams and large rivers	Yes | No	Yes | No	
PLANTS:				
Meadow Pussytoes	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4,950' – 7,900'	Yes | No	Yes | No	
Porter's Sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes Elevation: 5,300 – 6,500 feet	Yes | No	Yes | No	
Dubois Milkvetch	Barren shale, badlands, limestone, and redbed slopes and ridges 6,900' – 8,800"	Yes | No	Yes | No	
Limber Pine	Timberline and at lower elevation with sagebrush. Associated species are Rocky Mountain lodgepole pine, Engelmann spruce, whitebark pine, Rocky Mountain Douglas-fir, subalpine fir, Rocky Mountain juniper, Mountain Mahogany, and common juniper.	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Cedar Rim Thistle	Barren, chalky hills, gravelly slopes and fine-textured, sandy/shaley draws 6,700' – 7,200'	Yes | No	Yes | No	See comments for additional restrictions
Owl Creek Miner's	Sandy-gravelly slopes on sandstone of the Wind River Formation 4,700' – 6,000'	Yes | No	Yes | No	
Fremont Bladderpod	Rocky limestone slopes and ridges 7,000' – 9,000'	Yes | No	Yes | No	
Beaver Rim Phlox	Sparsely vegetated slopes on sand-stone, siltstone, or limestone substrates 6,000' – 7,4000'	Yes | No	Yes | No	
Rocky Mountain Twinpod	Sparsely vegetated, rocky slopes of limestone, sandstone or clay 5,600' – 8,300'	Yes | No	Yes | No	
Persistent Sepal Yellowcress	Riverbanks and shorelines, usually on sandy soils near high water line.	Yes | No	Yes | No	
Shoshonea	Shallow, stony calcareous soils of exposed limestone outcrops, ridgetops, and talus slopes 5,900' – 9,200'	Yes | No	Yes | No	
Barneby's Clover	Ledges, crevices and seams on reddish-cream Nugget Sandstone outcrops 5,600' – 6,700'	Yes | No	Yes | No	

COMMENTS:

Wildlife Biologist: Sarah Kempen-BRS 7/23/12

Form 3160-3
(August 2007)

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

RECEIVED
DEC 12 2011
LANDER FIELD OFFICE

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.: WYW-016008

6. If Indian, Allotee or Tribe Name:

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.: Grieve Unit WYW109538X

1b. Type of Well: ☐ Oil Well ☐ Gas Well ☑ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.: Grieve Unit #60

2. Name of Operator: Elk Petroleum, Inc

9. API Well No.:

3a. Address: 123 West 1st Street, Suite 550, Casper, WY 82601

3b. Phone No. *(include area code)*: 307-265-3326

10. Field and Pool, or Exploratory: Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*

At surface: 1428' FNL, 1862' FEL (SWNE), Section 22, T32N, R85W

At proposed prod. zone: 516' FNL, 1948' FEL (NWNE), Section 22, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area: Sec. 22, T32N, R85W, 6th PM

14. Distance in miles and direction from nearest town or post office*: Approximately 19 miles south of Powder River, Wyoming

12. County or Parish: Natrona

13. State: WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any): 516'

16. No. of acres in lease: 160

17. Spacing Unit dedicated to this well: 40 acres

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.: 15' (surface)

19. Proposed Depth: 7700'

20. BLM/BIA Bond No. on file: 800346757

21. Elevations (Show whether DF, KDB, RT, GL, etc.): 7057' GL

22. Approximate date work will start*: 06/01/2012

23. Estimated duration: 20 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature: Ralph Schulte

Name *(Printed/Typed)*: Ralph Schulte

Date: 12/6/2011

Title: Engineering Manager, Elk Petroleum

Approved by *(Signature)*:

Name *(Printed/Typed)*:

Date:

Title:

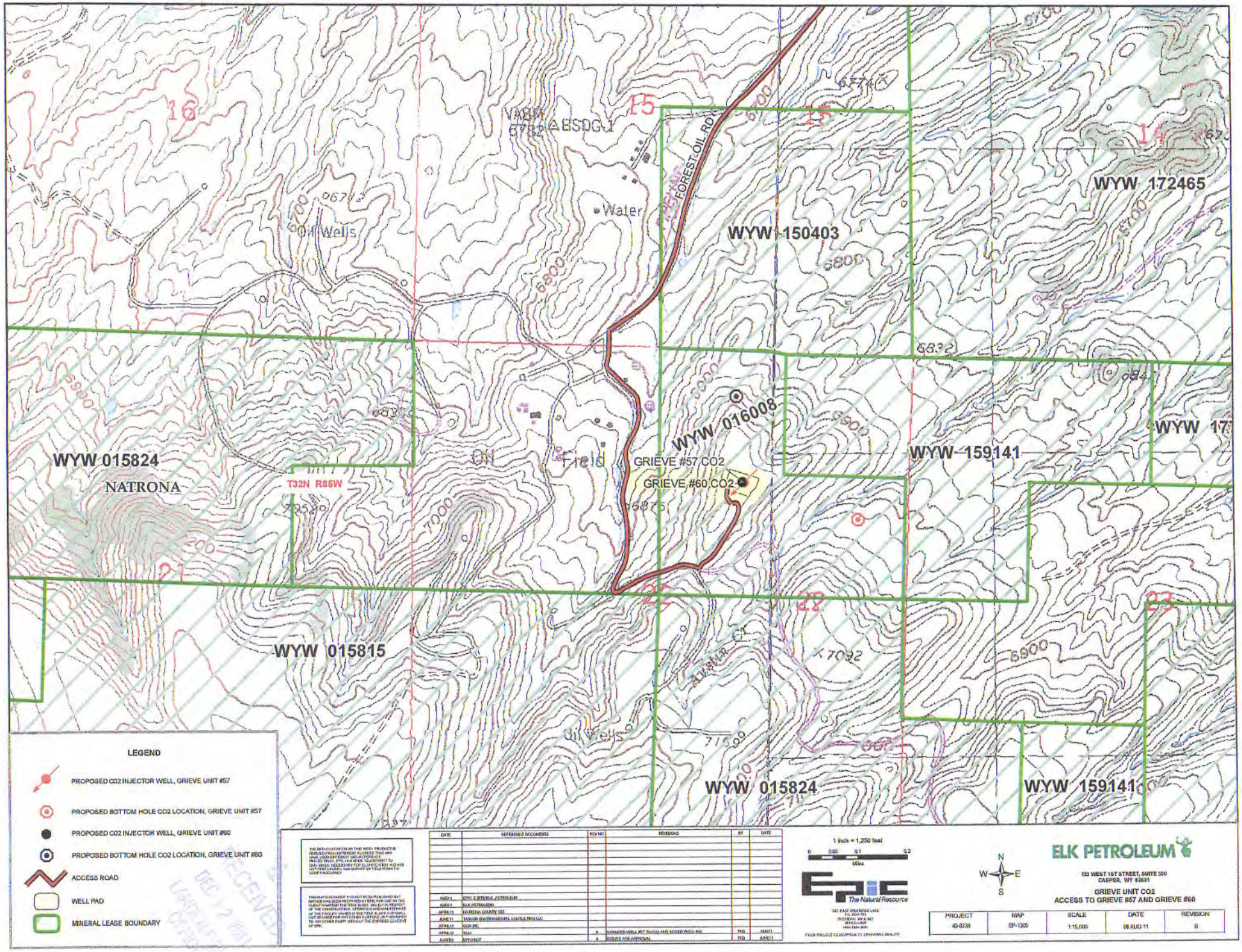
Office:

