BLM

Wyoming High Plains District – Casper Field Office

Environmental Assessment

Cole Creek Exploratory Drilling Project
Converse and Natrona Counties, Wyoming
WY-060-EA12-184

Bureau of Land Management
Casper Field Office
Casper, Wyoming

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ACRONYMS AND ABBREVIATIONS

ACEPM	Applicant-Committed Environmental Protection Measure
AO	Authorized Officer
APD	Application for Permit to Drill
AUM	Animal Unit Month
BBS	Breeding Bird Survey
BLM	Bureau of Land Management
BMP	Best Management Practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CIAA	Cumulative Impact Assessment Area
COA	Condition of Approval
CO2	Carbon Dioxide
CTTMP	Comprehensive Travel and Transportation Management Plan
DR	Decision Record
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FLPMA	Federal Land Policy Management Act
FO	Field Office
FONSI	Finding of No Significant Impact
FOOGRLA	Federal Onshore Oil and Gas Leasing Reform Act
GGRB	Greater Green River Basin
GPM	Gallons per Minutes
I-25	Interstate 25
MCF	Thousand Cubic Feet
MLA	Mineral Leasing Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOS	Notice of Staking
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OHV	Off-Highway Vehicle
PA	Programmatic Agreement
PIF	Partners in Flight
PUP	Pesticide Use Plan
PSI	Pounds per Square Inch
RMP	Resource Management Plan
ROW	Right-of-Way

SHMA	Sand Hills Management Area
SHPO	State Historic Preservation Officer
SMU	Soil Mapping Unit
SPCC	Spill Prevention, Control and Countermeasure Plan
SWD	Salt Water Disposal Well
TDS	Total Dissolved Solids
T/E	Threatened or Endangered Species
USDA	U.S. Department of Agriculture
USC	United States Code
USFS	U.S. Forest Service
USGS	U.S. Geologic Service
USFWS	U.S. Fish and Wildlife Service
WGFD	Wyoming Game and Fish Department
WOGCC	Wyoming Oil and Gas Conservation Commission
WSEO	Wyoming State Engineers Office

1.0 INTRODUCTION

This Environmental Assessment (EA) has been prepared to evaluate Blue Tip Energy Wyoming's (Blue Tip) proposed exploratory drilling program near Cole Creek, Wyoming. The proposed project constitutes a Federal action that is subject to evaluation by the Bureau of Land Management (BLM) under the National Environmental Policy Act (NEPA). This EA is an assessment of potential impacts that could result with the implementation of either the Proposed Action or the No Action Alternative. An EA also provides evidence for determining whether the BLM will make a "Finding of No Significant Impact" (FONSI).

A FONSI is a document that briefly presents the reasons why implementation of the preferred alternative would not result in significant environmental impacts beyond those already addressed in the BLM Casper Field Office (FO) Resource Management Plan (RMP) (BLM 2007). As defined by the Council on Environmental Quality (CEQ), the significance of a Federal action is determined by the context of the action in relation to the overall project setting, as well as the intensity of direct, indirect and cumulative effects resulting from the project. If the BLM determines that the preferred alternative would not result in significant impacts, a Decision Record (DR) and FONSI would be prepared approving the selected alternative. If the project is found to result in significant impacts, an Environmental Impact Statement (EIS) would be prepared.

1.1 BACKGROUND

The Cole Creek Project Area (Project Area) is located in the Cole Creek Unit in Natrona and Converse Counties, Wyoming, approximately 6 to 10 miles northeast of Casper in Sections 8, 9, 10, 15, 22, 23, and 27 of Township (T) 35 North (N), Range (R) 77 West (W), Sixth Principal Meridian (**Figure 1**, refer to **Appendix A** for all figures). Surface ownership in the Project Area is approximately 69 percent private, 25 percent Federal (managed by the BLM), and six percent State of Wyoming. Nine of the well pads proposed for development are located on private surface estate and two well pads are located on BLM-administered Federal surface estate. Mineral and surface ownership rights are summarized in **Table 1.1-1** and **Figure 1**.

The 11 proposed wells would be drilled to test the commercial productivity of the Dakota Formation (five wells) and the 2nd Frontier Formation (six wells).

Table 1.1-1 Cole Creek Exploratory Drilling Program

Well Name and Number	Location			Surface Ownership	Mineral Ownership	Formation
	Section	Township	Range			
Cole Creek 4-10	10	35N	77W	Federal	Federal	Dakota
Cole Creek 7-9	9	35N	77W	Private	Federal	Dakota
Cole Creek 11-9	9	35N	77W	Private	Federal	Dakota
Cole Creek 15-8H	8	35N	77W	Federal	Federal	Dakota
Cole Creek 3-22	22	35N	77W	Private	Federal	2nd Frontier
Cole Creek 15-15	15	35N	77W	Private	Federal	2nd Frontier

Well Name and Number	Location			Surface Ownership	Mineral Ownership	Formation
	Section	Township	Range			
Cole Creek 1-22	22	35N	77W	Private	Federal	2nd Frontier
Cole Creek 7-22	22	35N	77W	Private	Federal	2nd Frontier
Cole Creek 13-23	23	35N	77W	Private	Federal	2nd Frontier
Cole Creek 15-9	9	35N	77W	Private	Federal	Dakota
Cole Creek 9-15	15	35N	77W	Private	Federal	2nd Frontier

[1] Proposed wells located on private property and with private mineral ownership. These wells are evaluated in the No Action Alternative of this EA.

[2] Proposed wells located on Federal property, with Federal mineral ownership, or both. These wells constitute the Proposed Action that is evaluated in this EA.

Access to the well pad locations would be primarily from Interstate 25 (I-25) at Exit 182, then on County Road 256 (Cole Creek Road) to a grid of existing all-weather oilfield roads, upgraded two-track roads, and sections of proposed new roads. Any gas produced would be used to heat treatment facilities on the well pads, and no gathering pipelines would be constructed. Water disposal pipelines would be buried within the adjacent access road right-of-way (ROW). Overhead electrical power lines would be constructed within road ROW and then along access roads or cross-country to each well pad as necessary.

Land uses surrounding the Project Area are a mixture of rural residential and industrial development extending outward from the Casper metropolitan area. Characteristics associated with the rural setting include views of ranch and open lands, relative isolation, quiet, the presence of wildlife, and relatively little traffic. Intermixed industrial uses include field development and production activities, as evidenced by the presence of oil and gas infrastructure such as well pads, compressor stations and transmission lines. Approximately 14 operating wells are located in the vicinity of the Project Area. The I-25 area located about 3 miles south of the Project Area contains mixed commercial and industrial land uses including fueling stations, equipment storage facilities, hotels and restaurants.

1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.2.1 Purpose of the Proposed Action

The purpose of the proposed project is to explore and potentially develop oil and natural gas resources on Federal mineral leases consistent with Federal lease rights, where valid rights exist. The Mineral Leasing Act of 1920 (MLA) as amended by the Federal Land Policy and Management Act (FLPMA) of 1976 and the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (FOOGRLA) recognize the right of lease holders to develop Federal mineral resources to meet continuing needs and economic demands with the requirement that undue and unnecessary environmental degradation is not incurred. Under FLPMA, oil and gas development is recognized as one of the "principal' uses of the public lands. The proposed project would exercise Blue Tip's existing lease rights to drill for, extract, remove and market commercial quantities of oil and natural gas.

1.2.2 Need for the Proposed Action

The need for the exploration and development of oil and gas resources is established by the BLM's responsibility under the Mineral Leasing Act of 1920 (30 U.S.C.188 *et seq.*) (MLA) as amended to promote the mining of oil and gas on the public domain, and deposits of oil and gas owned by the United States, subject to disposition in the form and manner provided by the MLA, where applicable through the land use planning process.

Decision to be made:
The BLM will decide whether or not to authorize the exploration and development activities of Federal minerals only and, if so, under what terms and conditions.

1.3 RELATIONSHIP TO STATUTES, REGULATION, AND PLANS

1.3.1 Conformance to Existing Land Use Plans

Public lands in the vicinity of the Project Area are managed in accordance with the BLM Casper RMP. Goals, objectives and decisions of the RMP with respect to mineral resources (MR) are indicated in Table 1-1 of the RMP, pages 2-15 to 2-17 (BLM 2007). Objectives with respect to oil and gas development include:

- MR: 2.1 – Maintain oil and gas leasing, exploration, and development, while minimizing impacts to other resource values;
- MR: 2.4 – Facilitate the evaluation of public lands for oil and gas potential;
- MR: 3.1 – Maintain opportunities to explore and develop Federal oil and gas resources and other leasable minerals; and
- MR: 3.2 – Maintain opportunities for the collection of subsurface geological (geophysical) data to aid in the exploration of oil and gas resources.

The Casper RMP specified the following decisions/management actions to achieve the above objectives:

- Decision 2004 (Leasable Minerals) - The Casper FO is open to mineral leasing, including solid leasables and geothermal, unless specifically identified as administratively unavailable for the life of the plan for mineral leasing. These open areas will be managed on a case-by-case basis.
- Appendix D - Oil and Gas Operations, Application for Permit to Drill (APD) specified "If necessary, site-specific mitigation can be added to the APD as a Condition of Approval (COA) for protection of surface and/or subsurface resource values in the vicinity of the proposed activity".

In accordance with 43 CFR 1610.5-3(a), the Proposed Action has been determined to be in conformance with the Casper RMP. The Project Area has been determined to be suitable for oil and gas leasing and the proposed exploration and development with incorporated mitigation measures to reduce impacts to other resource values is consistent with the land use decisions and resource management goals and objectives.

1.3.2 Relationships to Statutes, Regulations, or Other Plans

This EA has been prepared in accordance with NEPA and is in compliance with all applicable regulations and laws passed subsequent thereto, including Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508). This document has been prepared according to directions contained in BLM Manual Handbook H-1790-1, covering the development of NEPA documents. The Proposed Action would conform to other applicable Federal and State regulations which may be required for project implementation. The proposed project would be consistent with other Federal, State and local laws, rules and regulations and Blue Tip would procure any required permits or easements prior to the commencement of drilling operations of the proposed wells as identified in **Table 1.3-1**.

Table 1.3-1 Major Federal, State and Local Permits and Approvals Required

Agency	Permit, Approval, or Action
Bureau of Land Management	Approval of the individual APDs for operations on Federally-owned mineral estate
U.S. Fish and Wildlife Service	Conformance with the Endangered Species Act
Wyoming State Engineer	Approval of permit to appropriate ground/surface water for use in drilling operations
Wyoming Oil and Gas Conservation Commission	Approval of the individual State of Wyoming drilling permit applications
Affected Private Surface Owners	Easements/agreements for surface disturbing operations on privately-owned surface estate

1.4 SCOPING, PUBLIC INVOLVEMENT AND ISSUES

Blue Tip filed Notices of Staking (NOS) for the 11 proposed wells involving Federally-owned mineral estate on November 2011. An on-site investigation of the proposed locations and access roads was conducted on January 26, 2012, with the exception of the Cole Creek 1-22, Cole Creek 3-22, and Cole Creek 7-22 locations which will require on-sites prior to APD approval. Findings and decisions discussed at that time of the on-sites have been incorporated into the EA analysis. Information regarding the NOS was posted at the Casper FO on April 23, 2012.

Due to the small scale of this project in an area of previous oil and gas development, no external public scoping was conducted for this project. Internal scoping was conducted by the BLM during an Interdisciplinary Team (IDT) meeting on January 26, 2012, followed by a field review session on the same day. A determination of the potential impacts to resources was conducted during the meeting and subsequent onsite field review. Participants at the meeting are listed in **Table 1.4-1** below.

Table 1.4-1 Interdisciplinary Team Meeting Participants

Name	Representing	Responsibility
David Korzilius	BLM Casper Field Office	Supervisory Natural Resource Specialist
Sara Bohl	BLM Casper Field Office	Natural Resource Specialist
Shane Gray	BLM Casper Field Office	Wildlife Biologist
Aaron Hugen	Blue Tip	Project Engineer

Name	Representing	Responsibility
Jane Boand	Kleinfelder	NEPA Project Manager
Chrissy Lawson	Kleinfelder	NEPA Assistant Project Manager
Dan Soucy	Kleinfelder	Wildlife Biologist

The resources with potential for impact as identified by the IDT are identified in **Table 1.4-2** below.

Table 1.4-2 Resources with Potential for Impact, as Identified by the BLM IDT

Resource	Rationale for Determination*
Soils	Potential impacts to soils from surface disturbing actions.
Threatened, Endangered or Candidate Animal Species (including Special Status Animal Species)	Raptors (nesting) Prairie dogs Mountain Plover Burrowing owl Greater Sage Grouse – Brooding and wintering grounds, outside core area
Threatened, Endangered or Candidate Plant Species (including Special Status Species)	Potential habitat for blowout penstemon
Vegetation	Some long-term surface disturbance would occur, resulting in potential impacts to vegetation.
Water Quality (surface resources, e.g. stormwater)	Determine potential impacts to Cole Creek, the North Platte River, and other surface water resources.
Wildlife	Potential Big Game habitat (mule deer and pronghorn).
Livestock Grazing	Potential impacts to the range resource include livestock displacement, lost forage, and the Animal Unit Months reduced for each allotment in the Project Area.
Sand Hills Management Area	A potential impact to Sand Hills Management Area, which is located in the northwest portion of the Project Area.

* The determination is made for resources evaluated per BLM policies as described in the BLM NEPA Handbook H-1790-1 (BLM 1988, 1999a).

2.0 PROPOSED ACTION AND ALTERNATIVES

This EA analyzes the impacts of the Proposed Action and the No Action Alternative relating to well development within the Cole Creek Unit in Natrona and Converse Counties, Wyoming. The wells would test the commercial productivity of oil and gas from the Dakota and 2nd Frontier Formations.

2.1 PROPOSED ACTION

Blue Tip proposes to construct and drill and operate a total of eleven (11) oil and gas wells within the Cole Creek Project Area, including constructing needed access roads and, if oil and gas is produced by the exploratory wells, and installing water pipelines and electrical power supply lines.
The locations of the proposed well pads are identified in **Table 2.1-1** and illustrated in **Figure 1**.

Table 2.1-1 Proposed Action Well Names, Locations, and Ownership

Well Name and Number	Location			Surface Ownership	Mineral Ownership	Formation
	Section	Township	Range			
Cole Creek 4-10	10	35N	77W	Federal	Federal	Dakota
Cole Creek 7-9	9	35N	77W	Private	Federal	Dakota
Cole Creek 11-9	9	35N	77W	Private	Federal	Dakota
Cole Creek 15-8H	8	35N	77W	Federal	Federal	Dakota
Cole Creek 3-22	22	35N	77W	Private	Federal	2nd Frontier
Cole Creek 15-15	15	35N	77W	Private	Federal	2nd Frontier
Cole Creek 1-22	22	35N	77W	Private	Federal	2nd Frontier
Cole Creek 7-22	22	35N	77W	Private	Federal	2nd Frontier
Cole Creek 13-23	23	35N	77W	Private	Federal	2nd Frontier
Cole Creek 15-9	9	35N	77W	Private	Federal	Dakota
Cole Creek 9-15	15	35N	77W	Private	Federal	2nd Frontier

Each proposed Dakota Formation well would be drilled to a total depth of approximately 8,500 feet, and each 2nd Frontier Formation well would be drilled to a total depth of approximately 7,500 feet. Drilling would be initiated as soon as all necessary permits are obtained. Preliminary drilling results coupled with the subsequent testing of the initial wells drilled in the Project Area would dictate the subsequent drilling schedule for the remaining wells. Approximately five wells would be drilled and completed per year, for a total development period of approximately two years. Should the exploratory wells become producers, it is anticipated that the life of an individual well could extend approximately 30 years. The associated access roads would remain in use during that same time period for operations and maintenance functions.

All lease operations would be conducted in full compliance with all applicable laws, regulations (43 CFR 3100 et al.), Onshore Oil and Gas Orders, the approved plan of operations and any applicable Notices to Lessees. Operations on Federal lands would be conducted in compliance with 43 CFR 2800 et al.

2.1.1 Construction Activities

Construction activities for each proposed well location, access road, and utility corridor would follow practices and procedures outlined in each individual APD and any Conditions of Approval (COAs) appended thereto by the BLM. Well pad, access road, and utility corridor construction activities would follow guidelines and standards as set forth in the joint BLM/U.S. Forest Service (USFS) publication: *Surface Operating Standards for Oil and Gas Exploration and Development* (Fourth Edition) (BLM-USFS 2007) and/or the contractual requirements of any affected private (fee) surface owner(s).

2.1.1.1 Well Pads

Well pad construction would consist of roughing in a new access road (or widening an existing access road) to the well site and then leveling a rectangular pad. With associated cut and fill slopes, berms and soil storage areas, each well pad would require 3.5 to 5.0 acres of surface land.

Sufficient topsoil to facilitate revegetation would be segregated from subsoil materials during construction, stockpiled and labeled with appropriate signage for future reclamation of the disturbed areas. The salvaged topsoil would be evenly distributed over those disturbed surfaces subject to reclamation upon termination of drilling and completion operations as part of the reclamation and revegetation program. Topsoil stockpiles would be stabilized with vegetation and/or the use of structure controls until used for reclamation purposes as necessary or required by the BLM. Topsoil stored for more than 6 months would be windrowed to a depth of 3 to 4 feet and reseeded with the seed mixture specified in the approved permit.

Each vertical well pad would contain a reserve pit approximately 150 feet by 80 feet in size and 12 feet deep for the containment of all cuttings and drilling fluids, and to allow for a minimum 2-foot freeboard. Pits that will hold fluids would include a permanent marker designating the point at which 2 feet of freeboard remains in the pit. Reserve pit walls would be sloped at a 1.5:1 ratio. The reserve pits would be lined with a synthetic liner of minimum 20 millimeter thickness, and padded with sufficient weed-free straw to cover all rocks. A felt liner would be used in cases where straw could not sufficiently cover bed rock fragments to prevent puncture. The reserve pits would be fenced on three sides during drilling activities. Following removal of the drill rig, the reserve pits would be fenced on the fourth side. The fourth side would be fenced if fluids are placed in the reserve pit prior to the drilling rig being moved onto location. No trash, scrap pipe, etc. would be disposed of in the reserve pit. Based on water production volumes at nearby wells, Blue Tip does not expect their proposed wells to yield substantial volumes of produced water. Therefore, reserve pits may not be needed at some or all of the proposed wells. Should a reserve pit not be used, the site would serve as the cuttings storage area. Cuttings storage areas generally would not be lined.

The drilling operations for the proposed horizontal well would use a closed loop mud and fluid system. Therefore, a reserve pit would not be necessary for the drilling of the proposed Cole Creek 15-8H well.

Any residual hydrocarbons remaining in the reserve pits upon completion of drilling operations would be promptly removed, as practical. If any hydrocarbons are in the pit following completion, the pit would be netted. If any reserve pits contain produced water or other free liquids and if removal is not practical,

netting would be placed above "inactive" reserve pit(s) after 60 days of inactivity to discourage entry by birds or other wildlife. Netting would remain in place until fluids are removed or evaporated. Once the pit is free of liquids, the reserve pit would be reclaimed by back filling the pit with sub-soil (spoil) material removed during construction. Fencing would remain in place until the pit is backfilled. Once the pit is backfilled, a portion of the stockpiled topsoil would be evenly distributed over the reclaimed area and reseeded in accordance with the specifications of the BLM. Reserve pit siting, design, construction, maintenance, closure, and reclamation criteria would conform to Instructional Memorandum WY-2012-007, "Management of Oil and Gas Exploration and Production Pits" (BLM 2011).

Use of erosion control measures, including proper grading to minimize slopes, diversion terraces and ditches, mulching, terracing, riprap, fiber matting, temporary sediment traps and broad-based drainage dips or low water crossings would be applied as appropriate or required, to minimize erosion and surface run-off during well pad construction and operation.

Total initial new surface disturbance from construction of the proposed 11 new well pads and access roads would be approximately 58 acres, of which approximately 44 acres are associated with well pad construction. The acreage of surface disturbance associated with the construction of each well pad location under the Proposed Action is outlined in **Table 2.1-2**. Following completion operations, a minimum of approximately 1.23 acres of each well pad not needed for production could be reclaimed. During interim reclamation the cut and fill areas would be recontoured to blend in with adjacent natural landscape and revegetated. Thus, of the estimated 44 acres of total new surface disturbance associated with well pad construction, a minimum of approximately 14 acres would be involved in interim reclamation activities. Assuming interim reclamation success, total long-term surface disturbance associated with new well pads would be reduced to a minimum of approximately 31 acres (see **Section 2.1.3** for more information).

Well pad construction is anticipated to require approximately 10 days per well pad depending on the features of each particular site. Construction of a typical well pad would involve the use of heavy equipment, such as a crawler tractor, motor grader, track hoe, backhoe, dump truck, and possibly a loader. However, equipment needs would vary depending on the site-specific conditions of the individual well pad. Construction equipment is anticipated to include haul trucks (approximately 80,000 pounds [lbs.]) making approximately three round trips per pad per day and light trucks (approximately 20,000 lbs.) making three round trips per pad per day, resulting in average daily traffic of six round trips per pad per day during the construction period.

On average, five personnel per day, mostly equipment operators, would work on the construction of an individual well pad. Those personnel would be required to carpool to and from each well pad site or to/from a central site serving multiple well pad locations, and would likely travel to/from the vicinity of Casper.

2.1.1.2 Access Roads

The primary access to the Project Area from Casper, Wyoming is from existing I-25. From I-25 North Exit 182, vehicles would follow the existing County Road 256 (Cole Creek Road) and continue northeasterly approximately 3 to 10 miles to local service roads.

For the Proposed Action, access to the proposed 11 well locations would be achieved by constructing new roads. Existing two-track routes would also be upgraded and new roads would be constructed to accommodate heavy equipment and vehicular travel. Low-water crossings or metal culverts would be installed and maintained at all drainage crossings. A total of approximately 3.75 miles of upgraded or new road would be required. Access roads would be constructed with an 18-foot travel surface within a 30-foot wide corridor that would also contain overhead power lines and, in some locations, buried water lines.

The total initial surface disturbance associated with the upgrade of unimproved two-tracks and construction of new roads for the Proposed Action would be approximately 13.6 acres. Following installation and reclamation, the linear road corridor would be reduces to 18 feet in width, resulting in 8.2 acres of long-term disturbance (see **Section 2.1.3** for more details).

New road construction and improvements of existing roads would typically require the use of motor graders, crawler tractors, 10-yard end dump trucks, and water trucks. The standard methodology for building new roads involves the use of a crawler tractor or track hoe to windrow vegetation to one side of the corridor, remove topsoil to the opposing side of the corridor, and rough-in the roadway. This is followed by a grader or bulldozer to establish barrow ditches and crown the road surface. Where culverts are required, a track hoe or backhoe would trench the road and install the culverts. Some hand labor would be required when installing and armoring culverts. Graveling or capping the roadbed would be performed as necessary to provide a well-constructed, safe road. Aggregate would be of sufficient size, type, and amount to allow all weather access and to help minimize fugitive dust. A grader would be used to smooth the running surface.

Construction of new roads or upgrades of existing roads would typically take 2 to 3 days per mile of road. Primary access roads or roads constructed or upgraded in steep terrain would require more time to complete; approximately 3 to 4 days per mile of road. Access roads to individual well pads would be constructed immediately prior to well pad construction. For access roads, several crews could operate simultaneously on different roads or different portions of the same road. Total crews working on road construction or improvements could range in size from 10 to 25 personnel. Each access road workforce would include an average of five personnel to operate the equipment.

2.1.1.3 Pipelines

If produced water quantities exceed 40 barrels of water per well per day, Blue Tip proposes to install water pipelines which would consist of buried 2- to 4-inch polypropylene pipelines that would connect wells within the six 2nd Frontier Formation well sites, identified in **Table 2.1-1**, to a proposed salt water disposal (SWD) well located on an existing well pad (Dakota F32-26G) in the southeastern portion of the Project Area. The pipelines would be installed at a minimum depth of 5 to 6 feet below ground level to

prevent freezing. All water pipeline segments would be located a 15-foot wide disturbance corridor within the 30-foot wide linear corridor also containing the road and power line.