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)


WYW 172465
WYW 150403
WYW 016008
GRIEVE #57 CO2
GRIEVE #60 CO2
WYW 159141
WYW 015824
NATRONA
T32N R85W
WYW 015815
WYW 015824
WYW 159141
FOREST OIL RD
Water
Oil Wells
Oil Field
LEGEND
PROPOSED CO2 INJECTOR WELL, GRIEVE UNIT #57
PROPOSED BOTTOM HOLE CO2 LOCATION, GRIEVE UNIT #57
PROPOSED CO2 INJECTOR WELL, GRIEVE UNIT #60
PROPOSED BOTTOM HOLE CO2 LOCATION, GRIEVE UNIT #60
ACCESS ROAD
WELL PAD
MINERAL LEASE BOUNDARY
1 inch = 1,250 feet
Miles
ELK PETROLEUM
123 WEST 1ST STREET, SUITE 550
CASPER, WY 82601
GRIEVE UNIT CO2
ACCESS TO GRIEVE #57 AND GRIEVE #60
PROJECT 40-0238
MAP EP-1305
SCALE 1:15,000
DATE 08 AUG 11
REVISION B

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF LAND MANAGEMENT
WILDLIFE CLEARANCE EVALUATION AND CONSULTATION FORM
LANDER FIELD OFFICE

TO: Lander Field Office, Wildlife Biologist

FROM: Melanie Leavenworth, Legal Assistant

DATE: July 23, 2012

SUBJECT: Request for Wildlife Clearance and Evaluation

Lease/Permit Number: **WYW-015824, Grieve Unit Well #61**
Project or Company Name: **Elk Petroleum Inc.**
Location: **T. 32 N., R. 85 W., 6th P.M., Sec. 21, SWSE**
County: **Natrona**
Project Description: **APD to drill C02 injection well, access roads & pipelines**
USGS Quadrangle: **Horse Creek Springs**
Lease Stips: **None**

Response: Data Review and Determination of Impact on Wildlife Habitat and Threatened or Endangered Species
To: Initiating Officer

This memo will become an appendix to the Environmental Documentation for this project. This proposal and relative data have been analyzed as to the impact of the proposed action.

**Coordination with Wyoming Game and Fish Department (IS) (IS NOT) recommended. Coordination may be needed due to unusual or excessive negative effects on big game, sage-grouse, riparian areas, fisheries, other priority species or potentially controversial actions.

Threatened, Endangered, and Proposed Species Clearance Form

ENDANGERED, THREATENED, OR PROPOSED SPECIES	HABITAT DESCRIPTION	PROJECT EFFECT CALL	CONSULTATION REQUIRED	JUSTIFICATION FOR EFFECTS DETERMINATION
Canada lynx (Threatened)	Coniferous forests with abundant snowshoe hare populations.	NE	Yes | (No)	X No suitable habitat present
Black-footed ferret (Endangered)	Large prairie dog complexes c White-tailed Prairie Dog	NE	Yes | (No)	X Area not suitable for reintroduction efforts c No habitat present or action is within a block cleared area c Within prairie dog town; not block-cleared; survey required
Grizzly Bear (Threatened)	Extensive forest cover interspersed with grasslands and meadows.	NE	Yes | (No)	X No suitable habitat present
Blowout Penstemon (Endangered)	Active sand dunes	NE	Yes | (No)	X No suitable habitat present c Suitable habitat present; survey required or presence assumed
Ute ladies'-tresses (Threatened)	Seasonally moist soils and wet meadows of drainages below 7,000 feet	NE	Yes | (No)	X No suitable habitat present c Suitable habitat present; survey required or presence assumed

Desert yellowhead (Threatened)	Barren slopes and ridges on outcrops of white silty clay or Miocene sandstones of the Split Rock Formation.	NE	Yes | No	X No suitable habitat present
Critical Habitat for the Desert yellowhead	Only one known location in the Beaver Rim area of southern Fremont County.	NE	Yes | No	X Not in critical habitat for Desert yellowhead.
Platte River Water Depletions (5 listed species and designated critical habitat)	Downstream riparian and riverine habitat of the Platte River System Whooping Crane – Endangered Interior Least Tern – Endangered Piping Plover – Threatened Pallid Sturgeon – Endangered Western Prairie Fringed Orchid –Threatened Critical Habitat for: Whooping Crane	NE	Yes | No	X Action will not deplete water from the Platte River System C Action will cause depletion to the Platte River system; consultation required C See comments for further restrictions and water source
Gray wolf (Non-essential, experimental population)	Habitats with abundant ungulate prey, secluded (i.e. forested) denning and rendezvous sites, and low levels of human activity.	NE	Yes | No	X No suitable habitat present. Project not in recovery area. No established populations in project area. C Project in suitable habitat; consultation required.

**Project effect determinations for T&E species are: no effect (NE); may affect (MA); not likely to adversely affect (NLAA); likely to adversely affect (LAA); Likely to jeopardize population (LJ): or not likely to jeopardize population (NLJ). Project effect determinations for candidate species are: will not contribute to the need to list (WNC); will contribute to the need to list (WC).

**Initiation of (FORMAL) (INFORMAL) consultation with U. S. Fish and Wildlife Service (IS) (IS NOT) necessary.

Sarah Wempen - NRS — 7/23/12

Wildlife Biologist — Date

BLM Consultation Letter Sent	FWS Consultation Letter Reply	Wildlife Biologist Initial
Date:	Date:	

SEO Letter Sent	SEO Letter Reply	Wildlife Biologist Initial
Date:	Date:	

WILDLIFE / RESOURCE CONCERN	HABITAT	DESIGNATED OR SUITABLE HABITAT	COA STIPULATION APPLIES	COA STIPULATION TIMING RESTRICTION
Sage Grouse Lek (Core Area)	Avoid disturbance or occupancy within 0.6 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.6 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Core	PIAA required and completed	Yes | No		
Sage Grouse Lek (non-Core Area)	Avoid disturbance or occupancy within 0.25 mile of perimeter of an occupied lek. No activity from 6PM to 8AM within a 0.25 mile of a lek	Yes | No	Yes | No	March 1 – May 15
Sage Grouse Nesting /Brood-rearing habitat (non-Core Area)	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable sage-grouse nesting and early brood-rearing habitat within mapped habitat important for connectivity or within 2 miles of any occupied or undetermined lek.	Yes | No	Yes | No	March 1 – July 15
Sage Grouse Winter Habitat	Surface disturbing and/or disruptive activities are prohibited or restricted in mapped or modeled winter habitats/concentration areas that support Core Area populations.	Yes | No	Yes | No	Nov 15 – March 1
Raptors (General)	Avoid surface disturbance or occupancy within a 0.75 mile buffer of raptor nests.	Yes | No	Yes | No	Feb 1 – July 31 Or until young have fledged.
Bald Eagle	Lakes, rivers and other large water bodies suitable for foraging with large trees for nesting and roosting	Yes | No	Yes | No	c No nest, roost, or feeding concentrations present. c Nest within 1 mile: Apply NSO Buffer c Roost within 1 mile: NSO and timing restrict. Nov 1 – Mar 31 c Other restrictions apply, see comments
Mountain Plover	Surface disturbing and/or disruptive activities are prohibited or restricted in suitable Mountain Plover nesting habitat.	Yes | No	Yes | No	April 10 – July 10
Big Game Crucial Winter Range And Elk Winter Range	Delineated by WGFD/BLM	Yes | No	Yes | No	Nov 15 - April 30
Big Game Parturition Areas	Delineated by WGFD/BLM	Yes | No	Yes | No	May 1 - June 30
Riparian Areas	Move Project > 500 feet from perennial streams/live water	Yes | No	Yes | No	Riparian Areas Previous disturbance area