Sufficient topsoil to facilitate revegetation would be segregated from subsoil materials during pipeline installation activities, stockpiled and labeled with appropriate signage for future reclamation of the disturbed areas. The salvaged topsoil would be evenly distributed over those disturbed surfaces subject to reclamation as part of the reclamation and revegetation program. Topsoil stockpiles would be stabilized with vegetation and/or the use of structure controls until used for reclamation purposes as necessary or required by the BLM. Topsoil stored for more than 6 months would be windrowed to a depth of 3 to 4 feet and reseeded with the seed mixture specified in the approved permit.

Water produced from five wells targeting the Dakota Formation, identified in **Table 2.1-1**, which would be located in the northern portion of the Project Area, would be piped to a holding tank located on each well pad. Water would then be transported by truck for disposal of at a State of Wyoming-approved facility located outside of the Project Area. Water trucks (approximately 60,000 lbs.) would make an average of one daily round trip per well during production.

2.1.1.4 Power Lines

Should the proposed wells become producing wells, Blue Tip proposes to install overhead power lines to production facilities (e.g., pump jacks) of the wells. Electrical power lines would be extended to each well pad from a central transmission line located outside of the Project Area. The power lines would involve an overhead 3-phase, 480-volt electrical power line that would be co-located with existing and proposed access roads within the same 30-foot corridor.

2.1.2 Well Development

2.1.2.1 Drilling Operations

A site-specific description of drilling procedures is included in the APDs submitted to BLM by the Applicant and is available at the BLM Casper FO.

A conventional rotary drill rig with capability matched to the depth requirements of the proposed wells would be used. Each proposed Dakota Formation well would be drilled to a total depth of approximately 8,500 feet, and each 2nd Frontier Formation well would be drilled to a total depth of approximately 7,500 feet.

Water required for drilling and completion would be obtained from the Cole Creek Sheep Company from a State permitted water supply well located in SW¼ NW¼ Section 31, T35N, R76W. Should additional water sources be required, they would be properly permitted through the Wyoming State Engineer's Office (WSEO). Water required for drilling and completion purposes would be trucked to the Project Area on existing roads.

No abnormal pressures are anticipated and the drilling equipment would be equipped with a blowout preventer system rated for 5,000 pounds per square inch (psi) pressure control, which would meet or

exceed the requirements indicated in Onshore Oil and Gas Order #2. Hydrogen sulfide gas is not expected in the formations to be encountered during drilling.

Blowout preventer equipment would be installed on the casing head and tested prior to initiating drilling activities to ensure the ability to control unexpected borehole pressures. This equipment, along with the drilling mud, prevents unexpected outflow of borehole fluids from the well. All fluids from the borehole are discharged into and contained within the reserve pit.

Well drilling and completion is anticipated to require approximately 10 days for each vertical well and 21 days for the proposed horizontal well. During the drilling period, vehicular traffic is anticipated to include haul trucks making two daily round trips per well pad; logging/mud trucks (70,000 lbs.) making one daily round trip per well pad; water trucks (approximately 60,000 lbs.) making three daily round trips per well pad, and light trucks making five daily round trips per well pad. Total average daily round trip traffic of 11 trips per well pad would be result over the 10 day period.

2.1.2.2 Completion Operations

Once a well has been drilled, completion operations would begin approximately 2 to 3 weeks after drilling is complete, depending on availability of crews and equipment. Well completion involves setting casing to depth and perforating the casing in target production zones, followed by hydraulic fracturing (fracing) the formation by injecting an agent into the formation under pressure. The fracing material would likely contain sand or other proppant to keep the fractures from closing, thereby allowing oil and gas to be produced from the formation. The next phase of completion would be to flow and test the well to determine rates of production. Depending upon the concentration of water and proppant in the flow from the well, this "test" gas would either be vented or flared.

Typical equipment and vehicles used during completion activities include sand transport trucks; water trucks; oil service trucks used to transport pumps and equipment for fracing; flat beds and gin trucks to move water tanks, rigs, tubing, and fracing chemicals; logging trucks and pickup trucks to haul personnel and miscellaneous small materials.

Completion activities on individual wells would occur 24 hours per day, 7 days per week, and would require approximately 15 workers. For shallow vertical and horizontal wells, completion of an individual well would generally take 10 to 15 days, depending on conditions at the individual well.

Flare lines would be directed so as to avoid damage to surrounding vegetation, or other resources, and as required by regulations. If necessary, flare lines would be in place on all well locations. In the event it becomes necessary to flare a well, a deflector and/or directional orifice would also be used to safeguard both personnel and adjacent natural rock faces.

Vehicular transport required for well completion is anticipated to require transport trucks carrying sand and water (approximately 80,000 lbs.) making up to 25 daily round trips per well; haul trucks making two daily round trips per well, and light trucks making four daily round trips per well.

2.1.2.3 Well Pad Production Equipment

If a well is productive, surface facilities for each well pad would consist of a wellhead, separating tank, pump jack with electric drive; pump-off controller and transformer; telemetry system, two 400-barrel oil tanks; one water tank; and solar panels. The water tank would remain on site until water flowline infrastructure is in place. All above-ground structures remaining on site longer than 6 months would be painted a flat, non-reflective, earth tone color such as Covert Green to match a standard environmental color as recommended by the BLM.

2.1.3 Surface Disturbance

A summary of the disturbance resulting from implementation of the Proposed Action is shown in **Table 2.1-2**. A total of approximately 58 acres of new surface disturbance would be required for the Proposed Action well pads, new or improved access roads, and co-located, buried water lines and overhead power lines.

Table 2.1-2 Surface Disturbance Acreages for the Proposed Action

Well Number	Short-term Surface Disturbance				Long-term Surface Disturbance			
	Well Pad (acres)	Utility Corridor		Total Acres	Well Pad (acres)	Utility Corridor		Total Acres
		Linear Feet	Acres[1]			Linear Feet	Acres[2]	
Cole Creek 4-10	4.8	1,247	0.9	5.7	3.6	1,247	0.5	4.1
Cole Creek 7-9	4.1	1,320	0.9	5.0	2.9	1,320	0.5	3.4
Cole Creek 11-9	3.6	2,794	1.9	5.5	2.4	2,794	1.2	3.5
Cole Creek 15-8H	4.0	3,993	2.8	6.8	2.8	3,993	1.7	4.4
Cole Creek 3-22	3.6	1,048	0.7	4.3	2.4	1,048	0.4	2.8
Cole Creek 15-15	3.6	2,088	1.4	5.0	2.4	2,088	0.9	3.2
Cole Creek 1-22	4.9	3,027	2.1	7.0	3.7	3,027	1.3	4.9
Cole Creek 7-22	4.3	797	0.5	4.8	3.1	797	0.3	3.4
Cole Creek 13-23	3.7	632	0.4	4.1	2.5	632	0.3	2.7
Cole Creek 15-9	3.5	666	0.5	4.0	2.3	666	0.3	2.5
Cole Creek 9-15	4.0	2,198	1.5	5.5	2.8	2,198	0.9	3.7
TOTAL[3]	**44.1**	**19,810**	**13.6**	**57.7**	**30.6**	**19,810**	**8.2**	**38.8**

Source: D.R. Griffin, 2011

[1] Based on a 30-foot wide disturbance corridor within the 30-foot wide ROW, which includes new roadway and co-located buried water pipelines and overhead power lines.

[2] Based on an 18-foot wide disturbance corridor within the 30-foot wide ROW, which includes new roadway and co-located buried water pipelines and overhead power lines.

[3] Total acreage estimates are based on GIS-software calculations and may not equal total acreage by well pad due to rounding, removal of overlapping development and minute boundary discrepancies. GIS-based calculations are considered more accurate than estimates calculated using simple addition and are therefore used throughout this document.

2.1.4 Water Supply and Disposal

It is estimated that about 1.1 acre-feet (8,534 barrels) of water would be needed to drill and complete each exploratory well, and an estimated 0.1 acre-foot (776 barrels) of water would be needed to control fugitive dust during dry and windy conditions. Thus, an estimated 13.2 acre-feet (102,411 barrels) of water (1.2 acre-feet x 11 wells) would be required for the Proposed Action. Water would be obtained from the Cole Creek Sheep Company from a State permitted water supply well located in SW¼NW¼ Section 31, T35N, R76W and trucked to each well or road construction site. Should additional water sources be required, they would be properly permitted through the WSEO. Water used during exploratory drilling and completion actions would be properly disposed of at a State of Wyoming-approved facility located outside of the Project Area.

2.1.5 Waste Disposal

Drill cuttings (wet sand, shale and rock) would be contained and buried in the reserve pit. Drilling fluids, including salts and chemicals, would be contained in the reserve pit. Any drilling fluids which accumulate in the pit would be promptly reclaimed. All drilling fluids would be fresh water based, typically containing total dissolved solids (TDS) of less than 3000 parts per million (PPM). No potassium chloride, chromates, trash, debris or other substances deemed hazardous would be placed in the pit.

If produced water quantities exceed 40 barrels of water per well per day, Blue Tip proposes to install water pipelines. However, if produced water pipelines are not warranted, Blue Tip would store produced water onsite in 400-barrel tanks prior to transporting the water via truck to a proposed SWD well located on an existing well pad (Dakota F32-26G) in the southeastern portion of the Project Area.

Upon termination of drilling and completion operations, the liquid contents of the reserve pit would be used at the next drill site or would be removed and disposed of at an approved waste disposal facility within 120 days after drilling is terminated. Immediately upon well completion, any hydrocarbons in the pit would be removed in accordance with 43 CFR 3162.7-1.

Any oil, gas, saltwater, or other noxious fluid spills would be immediately removed and transported to an approved disposal site. The spills would be reported to the BLM and other appropriate authorities.

No hazardous wastes (as defined in 40 CFR 355 or subject to reporting under SARA Title III) would be used, produced, stored, transported, or disposed of annually in association with the drilling, testing, or completing of the proposed well. In the course of drilling, Blue Tip and their contractors and subcontractors could potentially store and use diesel fuel, sand (silica), hydrochloric acid, and carbon dioxide (CO_2) gas, all described as hazardous substances in 40 CFR Part 302, Section 302.4, in quantities exceeding 10,000 pounds. In addition, natural gas condensate and crude oil, described as hazardous substances in 40 CFR Part 302, Section 302.4, may be stored or used in reportable quantities. During production operations, triethylene glycol, ethylene glycol mix (50 percent), and methanol, all described as hazardous substances in 40 CFR Part 302, Section 302.4, may be stored or used on site. Small quantities of retail products (paint/spray paint, solvents [e.g., "WD-40"], and lubrication oil) containing non-reportable volumes of hazardous substances may be stored and used on site at any time. No extremely hazardous substances, as defined in 40 CFR Part 355, would be used, produced, stored, transported, or disposed of under any of the alternatives.

Garbage, trash, and other waste materials would be collected in a portable, self-contained, fully-enclosed trash cage during operations. Trash would not be burned on location. A chemical porta-toilet would be furnished with the drilling rig. Human waste would be removed from the location and disposed of at an approved municipal sewage system.

2.1.6 Spill Procedures

Sources of potential contamination include leaks or spills of natural gas condensate liquids from wellheads, reserve pits, produced water sumps, and condensate storage tanks located on the well pads, leaks from natural gas gathering pipelines and water management facilities, and spills of produced water or condensate from the proposed conveyance pipelines. Of these materials, leaks or spills of natural gas condensate would have the greatest potential environmental impact. Leaks or spills of hydrofracturing chemicals, fuels, and lubricants could also result in soil contamination. Depending on the size and type of spill, the effect on soils would primarily consist of the potential loss of soil productivity that could inhibit plant growth and reclamation activities.

As each new well is completed, Blue Tip would complete a site-specific Spill Prevention, Control and Countermeasure Plan (SPCC) diagrams and applicable information, which would be added as an amendment to a field-wide SPCC. If spills of condensate, produced water, or other fluids were to occur in reportable amounts, as defined in BLM NTL-3A, Blue Tip, their contractors, or sub-contractors would immediately contact the BLM, and any other regulatory agencies (e.g., U.S. Environmental Protection Agency [EPA] National Response Center, State of Wyoming) as required by law or regulation. Strict cleanup efforts would be initiated as soon as practicable. Proper final remediation and reporting to the appropriate agencies would be completed by Blue Tip or subcontractors.

2.1.7 Reclamation

A reclamation plan that conforms to Instructional Memorandum WY-2012-032, "Wyoming Bureau of Land Management Reclamation Policy," has been submitted by Blue Tip with the Surface Use Plan of Operations. The reclamation plan discusses procedures for both interim and final reclamation, and is available in the APD package at the BLM Casper FO.

2.1.8 Control of Noxious and Invasive Weed Species

Noxious and invasive weed species would be controlled on all surface disturbance areas in the Project Area by the use of mechanical and/or chemical treatments designed to best control weed species at a specific site. The applicant has submitted an integrated pest and weed management plan (see APD package at the BLM Casper FO).

2.1.9 Applicant-Committed Environmental Protection Measures

In addition to the environmental protection measures required by applicable regulatory authorities, the following Applicant-Committed Environmental Protection Measures (ACEPMs) would be applied to all activities involving Federal lands and/or Federal minerals within the Project Area. Implementation of these measures would be incorporated as COAs, which authorizes the BLM to enforce these measures to help avoid or minimize impacts to the environment.

2.1.9.1 Cultural Resources

- Additional Class III cultural resource inventories would be conducted by a qualified cultural resource consultant on all areas proposed for surface disturbance that have not been previously surveyed. If any cultural resources are identified during these Class III surveys, avoidance or appropriate mitigation would be accomplished in consultation with the State Historic Preservation Officer (SHPO) and the BLM.
- Construction monitors and/or open trench inspections by a qualified cultural resource consultant will be utilized in circumstances where there is no surface indication of cultural resources but deeply buried, intact remains may be present within certain soil conditions such as semi-stabilized dunes and the floodplain of Cole Creek.
- If cultural resources are uncovered during surface-disturbing activities, Blue Tip would suspend operations at the site and immediately contact the BLM's Authorized Officer (AO), who would arrange for a determination of eligibility in consultation with the SHPO, and, if necessary, recommend a recovery or avoidance plan.
- All project personnel would be prohibited from collecting artifacts and from distributing any cultural resources in the area. Blue Tip would be responsible for all persons associated with this proposed project.

2.1.9.2 Paleontological Resources

- As directed by the BLM, a third-party paleontological monitor or representative of the BLM would be present during the use of excavation equipment, specifically during the original cutting of previously undisturbed lands of high paleontological resource potential to inspect exposures for contained fossils. The qualified paleontological monitor would adhere to the reporting and monitoring requirements prescribed by the BLM. A qualified paleontologist is defined as an individual with an M.S. or Ph.D. in paleontology or geology, who is familiar with paleontology procedures and techniques, and holds a BLM-issued paleontological permit.

2.1.9.3 Road Maintenance

- Blue Tip would maintain roads in a safe, usable condition. A regular maintenance program shall include, but not be limited to, blading, ditching, culvert installation, drainage installation, surfacing, and cattleguards, as needed. Design, construction, and maintenance of the roads would be in compliance with the standards contained in the BLM Manual, Section 9113 (Roads), and guidelines and standards identified in the *Surface Operating Standards for Oil and Gas Exploration and Development, 4*th *edition,* also known as the "Gold Book" (BLM/USFS 2007). Construction Best Management Practices (BMPs) for sandy soils (see Section 4.4) would be followed as appropriate.

2.1.9.4 Wildlife, Including Special Status Animal Species

Sage-Grouse

- A qualified biologist would conduct sage grouse surveys within the project area. To reduce potential impacts to sage-grouse nesting/brood-rearing habitats and strutting activities, Blue Tip would prohibit construction, drilling, or completion activities within 2 miles of an occupied lek or suitable habitat from March 15 to July 15.

Raptors

- Prior to any surface-disturbing activities proposed between February 1 and July 31, all areas within 0.5 mile of proposed construction activity would be surveyed for the presence of raptor nests. If occupied raptor nests are found, construction, drilling, and completion would not occur until after July 31 or until young have fledged the nest, except for the species listed below for which a 0.25 mile buffer will be applied for the following species:
    - Red-tailed Hawk
    - American Kestrel
    - Great-horned Owl
    - Northern Saw Whet Owl
    - Western Screech Owl
    - Swainson's Hawk
    - Osprey
    - Long-eared Owl
    - Common Barn Owl
- Overhead power lines will be designed, constructed and installed in accordance with the standards outlines in Suggested Practices for Raptor Protection on Power Lines: the State of the Art in 2006 (APLIC 2006).

Mountain Plover

- Suitable habitat for mountain plover may be present in the Project Area. Prior to any construction, drilling or completion during the mountain plover breeding season (April 10 – July 10), surveys would be conducted to determine presence/absence and nesting status. If nests are located, then construction would not occur in any mountain plover habitat until after July 10th.

Prairie Dog

- Prairie dog colonies within 0.5 miles of proposed well pads would be surveyed and added to project mapping. If construction, drilling and completion is proposed during the burrowing owl breeding season (March 1 – August 31), any prairie dog colonies within 0.5 mile of the proposed well pad and access road/power line corridor would be surveyed for the presence of nesting burrowing owls.

Burrowing Owl

- If burrowing owls are documented within 0.5 mile of the well pad access road/power line corridor, surface disturbing, drilling, or completion activities at that location would not commence until after August 31st.

2.1.9.5 Vegetation, Including Special Status Plant Species, and Invasive Non-Native Plant Species (Noxious Weeds)

Blowout Penstemon

- A qualified botanist would conduct surveys within the Project Area during the growing season (June 15 – July 15) to determine if habitat or individuals exist on sand dune locations. If blowout penstemon are located, no surface disturbing activities would be conducted that would directly affect existing plant populations.
- No surface disturbance would occur in suitable blowout penstemon habitat, which consists of open, sandy habitats of wind-excavated depressions (blowouts) in dune tops.

Invasive Non-Native Plant Species

- Blue Tip would control invasive plant species along road and power line corridors, well pads, and other applicable facilities, as well as on areas where these species originate on disturbed surface and invade adjacent areas. A list of invasive plant species would be obtained from the BLM or Natrona and Converse Counties. On lands administered by the BLM, an approved Pesticide Use Proposal (PUP) would be obtained before the application of herbicides or other pesticides for the control of these invasive plant species.

2.1.9.6 Erosion

- No installation activities would be performed during periods when the soil is too wet to adequately support installation equipment. If such equipment creates ruts in excess of three inches deep in straight line travel routes, the soil would be deemed too wet to adequately support the equipment, and installation would cease until drier or frozen conditions are encountered. BMPs for sandy soils will be applied as required in sand dune locations (see **Section 4.4**). For all proposed well sites, reserve pit topsoil would be stored separately from well pad topsoil stock piles.

2.1.9.7 Human Health and Safety

- To protect and minimize the possibility of fires during the construction phase, all equipment, including welding trucks, would be equipped with fire extinguishers and spark arresters. An emergency response plan is in place to identify appropriate response measures to situations such as fire, chemical spill or exposure, accident, injury or other type of situation that may require emergency medical treatment or evacuation.
- Implementation of the project SPCC Plan would minimize the risk of such spills by detailing techniques to prevent spills, and outlining measures to be taken in the event of a spill. In the event of a spill, Blue Tip would immediately contact the BLM, and any other regulatory agencies required by law. Strict cleanup efforts would be initiated immediately. Thus, given the reporting

and cleanup procedures that would be used, the potential for impacts to soils from spills is considered to be minor.

2.1.9.8 Air Quality

- If wells are productive and gas is produced in association with the targeted oil reserves, Blue Tip would comply with the Department of Interior's Notice to Lessees and Operators of Onshore Federal and Indian Oil and Gas Leases (NTL-4A). Specifically, current requirements state that during initial well evaluation tests, venting and flaring actions would be limited for a period not to exceed 30 days or the production of 50 MMcf of gas, whichever occurs first.
- Members of the pipeline construction crew would car pool to and from the surrounding cities and towns to minimize vehicle-related emissions. During hot, dry, and/or windy conditions, Blue Tip would implement dust control measures (e.g., watering) approved by the BLM during surface disturbing activities to minimize fugitive dust.

2.1.9.9 Water Quality

- Construction at drainage crossings would be limited to periods of low or no-flow.
- Blue Tip would follow all practical alternatives and designs to limit disturbance within drainage channels, including ephemeral and intermittent draws.
- A 100-foot wide buffer area of undisturbed land would be left between proposed well locations and ephemeral and intermittent channels.
- Channel crossings by pipelines and power lines would be constructed so that the pipe is buried at least four feet below the channel bottom.
- Channel crossings by roads, pipelines and power lines would be constructed perpendicular to flow and would not run parallel to ephemeral and intermittent channels.
- Disturbed channel beds would be reshaped to their approximate original configuration.
- All cuttings pits would be constructed with 100 percent of the total depth of the pit below the finished grade of the well location. Pit volumes would be calculated to allow for a minimum of four feet of overburden on the solidified cuttings upon pit closure.
- All cuttings and frac water pits would be designed with a minimum of two feet of freeboard.
- The discharge of all water (storm water, produced water, etc.) would be done in conformance with applicable Wyoming Department of Environmental Quality (WDEQ), BLM and WOGCC rules and regulations.

2.1.9.10 Livestock Grazing

- Removal or disturbance of vegetation would be kept to a minimum through construction site management (e.g., by utilizing previously disturbed areas, using existing ROWs, designating limited equipment/material storage yards and staging areas, scalping, etc.).
- Blue Tip would seed and stabilize disturbed areas in accordance with management direction from the BLM AO.
- Blue Tip would monitor for noxious and invasive weed species and would apply BLM approved weed control techniques (e.g., soil sterilants, biological controls, etc.) as necessary to control infestations with the prior approval of the BLM AO.

- Blue Tip would fence all open pits as deemed necessary by and in accordance with management direction received from both the BLM AO and the affected private surface owner.

2.1.9.11 Geology and Minerals

- If usable quality water and/or prospectively-valuable minerals, such as gilsonite, tar sands and oil shales, were encountered by the well bore, those formations would be isolated and/or protected by the cement program for the production casing. Based on cement log results, remedial cementing action would be conducted as necessary.

2.2 NO ACTION ALTERNATIVE

The CEQ regulations require the consideration of the alternative of No Action (40 CFR 1502.14). Under the No Action Alternative (**Figure 2**), the BLM would not approve any of the 11 proposed wells or associated access roads, pipelines, and power lines on Federal or private surface involving Federal mineral estate. In the future, individual wells may be approved individually on a case-by-case basis, or oil and gas leases may be developed in a different location where resource concerns are not affected or can be mitigated. Any future proposals for the development of any of those wells would also require evaluation under NEPA. However, Blue Tip could proceed with the development of seven wells and associated access roads and power lines located on private surface locations and involving privately held mineral estate (fee/fee) to the extent that those wells can be constructed without connection to power lines or roads on Federal lands (see **Table 2.2-1**).

Current land use practices in the project vicinity would likely continue, including private ranching activities and management of Federal grazing permits on BLM-administered lands.

Table 2.2-1 Surface Disturbance Acreages for the No Action Alternative

Well Number	Short-term Surface Disturbance				Long-term Surface Disturbance			
	Well Pad (acres)	Utility Corridor		Total Acres	Well Pad (acres)	Utility Corridor		Total Acres
		Linear Feet	Acres[1]			Linear Feet	Acres[2]	
Cole Creek 5-22	4.2	2,594	1.8	6.0	3.0	2,594	1.1	4.0
Cole Creek 11-22	4.0	1,190	0.8	4.8	2.8	1,190	0.5	3.3
Cole Creek 4-27	3.6	776	0.5	4.1	2.4	776	0.3	2.7
Cole Creek 8-27	3.8	NA	NA	3.8	2.6	NA	0.0	2.6
Cole Creek 11-27	3.6	1,678	1.2	4.8	2.4	1,678	0.7	3.1
Cole Creek 16-27	3.8	389	0.3	4.1	2.6	389	0.2	2.7
Cole Creek 12-23	3.4	4,362	3.0	6.4	2.2	4,362	1.8	4.0
TOTAL[3]	**26.4**	**10,989**	**7.6**	**34.0**	**17.8**	**10,989**	**4.5**	**22.3**

Source: D.R. Griffin, 2011

[1] Based on a 30-foot wide disturbance corridor within the 30-foot wide ROW, which includes new roadway and co-located buried water pipelines and overhead power lines.

[2] Based on an 18-foot wide disturbance corridor within the 30-foot wide ROW, which includes new roadway and co-located buried water pipelines and overhead power lines.

[3] Total acreage estimates are based on GIS-software calculations and may not equal total acreage by well pad due to rounding, removal of overlapping development and minute boundary discrepancies. GIS-based calculations are considered more accurate than estimates calculated using simple addition and are therefore used throughout this document.

3.0 AFFECTED ENVIRONMENT

Authorized uses on the Federal land in the Project Area include oil and natural gas development, domestic livestock grazing, wildlife habitat management, and dispersed recreation. Numerous road and utility (i.e., water, gas, electric transmission line) ROWs exist on the Federal land.

Casper has a population of 55,316 people (U.S. Census Bureau, 2010), and supports residential communities as well as commercial and industrial properties. However, there are no residential areas located on the Federal land or adjoining private and state lands. The nearest residential area is located in the City of Casper approximately 6 to 10 miles to the southwest of the Federal land boundary.

The primary access to the Project Area from Casper, Wyoming is located approximately 3 miles south from I-25. I-25 contains mixed commercial and industrial uses such as fueling stations, equipment storage facilities, hotels and restaurants.

There are approximately 16 operating wells located on private lands in the vicinity of the project area. Other land uses surrounding the project area are a mixture of grazing land, open space and industrial development extending outward from the Casper metropolitan area. Characteristics associated with the rural setting include views of ranch and open lands, relative isolation, quiet, the presence of wildlife, and relatively little traffic. Intermixed industrial uses include field development and production activities, as evidenced by the presence of oil and gas infrastructure such as well pads.

This chapter describes the affected environment in the vicinity of the Proposed Action (the Project Area) for the resources identified in Chapter 1, Purpose and Need, as potentially impacted by the Proposed Action.

3.1 CULTURAL RESOURCES

Cultural resources are sensitive and nonrenewable resources that can be irreversibly damaged or destroyed by ground-disturbing activities, such as site and road construction, and secondary surface activities, such as vehicular and pedestrian traffic. Oil and gas exploration and development activities in the Project Area are Federal undertakings in accordance with 36 Code of Federal Regulations (CFR) 800 (i.e., regulations implementing provisions of Section 106 of the National Historic Preservation Act [NHPA] of 1966, as amended). Any potential undertaking must consider potential effects to historic properties (i.e. those resources that are eligible for or listed on the National Register of Historic Places [NRHP]) must conform to Federal regulations in determining effects that a project may have on important cultural resources and in mitigating those effects determined to be adverse. As defined in 36 CFR 800, adverse effects to important historic properties include physical alteration, damage, or destruction, alteration of the character of the setting of a property that contributes to its importance, or neglect that results in deterioration or destruction. In Wyoming, a State Protocol Programmatic Agreement (PA) has been developed between the BLM and Wyoming SHPO (2006). This PA will be used to comply with the NHPA.

A series of Class III inventories have been completed for some of the proposed areas of disturbance presented in this EA by Frontier Archaeology (Frontier 2011a; 2011b; 2011c; 2011d; 2012a; 2012b; and 2012c). These inventories included an adequate buffer zone to account for project changes. Between March and May, 2012, a 500 acre block Class III cultural resource inventory was also completed (Frontier 2012d) to insure maximum flexibility in siting some of the proposed wells and facilities. In summary, three cultural resource sites and 21 isolated finds have been identified. While the consultant has recommended only one as eligible for the NRHP, these recommendations have not been reviewed by the BLM.

The consultant documented that almost the entire Project Area is situated in either a semi-stabilized dune field or on the floodplain of Cole Creek. Based on past research and evidence, both of these circumstances have a high potential to contain intact buried cultural materials that are not evident on the current ground surface. The consultant therefore recommended a series of monitors and open trench inspections. These recommendations were adopted by the project proponent (Blue Tip) as applicant-committed protection measures in this EA.

3.2 PALEONTOLOGY

The Project Area is underlain by rocks of the Lance Formation and alluvial deposits. The Lance Formation is known to contain a high occurrence of vertebrate and/or other fossil resources, primarily dinosaur and marine remains, which may vary in occurrence and predictability.

It should be noted that the Project Area is largely not surveyed for paleontological resources. However, as directed by the BLM, field surveys would be conducted prior to initiating any new surface disturbance and/or a paleontological monitor would be present during the use of excavation equipment, specifically during the original cutting of previously undisturbed lands of high paleontological resource potential to inspect exposures for contained fossils. Should any paleontological resources be identified, mitigation measures would be taken to prevent damage to, or destruction of, the site.

3.3 SOILS

The development of soils is governed by many factors, including climatic conditions (e.g., the amount and timing of precipitation, temperature, and wind), the parent material that the soil is derived from, topographic position (e.g., slope, elevation, and aspect), geomorphic processes, and time. The *Soil Survey of Converse County, Wyoming, Northern Part* and *Soil Survey of Natrona County Area, Wyoming* are the primary sources of information concerning soils in the Project Area (USDA-SCS 1988 and USDA-NRCS 1997). These surveys have been supplemented by additional information available on the National Resource Conservation Service (NRCS) Web Soil Survey website (USDA-NRCS 2012). **Figure 3** illustrates the soil map units within the Project Area. There are 25 soil map units within the Project Area, each composed of one or more soil types. Soils within the Project Area are mainly derived from alluvium and eolian deposits from sandstone and shale. They are mostly well-drained to excessively drained and are developed on hills, ridges, structural benches, alluvial fans, fan remnants, floodplains, and dunes.

For evaluation of potential environmental impacts to soils, the key attributes are their erosion potential and ease of reclamation after soil disturbance. These ratings, as well as soil characteristics that are relevant to erosion and reclamation potential, are provided in **Tables C-1** and **C-2** in **Appendix C**. The erosion potential of a soil is dependent on particle size distribution, the slopes on which it is found, and the amount and type of vegetative cover. The NRCS typically rates soil units for whole soil water erosion potential of the whole soil using the symbol K_w. The value of K_w ranges from 0.02 to 0.69. The higher the K_w value of a soil type, the more susceptible the soil type is to sheet and rill erosion. Typically, soils found on steeper slopes have a higher erosion hazard than those found on gentler slopes. The NRCS has provided erosion factors for all of the soils in the Project Area (USDA-NRCS 2012). Erosion potentials for these soils range from 0.17 to 0.37, indicating a low to moderate water erosion potential.

The wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion. The NRCS has provided wind erodibility index values for all the soils in the Project Area (USDA-NRCS 2012). The wind erodibility index values for these soils range from 48 to 134 tons per acre-year.

Reclamation potential is dependent on the soil structure, pH conditions, and soil salinity. Excessive salinity (salt content) or sodicity (sodium content) can inhibit the growth of desirable vegetation and therefore, successful reclamation. The NRCS has provided reclamation material source ratings for all of the soils in the Project Area (USDA-NRCS 2012). The soils in the Project Area are rated poor to fair for reclamation source material. Poor and fair reclamation ratings are generally due to high erosion potential, high clay content, low organic matter content, droughty conditions, and excessive salinity or sodicity.

3.4 GEOLOGY, MINERAL RESOURCES, AND ENERGY PRODUCTION

The Project Area is located in the Cole Creek oil field, which comprises a portion of the Powder River Basin. The Powder River Basin is one of the richest petroleum provinces in the Rocky Mountains, with more than 2.7 billion barrels of recoverable oil and over 2.3 trillion cubic feet of gas in about 700 fields since the discovery of the Salt Creek field in 1908 (Dolton and Fox 1995). Oil- and gas-producing formations within the Cole Creek field were discovered in 1938 (WOGCC 2012). As of 2011, a total of 18 wells, including 14 producing wells and four non-producing wells, were registered with the WOGCC within the Cole Creek field. These wells produced 24,221 barrels of oil and 8,184 thousand cubic feet (mcf) of gas in 2011, for a cumulative total of 18,391,253 barrels of oil and 645,444 mcf of gas produced from the Cole Creek field (WOGCC 2012).

The following oil- and gas-producing formations have been documented within the Cole Creek oil field and date from the Upper and Lower Cretaceous period:

- Shannon Sandstone - a marine cross-stratified, heterolithic sandstone with thin-bedded sandstone-shale alternations;

- Frontier Formation – a white to brown sandstone and dark-gray shale with oyster coquina in upper part and coal and lignite in lower part;
- Muddy Sandstone – variable fine- to very fine-grained sandstones containing lithic fragments, chert, and interstitial clay;
- Dakota Sandstone – variable assemblages of yellow-gray sandstone, conglomerate, shale, and coal; and

Lakota Formation – rusty to light-gray sandstone containing lenticular chert-pebble conglomerate interbedded with variegated bentonitic claystone (WSGS 2002).

Under the Proposed Action, the wells would be drilled to test the commercial productivity of the Dakota Formation and 2nd Frontier Formation at approximately 8,500 feet and 7,500 feet, respectively.

3.5 WATER QUALITY

According to the United States Geological Survey, the Project Area is located within the Middle North Platte-Casper watershed, Hydrologic Unit Code 10180007 (USGS 2012c). The portion of the North Platte River upstream of the Project Area and downstream of Casper is classified as a Category 5 water use, indicating impaired or threatened water quality and the need for a total maximum daily load determination (WDEQ 2012). Irrigated soils within the Middle North Platte-Casper watershed contain naturally high levels of selenium, which is readily dissolved and transported by water. Irrigation return flows contains high levels of selenium, resulting in selenium loading into the North Platte River and several other streams, wetlands, and reservoirs within the watershed. Exceedances of chronic aquatic life criterion for selenium have been detected in the North Platte River, Casper Creek, and lower Poison Spider Creek (WDEQ 2012).

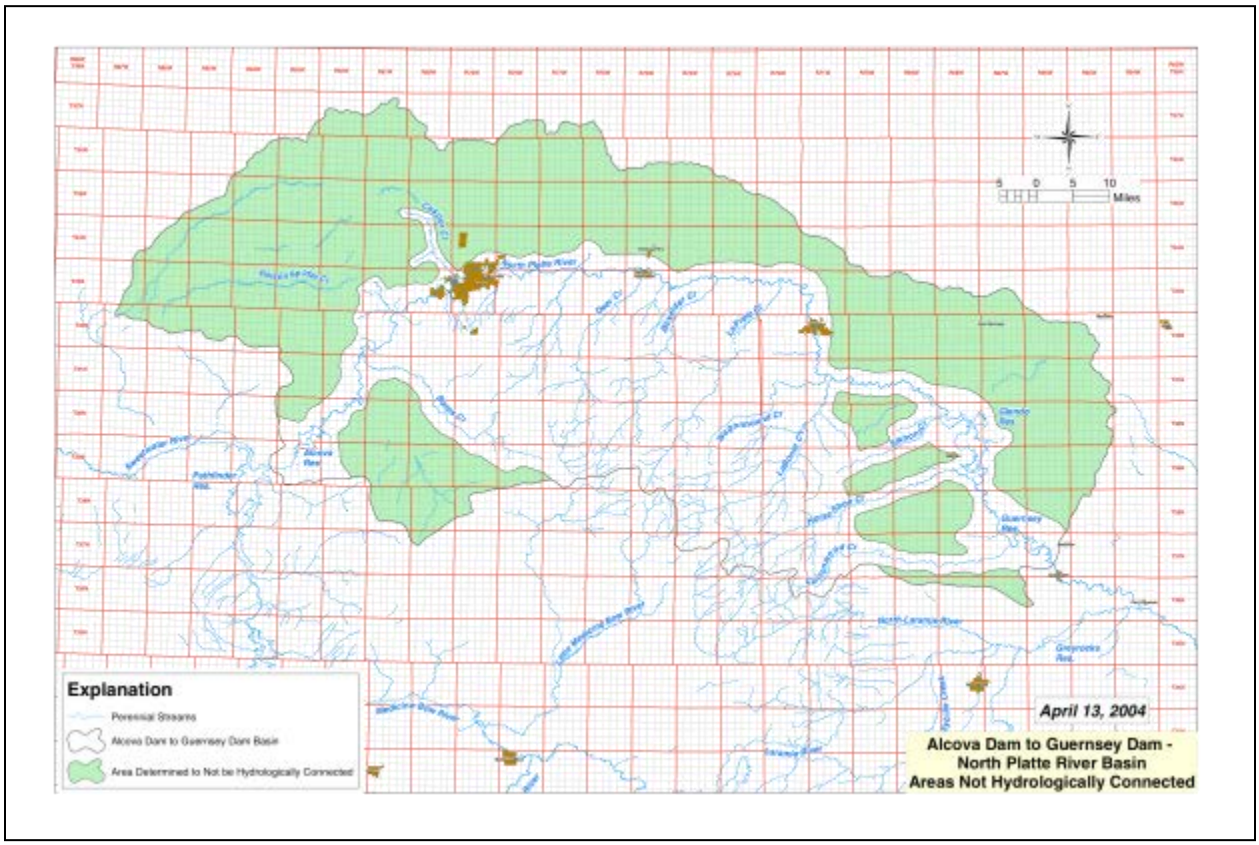
3.5.1 Ground Water Resources

Groundwater is an important resource for domestic, municipal, stock, and irrigation uses in southeastern Wyoming. The Project Area is located within the Pathfinder to Guernsey sub-basin, which is defined by the Wyoming Water Development Commission and is the second largest of the Platte River Basin sub-basins (WWDC 2012). The aquifers that underlie the Project Area include Quaternary non-alluvial aquifer systems and Late Cretaceous aquifer systems (WWDC 2012). The predominant water bearing geologic formations within the Late Cretaceous aquifer system include the Lance formation, Fox Hills sandstone, Mesaverde formation, and Frontier formation. Approximately 97 percent of the total groundwater use in the Pathfinder to Guernsey sub-basin is for agricultural, industrial, and municipal purposes. Agricultural wells account for approximately 53 percent of the total permitted groundwater use in the sub-basin, followed by 25 percent for industrial uses such as power generation, mining, and petroleum recovery. Another 20 percent of groundwater use is permitted for municipalities and community public water systems. Less than 3 percent of sub-basin groundwater use is for recreational and environmental purposes, and domestic use is negligible (WWDC 2012).

The Proposed Action plan is located within the geographic boundaries of the identified "Green Area" in **Figure 3.5-1** (WSEO 2012a). The "Green Area" indicates that the Project Area boundaries are within a North Platte River sub-basin where groundwater resources are considered non-hydrologically connected to the North Platte River and its tributaries. This sub-basin map was developed under application of the

2001 Modified North Platte Decree criteria, and subsequently adopted for the Wyoming Depletion Plan as part of the Platte River Recovery Implementation Program.

Figure 3.5-1 North Platte River Basin



According to the Wyoming State Engineer's Office, a total of 19 water wells have been permitted within the Project Area between 1922 and 2010 (see **Table 3.5-1**). Of the 19 water wells, six were completed for domestic and stockwater use, nine were completed for stockwater use only, and one was completed for industrial use. The water yield from these wells is documented between 5 and 100 gallons per minute, and the static water level ranges between 0 and 400 feet below ground surface. The nearest water well is a domestic groundwater well (Water Right Number P28121) and is located approximately 0.10 mile southeast of the proposed Cole Creek 12-23 well.

Table 3.5-1 Summary of Water Rights within the Project Area

Water Right Number	Location	Date	Status	Use	Total Depth	Static Water Level	Yield (GPM)[1]
P5016.0P	SWNW Sec 09 T35N R77W	09/27/1922	Complete	Stockwater	135	30	7.5
P5108.0P	NWSE Sec 14 T35N R77W	03/23/1943	Complete	Stockwater	108	20	7.5
P6410.0P	NWSW Sec 17 T35N R77W	09/21/1938	Complete	Stockwater	148	-1	8

Water Right Number	Location	Date	Status	Use	Total Depth	Static Water Level	Yield (GPM)[1]
P10663.0W	NESE Sec 21 T35N R77W	10/14/1971	Cancelled	Industrial	2430	---	40
P15741.0P	SENE Sec 17 T35N R77W	09/21/1945	Complete	Stockwater	235	-1	7.5
P15743.0P	NESE Sec 08 T35N R77W	12/21/1945	Complete	Stockwater	300	-1	7.5
P28114.0P	NWSW Sec 35 T35N R77W	08/15/1974	Complete	Domestic; Stockwater	91	50	5
P28121.0P	NWSW Sec 23 T35N R77W	08/15/1974	Complete	Domestic; Stockwater	163	140	25
P28122.0P	NWSW Sec 35 T35N R77W	08/15/1974	Complete	Domestic; Stockwater	142	80	5
P28123.0P	NENW Sec 34 T35N R77W	08/15/1974	Complete	Domestic; Stockwater	160	108	5
P53704.0W	NWSW Sec 35 T35N R77W	09/12/1980	Cancelled	Misc.	---	---	100
P74285.0W	SENW Sec 28 T35N R77W	03/13/1987	Cancelled	Domestic; Stockwater	---	---	25
P91730.0W	SENE Sec 09 T35N R77W	05/13/1993	Cancelled	Misc.; Stockwater	---	---	25
P91998.0W	SENE Sec 09 T35N R77W	06/16/1993	Incomplete	Misc.; Stockwater	340	190	25
P116911.0W	SENW Sec 28 T35N R77W	07/14/1999	Complete	Domestic; Stockwater	190	95	15
P148671.0W	NENW Sec 27 T35N R77W	09/05/2002	Complete	Stockwater	3250	400	20
P148672.0W	NWNE Sec 21 T35N R77W	09/05/2002	Complete	Stockwater	4390	400	20
P148673.0W	NENW Sec 21 T35N R77W	09/05/2002	Complete	Stockwater	3050	400	20
P193636.0W	NESE Sec 28 T35N R77W	06/30/2010	Complete	Stockwater	240	80	25

[1] GPM = gallons per minute

3.5.2 Surface Water Resources

The Project Area is located within the Platte River Basin, which encompasses approximately one-quarter of the State of Wyoming and includes all of Albany, Laramie, and Platte Counties and portions of Carbon, Converse, Fremont, Goshen, Natrona, Niobrara, Sublette, and Sweetwater Counties (WWDC 2006). The Platte River Basin system is largely driven by snowmelt originating from the Southern and Middle Rocky Mountains, which drains to the Missouri-Mississippi River Basin.

The majority of the Project Area, except the proposed Cole Creek 13-23 well, is located west of Cole Creek, an ephemeral steam that flows for short periods following precipitation or snowmelt. Cole Creek flows south into the North Platte River, which is approximately 7.6 miles south of the Project Area (**Figure 4**). The North Platte River is a major tributary of the Platte River and totals approximately 716

river miles over 550 linear miles. Its course lies within Colorado, Wyoming, and Nebraska and continues to the Missouri River.

3.6 VEGETATION, INCLUDING SPECIAL STATUS PLANT SPECIES, AND INVASIVE PLANTS & NOXIOUS WEEDS

3.6.1 General Vegetation

According to the EPA ecoregion descriptions, the Project Area lies along the border of the Wyoming Basin and northwestern Great Plains steppe ecoregions. The Wyoming Basin ecoregion is a broad intermontane basin dominated by arid grasslands and shrublands and interrupted by high hills and low mountains. Nearly surrounded by forest covered mountains, the region is somewhat drier than the northwestern Great Plains steppe to the northeast. Much of the region is used for livestock grazing, although many areas lack sufficient vegetation to support this activity. The region contains major producing natural gas and petroleum fields. The northwestern Great Plains steppe ecoregion encompasses the Missouri Plateau section of the Great Plains. It is a semiarid rolling plain of shale and sandstone punctuated by occasional buttes. Native grasslands, largely replaced on level ground by spring wheat and alfalfa, persist in rangeland areas on broken topography. Agriculture is restricted by the erratic precipitation and limited opportunities for irrigation.

The vegetation communities identified in this section are described using data obtained from USGS land cover vegetation descriptions (USGS 2000). Two land cover types are found within the Project Area, and include; mixed grass prairie and the Wyoming big sagebrush. **Figure 5** includes a map of the vegetative cover-types located within the Project Area, and **Table 3.6-1** summarizes acreages for all land cover-types identified. A brief description of each vegetation cover-type occurring within the Project Area is presented in the following paragraphs.

Table 3.6-1 Land Cover-types within the Project Area

Land Cover-type	Acreage within the Project Area
Mixed grass prairie	6,352
Wyoming big sagebrush	3,865
Total	**10,217**

Mixed Grass Prairie

Short, warm-season grasses predominate in this cover type, and there is a minor interspersion of forbs and shrubs. Vast stretches are dominated almost exclusively by blue grama, buffalo grass being a companion in many areas. The eastern part of the cover type, however, is dominated by grasses of medium stature, such as western wheatgrass and needlegrass. The occasional shrubs include juniper, silver sagebrush, silver buffalo berry, and skunk bush sumac in the northern reaches and rabbit brush and mesquite in the southern part. Forbs are generally quite common, but many are ephemerals.

Wyoming Big Sagebrush

The sagebrush cover type is characterized by shrubs, principally of the genus Artemisia, which are usually 1 to 4 feet high. Much of the sagebrush present in the Project Area is low-lying and scattered in nature, and is mainly located in the northern half of the Project Area. There are pockets of denser and taller sagebrush within draws and between hills, where more moisture may accumulate. In other places, grasses such as those of the genera Agropyron, Festuca, Poa, and Bromus, as well as broad-leaved herbs, are found in the understory.

3.6.2 BLM Sensitive Plant Species

BLM sensitive species are generally those species that are in need of special management considerations. **Table 3.6-2** contains a listing of those BLM sensitive plant species that may occur in the vicinity of the Project Area and their habitat preferences.

Table 3.6-2 Wyoming BLM Sensitive Plant Species and Habitat Preferences

Common Name	Scientific Name	Preferred Habitat	Likely to Occur
Porter's sagebrush	*Artemisia porteri*	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes at 5,300 to 6,500 feet elevation	No
Nelson's milkvetch	*Astragalus nelsonianus*	Alkaline clay flats, shale bluffs and gullies, pebbly slopes, and volcanic cinders in sparsely vegetated sagebrush, juniper, and cushion plant communities at 5,200 to 7,600 feet elevation	No
Many-stemmed spider-flower	*Cleome multicaulis*	Semi-moist, open saline banks of shallow ponds, lakes with Baltic rush and bulrush at 5,900 feet elevation	No
William's wafer-parsnip	*Cymopterus williamsii*	Open ridge tops and upper slopes with exposed limestone outcrops or rockslides at 6,000 to 8,300 feet elevation	No
Laramie false sagebrush	*Sphaeromeria somplex*	Cushion plant communities on rocky limestone ridges and gentle slopes at 7,500 to 8,600 feet elevation	No

3.6.3 Threatened and Endangered Plant Species

Several Federally-listed threatened and endangered or candidate plant species have the potential to occur within the Project Area, as shown in **Table 3.6-3** below.

Table 3.6-3 Federally-listed Threatened and Endangered Plant Species and Their Potential Occurrence within the Project Area

Common Name	Scientific Name	Federal Status[1]	Potential Occurence[2]
Blowout penstemon	*Penstemon haydenii*	E	L
Ute ladies'-tresses	*Spiranthes diluvialis*	T	U

Common Name	Scientific Name	Federal Status[1]	Potential Occurence[2]
Western prairie fringed orchid	*Platanthera praeclara*	T	U
Colorado butterfly plant	*Gaura neomexicana* ssp. *coloradoensis*	T	U

[1] E: Endangered, T: Threatened

[2] U: Unlikely to Occur, L: Likely to Occur

One species, the Blowout penstemon (*Penstemon haydenii*) has the potential to occur within the Project Area. The Blowout penstemon is a short-lived perennial, frequently occurring in large, multi-stemmed clumps containing flowering and vegetative stems. Vegetative stems are commonly up to 1-foot tall, but can sometimes reach nearly 2 feet. It is a potential resident in "blowouts" - sparsely vegetated depressions in active sand dunes created by wind erosion which typically form on windward sandy slopes where the vegetation has been removed or disturbed (Fertig 2000a). In Wyoming, the only known populations of blowout penstemon are located at the eastern end of the Ferris sand dune system at the head of Schoolhouse Creek and on the west side of Bradley Peak in Carbon County (BLM 2003). Given there are active sand dunes known to exist within the northern portion of the Project Area, this species has the potential to occur within the overall Project Area.