COMMENTS:

Date of Field Visit: 6/15/11

Photos Attached: YES or NO

Sarah Wempen- NRS 7/23/12
Wildlife Biologist (DATE)

COMMENTS:

BLM SENSITIVE SPECIES	HABITAT	POTENTIAL HABITAT	COA /TLS/ STIPULATION APPLIES	COA /TLS/ STIPULATION
BIRDS OF PREY:				
Northern Goshawk	Conifer and deciduous forests	Yes | No	Yes | No	
Ferruginous Hawk	Basin – prairie shrub, grassland, rock outcrops	Yes | No	Yes | No	
Burrowing Owl	Grasslands, basin-prairie shrub	Yes | No	Yes | No	
Peregrine Falcon	Tall Cliffs	Yes | No	Yes | No	
BATS:				
Long-eared Myotis	Conifer and deciduous forest, caves and mines	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Spotted Bat	Cliffs over perennial water, basin-prairie shrub	Yes | No	Yes | No	See comments for additional restrictions
Townsend's Big-eared Bat	Forests, basin-prairie shrub, caves and mines	Yes | No	Yes | No	
PRAIRE DOGS:				Avoid burrows and colonies where possible
White-tailed	Basin prairie shrub, grasslands	Yes | No	Yes | No	See comments for additional restrictions
GRASSLAND OBLIGATES:				
Swift Fox	Grasslands	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Long-billed Curlew	Grasslands, plains, foothills, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
SAGEBRUSH OBLIGATES:				
Sage Thrasher	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	
Loggerhead Shrike	Basin-prairie shrub, mountain foothill shrub	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
Sage Sparrow	Basin prairie shrub, mountain foothill shrub	Yes | No	Yes | No	See comments for additional restrictions
Brewer's Sparrow	Basin-prairie shrub	Yes | No	Yes | No	
Pygmy Rabbit	Basin-prairie and riparian shrub	Yes | No	Yes | No	
RIPARIAN/WETLAND OBLIGATES:				
Yellow-billed Cuckoo	Open woodlands, streamside willow and alder groves	Yes | No	Yes | No	Avoid habitat where possible and minimize disturbance
White-faced Ibis	Marshes, wet meadows	Yes | No	Yes | No	See comments for additional restrictions
Trumpeter Swan	Lakes, ponds, rivers	Yes | No	Yes | No	
Northern Leopard Frog	Beaver ponds, permanent water in plains and foothills	Yes | No	Yes | No	
Great Basin spadefoot	Spring seeps, permanent and temporary waters	Yes | No	Yes | No	

Boreal toad (Northern Rocky Mtn. population)	Pond margins, wet meadows, riparian areas.	(Yes) | No	Yes | (No)	
Spotted frog	Ponds, sloughs, small streams	(Yes) | No	Yes | (No)	
Yellowstone cutthroat trout	Yellowstone drainage, small mountain streams and large rivers	Yes | (No)	Yes | (No)	
PLANTS:				
Meadow Pussytoes	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4,950' – 7,900'	Yes | (No)	Yes | (No)	
Porter's Sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes Elevation: 5,300 – 6,500 feet	Yes (No)	Yes | (No)	
Dubois Milkvetch	Barren shale, badlands, limestone, and redbed slopes and ridges 6,900' – 8,800"	Yes (No)	Yes (No)	
Limber Pine	Timberline and at lower elevation with sagebrush. Associated species are Rocky Mountain lodgepole pine, Engelmann spruce, whitebark pine, Rocky Mountain Douglas-fir, subalpine fir, Rocky Mountain juniper, Mountain Mahogany, and common juniper.	Yes | (No)	Yes | (No)	Avoid habitat where possible and minimize disturbance
Cedar Rim Thistle	Barren, chalky hills, gravelly slopes and fine-textured, sandy/shaley draws 6,700' – 7,200'	Yes | (No)	Yes | (No)	See comments for additional restrictions
Owl Creek Miner's	Sandy-gravelly slopes on sandstone of the Wind River Formation 4,700' – 6,000'	Yes | (No)	Yes | (No)	
Fremont Bladderpod	Rocky limestone slopes and ridges 7,000' – 9,000'	Yes | (No)	Yes | (No)	
Beaver Rim Phlox	Sparsely vegetated slopes on sand-stone, siltstone, or limestone substrates 6,000' – 7,4000'	Yes | (No)	Yes | (No)	
Rocky Mountain Twinpod	Sparsely vegetated, rocky slopes of limestone, sandstone or clay 5,600' – 8,300'	Yes | (No)	Yes | (No)	
Persistent Sepal Yellowcress	Riverbanks and shorelines, usually on sandy soils near high water line.	Yes | (No)	Yes | (No)	
Shoshonea	Shallow, stony calcareous soils of exposed limestone outcrops, ridgetops, and talus slopes 5,900' – 9,200'	Yes | (No)	Yes | (No)	
Barneby's Clover	Ledges, crevices and seams on reddish-cream Nugget Sandstone outcrops 5,600' – 6,700'	Yes | (No)	Yes (No)	

COMMENTS:

Wildlife Biologist: Sarah Wempen WRS 7/23/12

Form 3160-3
(August 2007)

RECEIVED
DEC 12 2011
LANDER FIELD OFFICE

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-015824

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☑ Oil Well ☐ Gas Well ☐ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #61

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address 123 West 1st Street, Suite 550
Casper, WY 82601

3b. Phone No. *(include area code)*
307-265-3326

10. Field and Pool, or Exploratory
Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface 358' FSL, 1916' FEL (SWSE), Section 16, T32N, R85W
At proposed prod. zone 472' FNL, 1337' FEL (NWNE), Section 21, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 21, T32N, R85W, 6th PM

14. Distance in miles and direction from nearest town or post office*
Approximately 19 miles south of Powder River, Wyoming

12. County or Parish
Natrona

13. State
WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)	16. No. of acres in lease	17. Spacing Unit dedicated to this well
472'	600	40 acres
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.	**19. Proposed Depth**	**20. BLM/BIA Bond No. on file**
15' (surface)	6600'	800346757
21. Elevations (Show whether DF, KDB, RT, GL, etc.)	**22. Approximate date work will start***	**23. Estimated duration**
6798' GL	06/01/2012	20 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature	Name *(Printed/Typed)*	Date
Ralph Schulte	Ralph Schulte	12/9/2011

Title
Engineering Manager, Elk Petroleum

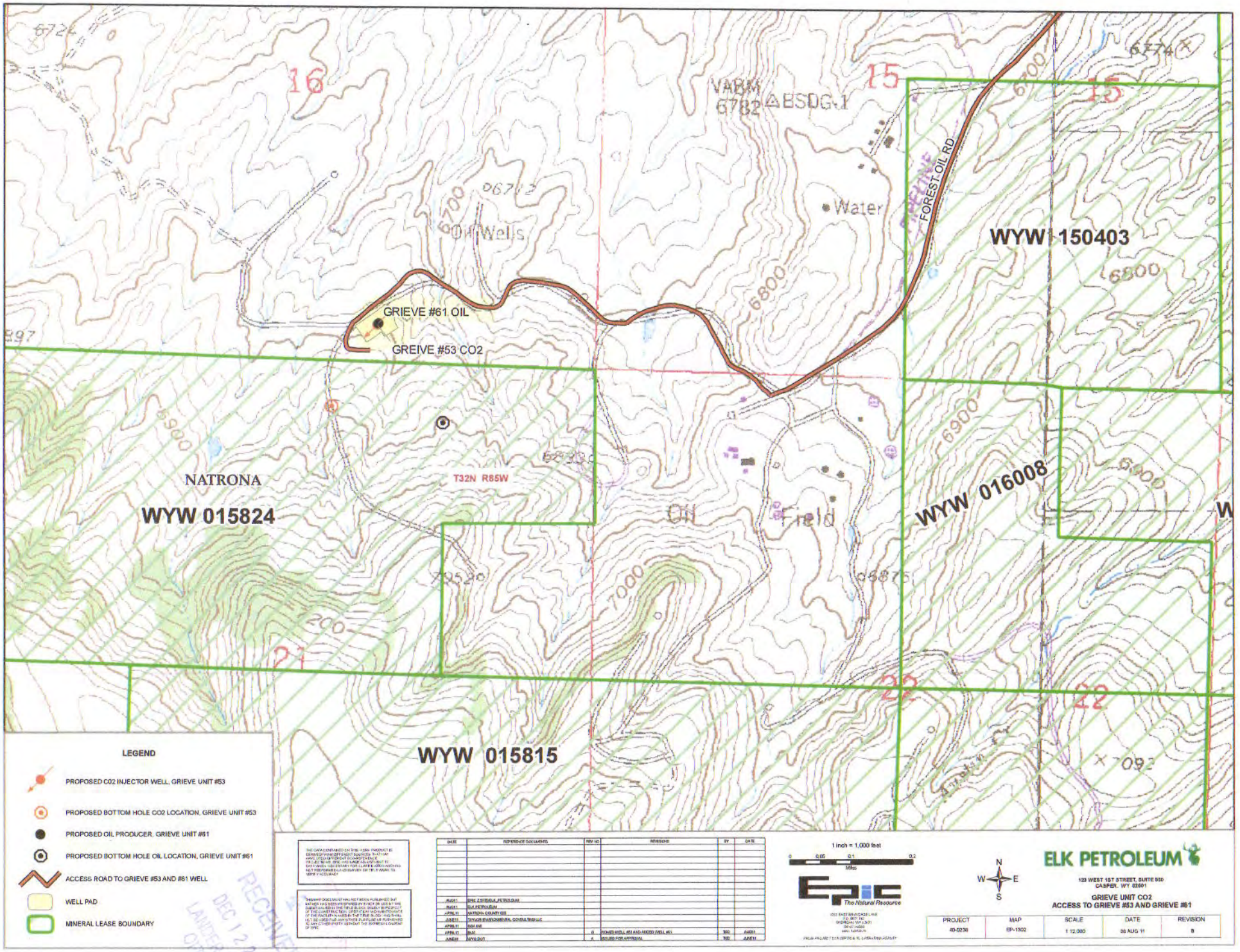
Approved by *(Signature)*	Name *(Printed/Typed)*	Date
Title	**Office**	

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)



RECEIVED
DEC 12 2011
LANDER FIELD OFFICE

TO: Lander Field Office, Assistant Field Manager, Resources

FROM: Melanie Leavenworth, Legal Assistant

DATE: June 14, 2011

SUBJECT: Request for Range Evaluation/No Affect

Please evaluate the attached proposed action and return.

Reference No. **WYW-015814, Grieve Unit Well #54**
(Include Appropriate Well, Lease, ROW, or Case No.)
Project or Company Name: **Elk Petroleum, Inc.**
Location: **T. 32 N., R. 85 W., 6th P.M., Sec. 27, SWNE**
USGS Quadrangle: **Horse Creek Springs**
County: **Natrona**
Project Description:
APD to drill C02 injection well, access roads and pipelines.

Response: Data Review and Determination of Impact on Range Studies or Grazing Activities

This proposal and relative data have been analyzed as to the impact of the proposed action upon Range Studies or Grazing Activities on public lands under the jurisdiction of Lander Field Office RMP. These are listed in the attached document(s). The data used to support this determination was summarized and filed in the Lander RMP, Range files and Overlays and Retrieval System Overlay in the Field Office.

Please Identify (Use additional sheets if necessary):

Allotment number or name D1604 #17 Horse Heaven Judi

Season of use 6/14 to 10/7

Type of use & numbers 949

Wild Horse Herd Management Area (if applicable) NO

Range improvement projects in the area and location NO

Range Monitoring/Study Sites NO

Recommended Seed Mixture (attached / or no recommendation) NO

Any current conflicts or issues occurring in the area? NO

Additional Comments

Judi Mott — Signed

RMS — Title

7/21/11 — Date

Rev. 12/18/2007

LANDER FIELD OFFICE

Form 3160-3
(August 2007)

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-015813 (Bottomhole)

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☐ Oil Well ☐ Gas Well ☑ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #54

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address 123 West 1st Street, Suite 550
Casper, WY 82601

3b. Phone No. *(include area code)*
307-265-3326

10. Field and Pool, or Exploratory
Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface 1790' FNL, 2112' FEL (SWNE), Section 27, T32N, R85W
At proposed prod. zone 972' FNL, 1903' FWL (NENW), Section 27, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 27, T32N, R85W

14. Distance in miles and direction from nearest town or post office*
Approximately 19 miles south of Powder River, Wyoming

12. County or Parish
Natrona

13. State
WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)	16. No. of acres in lease	17. Spacing Unit dedicated to this well
972'	640	40 acres
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.	**19. Proposed Depth**	**20. BLM/BIA Bond No. on file**
≈1870'	7130'	800346757
21. Elevations (Show whether DF, KDB, RT, GL, etc.)	**22. Approximate date work will start***	**23. Estimated duration**
7322' GL	02/01/2012	20 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature	Name *(Printed Typed)*	Date
Ralph Schulte	Ralph Schulte	4/8/2011