3.6.4 Noxious Weeds

Non-native plant species that are difficult to control, easily spread, and injurious to public health, crops, livestock, land or other property have been designated as noxious weeds under the Wyoming Weed and Pest Control Act of 1973. Prohibited noxious weeds pursuant to Wyoming Statute 11-12-104 are identified in **Table 3.6-4**. No surveys have been conducted or are available for the overall Project Area to determine either the presence or absence of those noxious weeds identified in **Table 3.6-4**.

Table 3.6-4 Designated Noxious Weeds in Wyoming

Common Name	Scientific Name
Canada thistle	*Cirsium arvense* L.
Common burdock	*Arctium minus* (Hill) Bernh.
Common St. Johnswort	*Hypericum perforatum*
Common tansy	*Tanacetum vulgare*
Dalmatian toadflax	*Linaria dalmatica* (L.) Mill.
Diffuse knapweed	*Centaurea diffusa* Lam
Dyers woad	*Isatis tinctoria* L.
Field bindweed	*Convolvulus arvensis* L.
Hoary cress (whitetop)	*Cardaria draba* and *Cardaria pubescens* (L.) Desv.
Houndstongue	*Cynoglossum officinale* L.
Leafy spurge	*Euphorbia esula* L.
Musk thistle	*Carduus nutans* L.
Ox-eye daisy	*Chrysanthemum leucanthemum* L.
Perennial pepperweed (giant whitetop)	*Lepidium latifolium* L.
Perennial sowthistle	*Sonchus arvensis* L.
Plumeless thistle	*Carduus acanthoides* L.

Common Name	Scientific Name
Purple loosestrife	*Lythrum salicaria* L.
Quackgrass	*Agropyron repens* (L.) *Beauv.*
Russian knapweed	*Centaurea repens* L.
Russian olive	*Elaeagnus angustifolia* L.
Saltcedar	*Tamarix* ssp.
Scotch thistle	*Onopordum acanthium* L.
Skeletonleaf bursage	*Franseria discolor* Nutt.
Spotted knapweed	*Centaurea maculosa* Lam.
Yellow toadflax	*Linaria vulgaris* L.

Reference: Wyoming Weed and Pest Council 2012

3.7 FISH AND WILDLIFE SPECIES, INCLUDING SPECIAL STATUS SPECIES

3.7.1 Big Game Species

Two big game species, mule deer (*Odocoileus hemionus*) and pronghorn antelope (*Antilocapra Americana*), inhabit the general Project Area. Mule deer and pronghorn antelope populations within the Project Area are classified into the North Converse herd unit. Herd objectives for both mule deer and antelope in the North Converse Herd Unit are 9,100 and 28,000 post hunt animals, respectively (WGFD 2010). The 2009 estimated post-season populations for the North Converse Herd Unit were 8,328 mule deer and 37,083 antelope. Mule deer populations in the North Converse Herd Unit are approximately 8.5 percent below herd objectives, while antelope populations are approximately 32.5 percent above herd objectives. There are no crucial mule deer or antelope habitats located within the Project Area (WGFD 2010).

3.7.2 BLM Sensitive Wildlife Species

BLM sensitive species are generally those species that are in need of special management considerations. **Table 3.7-1** contains a listing of those BLM sensitive wildlife species that may occur in the vicinity of Casper, Wyoming and their habitat preferences.

Table 3.7-1 Wyoming BLM Sensitive Wildlife Species and Habitat Preferences

Common Name	Scientific Name	Preferred Habitat	Likely to Occur
Mammals			
Long-eared myotis	*Myotis evotis*	Conifer and deciduous forests, caves and mines	No
Fringed myotis	*Myotis thysandes*	Conifer forests, woodland-chaparral, caves and mines	No
Spotted bat	*Euderma maculatum*	Cliffs over perennial water, basin-prairie shrub	No
Townsend's big-eared bat	*Corynorhinus townsendii*	Forests, basin-prairie shrub, caves and	No

Common Name	Scientific Name	Preferred Habitat	Likely to Occur
		mines	
White-tailed prairie dog	*Cynomys leucurus*	Basin-prairie shrub, grasslands	No
Swift fox	*Vulpes velox*	Grasslands	No
Birds			
White-faced Ibis	*Pledadis chihi*	Marshes, wet meadows	No
Trumpeter swan	*Cygnus buccinators*	Lakes, ponds, rivers	No
Northern goshawk	*Accipeter gentilis*	Conifer and Deciduous forests	No
Ferruginous hawk	*Buteo regalis*	Basin-prairie shrub, grassland, rock outcrops	Yes
Peregrine falcon	*Falco peregrinus*	Tall cliffs	No
Greater sage-grouse	*Centrocercus urophasianus*	Basin-prairie shrub, mountain-foothill shrub	Yes
Long-billed curlew	*Numenius americanus*	Grasslands, plains, foothills, wet meadows	No
Yellow-billed cuckoo	*Coccyzus americanus*	Open woodlands, streamside willow and alder groves	No
Burrowing owl	*Athene cunicularia*	Grasslands, basin-prairie shrub	Yes
Sage thrasher	*Oreoscoptes montanus*	Basin-prairie shrub, mountain foothill shrub	Yes
Loggerhead shrike	*Lanius ludovicianus*	Basin-prairie shrub, mountain foothill shrub	Yes
Brewer's sparrow	*Spizella breweri*	Basin-prairie shrub	Yes
Sage sparrow	*Amphispiza belli*	Basin-prairie shrub, mountain foothill shrub	Yes
Baird's sparrow	*Ammodramus bairdii*	Grasslands, weedy fields	No
Mountain plover	*Charadrius montanus*	Shortgrass, great basin-foothills grassland, and sagebrush grasslands	Yes
Amphibians			
Northern leopard frog	*Rana pipiens*	Beaver ponds, permanent water in plains and foothills	No

BLM sensitive wildlife species potentially occurring in the overall Project Area include ferruginous hawk, greater sage-grouse, burrowing owl, sage thrasher, loggerhead shrike, Brewer's sparrow, sage sparrow and mountain plover. The greater sage-grouse (*Centrocercus urophasianus*) is evaluated as both a BLM-sensitive species and as a Federally-listed candidate species. There are no historic greater sage-grouse leks known to exist within the overall Project Area (BLM 2011) and the Project Area is outside of key sage-grouse breeding habitat (WGFD 2011). The general Project Area is predominately a western mixed grass/short-grass prairie exhibiting a lack of sagebrush habitats that would be considered as suitable nesting and brood-rearing habitat. Consequently, this species is not evaluated further in this EA.

Two sensitive species are more likely to occur within the Project Area than the remaining species based upon both prior observations of the Project Area and a review of habitat types therein. These species

include burrowing owl and mountain plover. A brief discussion of these two individual species is presented below:

Burrowing Owl

The burrowing owl (*Athene cunicularia*) breeds from south-central British Columbia, south through most of the western U.S. and Mexico (WGFD 2005). In Wyoming, the highest concentrations of burrowing owls are in the south and east, although it occurs and breeds throughout most of the state. The burrowing owl is considered an uncommon summer resident in Wyoming. The Wyoming Game and Fish Department (WGFD) classify it as a species of special concern. The burrowing owl uses a wide variety of arid and semiarid environments, with well-drained, level to gently sloping areas characterized by sparse vegetation and bare ground. It prefers open prairie, grassland, desert, and shrub-steppe habitats, and may also inhabit agricultural areas. The burrowing owl depends on mammals, particularly prairie dogs and ground squirrels that dig burrows, which it uses for nesting, roosting, and escape. Ground surveys were conducted from February 29 to March 2, 2012 to determine whether any suitable habitat was present in the Project Area within 0.25 mile from proposed activities. Prairie dog colonies were identified within 0.25 mile of proposed activities; therefore there is the potential for this species to occur within the Project Area. **Appendix A** includes **Figure 6** identifying prairie dog colonies located within the Project Area.

Mountain Plover

Mountain plover (*Charadrius montanus)* occur and breed throughout most of Wyoming. Is considered a common summer resident in Wyoming, with a statewide population of approximately 3,400, ranging from 2,270 to 4,430 feet in elevation. The WGFD classifies it as a species of special concern. The mountain plover inhabits low, open habitats such as arid shortgrass and mixed-grass prairies dominated by blue grama and buffalo grass with scattered clumps of cacti and forbs, and saltbush habitats of the shrub-steppe of central and western Wyoming. It prefers to nest in large, flat grassland expanses with sparse, short vegetation and bare ground. It is adapted to areas that have been disturbed by prairie dogs, heavy grazing, or fire. Ground surveys were conducted from February 29, 2012 to March 2, 2012 to determine location, size, and composition of suitable habitat. Suitable habitat was mapped within 0.25 mile of the proposed well pads and access roads. Based on the results of the 2012 mountain plover habitat surveys, the known distribution of the mountain plover in Wyoming, mountain plovers could potentially occur within the Project Area. Therefore, the potential for this species to occur within the Project Area is considered high. **Appendix A** includes **Figure 7** illustrating mountain plover habitat within the Project Area.

3.7.3 Raptor Species

An inventory of raptor nesting activity within the Project Area was completed in response to present activities conducted by Blue Tip, but these inventories were generally limited to an inventory of historic nests located within the Project Area. Comprehensive biological inventories were also conducted by Kleinfelder, Inc. in February 2012 within the Project Area and did not locate any raptor nests or evidence of nesting activities.

3.7.4 Threatened and Endangered Wildlife Species

Threatened and endangered (T/E) species include those species which are in danger of extinction due to habitat degradation and drastic population declines and which have subsequently been listed as threatened, endangered or candidate species pursuant to the Endangered Species Act (ESA) of 1973 (as amended). Those T/E species listed in Natrona and Converse Counties by the USFWS are identified in **Table 3.7-2**.

Table 3.7-2 Federally Listed Threatened and Endangered Wildlife Species and Their Potential Occurrence within the Project Area

Common Name	Scientific Name	Federal Status[1]	Potential Occurence[2]
Mammals			
Black-footed ferret	*Mustela nigripes*	E	U
Birds			
Greater sage-grouse	*Centrocercus urophasianus*	C	U
Interior least tern	*Sterna antillarum*	E	U
Piping plover	*Charadrius melodus*	T	U
Whooping crane	*Grus americana*	E	U
Fishes			
Pallid sturgeon	*Scaphirhynchus albus*	E	U

[1] E: Endangered, T: Threatened, C: Candidate

[2] U: Unlikely to Occur

3.7.5 Migratory Bird Species

Habitats in the overall Project Area are primarily mixed prairie grass (shrub-steppe) with interspersed sagebrush uplands. Wyoming Partners in Flight (PIF) priority species potentially occurring in the shrub-steppe and shortgrass prairie habitat types are listed in **Table 3.7-3** (Nicholoff 2003).

Table 3.7-3 List of Partners in Flight (PIF) Priority Bird Species Potentially Found within the Project Area

Common Name	Scientific Name	Habitat Type	Distribution Area[1]
Level I Species (Conservation Action)			
Ferruginous hawk	*Buteo regalis*	Shrub-steppe	B
Greater sage-grouse	*Centrocercus urophasianus*	Shrub-steppe/Shortgrass prairie	B
Mountain plover	*Charadrius montanus*	Shortgrass prairie	B
Upland sandpiper	*Bartamia longicauda*	Shortgrass prairie	O
Long-billed curlew	*Numenius americana*	Shortgrass prairie	B
Burrowing owl	*Athene cunnicularia*	Shortgrass prairie	B
Short-eared owl	*Asio flammeus*	Shortgrass prairie	B
Baird's sparrow	*Ammodramus bairdii*	Shrub-steppe	B
Brewer's sparrow	*Spizella breweri*	Shrub-steppe	B
Sage sparrow	*Amphispiza belli*	Shrub-steppe/Shortgrass prairie	B
McCown's longspur	*Calcarius mccownii*	Shrub-steppe/Shortgrass prairie	B
Level II Species (Monitoring)			
Black-chinned hummingbird	*Archilochus alexandri*	Shrub-steppe	B

Common Name	Scientific Name	Habitat Type	Distribution Area[1]
Loggerhead shrike	*Lanius ludovicianus*	Shrub-steppe	B
Sage thrasher	*Oreoscoptes mantanus*	Shrub-steppe	B
Vesper sparrrow	*Pooecetes gramineus*	Shrub-steppe	B
Lark sparrow	*Chondestes grammacus*	Shrub-steppe	B
Lark bunting	*Calamospiza melanocorys*	Shortgrass prairie	B
Grasshopper sparrow	*Ammodramus savannarum*	Shortgrass prairie	B
Dickcissel	*Spiza americana*	Shortgrass prairie	O
Bobolink	*Dolichonyx oryzivorus*	Shortgrass prairie	O

Definition for Distribution Area: (B) Nest or young dependent upon parent birds observed; (O) The species has been observed, but there was no evidence of nesting; (N) The species has not been observed in the area.

Species distribution as reported in The Atlas of Birds, Mammals, Reptiles and Amphibians in Wyoming (WGFD 1999) includes a compilation of observations mapped by latitude and longitude, with the State of Wyoming divided into 28 different regions, where these observations are reported within a specific region of the State. These regions are based upon a one degree separation of both latitude and longitude. The Project Area falls with Wyoming Distribution Area 12 and 13 as defined by WGFD (WGFD 1990). Avian distribution data for those PIF priority species potentially occurring within the Project Area are included in **Table 3.7-3**. Only those birds that have been classified by WGFD (WGFD 1999) as confirmed breeders (nests and/or young observed), with circumstantial evidence of breeding (nests and/or young not located), or that have been observed at any time (season) within the general area (but without any evidence of breeding) are included in the list. Breeding Bird Survey (BBS) data for survey routes within Wyoming were included in this database (WGFD 1999).

Most of the birds listed in **Table 3.7-3** typically nest either on the ground or in shrubs. Potential losses are indeterminate as there are no BBS routes located within the immediate vicinity of the Project Area which could provide information on breeding bird densities within the shrub-steppe and shortgrass prairie habitats encountered in the overall Project Area. Concerns regarding the decline of both migratory and non-migratory bird populations both locally and on a continental scale have resulted in a nationwide bird conservation planning effort.

3.8 LIVESTOCK GRAZING

The Proposed Action plan is located within the Cole Creek grazing allotment. The Cole Creek Allotment is comprised of Federal and non-Federal land for a total allotment of 19,378 acres, 24 percent of which is Federal land. The Cole Creek Allotment is authorized for cattle and horses on a yearlong basis. Based on an average of 1.4 acres/Animal Unit Month (AUM) to support one cow, or a cow-nursing calf pair, for one month within these allotments, the 4,651 acres of public land supports approximately 3,322 AUMs. However, the total authorized Federal grazing use on the allotment is 3,265 AUM's.

3.9 ACCESS

The primary access to the Federal and non-Federal surface well locations from Casper, Wyoming is from I-25. From I-25 North Exit 182, employees and contractors would follow the existing County Road 256 (Cole Creek Road) and continue northeasterly for approximately 3 to 10 miles to local service roads. The

southern portion of the Federal land is primarily accessed by Sage Creek Road. There also is a network of county and BLM roads serving rural areas in the vicinity, none of which are paved. These roads are typically in poor to fair condition and are irregularly maintained (BLM 2003a).

Sand Hills Management Area

The Sand Hills Management Area (SHMA) is located northeast of Casper, Wyoming encompassing approximately 17,633 acres of BLM-administered lands (**Figure 8**). The area is comprised of large stabilized sand dunes and the associated vegetation communities. The ecosystem is easily impacted by ground-disturbing activities. As such, a comprehensive travel and transportation management plan (CTTMP) for the SHMA was implemented for more intensive management practices to preserve natural resources and ecosystems (BLM 2010). The purpose of the Sand Hills CTTMP was to establish a transportation plan for a designated network of roads and trails for public access, recreation use and resource management of sensitive soils and unique vegetative communities while maintaining valid and existing rights and other obligations already established within the Sand Hills Management Area.

All existing roads and trails including any new routes within the SHMA must meet resource needs and the management objectives outlined in the Casper FO RMP (BLM 2007) in order to be considered for inclusion. This process takes into account the following factors:

- Access needs for all BLM-administered programs and resource activities, including but not limited to access associated with mineral and energy development, rights-of-way and utility corridors, grazing management, wildlife, vegetation management, fire, lands, and recreation.
- Mitigation measures including seasonal restrictions to avoid on-site and off-site impacts to important natural resources from current and future land uses. Examples of resource concerns include, among other issues, erodible soils, listed and sensitive species habitats, historic and archeological sites, and habitat fragmentation.
- Consistency with resource program goals and objectives.
- Trail suitability for different categories of off-highway vehicles (OHVs) including but not limited to dirt bikes, all-terrain vehicles (ATVs), dune buggies, 4-wheel drive vehicles, and over snow vehicles as well as opportunities for joint trail use.
- Opportunities to enhance non-motorized trail and off-trail recreational use.

The Sand Hills MA has no legal motorized public access, limiting public recreation and motorized travel in the area. User groups include land owners whose properties border the planning area, developers, and professional hunting guides who have obtained land access agreements.

A new access road 0.69 mile in length would be required to access the proposed 15-8H well.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

The potential environmental consequences of construction, drilling, completion, and maintenance activities associated with the Proposed Action and No Action Alternative are discussed for each potentially affected resource. An environmental impact is defined as a change in the quality or quantity of a given resource due to a modification in the existing environment resulting from project-related activities. Impacts can be beneficial or adverse; a primary (direct) result or a secondary (indirect) result of an action; long-term (more than five years) or short-term (less than five years) in duration; and can vary in degree from a slightly discernible change to a total change in the environment.

In accordance with 40 CFR 1502.16, this chapter includes a discussion of the potential environmental consequences of the Proposed Action and the No Action alternative on each of the affected resources. Potential impacts are quantified when possible; however, when impacts are not quantifiable appropriate descriptions are used to describe the level of impact, and mitigation measures are included where appropriate.

4.1.1 Background Information for Cumulative Impact Analysis

The assessment of cumulative impacts in NEPA documents is required by CEQ regulations. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over time. This chapter discusses cumulative impacts (i.e., from past, present, and reasonably foreseeable future actions) as the incremental effect to specific resources or issues that would occur from implementation of the Proposed Action and the No Action Alternatives, in conjunction with other energy- and non-energy actions, for a given area over the next 10 to 15 years. Spatial boundaries and temporal timeframes for a Cumulative Impact Assessment Area (CIAA) can often vary by resource or issue**. Table 4.1-1** defines the CIAA for each resource examined in this EA.

Table 4.1-1 Cumulative Impact Assessment Areas

Resource	Cumulative Impact Assessment Areas
Cultural Resources	Project Area
Paleontological Resources	Project Area
Soils	Project Area
Geology, Mineral Resources, and Energy Production	Project Area
Water Quality	Middle Cole Creek, Pratts Soda Lakes, and Upper Cole Creek watersheds, which encompasses the Project Area (**Figure 9**)
Vegetation, Including Special Status Plant Species, and Invasive Plants and Noxious Weeds	Project Area
Fish And Wildlife Species, Including Special Status Species	Project Area
Livestock Grazing and Agriculture	Project Area
Access	Project Area

4.1.2 Reasonable Foreseeable Future Development

As stated above cumulative impacts are derived from past, present and reasonably foreseeable future actions within the geographic scope and timeframe set out above. In the assessment, consideration needs to include both other energy and non-energy-related actions. Reasonably foreseeable future actions are those for which there is existing decisions, funding, formal proposals, or which are highly probably, based on known opportunities or trends.

For purposes of assessment in this EA, it is assumed that energy-related actions would affect the greatest element of change to the CIAA. All other actions that could affect the CIAA are assumed to remain at current trends, with only minor deviations.

Project Area CIAA

According to the Wyoming Oil and Gas Conservation Commission (WOGCC), approximately 27 oil and gas wells have been drilled in within the Project Area CIAA, with two of these wells non-operating, and four subsequently plugged and abandoned. For the purposes of this analysis, it is assumed that these four wells have been successfully reclaimed and no longer represent long-term surface disturbance within the Project Area CIAA, while the remaining 23 wells either are or will shortly be producing and thus represent a cumulative, long-term impact upon the human environment. Using these assumptions, the surface disturbance within the overall Project Area CIAA resulting from previous and ongoing oil and gas exploration and development activities is as follows:

- Approximately 64 acres of long-term disturbance for the 23 producing wells located in the Project Area CIAA. These disturbance acreages are based on the assumptions for initial well pad construction and interim reclamation following completion activities referenced in **Sections 2.1.1.1** and **2.1.1.2**. It is assumed that the existing wells were drilled as vertical wells with no provision for multiple wells from a single well pad, and each existing well is assumed to result in approximately 4 acres of disturbance. Surface disturbance resulting from the installation of pipelines and power lines associated with these 23 wells is considered short-term in nature and does not represent a cumulative impact as most of this disturbance has already been reclaimed.
- Approximately 293 acres of long term surface disturbance associated with 46 miles of existing road within the Project Area CIAA. Existing surface disturbance within the overall Project Area CIAA attributable to the existing road network is based on the assumption that the average existing road is approximately 30 feet wide and the outslope and borrow ditch areas of these roads have already been reseeded.

Middle Cole Creek, Pratts Soda Lakes, and Upper Cole Creek watersheds CIAA

According to the Wyoming Oil and Gas Conservation Commission (WOGCC), approximately 28 oil and gas wells have been drilled in within the Middle Cole Creek, Pratts Soda Lakes, and Upper Cole Creek watersheds CIAA (Watersheds CIAA) which includes the Project Area, with three of these wells non-operating, and nine subsequently plugged and abandoned. For the purposes of this analysis, it is assumed that these nine wells have been successfully reclaimed and no longer represent long-term surface disturbance within the Watersheds CIAA, while the remaining 16 wells either are or will shortly be producing and thus represent a cumulative, long-term impact upon the human environment. Using these assumptions, the surface disturbance within the overall Watersheds CIAA resulting from previous and ongoing oil and gas exploration and development activities is as follows:

- Approximately 76 acres of long-term disturbance for the 19 producing wells located in the Watersheds CIAA. These disturbance acreages are based on the assumptions for initial well pad construction and interim reclamation following completion activities referenced in **Sections 2.1.1.1** and **2.1.1.2**. It is assumed that the existing wells were drilled as vertical wells with no provision for multiple wells from a single well pad, and each existing well is assumed to result in approximately 4 acres of disturbance. Surface disturbance resulting from the installation of pipelines and power lines associated with these 19 wells is considered short-term in nature and does not represent a cumulative impact as most of this disturbance has already been reclaimed.
- Approximately 230 acres of long term surface disturbance associated with 92 miles of existing road within the Watersheds CIAA. Existing surface disturbance within the overall Watersheds CIAA attributable to the existing road network is based on the assumption that the average existing road is approximately 30 feet wide and the outslope and borrow ditch areas of these roads have already been reseeded.
- Approximately 376 acres of long term disturbance associated with an existing wind farm located in the northeastern portion of the Watersheds CIAA. Of the 376 acres of disturbance, 280 acres are associated with the approximate 70 wind turbine pads, four acres are associated with the substation, 20 acres are associated with ancillary facilities, and 72 acres are associated with the access roads.

There are no other projects currently proposed or planned in the reasonably foreseeable future within or directly adjacent to the overall Project Area that would contribute to the impacts of those facilities proposed within the CIAA.

4.2 CULTURAL RESOURCES

4.2.1 Alternative A – Proposed Action

As defined in 36 CFR 800, adverse effects 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 importance; introducing visual or audible elements that are out of character with the property or alter its setting; and neglecting the resource to the extent that it deteriorates or is destroyed.

Impacts to cultural resources could result from surface-disturbing actions proposed predominately with the well pad construction, access road upgrading and/or construction, pipeline/flow line construction, and potential power line installation. As currently staked, no historic properties (resources listed on eligible for the National Register of Historic Places) will be affected by the Proposed Action. There are, however, several isolated finds that may be impacted; but these are not considered as historic properties and will be documented as "No Historic Properties Affected" (BLM/SHPO Programmatic Agreement Protocol, Section V and VI, 2006). . Nevertheless, the majority of the project area is located in eolian deposits, semi-stabilized dune field, or the floodplain of Cole Creek, all of which are areas where intact buried cultural materials could exist that were not evident on the present ground surface..