Title
Engineering Manager, Elk Petroleum

Approved by *(Signature)*	Name *(Printed Typed)*	Date
Title	**Office**	

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

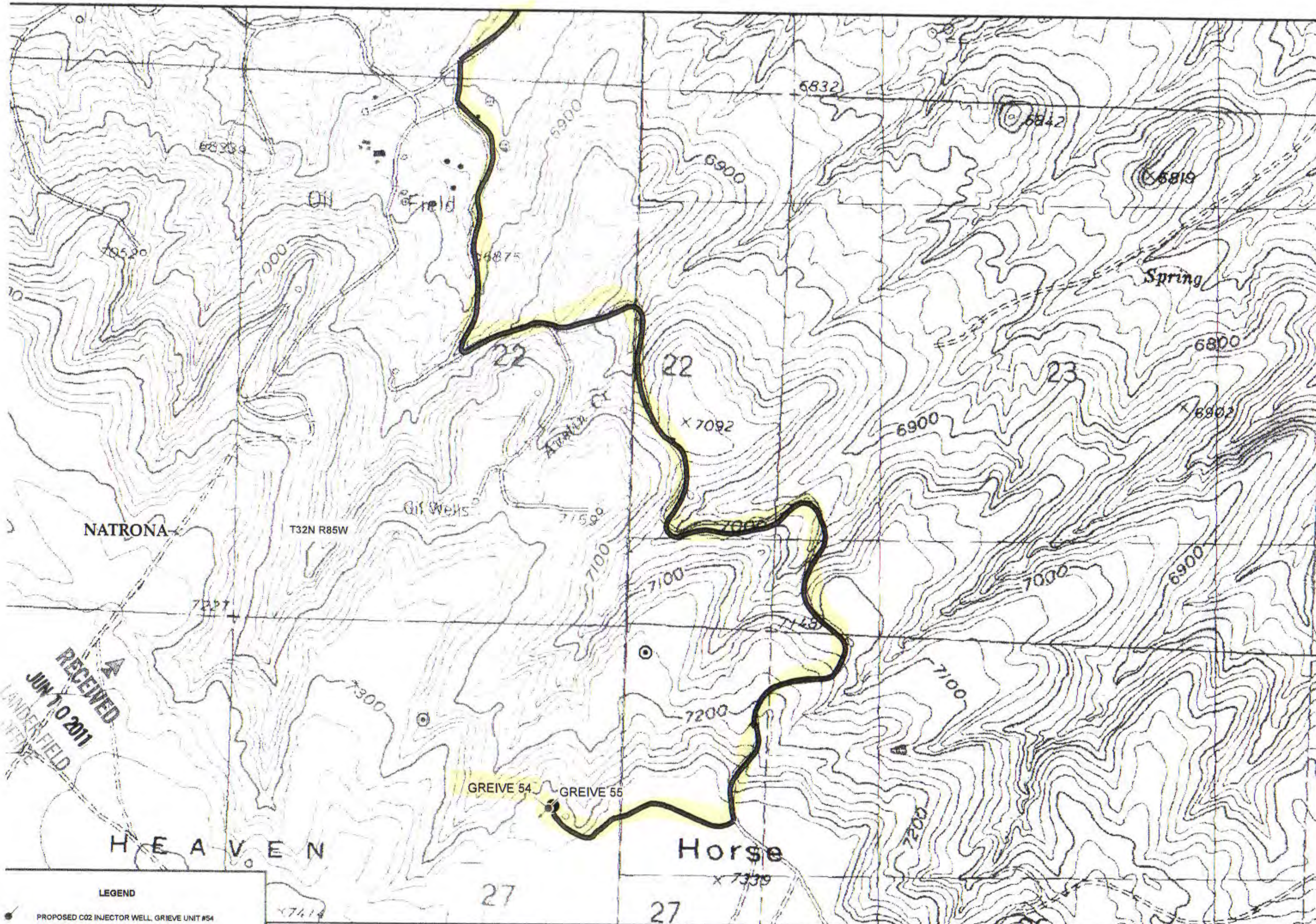
Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)

RECEIVED
JUN 10 2011
LANDER FIELD OFFICE

Posted 6/10/11



LEGEND

- PROPOSED C02 INJECTOR WELL, GRIEVE UNIT #54
- PROPOSED BOTTOM HOLE CO2 LOCATION, GRIEVE UNIT #54
- PROPOSED OIL PRODUCER, GRIEVE UNIT #55
- PROPOSED BOTTOM HOLE OIL LOCATION, GRIEVE UNIT #55
- ACCESS ROAD TO GRIEVE #54 AND #55

DATE	REFERENCE DOCUMENTS	REV NO	REVISIONS	BY	DATE
JUNE11	EPIC Z:SITEBLK_PETROLEUM				
JUNE11	ELK PETROLEUM				
APRIL11	NATRONA COUNTY GIS				
APRIL11	TAYLOR ENVIRONMENTAL CONSULTING LLC				
APRIL11	GGA INC				
APRIL11	BLM				
JUNE09	WYO DOT	A	ISSUED FOR APPROVAL	TED	JUNE11

1 Inch = 1,250 feet

0 0.05 0.1 0.2
Miles

Epic The Natural Resource

1461 EAST BRUNDAGE LANE
P.O. BOX 793
SHERIDAN, WY 82801
307-673-0060
www.1epic.com

FROM PROJECT CONCEPTION TO OPERATING REALITY

N W E S

ELK PETROLEUM

123 WEST 1ST STREET, SUITE 550
CASPER, WY 82601

GRIEVE UNIT CO2
ACCESS TO GRIEVE #54 AND #55

PROJECT	MAP	SCALE	DATE	REVISION
40-0238	EP-1303	1:15,000	07 JUNE 11	A

TO: Lander Field Office, Assistant Field Manager, Resources

FROM: Melanie Leavenworth, Legal Assistant

DATE: June 13, 2011

SUBJECT: Request for Range Evaluation/No Affect

Please evaluate the attached proposed action and return.

Reference No. **WYW-015814, Grieve Unit Well #55**
(Include Appropriate Well, Lease, ROW, or Case No.)
Project or Company Name: **Elk Petroleum, Inc.**
Location: **T. 32 N., R. 85 W., 6th P.M., Sec. 27, SWNE**
USGS Quadrangle: **Horse Creek Springs**
County: **Natrona**
Project Description:
APD to drill Oil well, associated pipelines & access roads.

Response: Data Review and Determination of Impact on Range Studies or Grazing Activities

This proposal and relative data have been analyzed as to the impact of the proposed action upon Range Studies or Grazing Activities on public lands under the jurisdiction of Lander Field Office RMP. These are listed in the attached document(s). The data used to support this determination was summarized and filed in the Lander RMP, Range files and Overlays and Retrieval System Overlay in the Field Office.

Please Identify (Use additional sheets if necessary):

Allotment number or name 01604 #17 Horse Heaven Judi
Season of use 6/14 to 10/7
Type of use & numbers 949
Wild Horse Herd Management Area (if applicable) NO
Range improvement projects in the area and location NO
Range Monitoring/Study Sites NO
Recommended Seed Mixture (attached / or no recommendation) NO
Any current conflicts or issues occurring in the area? NO
Additional Comments

Judi Mott — Signed
RMS — Title
7/21/11 — Date

Rev. 12/18/2007

LANDER FIELD OFFICE

Form 3160-3
(August 2007)

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-015814

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☑ Oil Well ☐ Gas Well ☐ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #55

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address 123 West 1st Street, Suite 550
Casper, WY 82601

3b. Phone No. *(include area code)*
307-265-3326

10. Field and Pool, or Exploratory
Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface 1768' FNL, 2067' FEL (SWNE), Section 27, T32N, R85W
At proposed prod. zone 247' FNL, 1199' FEL (NENE), Section 27, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 27, T32N, R85W

14. Distance in miles and direction from nearest town or post office*
Approximately 19 miles south of Powder River, Wyoming

12. County or Parish
Natrona

13. State
WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)	16. No. of acres in lease	17. Spacing Unit dedicated to this well
247'	640	40 acres
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft	**19. Proposed Depth**	**20. BLM/BIA Bond No. on file**
≈1250'	7000'	800346757
21. Elevations (Show whether DF, KDB, RT, GL, etc.)	**22. Approximate date work will start***	**23. Estimated duration**
7322' GL	02/01/2012	20 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature	Name *(Printed Typed)*	Date
	Ralph Schulte	4/8/2011