4.2.1.1 Mitigation

Impacts to cultural resources would be minimized by avoidance as discussed above, as well as by the ACEPMs listed in **Section 2.1.9** of this EA.

4.2.2 Alternative B – No Action

Under the No Action Alternative, the BLM would not approve any of the 11 proposed wells or associated access roads and power lines on Federal surface involving Federal mineral estate. However, seven fee/fee wells may be constructed. Therefore, impacts to cultural resources could result from surface-disturbing actions predominately with the well pad construction, access road upgrading and/or construction, pipeline/flow line construction, and potential power line installation. Further, because these actions would only be located on private surface/private minerals, there is no requirement to inventory, report or document any impacts to historic properties. Because the federal wells would not be drilled there would be no impacts to any known, unexpected, or buried cultural resources.

4.2.2.1 Mitigation

Impacts to cultural resources would be minimized by avoidance as discussed above.

4.2.3 Cumulative Impacts

The CIAA for cultural resources is the boundary of the Project Area, since impacts to cultural resources are not additive across a landscape. Under the Proposed Action and No Action Alternative, impacts to cultural resources in the CIAA from reasonably foreseeable future actions would primarily result from activities associated with surface and subsurface disturbance. Neither the Proposed Action, nor the No Action Alternative, would appreciably alter the cumulative impacts to cultural resources from oil and gas exploration and development in the Project Area CIAA.

4.3 PALEONTOLOGY

4.3.1 Alternative A – Proposed Action

Installation of the Proposed Action would result in the disturbance of 57.7 acres of existing topography in the Project Area. The installation of the Proposed Action could directly expose, damage, or destroy significant fossil resources. If fossil resources are uncovered during construction, the mitigation measures would further protect these resources from damage.

4.3.1.1 Mitigation

As directed by the BLM, a third-party paleontological monitor or representative of the BLM would be present during the use of excavation equipment, specifically during the original cutting of previously undisturbed lands of high paleontological resource potential to inspect exposures for contained fossils. The qualified paleontological monitor would adhere to the reporting and monitoring requirements prescribed by the BLM. A qualified paleontologist is defined as an individual with an M.S. or Ph.D. in paleontology or geology, who is familiar with paleontology procedures and techniques, and holds a BLM-issued paleontological permit.

4.3.2 Alternative B – No Action Alternative

Under the No Action Alternative, the BLM would not approve any of the 11 proposed wells or associated access roads and power lines on Federal surface involving Federal mineral estate. However, seven fee/fee wells may be constructed. Therefore, impacts to paleontological resources could result from surface-disturbing actions predominately with the well pad construction, access road upgrading and/or construction, and potential power line installation.

4.3.3 Cumulative Impacts

As cumulative impacts to paleontological resources across a geographic landscape are not additive, the CIAA for paleontological resources is defined as the Project Area. Cumulative impacts to paleontological resources in the Project Area CIAA would primarily result from activities associated with surface and subsurface disturbance from oil and gas development projects, with additional impacts from OHV travel, grazing activities, and private road construction. The total projected surface disturbance in the Project Area CIAA from past, present, and reasonably foreseeable future actions is 357 acres. It is assumed that future impacts to paleontological resource in the Project Area CIAA would primarily result from additional oil and gas development projects and increased visitation to the Project Area CIAA. If implemented, the Proposed Action would disturb about 57.7 acres in the Project Area CIAA, whereas implementation of the No Action Alternative would result in approximately 34.0 acres of surface disturbance. These alternatives, when considered along with other past, present, and reasonably foreseeable actions in the Project Area CIAA, could have short- and long-term cumulative effects on paleontological resources in the Project Area CIAA. Potential adverse effects include physical damage to or destruction of fossils, as well as increased vandalism and theft that result from improved access to fossil localities. Surface-disturbing activities could also have a beneficial effect on paleontological resources by drawing the attention of a qualified paleontologist to areas that are not currently being researched, resulting in the collection of specimens and data that would not otherwise be recovered. Scientifically important fossils could be uncovered in this manner.

4.4 SOILS

4.4.1 Alternative A – Proposed Action

Impacts to soil resources in the proposed Project Area are directly related to the amount of surface disturbances resulting from the Proposed Action. Direct soil impacts include soil horizon[1] disturbances to the O, A, E, and upper B horizons[2] resulting from site clearing, cut and fills, and location and access road

[1] Soil is made of distinct layers that lie one above the other, parallel to the soil surface. Each distinct layer is called a soil horizon. A vertical cross-section of a soil known as the soil profile reveals the various horizons of the soil. Each horizon is the result of a number of geological, chemical and biological processes that have been taking place for over thousands of years. The various soil horizons are identified on the basis of physical features, mainly their color, texture and particle size. Though the soil composition varies from place to place, most soils conform to a general pattern consisting of six horizons.

[2]

grading. Additionally, topsoil and subsoil would be stockpiled separately along the sides of the well pads or roads. If not done carefully, the segregation and reapplication of surface soils could result in the mixing of shallow soil horizons, resulting in a blending of soil characteristics and types. This blending would modify physical characteristics of the soils including structure, texture, and rock content, potentially leading to a loss of soil productivity and reduced reclamation potential. Compaction due to construction activities, such as grading at the well pads and along access roads, would reduce aeration, permeability, and water-holding capacity of the soils. An increase in surface runoff could be expected, potentially causing increased sheet, rill, and gully erosion. These impacts would be localized in nature. In addition to the lands directly disturbed by construction activities, the area impacted could include lands adjacent to the proposed facilities if excessive erosion or gullying occurs in these areas.

Secondary impacts to soils include loss of soils to wind, rain, and other erosive forces following horizon disturbances. Some soil erosion is expected to occur due to exposed soils on the proposed well pads and access roads required for construction. For well pad and access road construction, a minimum of 4 inches of topsoil would be stripped from the E and A horizons in each respective footprint and temporarily stored along the sides of the road or per well pad layout to provide access to the subsoils found in the lower B horizon. Implementation of BMPs such as dust suppression on roads, and interim reclamation measures by the operator is projected to reduce and maintain negligible levels of erosion throughout the Project Area.

A maximum total of about 57.7 acres of soils located within eight soil map units would initially be disturbed during the construction of the Proposed Action prior to interim reclamation. If interim reclamation activities are successful, the long-term, or residual, disturbance would be reduced to about 38.8 acres.

The reclamation source material ratings of the soil map units within the Project Area are judged to be poor, which could make reclamation of disturbed areas more difficult. It is expected that following re-vegetation and five to eight growing seasons, the erosion rate would drop to near baseline conditions from

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O Horizon - The letter 'O' stands for organic. As the name suggests, this horizon is rich in organic material of plant and animal origin. These materials are generally in various stages of decomposition. This decomposed organic material is called the humus that gives this horizon its characteristic dark color.

A Horizon - This is also known as the 'topsoil', and it is the topmost layer of the mineral soil. However, as it lies just below the O horizon, this layer also has some amount of humus in it. Hence, it is darker in color than the layers lying below it. This layer is also known as the 'biomantle' as it is the A horizon in which most of the biological activities take place. Soil organisms like earthworms, fungi and bacteria are mainly concentrated in this layer. The soil particles in this region are smallest and finest as compared to the lower horizons of the soil.

E Horizon - This layer lies below the A horizon and above the B horizon. It is light in color and contains mainly sand and silt. It is poor in mineral and clay content as these are lost to the lower layer by the process of leaching. Hence, this horizon is also called the layer of eluviation (leaching). The soil particles of this layer are larger in size than those in the A horizon but smaller than those in the underlying B horizon.

B Horizon - This is referred to as the 'subsoil'. This lies just below the E horizon and is rich in clay and minerals like iron or aluminum. Though this layer has a higher mineral content than the topsoil, some organic material may reach this layer from the layers above by the process of leaching. Plant roots may reach this layer. However, the B horizon is reddish or brownish due to the oxides of iron and clay.

well pads and pipeline corridors, but would remain at slightly elevated levels for the new and upgraded access roads. That is because portions of the well pads and pipeline ROWs would be reclaimed and revegetated, whereas the access road surfaces would continue to be eroded, even in the absence of high traffic volumes.

4.4.1.1 Mitigation

The operator will follow the guidance provided in the Wyoming Policy on Reclamation (Instructional Memorandum WY-2012-032). The Wyoming Reclamation Policy applies to all surface disturbing activities. Authorizations for surface disturbing actions are based upon the assumptions that an area can and ultimately will be successfully reclaimed. BLM reclamation goals emphasize eventual ecosystem reconstruction, which means returning the land to a condition approximate to an approved "Reference Site" or NRCS Ecological Site Transition State. Final reclamation measures are used to achieve this goal. BLM reclamation goals also include the short-term goal of quickly stabilizing disturbed areas to protect both disturbed and adjacent undisturbed areas from unnecessary degradation. Interim reclamation measures are used to achieve this short-term goal.

Topsoil and subsoil would be stockpiled separately. Stockpiled topsoil would be labeled with signage.

Proposed surface-disturbing activities will be modified (located) to avoid areas of highly erosive soils to the greatest extent practicable. When avoidance of highly erosive soils is not practicable the operator shall submit an individual site plan to and approved by the BLM AO meeting the following requirements.

- Engineered drawings for construction, site drainage design, and final rehabilitation contours with a written rational describing how the proposed controls will prevent slope failure and erosion, while maintaining viable topsoil for final reclamation.
- This plan should also include a timeline identifying the actions that will be applied during the construction, production and rehabilitation phases of the plan so appropriate monitoring protocols can be developed by the BLM to ensure that the plan is meeting the objective described in its rationale.

4.4.2 Alternative B – No Action

Direct impacts to soils under the No Action Alternative would be similar to those for the Proposed Action but of lesser magnitude. Under the No Action Alternative, Blue Tip could proceed with the development of seven wells and associated access roads and power lines located on private surface locations and involving privately held mineral estate. A total of about 34.0 acres of soils would initially be disturbed during the construction of well pads, access roads, and pipelines. The reclamation potential of the soil map units within the Project Area are judged to be poor, which could make reclamation of disturbed areas more difficult. If interim reclamation activities are successful, the residual disturbance would be reduced to about 22.3 acres.

4.4.2.1 Mitigation

Site preparation and reclamation on BLM lands would follow the Record of Decision and Approved Casper RMP, Appendix I - Mitigation Guidelines for Surface-Disturbing and Disruptive Activities (BLM 2007), the Gold Book (BLM-USFS 2007), and *Wyoming BLM Reclamation Policy* (BLM 2012). As part

of the Proposed Action, topsoil would be conserved. Topsoil excavated from drilling locations and new roads would be stockpiled for interim and final reclamation. During interim reclamation, unused portions of well pads and pipeline ROWs would be revegetated and fills would be recontoured to blend in with adjacent natural slopes. At the completion of the project, or if a well is not productive, the well pads would be completely reclaimed. Reclamation of well pads would generally consist of backfilling reserve pits, regrading the area to the approximate natural contours, spreading stockpiled soils over the disturbed area, and reseeding with a BLM-approved seed mixture.

Proposed surface-disturbing activities will be modified (located) to avoid areas of highly erosive soils to the greatest extent practicable. When avoidance of highly erosive soils is not practicable the operator shall submit an individual site plan to and approved by the BLM AO meeting the following requirements.

- Engineered drawings for construction, site drainage design, and final rehabilitation contours with a written rational describing how the proposed controls will prevent slope failure and erosion, while maintaining viable topsoil for final reclamation.
- This plan should also include a timeline identifying the actions that will be applied during the construction, production and rehabilitation phases of the plan so appropriate monitoring protocols can be developed by the BLM to ensure that the plan is meeting the objective described in its rationale.

4.4.3 Cumulative Impacts

According to the surface disturbance identified in **Section 4.1.2**, a total of 357 acres of existing and proposed surface disturbance are considered in the cumulative impacts assessment. The Proposed Action wells would add 57.7 acres of short-term surface disturbance and 38.8 acres of long-term surface disturbance. The No Action Alternative would add approximately 34.0 acres of short-term surface disturbance and 22.3 acres of long-term disturbance.

Other proposed activities within the Project Area that could increase surface disturbance and erosion rates include ongoing cattle grazing, prescribed burns, habitat enhancement projects, recreation activities, and other existing and future oil and gas projects. Ongoing and future cattle grazing, prescribed burns, and habitat enhancement projects would temporarily remove existing vegetation from soils. These activities would therefore increase the potential for soil erosion in localized areas, and would add to the cumulative adverse effects across the Project Area CIAA. The Proposed Action and No Action Alternative assessed in this EA, combined with other reasonably foreseeable future proposed actions for the Project Area CIAA, would cause further impacts to soils including mixing of soil horizons, soil compaction, increased susceptibility of the soils to wind and water erosion, and the potential for contamination of soils with petroleum products or other chemicals.

4.5 GEOLOGY, MINERAL RESOURCES, AND ENERGY PRODUCTION

4.5.1 Alternative A – Proposed Action

Under the Proposed Action, 11 oil and gas wells would be drilled to test the commercial productivity of the Dakota Formation (five wells) and 2nd Frontier Formation (six wells). Because the volume of gas produced from all 11 wells is expected to be minimal, piping infrastructure would not be constructed and

the gas would be flared at the well pads. Although the productive oil output of the proposed wells is unknown, the operational life of a single productive well could extend to approximately 30 years.

4.5.1.1 Mitigation

If wells are productive and gas is produced in association with the targeted oil reserves, Blue Tip would comply with the Department of Interior's Notice to Lessees and Operators of Onshore Federal and Indian Oil and Gas Leases (NTL-4A). Specifically, current requirements state that during initial well evaluation tests, venting and flaring actions would be limited for a period not to exceed 30 days or the production of 50 MMcf of gas, whichever occurs first.

As discussed previously in **Section 2.1.1**, drilling and completion operations would be conducted in accordance with Onshore Oil and Gas Order No. 2 (BLM 1988) and the Gold Book (BLM-USFS 2007). If usable quality water and/or prospectively-valuable minerals, such as gilsonite, tar sands and oil shales, were encountered by the well bore, those formations would be isolated and/or protected by the cement program for the production casing. Based on cement log results, remedial cementing action would be required as necessary.

4.5.2 Alternative B – No Action Alternative

Under the No Action Alternative, the BLM would not approve any of the 11 proposed wells involving Federal surface and/or Federal mineral estate. However, Blue Tip would proceed with the development of seven wells located on private surface involving privately held mineral estate. As discussed in **Section 4.5.1**, gas produced from these wells is expected to be minimal, therefore piping infrastructure would not be constructed and the gas would be flared at the well pads. Although the productive oil output of the proposed wells is unknown, the operational life of a single productive well could extend to approximately 30 years.

4.5.2.1 Mitigation

Mitigation measures would be the same as the Proposed Action mitigation (**Section 4.5.1.1**).

4.5.3 Cumulative Impacts

According to the surface disturbance discussed in **Section 4.1.2**, a total of 357 acres of existing and proposed surface disturbance are considered in the Project Area CIAA. The Proposed Action and No Action Alternative assessed in this EA, combined with other oil and gas development within the Project Area CIAA, would cause further depletions of oil and gas resources in the Project Area CIAA.

4.6 WATER QUALITY

4.6.1 Alternative A – Proposed Action

Hydrologic impacts resulting from surface disturbances associated with the Proposed Action would include the removal of vegetation, exposure of the underlying soil surface, and compaction of the soil. These impacts would result in an increased overland flow of surface runoff with subsequent erosion and off-site sedimentation. Consequently, these changes in the local environment could create the potential

for increased stream flow, increased sediment loading and the subsequent degradation of both surface and subsurface water quality below acceptable standards if they are not properly controlled or occur in close proximity to a perennial stream or aquifer recharge point. Both the magnitude and duration of these impacts depend upon several factors including slope aspect and gradient, degree and extent of soil disturbance(s), susceptibility of the soil to erosion, proximity of the disturbance to existing stream channels, and mitigation measures implemented.

Additional factors would include the duration of construction (surface disturbing) activities coupled with the timely implementation and subsequent success (or failure) of applicable reclamation measures. These potential impacts would be greatest during construction activities, but would begin to decrease shortly after completion of surface disturbing activities due to a combination of passive stabilization and implementation of erosion and sediment control measures as necessary to control runoff.

A total of 57.7 acres of short-term surface disturbance within the Project Area would occur in the watershed of the North Platte River sub-basin. The potential for off-site erosion and sedimentation throughout the Project Area would be reduced through the implementation of BMPs in the construction and subsequent reclamation of surface disturbances. Consequently, the potential for increased erosion and sedimentation within or directly adjacent to the proposed project is considered to be negligible when one considers the following:

1. The total amount of long-term surface disturbance that would result from the Proposed Action would be reduced to approximately 38.8 acres with successful interim reclamation activities, thereby further reducing the potential for erosion and off-site sedimentation , and:
2. The implementation of site-specific "Best Management" reclamation practices designed to stabilize disturbed areas as quickly as possible, would result in an estimated 94 percent overall reduction in erosion after the first year and a 95 percent reduction in erosion after five years (refer to **Section 4.5.1**).

Ground Water Resources

Water required for drilling and completion activities would be obtained from the Cole Creek Sheep Company from a State permitted water supply well located in SW¼NW¼ Section 31, T35N, R76W. Water required for drilling and completion purposes would be trucked from the water supply well to the Project Area. It is estimated that about 1.1 acre-feet (8,534 barrels) of water would be needed to drill and complete each exploratory well, and an estimated 0.1 acre-foot (776 barrels) of water would be needed to control fugitive dust during dry and windy conditions. Thus, an estimated 13.2 acre-feet (102,411 barrels) of water (1.2 acre-feet x 11 wells) would be required for the Proposed Action. Should additional water sources be required, they would be properly permitted through the WSEO. Water used during exploratory drilling and completion actions would be properly disposed of at a State of Wyoming-approved facility located outside of the Project Area.

As discussed in **Section 3.5.1**, there are a total of 99 permitted water wells in T35N, R77W (WSEO 2012b). A total of three permitted water wells are located within Sections 8, 9, and 23, T35N, R77W, which also contain proposed oil and gas wells associated with the Proposed Action. No permitted water wells are located within the remaining sections of the Proposed Action. The nearest water well is a

domestic groundwater well (Water Right Number P28121) and is located approximately 0.10 miles southeast of the proposed Cole Creek 12-23 well. Impacts to groundwater from the Proposed Action could include drawdown[3] on existing waters wells, and the introduction of hydrocarbons and fracing fluids to groundwater. However, based on Blue Tip's casing program (**Section 2.1.2**), impacts to water wells within the Project Area are not likely to occur. Blue Tip would perform drawdown measurements and monitor the water quality for existing water wells in the vicinity of the proposed actions, as required by the BLM AO.

Surface Water Resources

As stated in **Section 3.5.1**, the Proposed Action is located within the geographic boundaries of the identified "Green Area" within the North Platte River Basin by the WSEO (see **Section 3.5-1**, **Figure 3.5-1**). This area is identified as non-hydrologically connected to the North Platte River or its tributaries. Due to this determination, it is unlikely that any accidental spills of fuel, lubricants, hydraulic fluids, drilling fluids, produced water, or assorted chemicals required for standard well field operations would result in impacts to the North Platte River.

Low-water crossings or metal culverts would be installed and maintained at the two proposed drainage crossings at wells 12-23 and 13-23, located adjacent to Cole Creek. The culvert design would be determined prior to construction activities and would be sized adequately to meet anticipated stream flows, minimizing impact to streamflow volume to Cole Creek.

4.6.1.1 Mitigation

Any residual hydrocarbons remaining in the reserve pits following the completion of drilling operations would be promptly removed, as practical. Once the pit is backfilled, a portion of the stockpiled topsoil would be evenly distributed over the reclaimed area and reseeded in accordance with the specifications of the BLM. Use of erosion control measures, including proper grading to minimize slopes, diversion terraces and ditches, mulching, terracing, riprap, fiber matting, temporary sediment traps and broad-based drainage dips or low water crossings would be applied as appropriate or required, to minimize erosion and surface run-off during well pad construction and operation.

The potential for off-site erosion and sedimentation throughout the Project Area would be reduced through the implementation of BMPs in the construction and subsequent reclamation of surface disturbances.

Construction activities for each proposed well location, access road, and utility corridor would follow practices and procedures outlined in each individual APD and any COAs appended thereto by the BLM. Well pad, access road, and utility corridor construction activities would follow guidelines and standards as set forth in the Gold Book and/or the contractual requirements of any affected fee/private surface owner(s).

[3] Drawdown is the drop in the level of water in a well when water is being pumped. Drawdown is usually measured in feet or meters.

Culvert design would be determined prior to construction activities and would be sized adequately to meet anticipated stream flows, minimizing impact to streamflow volume to Cole Creek.

As determined by the BLM AO, Storm Water Management Plans (WYPDES Storm Water Permit) will be required on all new BLM projects of more than 1 acre (BLM 2007).

4.6.2 No Action Alternative

Under the No Action alternative, no additional oil and gas exploration and development activities would occur and impacts to surface and ground water resources within the overall Project Area would continue at current rates without the added impacts resulting from the activities associated with the Proposed Action.

4.6.2.1 Mitigation

Any residual hydrocarbons remaining in the reserve pits following the completion of drilling operations would be promptly removed, as practical. Once the pit is backfilled, a portion of the stockpiled topsoil would be evenly distributed over the reclaimed area and reseeded. Use of erosion control measures, including proper grading to minimize slopes, diversion terraces and ditches, mulching, terracing, riprap, fiber matting, temporary sediment traps and broad-based drainage dips or low water crossings would be applied as appropriate or required, to minimize erosion and surface run-off during well pad construction and operation.

The potential for off-site erosion and sedimentation throughout the Project Area would be reduced through the implementation of BMPs in the construction and subsequent reclamation of surface disturbances.

Well pad, access road, and utility corridor construction activities would follow guidelines and standards as set forth in the contractual requirements of any affected fee/private surface owner(s).

Culvert design would be determined prior to construction activities and would be sized adequately to meet anticipated stream flows, minimizing impact to streamflow volume to Cole Creek.

4.6.3 Cumulative Impacts

The cumulative impact analysis area for water quality includes the watersheds that drain the Project Area to Cole Creek. Based on erosion control and spill prevention design features included in the Proposed Action, direct and indirect impacts to water resources from construction, drilling, and completion would be avoided or negligible. Cumulative effects from other land disturbing activities (agriculture, residential impacts, well pads, drilling activities, prescribed burns, and road use) within the Project Area could continue to contribute sediment and possible contaminants to Project Area drainages, which could eventually be yielded to the North Platte River.

The cumulative impact analysis area for water resources also considers the depletion of surface waters used in drilling and well completion. Cumulative impacts on water resources from the development of

the Proposed Action would largely be limited to flow depletion. Approximately 13.2 acre-feet (102,411 barrels) of water (1.2 acre-feet x 11 wells) would be required for the Proposed Action. Approximately 8.4 acre-feet (65,170 barrels) of water (1.2 acre-feet x 7 wells) would be required for the No Action Alternative. Water would be obtained from the Cole Creek Sheep Company from a State permitted water supply well located in SW¼NW¼ Section 31, T35N, R76W and trucked to each well or road construction site by a licensed water hauler. No surface water sources would be used in the drilling and completion activities for the project. Therefore, no change in the stream flow regime would occur.

4.7 VEGETATION, INCLUDING SPECIAL STATUS PLANT SPECIES, AND INVASIVE PLANTS AND NOXIOUS WEEDS

4.7.1 Alternative A – Proposed Action

The Proposed Action would result in the long-term loss of existing vegetation on a total of approximately 38.8 acres. Approximately 57.7 acres would be involved in short-term disturbance. Interim reclamation and revegetation actions would be implemented on those disturbed areas not needed for production operations.

Removal of this vegetation would allow for the introduction and expansion of invasive and noxious weed species in the Project Area, particularly along roadways, shoulders, and proposed well pads. Indirect effects to vegetation would occur as a result of activities other than removal of vegetation. Sources of indirect effects would include the introduction or spread of noxious and invasive weed species or other changes in vegetation community composition following rehabilitation; increased public access and associated vegetation trampling/harvest; fugitive dust; and increased risk of human-caused wildfire. The severity of these invasions would depend on the length of time until revegetation was implemented, the degree and success of reclamation and revegetation, and the degree and success of noxious and invasive weed control efforts. Project-related vehicles traveling through infested areas of the Project Area could transport seed and/or plant material to new areas, increasing the spread and proliferation of invasive plants and noxious weeds both within the Project Area and to adjacent areas outside the Project Area.