Title
Engineering Manager, Elk Petroleum

Approved by *(Signature)*	Name *(Printed Typed)*	Date
Title	Office	

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

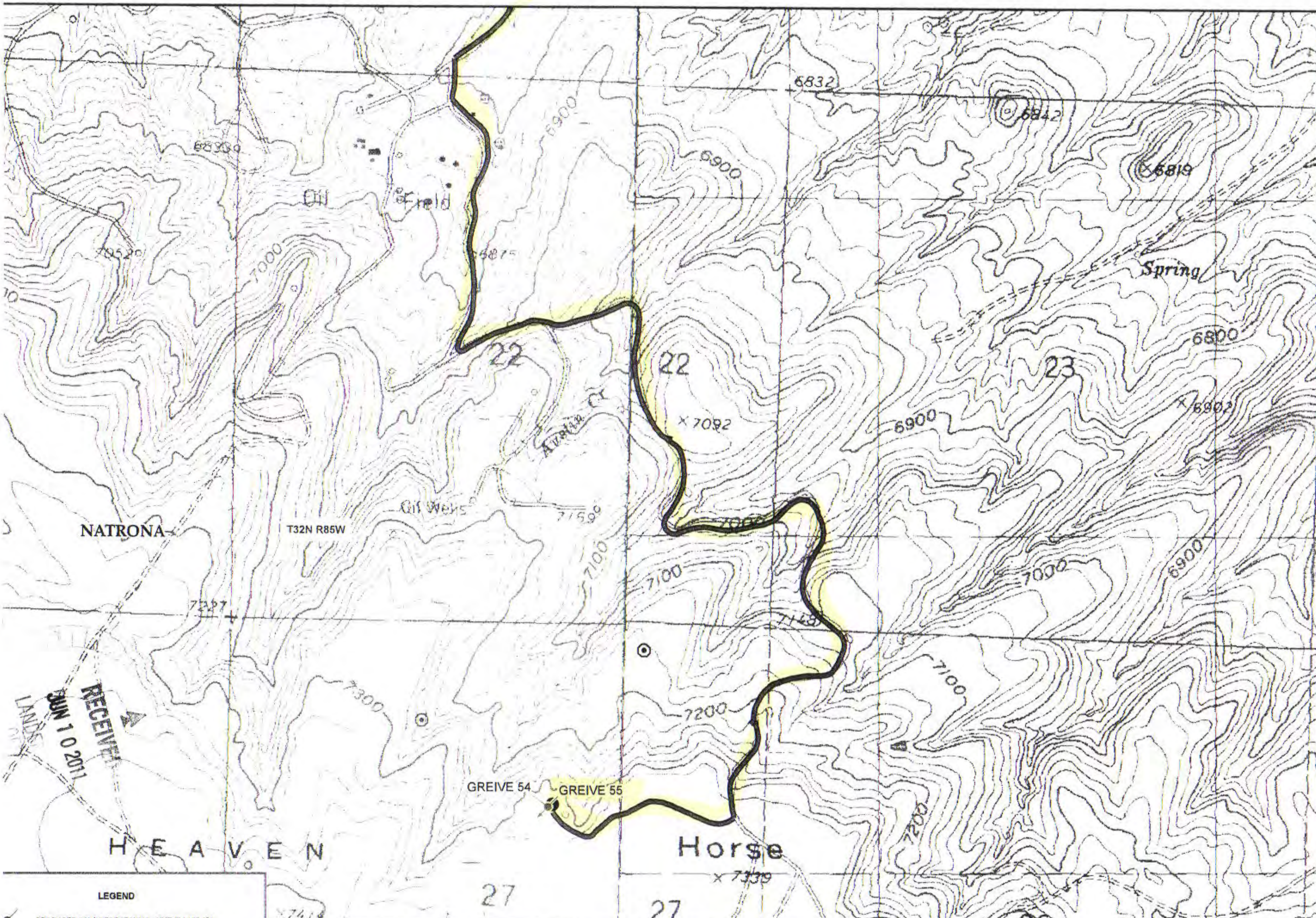
Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)

RECEIVED
JUN 10 2011
LANDER FIELD OFFICE

Posted 6/10/11



LEGEND

- PROPOSED C02 INJECTOR WELL, GRIEVE UNIT #54
- PROPOSED BOTTOM HOLE CO2 LOCATION, GRIEVE UNIT #54
- PROPOSED OIL PRODUCER, GRIEVE UNIT #55
- PROPOSED BOTTOM HOLE OIL LOCATION, GRIEVE UNIT #55
- ACCESS ROAD TO GRIEVE #54 AND #55

THE DATA CONTAINED ON THIS WORK PRODUCT IS DERIVED FROM DIFFERENT SOURCES THAT MAY HAVE USED DIFFERENT GEO-REFERENCE PROJECTIONS. EPIC HAS MADE ADJUSTMENT TO DATA WHEN NECESSARY FOR CLARIFICATION AND HAS NOT PERFORMED LAND SURVEY OR TITLE WORK TO VERIFY ACCURACY.

THIS MAP DOCUMENT HAS NOT BEEN PUBLISHED BUT RATHER HAS BEEN PREPARED BY EPIC FOR USE BY THE CLIENT NAMED IN THE TITLE BLOCK SOLELY IN RESPECT OF THE CONSTRUCTION, OPERATION AND MAINTENANCE OF THE FACILITY NAMED IN THE TITLE BLOCK AND SHALL NOT BE USED FOR ANY OTHER PURPOSE OR FURNISHED TO ANY OTHER PARTY WITHOUT THE EXPRESS CONSENT OF EPIC.

DATE	REFERENCE DOCUMENTS	REV NO	REVISIONS	BY	DATE
JUNE11	EPIC Z:SITES\ELK PETROLEUM				
JUNE11	ELK PETROLEUM				
APRIL11	NATRONA COUNTY GIS				
APRIL11	TAYLOR ENVIRONMENTAL CONSULTING LLC				
APRIL11	SGA INC				
APRIL11	BLM				
JUNE09	WYO DOT	A	ISSUED FOR APPROVAL	TKD	JUNE11

1 inch = 1,250 feet

0 0.05 0.1 0.2 Miles

Epic
The Natural Resource

FROM PROJECT CONCEPTION TO OPERATING REALITY

N W E S

ELK PETROLEUM

123 WEST 1ST STREET, SUITE 550
CASPER, WY 82601

GRIEVE UNIT CO2
ACCESS TO GRIEVE #54 AND #55

PROJECT	MAP	SCALE	DATE	REVISION
40-0238	EP-1303	1:15,000	07 JUNE 11	A

TO: Lander Field Office, Assistant Field Manager, Resources

FROM: Melanie Leavenworth, Legal Assistant

DATE: June 14, 2011

SUBJECT: Request for Range Evaluation/No Affect

Please evaluate the attached proposed action and return.

Reference No. **WYW-015824, Grieve Unit Well #57**
(Include Appropriate Well, Lease, ROW, or Case No.)
Project or Company Name: **Elk Petroleum, Inc.**
Location: **T. 32 N., R. 85 W., 6th P.M., Sec. 22, NESE**
USGS Quadrangle: **McCleary Reservoir**
County: **Natrona**
Project Description:
APD to drill water injection well, access roads and pipelines.

Response: Data Review and Determination of Impact on Range Studies or Grazing Activities

This proposal and relative data have been analyzed as to the impact of the proposed action upon Range Studies or Grazing Activities on public lands under the jurisdiction of Lander Field Office RMP. These are listed in the attached document(s). The data used to support this determination was summarized and filed in the Lander RMP, Range files and Overlays and Retrieval System Overlay in the Field Office.