Special Status Plants

Potential blowout penstemon (*Penstemon haydenii*) habitat is present in the northern portion of the Project Area where dunes are present. Most of these dunes are vegetated, however there are exposed portions of these dunes where sand is present on the surface. A field habitat survey was conducted by Kleinfelder, Inc. in March 2012, which did not identify any "blowouts" along the areas proposed for well pad and access road construction. In Wyoming, the only known populations of blowout penstemon are located at the eastern end of the Ferris sand dune system at the head of Schoolhouse Creek and on the west side of Bradley Peak in Carbon County (BLM 2003). Therefore, no direct impacts to this species are anticipated as a result of the Proposed Action. Possible indirect negative impacts which may result from implementation of the Proposed Action include:

- The long-term disturbance of 38.8 acres (disturbance would not occur in suitable habitat for blowout penstemon);

- increased competition for space, light, and nutrients with noxious weed species introduced and spread due to the Proposed Action;
- Altered photosynthesis, respiration, and transpiration due to increased fugitive dust resulting from the surface disturbance and project related traffic; and reduced seed production due to the potential loss.

Due to the ACEPMs in **Section 2.1.9** and the mitigation measures, all direct and indirect impacts from implementation of the Proposed Action would be fully mitigated; therefore, there will be "***No Effect***" to the blowout penstemon (*Penstemon haydenii*).

4.7.1.1 Mitigation

Impacts to vegetation would be partially mitigated by proper storage of topsoil and subsoil stockpiles, reclamation of disturbed areas with desired plant species and control of noxious and invasive weeds. Effective weed control would be needed to minimize impacts from noxious and invasive weed infestations until reclamation is deemed successful.

Areas known or suspected to contain essential habitat for special status plant species will be subject to a controlled use restriction requiring Blue Tip to conduct inventories or surveys to verify the presence or absence of special status species. Additionally, no well pads or access roads will be placed on top of sand dunes which provide potential suitable habitat for blowout penstemon. A qualified botanist would conduct surveys within the project area during the growing season (June 15 – July 15) to determine if habitat or individuals exist on sand dune locations. If individuals are located, no well site development activities would take place.

Indirect impacts will be addressed through the ACEPMs to minimize dust and control weed dispersal.

4.7.2 Alternative B – No Action

Direct impacts to soils under the No Action Alternative would be similar to those for the Proposed Action but of less magnitude. Under the No Action Alternative, Blue Tip could proceed with the development of seven wells and associated access roads and power lines located on private surface locations and involving privately held mineral estate. A total of about 34.0 acres would initially be disturbed during the construction of well pads, access roads, and pipelines. If interim reclamation activities are successful, the residual disturbance would be reduced to about 22.3 acres.

Special Status Plants

Habitat associated with blowout penstemon (*Penstemon haydenii*) is not present in the area where the seven well pads and access roads would be located under the No Action Alternative. In Wyoming, the only known populations of blowout penstemon are located at the eastern end of the Ferris sand dune system at the head of Schoolhouse Creek and on the west side of Bradley Peak in Carbon County (BLM 2003). Therefore, this species is not expected to be impacted under the No Action Alternative.

4.7.2.1 Mitigation

Areas known or suspected to contain essential habitat for special status plant species will be subject to a controlled use restriction requiring Blue Tip to conduct inventories or surveys to verify the presence or absence of special status species. Additionally, no well pads or access roads will be placed on top of sand dunes which provide potential habitat for blowout penstemon. A qualified botanist would conduct surveys within the Project Area during the growing season (June 15 to July 15) to determine if habitat or individuals exist on sand dune locations. If individuals are located, no well site development activities would take place.

4.7.3 Cumulative Impacts

Construction of the project could have temporary to long-term impacts on vegetation. For example, removal of vegetation and the disturbance of soils during construction would create optimal conditions for the invasion and establishment of invasive, non-native species that could continue for many years after the initial disturbance. The Proposed Action would add 57.7 acres of short-term surface disturbance and 38.8 acres of long-term surface disturbance. The No Action Alternative would add approximately 34.0 acres of short-term surface disturbance and 22.3 acres of long-term disturbance.

Other proposed activities within the Project Area that could increase surface disturbance include ongoing cattle grazing, prescribed burns, habitat enhancement projects, recreation activities, and other existing and future oil and gas projects. Ongoing and future cattle grazing, prescribed burns, and habitat enhancement projects would temporarily remove existing vegetation. These activities would therefore increase the potential for soil erosion in localized areas, and would add to the cumulative adverse effects across the Project Area. The Proposed Action and No Action Alternative assessed in this EA, combined with other reasonably foreseeable future activities in the Project Area, would cause further impacts to vegetation, by increasing erosion, incrementally adding to the overall native vegetation loss, and potentially increasing invasion or expansion of invasive and noxious weeds.

4.8 FISH AND WILDLIFE SPECIES, INCLUDING SPECIAL STATUS SPECIES

Impacts on local wildlife populations would result from direct removal or alteration of habitat, increased human presence associated with additional oil and gas exploration and development activities, and direct wildlife/human interaction. Activities associated with Proposed Action would temporarily eliminate approximately 57.7 acres of wildlife habitat, consisting mostly of grasses and forbs. These losses would result in a proportionate reduction in the amount of herbaceous and browse forage available to herbivorous species such as mule deer and antelope, as well as a reduction in nesting, feeding and security habitat for migratory birds and those smaller vertebrate species that may inhabit the affected areas. These habitat losses can generally be classified as being either short-term or long-term in duration, with these terms defined below:

- Short-term loss refers to disturbances that would be reclaimed immediately after exploration and/or development activities are completed. Loss or alteration of habitats in grass-shrub

meadows and/or on grassy slopes would be considered short-term and are expected to occur in conjunction with lease development.

- Long-term loss would occur in areas that could not be returned to their original vegetative state within a reasonable period of time (3 to 5 years), such as producing well sites and access roads.

4.8.1 Alternative A – Proposed Action

The removal of 57.7 acres of wildlife habitat in the short-term and 38.8 acres in the long-term would have a negligible impact on wildlife populations due to the small area(s) affected and the relative availability of similar, undisturbed habitats in directly adjacent areas. Upon conclusion of operations within the Project Area and once successful reclamation of these disturbed areas has been achieved, these affected habitats would ultimately return to pre-project conditions.

Big Game Species

As stated in **Section 3.7.1**, there are no crucial big game habitats within the Project Area. Rather than direct habitat loss, the greatest impact on wildlife populations would be from displacement of big game species from preferred habitats as a result of increased level(s) of human activity (including vehicular traffic) and associated noise. The extent of this displacement is difficult to predict when one considers that response to noise and human presence varies from species to species as well as among individuals of the same species. In some cases, wildlife species may habituate to noise and human presence after initial exposure, and begin to utilize areas that were formerly avoided. Numerous studies have examined the effects of human presence on big game species (Klein 1974; Irwin and Peek 1979; Ward and Cupal 1979; MacArthur et al. 1982; Brekke 1985) and it is commonly presumed that these effects are detrimental to individual species. However, research on the relationship between displacement from preferred habitats and increased stress due to human harassment (both intentional and otherwise) on overall population dynamics has been inconclusive to date, particularly pertaining to oil and gas exploration and development activity.

In addition to the avoidance response, an increased human presence intensifies the potential for wildlife-human interactions ranging from the harassment of wildlife to poaching and increased legal harvest. Likewise, increased traffic levels on existing access roads could increase the potential for wildlife-vehicle collisions. These collisions are most frequent where roads traverse areas commonly frequented by game species. Generally, construction, drilling and completion activities within the Project Area would temporarily displace big game animals in the immediate vicinity of such activities. However, once these intensive activities have been completed, most big game animals would become acclimated to the reduction in traffic and human activity and would continue to utilize suitable habitat in closer proximity to well pads and access road routes. Yet, such habitat may not be utilized to the same extent as it was prior to disturbance because of the lengthy time for some reclaimed areas to attain pre-disturbance shrub conditions and vegetation diversity. However, once all production operations have been terminated, existing facilities abandoned and removed, reclamation and reseeding operations completed, and suitable vegetation has been re-established, big game animals would likely re-occupy all previously disturbed areas within the Project Area.

Raptor Species

Surface disturbance and concomitant human intrusion(s) associated with additional oil and gas exploration and development activity within the Project Area could have a negative effect upon raptor breeding and/or nesting activities within the overall Project Area if these activities were allowed to proceed during the breeding/nesting season. Surface disturbances associated with the Proposed Action would result in the long-term loss of approximately 38.8 acres of potential habitat for raptor prey species such as small mammals, migratory birds and reptiles. However, with the lack of suitable nesting habitat for raptors within the Project Area, this negative impact would be minimal. Raptor nests were not observed within the Project Area during the wildlife surveys. At this time, there is no definitive data on the particular raptor species associated with these historic nests or the annual use thereof.

Special Status/Sensitive Species

Sage Grouse

The Proposed Action could result in disturbances to foraging and nesting cover of sage-grouse within the Project Area. However, there are no sage-grouse leks known to exist within the Project Area and this area is outside of identified sage-grouse core area habitat. As a consequence, it is unlikely that the Proposed Action would have an adverse impact upon sage-grouse populations or their habitat within the Project Area.

Mountain Plover

The Proposed Action could result in disturbances to breeding, nesting, and fledgling success of mountain plovers. Impacts to mountain plover include the direct loss of grassland-low shrub habitat suitable for reproduction and foraging, and timing of surface disturbing actions and increased human presence during sensitive breeding and nesting periods. These impacts could cause individual breeding pairs to abandon the area and/or abandon nest and young, choosing other areas. Indirect impacts could include increased inter- and intra-species competition for suitable breeding and foraging sites elsewhere within the grassland habitats in the Project Area and surrounding areas. Suitable mountain plover reproduction and foraging habitat occurs within the Project Area. To avoid impacts to breeding mountain plovers, Blue Tip has committed to avoiding construction during the mountain plover nesting period (April 10 to July 10). Therefore, impacts to breeding mountain plovers would be low.

As such the impacts to mountain plover from implementation of the Proposed Action, would not likely affect the species at the population level, or contribute to a trend such that protection under the ESA would be appropriate.

Burrowing Owl

Implementation of the Proposed Action would not result in the direct loss of burrowing owl nesting habitat as there are no prairie dog colonies in the areas proposed for development. Prairie dog colonies do occur within the Project Area and are within 0.25 mile from proposed activities for the Federal 15-9 and Federal 11-27 wells. The Proposed Action could result in disturbances to breeding, nesting, and fledgling success. Proposed oil and gas activities would further reduce the amount of suitable habitat for burrowing owls. Well drilling and other human activities (both directly and indirectly associated with these projects) would incrementally reduce the productivity of the habitats affected and increase the amount of human presence within the Project Area.

Indirect negative impacts could include displacement from foraging areas and reduction of prey species. In general, the severity of the cumulative effects would depend on factors such as the sensitivity of the species, seasonal intensity of use, type of project activity, and physical parameters (e.g., topography, forage, and habitat availability). Overall, the Proposed Action may affect individual burrowing owls but would not likely result in a trend towards Federal listing of the species. If any ground disturbing activity is proposed for the Federal 15-9 well during the breeding season, prairie dog colonies within 0.25 mile of the proposed surface disturbance would be surveyed for the presence of nesting burrowing owls. If burrowing owls are documented within 0.25 mile of a host location, surface disturbing, drilling, or completion activities at that location would not commence until after the breeding season.

Migratory Bird Species

Numerous species of migratory birds, including passerines, may forage or nest in or near the Project Area. Under the Proposed Action, impacts to migratory birds in the Project Area would be similar for all migratory bird species, but would vary depending on loss of habitat types and species' or individual birds' sensitivities to disturbance. For the purposes of analysis in this EA, impacts to migratory birds within the Project Area are discussed together. Approximately 57.7 acres of vegetation utilized by migratory birds for nesting and foraging habitats would experience short-term disturbance under the Proposed Action and 38.8 acres of long-term disturbance. Successful interim and final reclamation, in conjunction with weed control efforts, would help to restore the needed forage and cover types required by migratory birds over time.

Other impacts to migratory birds associated with the implementation of the Proposed Action would be dependent upon seasonal timing of construction, drilling, and completion activities. If these activities were to be conducted in the late fall, many of the migratory species would have left the Project Area for southern wintering grounds. Surface disturbance, visual and noise impacts during this time would not impact most individual birds or nesting locations. However, if such activities were to occur during the spring or summer months, this could result in displacement of nesting pairs from establishing nests or cause nest abandonment. Associated noise and increased human presence could cause displacement for foraging and nesting habitats.

4.8.1.1 Mitigation

Direct and indirect impacts to big game would be minimized through ACEPMs regarding revegetation and erosion control to restore suitable habitat that provides sufficient forage and needed cover.

To avoid impacts to breeding mountain plovers, Blue Tip has committed to avoiding construction during the mountain plover nesting period (April 10 to July 10).

If any ground disturbing activity is proposed for the Federal 15-9 well during the breeding season, prairie dog colonies within 0.25 mile of the proposed surface disturbance would be surveyed for the presence of nesting burrowing owls. If burrowing owls are documented within 0.25 mile of a host location, surface disturbing, drilling, or completion activities at that location would not commence until after the breeding season.

Successful interim and final reclamation, in conjunction with weed control efforts, would help to restore the needed forage and cover types required by migratory birds over time.

4.8.2 Alternative B – No Action

Direct impacts to wildlife under the No Action Alternative would be similar to those for the Proposed Action but of less magnitude. Under the No Action Alternative, Blue Tip could proceed with the development of seven wells and associated access roads and power lines located on private surface locations and involving privately held mineral estate. A total of about 34.0 acres of wildlife habitat would initially be disturbed during the construction of well pads, access roads, and pipelines. If interim reclamation activities are successful, the residual disturbance would be reduced to about 22.3 acres.

Big Game Species

Impacts to big game are anticipated to be similar to those discussed under the Proposed Action.

Raptor Species

Impacts to raptors are anticipated to be similar in nature under the No Action Alternative as they were under the Proposed Action.

Special Status/Sensitive Species

Sage Grouse

Impacts to sage grouse are anticipated to be similar in nature under the No Action Alternative as they were under the Proposed Action.

Mountain Plover

The No Action Alternative could result in disturbances to breeding, nesting, and fledgling success of mountain plovers. Impacts to mountain plover include the direct loss of grassland-low shrub habitat suitable for reproduction and foraging, and timing of surface disturbing actions and increased human presence during sensitive breeding and nesting periods. These impacts could cause individual breeding pairs to abandon the area and/or abandon nest and young, choosing other areas. Indirect impacts could include increased inter- and intra-species competition for suitable breeding and foraging sites elsewhere within the grassland habitats in the Project Area and surrounding areas. Potential mountain plover reproduction and foraging habitat occurs within the Project Area. To avoid impacts to breeding mountain plovers, Blue Tip has committed to avoiding construction during the mountain plover nesting period (April 10 – July 10).Therefore, impacts to breeding mountain plovers would be low.

As such the impacts to mountain plover from implementation of the Proposed Action, would not likely affect the species at the population level, or contribute to a trend such that protection under the ESA would be appropriate.

Burrowing Owl

Implementation of the Proposed Action would not result in the direct loss of burrowing owl nesting habitat as there are no prairie dog colonies in the areas proposed for development. However, an inactive prairie dog colony does occur within 0.25 mile from proposed activities for Federal 11-27. The No

Action Alternative could result in disturbances to breeding, nesting, and fledgling success. Proposed oil and gas activities would further reduce the amount of suitable habitat for burrowing owls. Well drilling and other human activities (both directly and indirectly associated with these projects) would incrementally reduce the productivity of the habitats affected and increase the amount of human presence within the Project Area.

Indirect negative impacts could include displacement from foraging areas and reduction of prey species. In general, the severity of the cumulative effects would depend on factors such as the sensitivity of the species, seasonal intensity of use, type of project activity, and physical parameters (e.g., topography, forage, and habitat availability). Overall, the No Action Alternative may affect individual burrowing owls but would not likely result in a trend towards Federal listing of the species. If any ground disturbing activity is proposed at the Federal 11-27 well location during the breeding season, mitigation measure are discussed in **Section 4.8.2.1**.

Migratory Bird Species

Impacts to migratory birds are anticipated to be similar in nature under the No Action Alternative as under the Proposed Action.

4.8.2.1 Mitigation

To avoid impacts to breeding mountain plovers, Blue Tip has committed to avoiding construction during the mountain plover nesting period (April 10 – July 10).Therefore, impacts to breeding mountain plovers would be low.

If any ground disturbing activity is proposed at the Federal 11-27 well location during the breeding season, the identified prairie dog colony would be surveyed for the presence of nesting burrowing owls. If burrowing owls are documented within 0.25 mile of the host location or access road, surface disturbing, drilling, or completion activities at that location would not commence until after the breeding season.

4.8.3 Cumulative Impacts

Cumulative impacts to wildlife resources would be directly related to habitat loss, habitat fragmentation, animal displacement, and direct mortalities. Long-term surface disturbance incrementally adds to wildlife habitat losses, overall habitat fragmentation, and animal displacement. In areas where development has occurred, habitat fragmentation may have resulted in the disruption of seasonal patterns or migration routes. Historic, current, and future developments in the vicinity of the Project Area have resulted, or would result, in the reduction of carrying capacities as characterized by the amount of available cover, forage, and breeding areas for wildlife species. Surface disturbance in the region primarily results from oil and gas development, including pipelines and seismic exploration, and mining. However, other activities such as livestock grazing, development of recreational facilities, and growth of Wyoming communities also contribute to cumulative impacts on wildlife and their habitats.

Big game, especially pronghorn, would be most susceptible to these impacts since encroaching human activities associated with development activities have resulted, or would result, in habitat loss and fragmentation and animal displacement. Many of the local wildlife populations (e.g., small game,

migratory birds) that occur in the Project region likely would continue to occupy their respective ranges and breed successfully, although population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from incremental development.

The Proposed Action would add 57.7 acres of short-term surface disturbance and 38.8 acres of long-term surface disturbance. The No Action alternative would add approximately 34.0 acres of short term surface disturbance and 22.3 acres of long term disturbance.

The Proposed Action and No Action Alternative assessed in this EA, combined with other oil and gas drilling currently proposed for the Project Area, would cause further impacts to vegetation and habitat loss or alteration, incrementally adding to the overall native vegetation loss, and potentially increasing impacts to wildlife species and habitat.

4.9 LIVESTOCK GRAZING

4.9.1 Alternative A– Proposed Action

Under the Proposed Action, the existing livestock grazing lease within the Project Area for the Cole Creek Allotment issued to the Cole Creek Sheep Company would result in the short-term loss of approximately 41 AUMs, and the permanent loss of approximately 28 AUMs, or a 0.9 percent reduction in the Federal range (28 AUMs/3,265 total AUMs). Although a permanent loss would occur, the Proposed Action would be minimal at less than one percent and would not affect livestock use and/or trend within the remainder of the Cole Creek Allotment.

4.9.1.1 Mitigation

All lease operations would be conducted in full compliance with all applicable laws, regulations (43 CFR 3100 et al.), Onshore Oil and Gas Orders, the approved plan of operations and any applicable Notices to Lessees. Operations on Federal lands would be conducted in compliance with 43 CFR 2800 et al.

4.9.2 Alternative B– No Action Alternative

The No Action Alternative would result in the permanent loss of approximately 16 AUMs resulting in negligible impacts the livestock grazing currently authorized for the Cole Creek Allotment. The existing livestock grazing leases that are active on Federal and private land would remain in effect until the lease expires. Existing trends in livestock use would remain unaffected by the No Action Alternative.

4.9.2.1 Mitigation

None

4.9.3 Cumulative Impacts

Cole Creek Allotment is authorized for cattle and horses on a yearlong basis. Total authorized Federal grazing use on the allotment is 3,265 AUMs. The average carrying capacity, or the acreage required to support one cow, or a cow-nursing calf pair, for one month (i.e., an AUM), is approximately 1.4 acres.

The Proposed Action would affect approximately 41 Federal AUMs, or approximately 1.3 percent of the total active AUMs authorized for Cole Creek Allotment. Interim and final reclamation activities would eventually restore these acres back to live stock and grazing land. However, the potential loss would contribute to the cumulative change in the use of these lands from livestock and grazing to more of an industrial setting.

Long-term surface disturbance within the overall Project Area upon addition of the disturbances described in **Section 2.1.2** and the long-term surface disturbance of 38.8 acres associated with the Proposed Action would equal approximately 396 acres of the overall Project Area CIAA. This long-term disturbance would result in the cumulative loss of approximately 283 AUMs. This long term loss of grazing equates to an overall decline in available AUMs within the overall Project Area CIAA. Considering that the majority of the overall Project Area consists of private surface estate, the loss of an additional 41 AUMs (1.3 percent) attributable to the Proposed Action, or the 16 AUMs (0.5 percent) attributable to the No Action Alternative, over the long-term would not represent an adverse cumulative impact.

In addition to the loss of grazing AUMs, the disturbance of existing, native vegetation would create opportunities for the establishment of invasive, non-native (noxious) species. Invasive species are easily established and commonly found on all newly disturbed and reclaimed sites throughout Wyoming. These species are fast growing, can out-compete native species, can increase the danger of wildfires, and can prevent the establishment of native species including grasses, forbs and, and shrubs. Considering that invasive, non-native plant species would be controlled by Blue Tip within the overall Project Area, it is unlikely that the Proposed Action and No Action Alternative would have any adverse cumulative impacts on native plant communities arising from the invasion of and replacement with non-native species. However, any area(s) within the overall Project Area subjected to new surface disturbance would represent an opportunity for the establishment of these invasive, non-native species.

4.10 ACCESS

4.10.1 Alternative A – Proposed Action

The total short-term surface disturbance associated with the upgrade of unimproved two-tracks and construction of new roads under the 11 wells evaluated for the Preferred Alternative would be approximately 13.6 acres. After road construction, reclamation activities including regrading and reseeding would reduce the disturbed ROW area from 30 feet to approximately 18 feet, resulting in approximately 8.2 acres of long-term surface disturbance.

Construction of buried pipelines and increased traffic on roads co-located with buried pipelines may potentially impact the integrity of existing ROWs within the Project Area. However, because all of all proposed pipelines would be buried, minimal adverse impacts to existing ROWs would occur.

Sand Hill Management Area

The general Project Area is generally isolated due to a lack of public access roads or trails. One proposed well site (Federal 15-8H) within Section 8, T.35N., R.77W., is located within the SHMA. Disturbance to land located within the SHMA would be limited to this one site. The proposed Federal 15-8H pad and associated 0.76 mile access road would initially require approximately 6.8 acres of land. Approximately

0.25 mile of the road would be constructed within the SHMA. The total amount of land area required would be reduced to 4.4 acres after reclamation. This associated access road would remain in use during the time period for operations and maintenance of the well.

The Proposed Action would temporarily result in increased vehicle traffic, noise, dust, and human activity during the construction period in the vicinity of the proposed Federal 15-8H well within the SHMA.

4.10.1.1Mitigation

To maintain the integrity of vegetation and to protect highly erosive soils and watershed values in the SHMA, travel on the access road associated with the Federal 15-8H well would be designated as limited to authorized use only, and would be restricted to permitted users having authorization for use of specific routes.

4.10.2 Alternative B – No Action

Implementation of the No Action Alternative, no access would be provided within the SHMA.

4.10.3 Cumulative Impacts

Traffic volumes generated by the construction of the new access road within the SHMA, would be for the construction, operation, and maintenance of the access road and well only, as it would be designated as authorized use only. The addition of project-related traffic would not create or increase access to the SHMA by the public,

5.0 CONSULTATION AND COORDINATION

5.1 BACKGROUND

The Cole Creek Exploration Project Environmental Assessment was prepared by Kleinfelder, Inc., an independent consulting firm, with the guidance, participation and independent evaluation by the BLM. A list of the personnel responsible for document preparation and their individual responsibilities are provided below.

5.2 LIST OF PREPARERS

Table 5.2-1 identifies the BLM personnel associated with the review of this EA.

Table 5.2-1 BLM Interdisciplinary Team

Name	Office	Responsibility
Arthur Terry	BLM Casper Field Office	Environmental Protection Specialist
David Korzilius	BLM Casper Field Office	Supervisory Natural Resource Specialist
Eric Holborn	BLM Casper Field Office	Acting Supervisory Natural Resource Specialist
Kathleen Lacko	BLM Casper Field Office	Planning & Environmental Coordinator
Joseph Meyer	BLM Casper Field Office	Field Manager
Matthew Roberts	BLM Casper Field Office	Range Management Specialist
Patrick Moore	BLM Casper Field Office	Assistant Field Manager Minerals & Lands
Sara Bohl	BLM Casper Field Office	Natural Resource Specialist, Project Manager
Shane Gray	BLM Casper Field Office	Wildlife Biologist
Shane Evans	BLM Casper Field Office	Hydrologist
Thomas Foertsch	BLM Casper Field Office	Geologist

Table 5.2-2 identifies those companies and associated personnel responsible for the preparation of the environmental assessment document.

Table 5.2-2 Independent EA Preparers

Name	Company Affiliation	Responsibility
Amy Gartin	Kleinfelder	Water Quality, Livestock Grazing, Lands and Access
Ashley Hawes	Kleinfelder	Soils, Geology, Mineral Resources, & Energy Production
Chrissy Lawson	Kleinfelder	Project Manager, Peer Reviewer
Dan Soucy Rick Jones	Kleinfelder	Vegetation, Including Special Status Plant Species, and Invasive Plants & Noxious Weeds; Fish and Wildlife Species, Including Special Status Species
Elyssa Figari	Kleinfelder	Cultural Resources
Jane Boand	Kleinfelder	Project Manager
Lindsey Hockert	Kleinfelder	GIS - Mapping

6.0 REFERENCES

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC and the California Energy Commission. Accessed at: http://www.aplic.org/uploads/files/2643/SuggestedPractices 2006(LR-2).

Brekke, E.B. 1985. Effects of CO 2 Development on Elk Calving in South-central Colorado. Unpublished report. Bureau of Land Management. Canon City, Colorado.

Bureau of Land Management (BLM). 1988. Onshore Oil and Gas Order No. 2, Drilling Operations. Federal Register Vol. 53, No. 223. November 18, 1988.

Bureau of Land Management (BLM) 2003. Environmental Assessment of Bill Barrett Corporation's Proposed Wallace Creek Raderville Formation Field Development Project, Natrona County, Wyoming. EA Number WY-060-03-108. Prepared by the Casper Field Office, Bureau of Land Management. Casper, Wyoming.

Bureau of Land Management (BLM). 2007. Record of Decision and Approved Casper Resource Management Plan. U.S. Department of the Interior, Bureau of Land Management, Casper Field Office. December 2007.

Bureau of Land Management (BLM). 2011. Instruction Memorandum No. WY-2012-007 - Management of Oil and Gas Exploration and Production Pits. U.S. Department of the Interior, Bureau of Land Management, Wyoming State Office. November 2011

Bureau of Land Management (BLM) and U.S. Department of Agriculture Forest Service (USFS). 2007. Surface Operating Standards for Oil and Gas Extraction and Development 4th Edition.

Dolton, G.L., and Fox, J.E. 1995. Powder River Basin Province (033) in Gautier, D.L., Dolton, G.L., Takahashi, K.I., and Varnes, K.L. eds. In 1995 National assessment of United States oil and gas resources – Results, methodology, and supporting data. U.S. Geological Survey Digital Data Series 30.

Environmental Protection Agency (EPA). 2009. Information acquired from the Internet via the U.S. Environmental Protection Agency, Western Ecology Division website:https://www.epa.gov/naaujdh/pages/ecoregions/wy_eco.htm.

Frontier Archaeology (Frontier), 2012a. Class III Cultural Resource Inventory of the Blue Tip Energy Wyoming, Inc., Cole Creek Federal #15-9 Well and Access. 23 April 2012.

Frontier, 2012b. Class III Cultural Resource Inventory of the Blue Tip Energy Wyoming, Inc., Cole Creek Federal #35-9 Well and Access. 25 April 2012.

Frontier, 2012c. Class III Cultural Resource Inventory of the Blue Tip Energy Wyoming, Inc., Cole Creek Oilfield Expansion Blocks. 11 June 2012.

Irwin, L.L. and J.M. Peek. 1979. Relationship between road closures and elk behavior in northern Idaho. Pages 199-204. In: North American Elk: Ecology, Behavior and Management edited by M.S. Boyce and L.D. Hayden-Wing. University of Wyoming. Laramie, Wyoming.

Keinath, D., B. Heidel and G.P Beauvais. 2003. Wyoming Plant and Animal Species of Concern. Prepared by the Wyoming Natural Diversity Database, University of Wyoming. Laramie, Wyoming.

Klein, D.R. 1974. The Reaction of Some Northern Mammals to Aircraft Disturbance. Pages 377. 7th International Congress of Game Biologists; September 3-7, 1973.

Stockholm, Sweden. Swedish Environmental Protection Board. Stockholm, Sweden.

Nicholoff, S.H., compiler. 2003. Wyoming Bird Conservation Plan, Version 2.0. Wyoming Partners in Flight. Wyoming Game and Fish Department. Lander, Wyoming. 668 pp.

MacArthur, R.A., V. Geist and R.H. Johnson. 1982. Cardiac and Behavioral Responses of Mountain Sheep to Human Disturbance. Journal of Wildlife Management 46:351-358.

U.S. Department of Agriculture – Soil Conservation Service (USDA-SCS). 1988. Soil Survey of Converse County, Wyoming, Northern Part.

U.S. Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS). 1997. Soil Survey of Natrona County Area, Wyoming.

U.S. Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS). 2012. Web Soil Survey. Accessed at: http://websoilsurvey.nrcs.usda.gov on March 25, 2012.

U.S. Fish and Wildlife Service (USFWS). 2012. Information acquired from the Internet via the U.S. Fish and Wildlife Services Endangered Species website: http://ecos.fws.gov/ipac/wizard/trustResourceList!prepare.action

U.S. Geological Survey (USGS). 2012a. Ground Water Atlas of the United States: Montana, North Dakota, South Dakota, Wyoming (HA 730-I). Accessed at: http://pubs.usgs.gov/ha/ha730/ch_i/I-text1.html#uptert on March 25, 2012.

U.S. Geological Survey (USGS). 2012b. Water Watch Home. Accessed at: http://waterwatch.usgs.gov/index.php?id=ww on March 25, 2012.

United States Geological Survey (USGS). 2012c. 10180007 – Middle North Fork Platte-Casper Watershed. Accessed July 12, 2012. Available online at: http://water.usgs.gov/lookup/getwatershed?10180007/www/cgi-bin/lookup/getwatershed.

U.S. Geological Survey (USGS) Land Cover Institute. 2010. Information acquired from the Internet via the Wyoming Land Cover Map. Website: http://landcover.usgs.gov/wyoming.php

U.S. Geological Survey Laramie County Conservation District, Platte County Resource District. Groundwater Quality of Southeastern Wyoming. Fact Sheet 2011-3106. September 2011.

Ward, A.L. and J.J. Cupal. 1979. Telemetered Heart Rate of Three Elk as Affected by Activity and Human Disturbance. Pages 47-56. In: Proceedings of the Dispersed Recreation and Natural Resource Management Symposium. Utah State University. Logan, Utah.

Wyoming Department of Environmental Quality (WDEQ). 2012. Water Quality Assessment and Impaired Waters List (2012 Integrated 305(b) and 303(d) Report). Document Number 12-0203. Available online at: http://deq.state.wy.us/wqd/watershed/Downloads/305b/2012/WY2012IR.pdf

Wyoming Game and Fish Department (WGFD). 1999. Atlas of Birds, Mammals, Reptiles, and Amphibians in Wyoming. Wyoming Game and Fish Department, Wildlife Division. Cheyenne, Wyoming. 190 pp. + appendices.

Wyoming Game and Fish Department (WGFD). 2010. Casper Region 2009 Annual Big Game Herd Reports. Cheyenne, Wyoming. 429 pp. Accessed at: http://gf.state.wy.us/wildlife/biggamejcr2009/Casper%20Complete%20Report.pdf

Wyoming Game and Fish Department (WGFD. 2011. Sage Grouse Core Breeding Areas - Version 3. Cheyenne, Wyoming. 1 pp. Accessed at: http://gf.state.wy.us/wildlife/wildlife_management/sagegrouse/index.asp.

Wyoming Oil and Gas Conservation Commission (WOGCC). 2012. State Field Report for 2011. Accessed at http://wogcc.state.wy.us/FieldReportYear.cfm on March 29, 2012.

Wyoming State. 2012. Wyoming State Water Plan: Stream Flow Statistics for High, Low, and Average or Normal Years. Accessed at: http://waterplan.state.wy.us/plan/platte/atlas/above/above_rivers_streamflow.htm.

Wyoming State. 2012. Wyoming State Water Plan: Available Groundwater Determination Technical Memorandum, WWDC Green River Basin Water Plan II, Groundwater Study Level 1 (2007-2009). August, 2012. Accessed at: http://waterplan.state.wy.us/plan/green/2010/finalrept/gw_toc.htm.

Wyoming State Engineer's Office (WSEO). 2012a. North Platte River Basin Green Area Maps – Hydrological Connection. Accessed July 12, 2012. Available online at http://seo.state.wy.us/maps.aspx/

Wyoming State Engineer's Office (WSEO). 2012b. e-Permit Water Rights Database. Accessed July 12, 2012. Available online at https://seoweb.wyo.gov/e-Permit/Common/Login.aspx.

Wyoming State Geological Survey (WSGS). 2002. Oil and Gas Map of Wyoming. October 14, 2002.

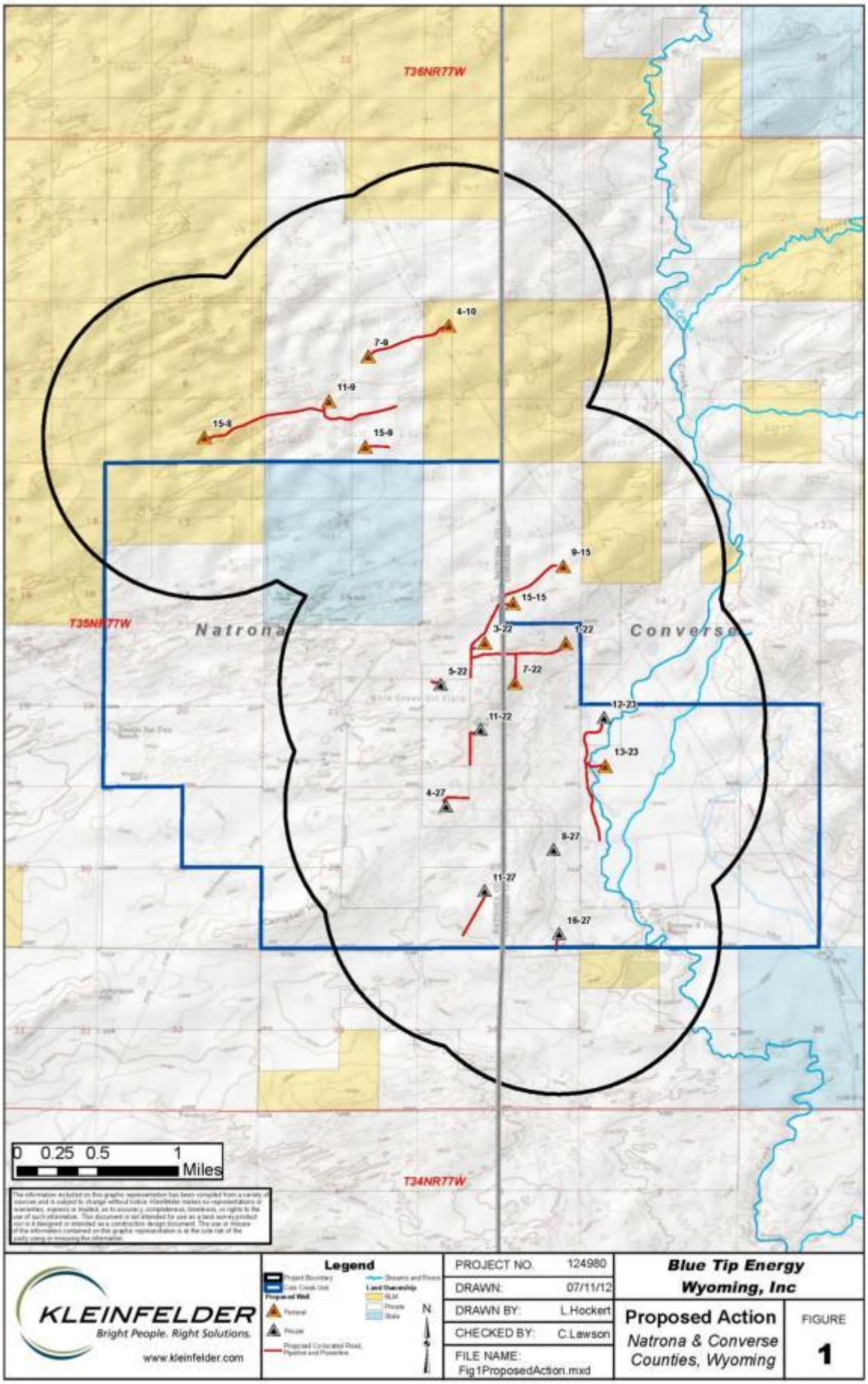
Wyoming State Geological Survey (WSGS). 2012. Northern Powder River Basin IMS Project. Accessed at: http://ims.wsgs.uwyo.edu/PRB on March 29, 2012.

Wyoming Water Development Commission (WWDC). 2006. Platte River Basin Plan Final Report. May 2006. Available online at http://waterplan.state.wy.us/plan/platte/finalrept/Final_report.pdf.

Wyoming Water Development Commission (WWDC). 2012. Wyoming State Water Plan Platte River Basin Water Atlas. Accessed July 7, 2012. Available at http://waterplan.state.wy.us/plan/platte/atlas/index.htm.

Wyoming Weed and Pest Control Council. 2012. Information acquired from the Intranet via the Wyoming Weed and Pest Council website: http://www.wyoweed.org/statelist.html