Please Identify (Use additional sheets if necessary):

Allotment number or name 01604 #17 Horse Heaven Pst. Judi

Season of use 6/14 to 10/7

Type of use & numbers 949 Cattle

Wild Horse Herd Management Area (if applicable) NO

Range improvement projects in the area and location NO

Range Monitoring/Study Sites NO

Recommended Seed Mixture (attached / or no recommendation) NO

Any current conflicts or issues occurring in the area? No

Additional Comments

Judi Mott — Signed
RMS — Title
7/21/11 — Date

Rev. 12/18/2007

LANDER FIELD OFFICE

Form 3160-3
(August 2007)

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-016008 (Bottomhole)

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☐ Oil Well ☐ Gas Well ☑ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #57

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address 123 West 1st Street, Suite 550
Casper, WY 82601

3b. Phone No. *(include area code)*
307-265-3326

10. Field and Pool, or Exploratory
Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*

At surface 2256' FSL, 974' FEL (NESE), Section 22, T32N, R85W

At proposed prod. zone 2101' FNL, 666' FEL (SENE), Section 22, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 22, T32N, R85W, 6th PM

14. Distance in miles and direction from nearest town or post office*
Approximately 19 miles south of Powder River, Wyoming

12. County or Parish
Natrona

13. State
WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)	16. No. of acres in lease	17. Spacing Unit dedicated to this well
539'	160	40 acres
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft	**19. Proposed Depth**	**20. BLM/BIA Bond No. on file**
≈1115'	7330'	800346757
21. Elevations (Show whether DF, KDB, RT, GL, etc.)	**22. Approximate date work will start***	**23. Estimated duration**
7088' GL	02/01/2012	20 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office)
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature	Name *(Printed Typed)*	Date
	Ralph Schulte	6/8/2011

Title
Engineering Manager, Elk Petroleum

Approved by *(Signature)*	Name *(Printed Typed)*	Date
Title	**Office**	

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

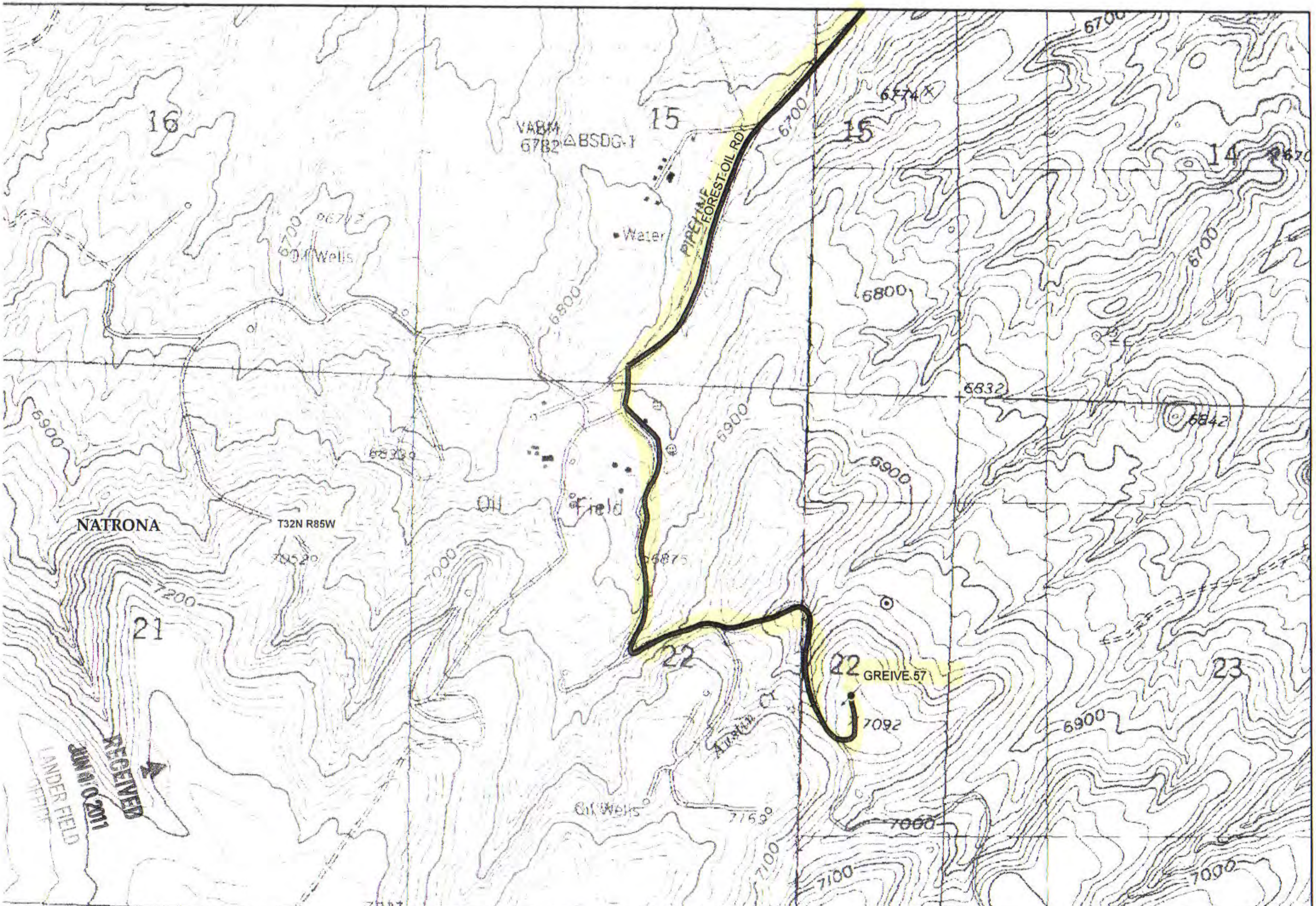
Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*(Instructions on page 2)

RECEIVED
JUN 10 2011
LANDER FIELD OFFICE

Posted 6/10/11



LEGEND

- PROPOSED WATER INJECTOR WELL, GRIEVE UNIT #57
- PROPOSED BOTTOM HOLE WATER LOCATION, GRIEVE UNIT #57
- ACCESS ROAD

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DATE	REFERENCE DOCUMENTS	REV NO	REVISIONS	BY	DATE
JUNE11	EPIC Z SITE\ELK_PETROLEUM				
JUNE11	ELK PETROLEUM				
APRIL11	NATRONA COUNTY GIS				
APRIL11	TAYLOR ENVIRONMENTAL CONSULTING LLC				
APRIL11	SGA INC				
APRIL11	BLM				
JUNE08	WYO DOT	A	ISSUED FOR APPROVAL	TKD	JUNE11

1 Inch = 1,250 feet

0 0.05 0.1 0.2
Miles

Epic
The Natural Resource

FROM PROJECT CONCEPTION TO OPERATING REALITY

N W E S

ELK PETROLEUM

123 WEST 1ST STREET, SUITE 550
CASPER, WY 82601

GRIEVE UNIT CO2
ACCESS TO GRIEVE #57

PROJECT	MAP	SCALE	DATE	REVISION
40-0238	EP-1305	1:15,000	07 JUNE 11	A

TO: Lander Field Office, Assistant Field Manager, Resources

FROM: Melanie Leavenworth, Legal Assistant

DATE: June 13, 2011

SUBJECT: Request for Range Evaluation/No Affect

Please evaluate the attached proposed action and return.

Reference No. **WYW-015815, Grieve Unit Well #58**
(Include Appropriate Well, Lease, ROW, or Case No.)
Project or Company Name: **Elk Petroleum, Inc.**
Location: **T. 32 N., R. 85 W., 6th P.M., Sec. 26, NENW**
USGS Quadrangle: **McCleary Reservoir**
County: **Natrona**
Project Description:
APD to drill Water Injection well, associated pipelines & access roads.

Response: Data Review and Determination of Impact on Range Studies or Grazing Activities

This proposal and relative data have been analyzed as to the impact of the proposed action upon Range Studies or Grazing Activities on public lands under the jurisdiction of Lander Field Office RMP. These are listed in the attached document(s). The data used to support this determination was summarized and filed in the Lander RMP, Range files and Overlays and Retrieval System Overlay in the Field Office.

Please Identify (Use additional sheets if necessary):

Allotment number or name 01604 #17 Horseheaven Judi

Season of use 6/14 to 10/7

Type of use & numbers 949 Cattle

Wild Horse Herd Management Area (if applicable) NO

Range improvement projects in the area and location NO

Range Monitoring/Study Sites NO

Recommended Seed Mixture (attached / or no recommendation) NO

Any current conflicts or issues occurring in the area? NO

Additional Comments

Judi Mott — Signed
RMS — Title
7/21/11 — Date

Rev. 12/18/2007

Form 3160-3
(August 2007)

FORM APPROVED
OMB No. 1004-0137
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
WYW-015815

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.
Grieve Unit WYW109538X

1b. Type of Well: ☐ Oil Well ☐ Gas Well ☑ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
Grieve Unit #58

2. Name of Operator Elk Petroleum, Inc

9. API Well No.

3a. Address	3b. Phone No. *(include area code)*	10. Field and Pool, or Exploratory
123 West 1st Street, Suite 550 Casper, WY 82601	307-265-3326	Grieve Exploratory Unit, Muddy

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*

At surface 565' FNL, 1589' FWL (NENW), Section 26, T32N, R85W

At proposed prod. zone 571' FNL, 2030' FWL (NENW), Section 26, T32N, R85W

11. Sec., T. R. M. or Blk. and Survey or Area
Sec. 26, T32N, R85W, 6th PM

14. Distance in miles and direction from nearest town or post office*	12. County or Parish	13. State
Approximately 19 miles south of Powder River, Wyoming	Natrona	WY

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)	16. No. of acres in lease	17. Spacing Unit dedicated to this well
571'	2040	40 acres

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft	19. Proposed Depth	20. BLM/BIA Bond No. on file
≈805'	7460'	800346757

21. Elevations (Show whether DF, KDB, RT, GL, etc.)	22. Approximate date work will start*	23. Estimated duration
7114' GL	02/01/2012	20 days

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6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature	Name *(Printed Typed)*	Date
	Ralph Schulte	6/8/2011

Title
Engineering Manager, Elk Petroleum

Approved by *(Signature)*	Name *(Printed Typed)*	Date

Title	Office

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(Continued on page 2)

*(Instructions on page 2)

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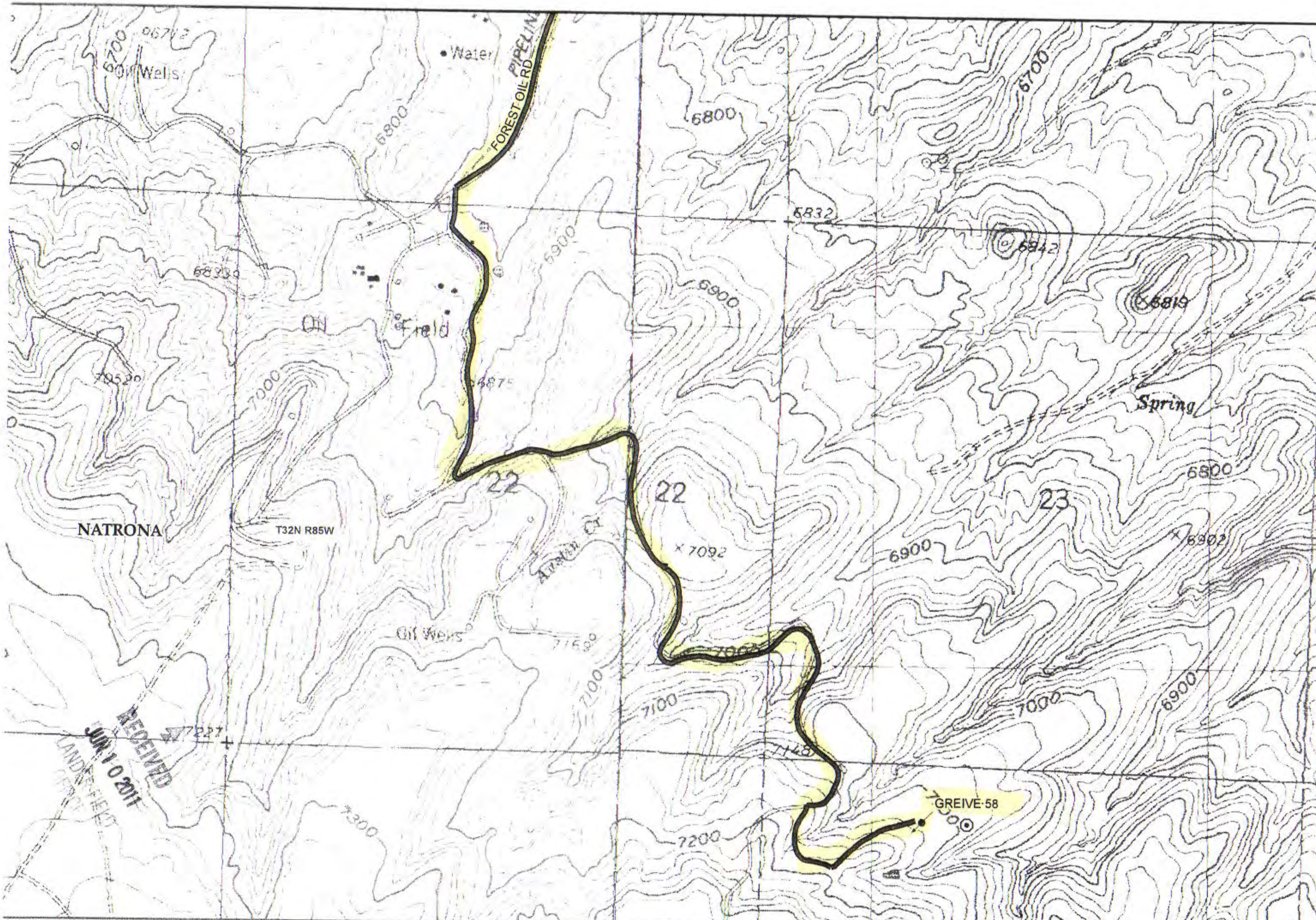
LANDER FIELD OFFICE

Posted
6/10/11



LEGEND

- PROPOSED WATER INJECTOR WELL, GRIEVE UNIT #58
- PROPOSED BOTTOM HOLE WATER LOCATION, GRIEVE UNIT #58
- ACCESS ROAD

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JUNE11	ELK PETROLEUM				
APRIL11	NATRONA COUNTY GIS				
APRIL11	TAYLOR ENVIRONMENTAL CONSULTING LLC				
APRIL11	GGA INC				
APRIL11	BLM				
JUNE09	WYO DOT	A	ISSUED FOR APPROVAL	TKO	JUNE11

1 inch = 1,250 feet

0 0.05 0.1 0.2 Miles

Epic The Natural Resource

FROM PROJECT CONCEPTION TO OPERATING REALITY

N W E S

ELK PETROLEUM

123 WEST 1ST STREET, SUITE 550
CASPER, WY 82601

GRIEVE UNIT CO2
ACCESS TO GRIEVE #58

PROJECT	MAP	SCALE	DATE	REVISION
40-0238	EP-1306	1:15,000	07 JUNE 11	A