APPENDIX A: FIGURES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Legend
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PROJECT NO. 124980
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DRAWN BY: L.Hockert
CHECKED BY: C.Lawson
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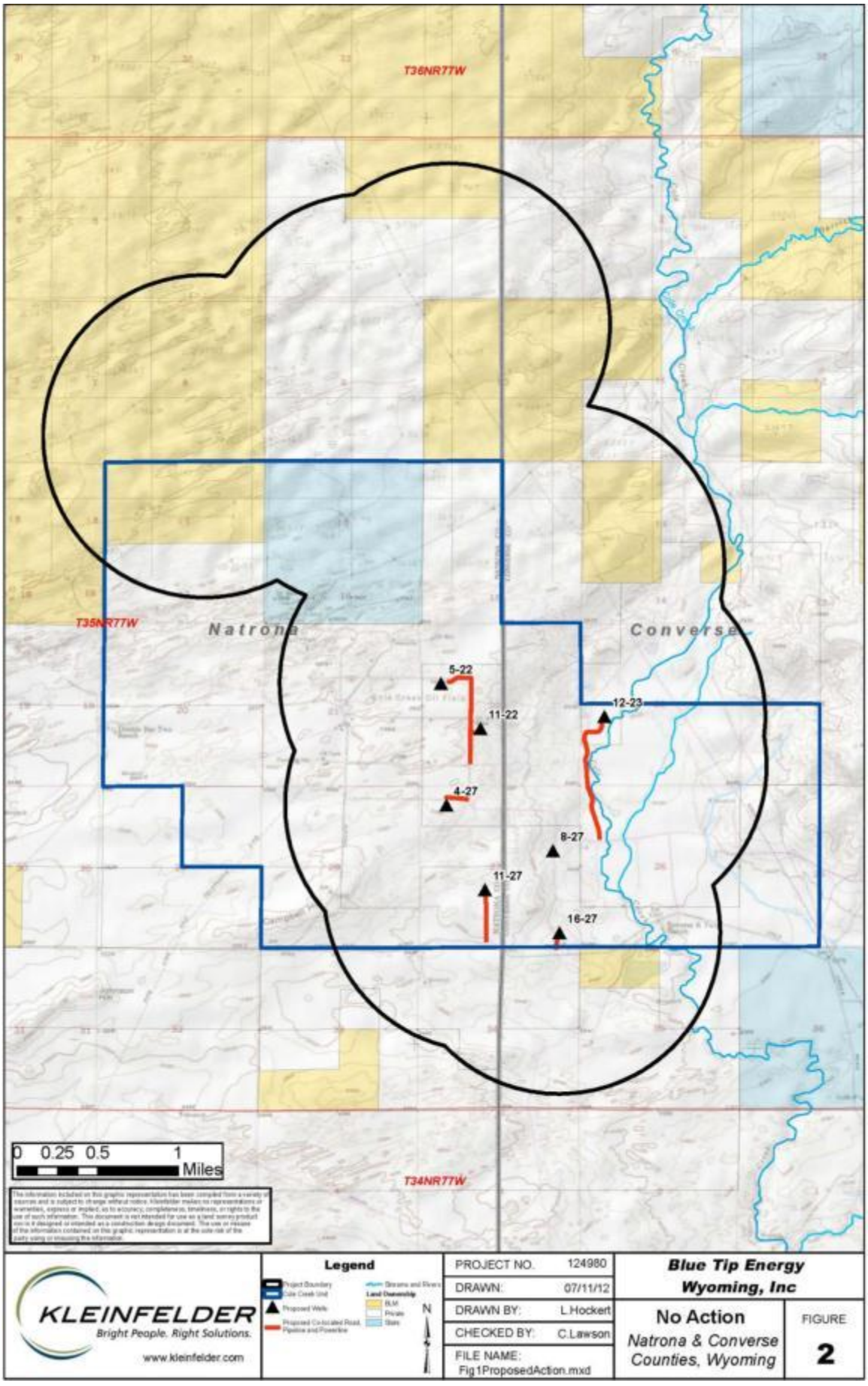
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Cole Creek Unit
Proposed Wells
Proposed Co-located Road, Pipeline and Powerline
Streams and Rivers
Land Ownership
BLM
Private
State
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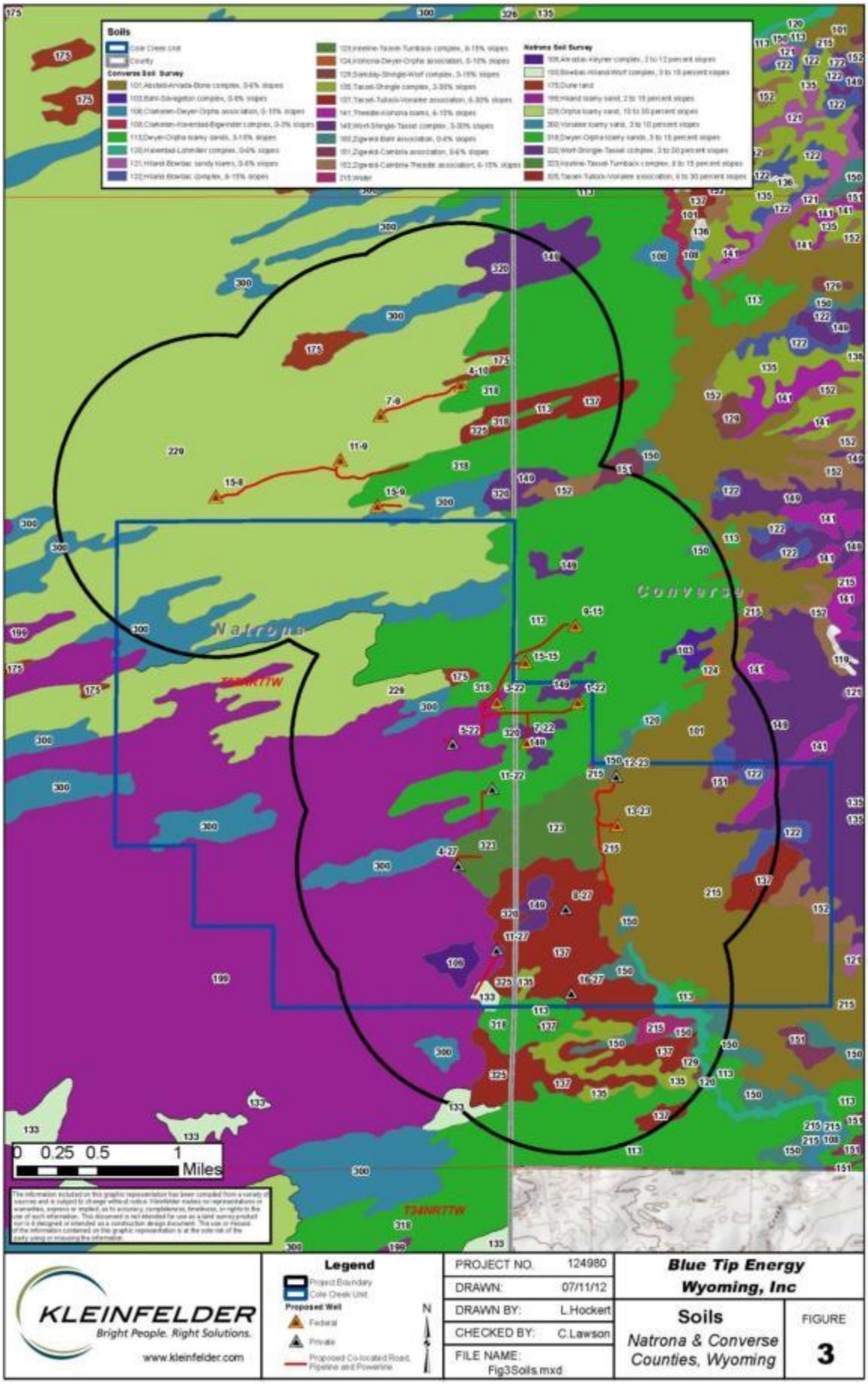
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Legend
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Cole Creek Unit
Proposed Well
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Proposed Co-located Road, Pipeline and Powerline
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DRAWN BY: L.Hockert
CHECKED BY: C.Lawson
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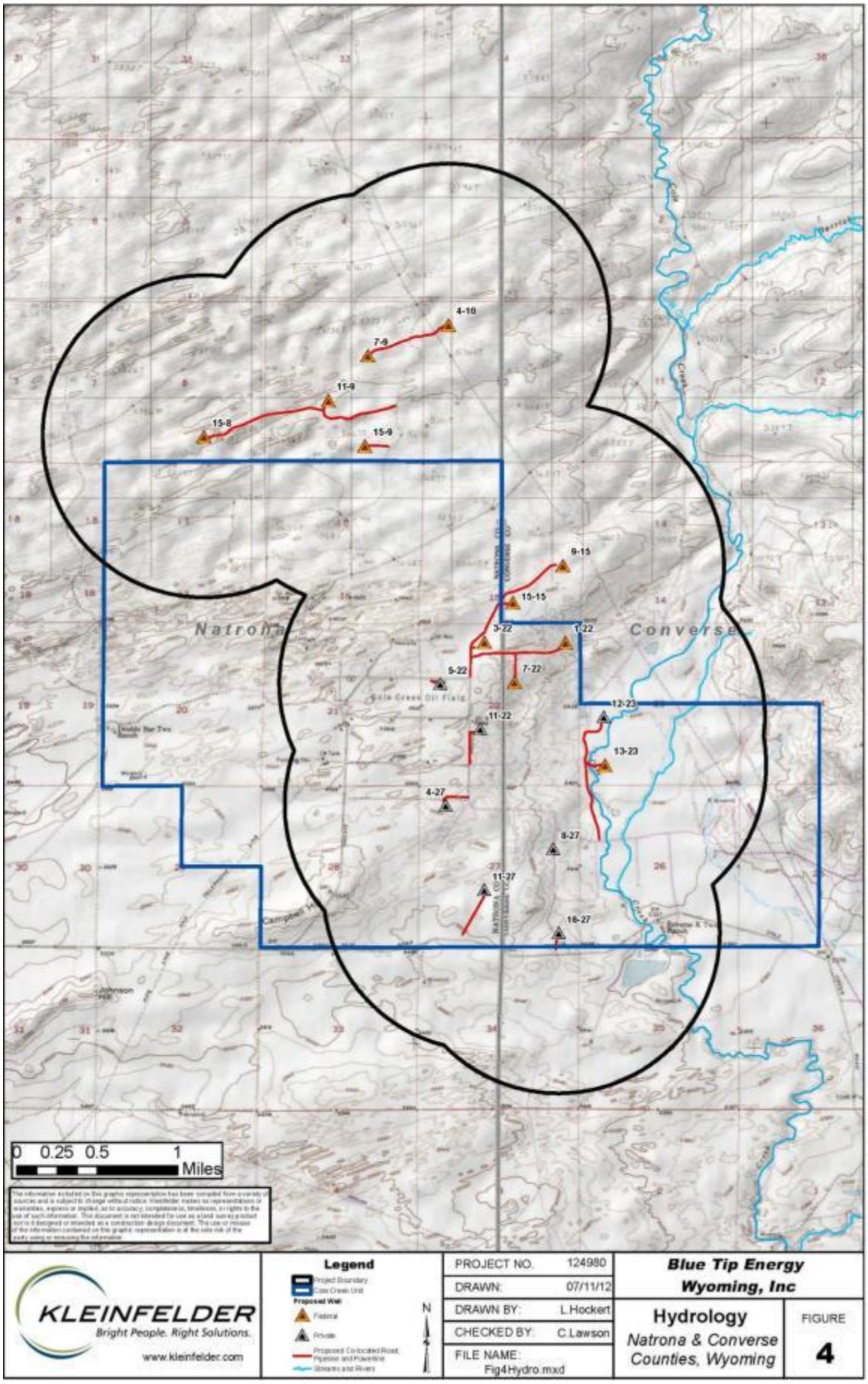
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Legend
Project Boundary
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Federal
Private
Proposed Co-located Road, Pipeline and Powerline
Streams and Rivers
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DRAWN BY: L.Hockert
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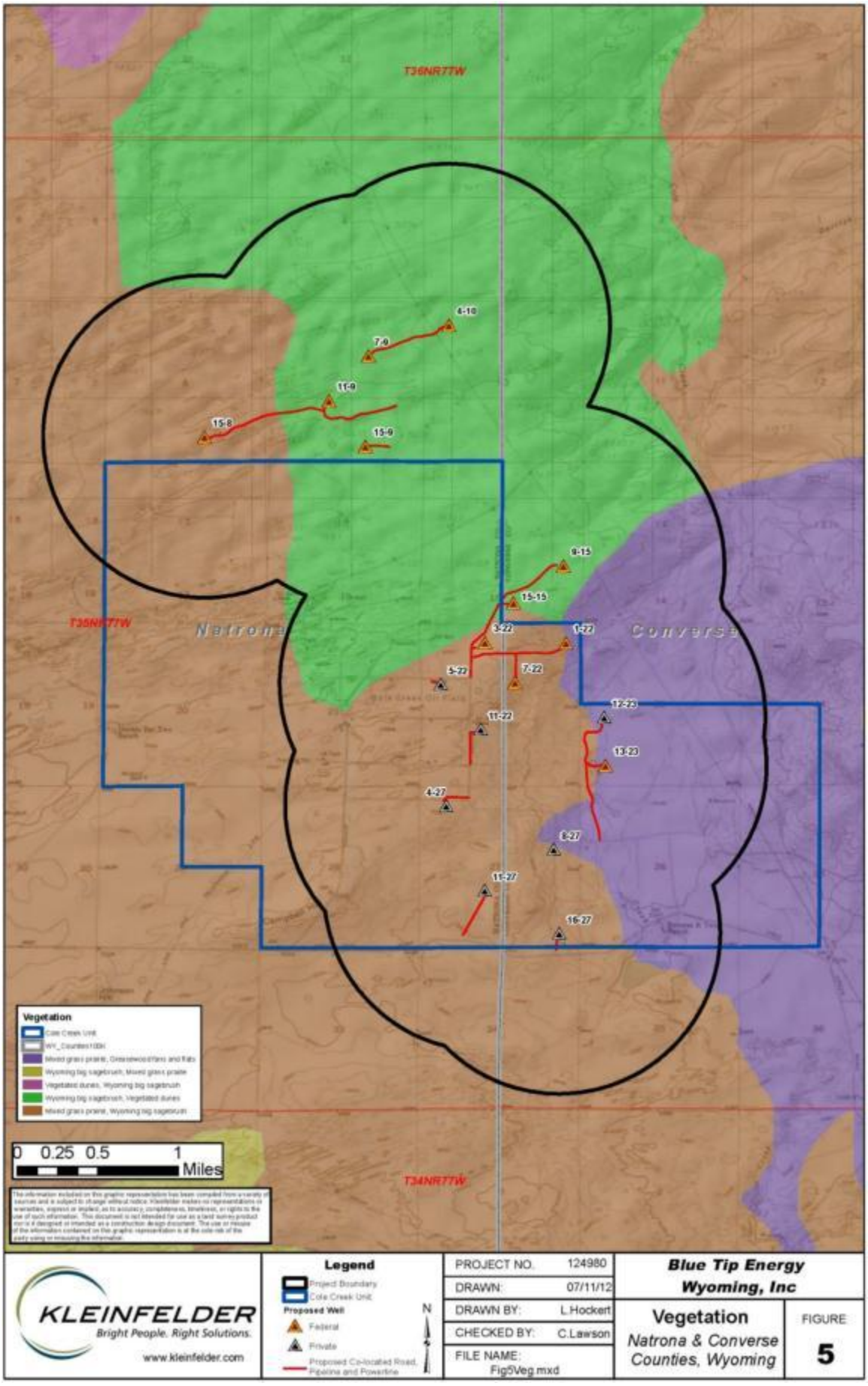
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Vegetation
Cole Creek Unit
Mixed grass prairie, Greasewood flats and flats
Wyoming big sagebrush, Mixed grass prairie
Vegetated dunes, Wyoming big sagebrush
Wyoming big sagebrush, Vegetated dunes
Mixed grass prairie, Wyoming big sagebrush
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Project Boundary
Cole Creek Unit
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CHECKED BY: C.Lawson
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Vegetation
Natrona & Converse Counties, Wyoming
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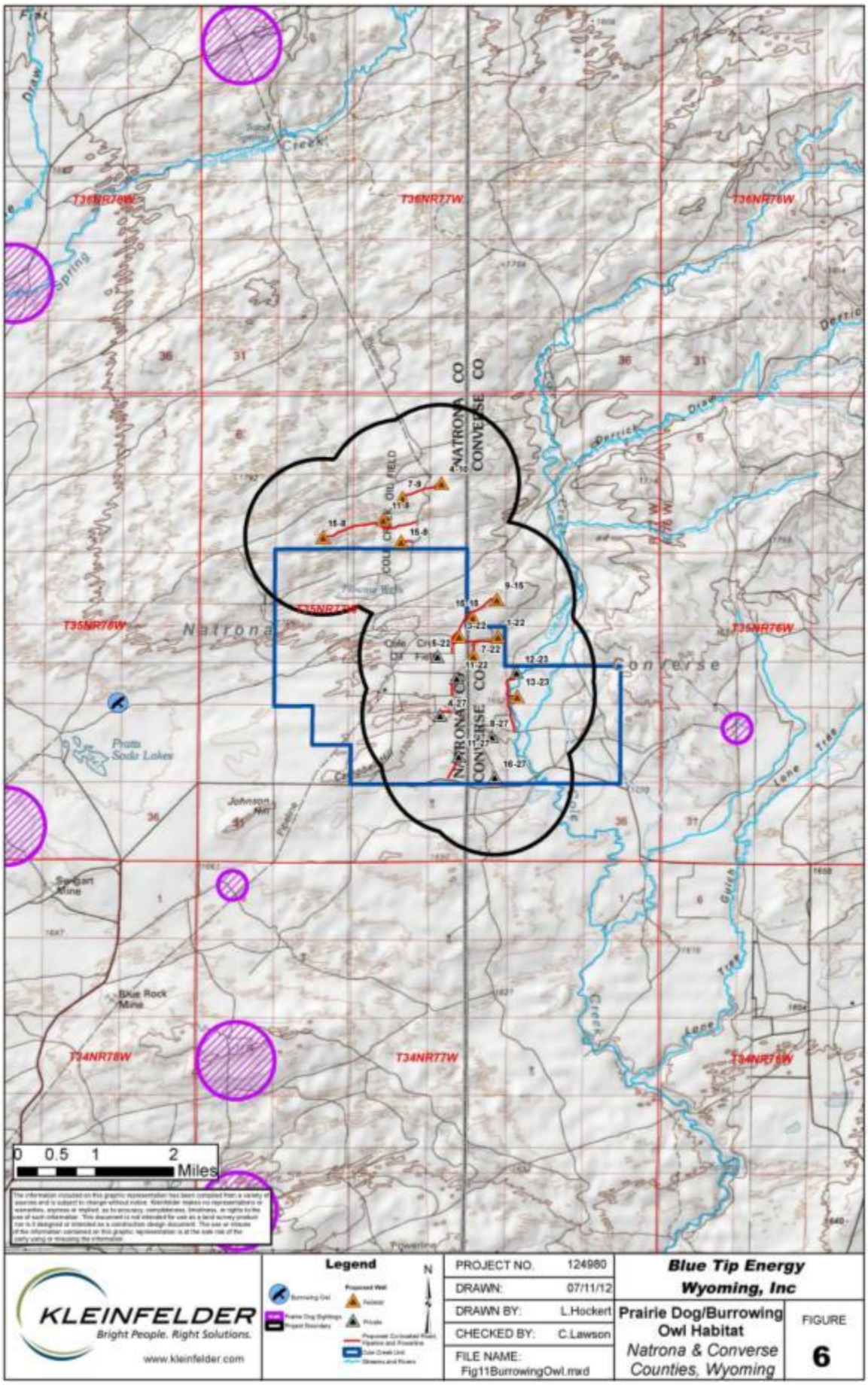
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CONVERSE CO
COLE CREEK OIL FIELD
Natrona
Converse
Pratts Soda Lakes
Johnson Mtn
Sweetheart Mine
Blue Rock Mine
Derrick Draw
Lone Tree Creek
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CHECKED BY: C.Lawson
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Natrona & Converse Counties, Wyoming
FIGURE
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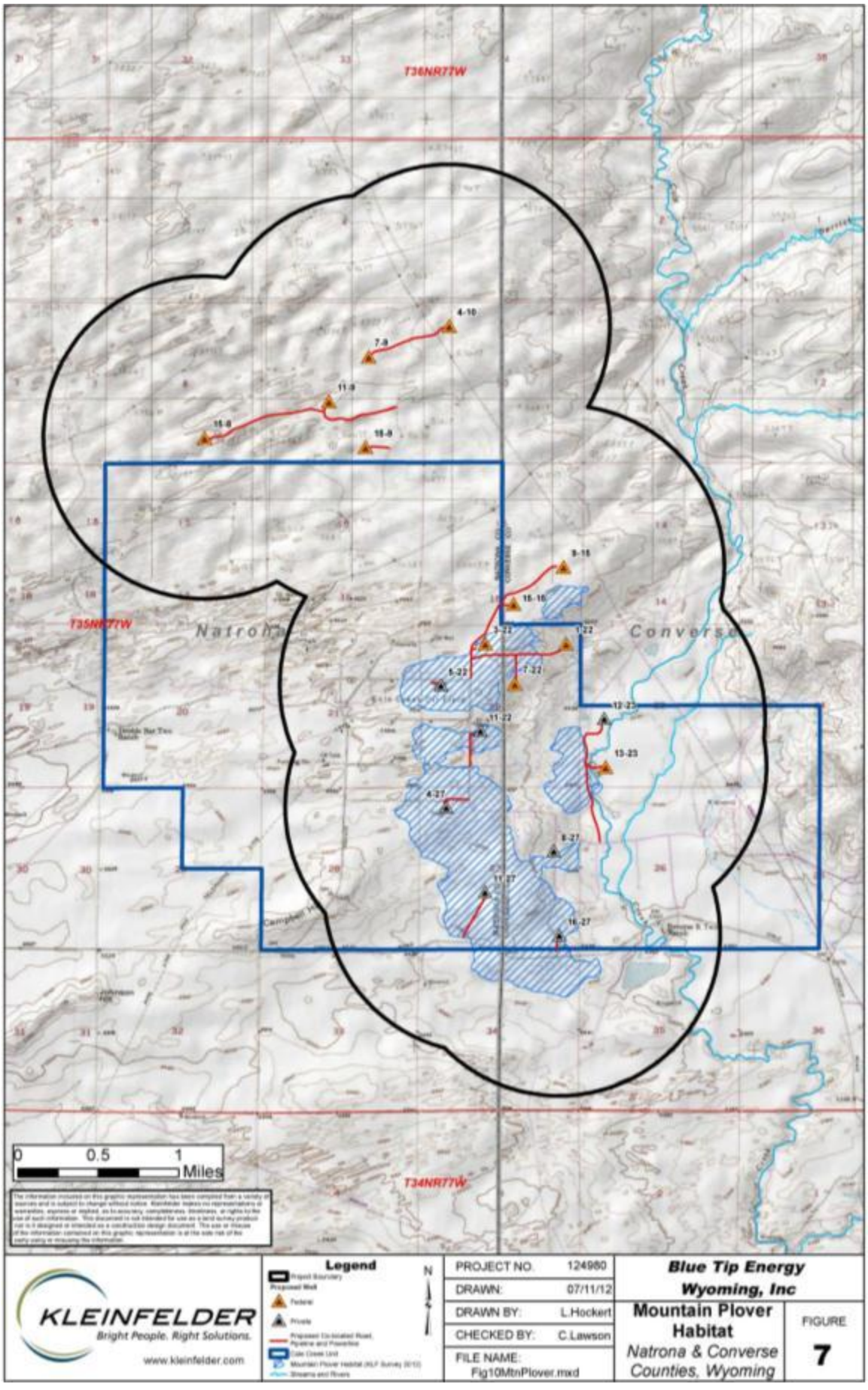
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DRAWN BY: L.Hockert
CHECKED BY: C.Lawson
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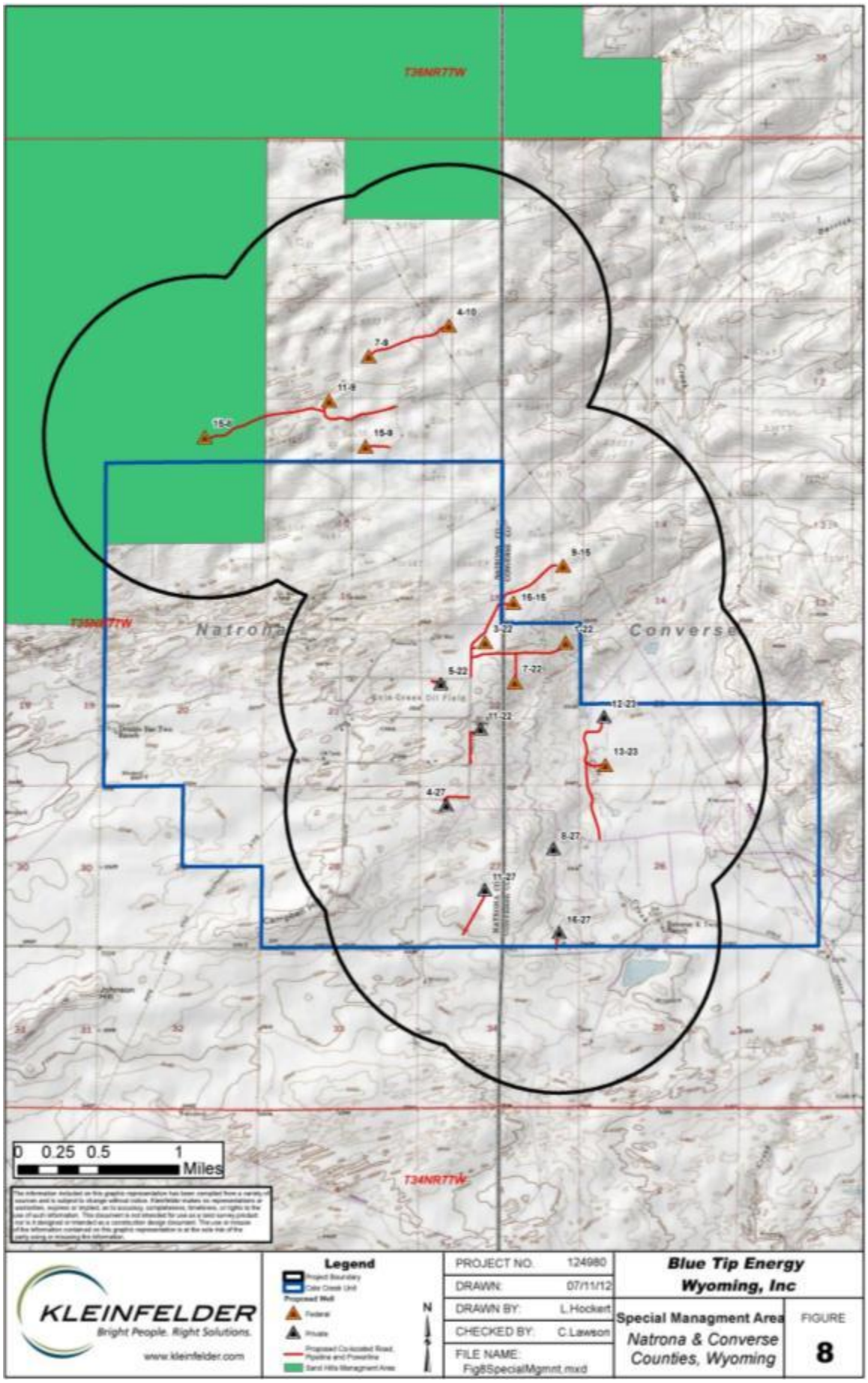
Blue Tip Energy Wyoming, Inc
Mountain Plover Habitat
Natrona & Converse Counties, Wyoming
FIGURE 7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Legend
Project Boundary
Cole Creek Unit
Proposed Well
Federal
Private
Proposed Co-located Road, Pipeline and Powerline
Sand Hills Managment Area
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PROJECT NO. 124980
DRAWN: 07/11/12
DRAWN BY: L.Hockert
CHECKED BY: C.Lawson
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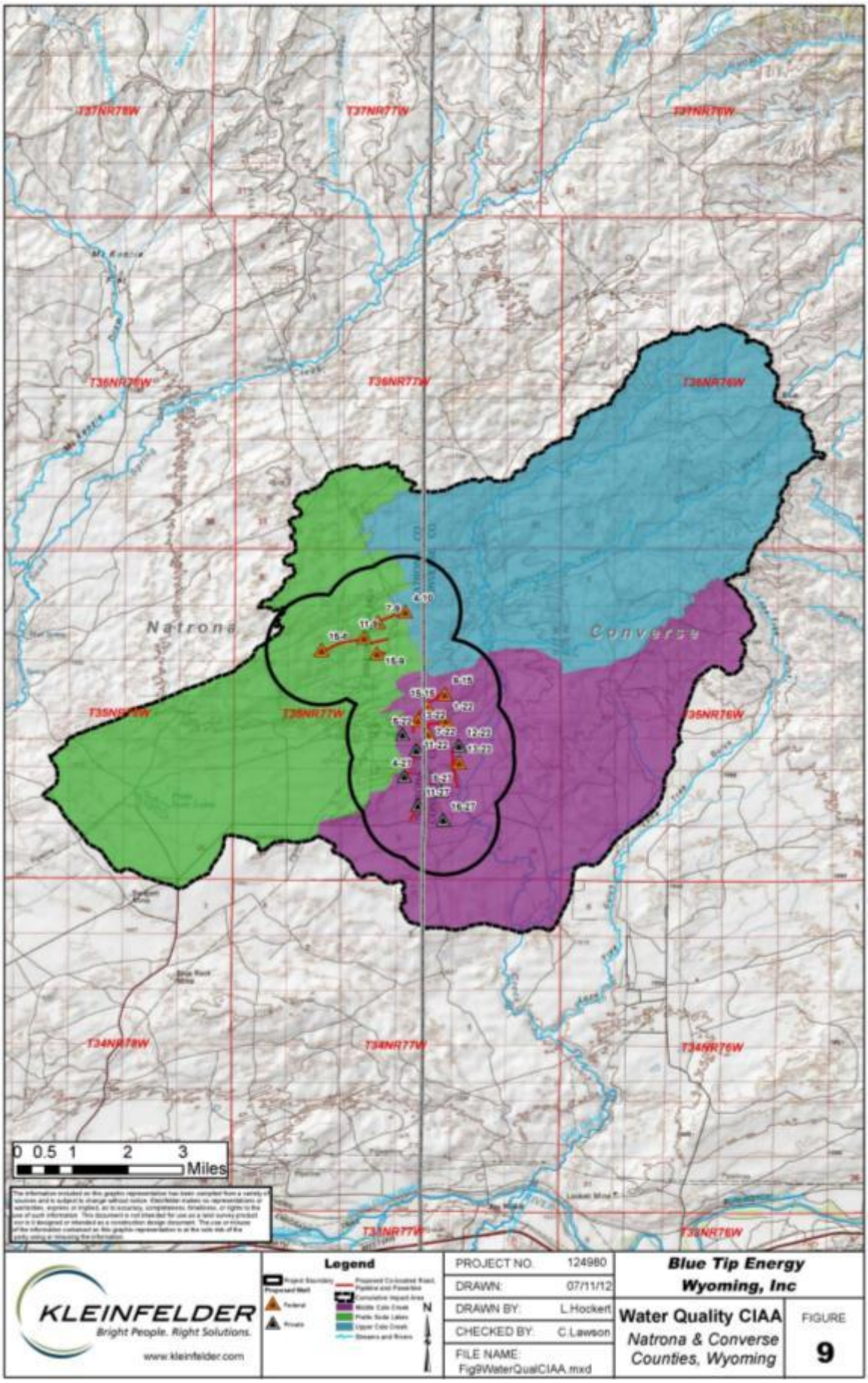
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Wyoming, Inc
Water Quality CIAA
Natrona & Converse
Counties, Wyoming
FIGURE
9

APPENDIX B: INTERDISCIPLINARY TEAM CHECKLIST

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Casper Field Office
2987 Prospector Drive
Casper, WY 82604-2968
307-261-7600 FAX 307-261-7587

January 26, 2012

To: Case File for Cole Creek Proposal
From: David Korzilius, Project Manager
Subject: Meeting with Interdisciplinary Team (IDT)
Project: Cole Creek Environmental Assessment
Attendees: David Korzilius (BLM Project Manager), Sara Bohl (BLM Natural Resource Specialist), Shane Gray (Wildlife Biologist), Jane Boand (Contractor), Chrissy Lawson (Contractor), Dan Soucy (Contractor), Aaron Hugen (Proponent)

INTERDISCIPLINARY TEAM ANALYSIS RECORD CHECKLIST

An IDT meeting was held on January 26, 2012 to identify the preliminary issues for the proposed Cole Creek exploratory drilling project. The following issues were identified:

DETERMINATION OF STAFF: (Choose one of the following abbreviated options for the left column)

NP Not present in the area impacted by the proposed or alternative actions.
NI Present, but not affected to a degree that detailed analysis is required.
PI Present with potential for significant impact analyzed in detail in the EA; or identified in a DNA as requiring further analysis.
NC Actions and impacts not changed from those disclosed in the existing NEPA documents cited in Section C of the DNA form (DNAs only).

Determination	Resource	Rationale for Determination*
NI	Air Quality (including greenhouse gas emissions)	Air quality analyses have been conducted in the general vicinity of the proposed well locations in Natrona and Converse Counties, Wyoming in conjunction with environmental analyses. These analyses concluded that no significant impacts would occur to air quality to the air shed as a result of the activities proposed therein. The 7-9 site-specific EA will look at air quality on a site-

		specific, single well scenario; and thus, the analysis will not reference area or regional models.
NP	Areas of Critical Environmental Concern	Not present as per GIS and RMP review.
NP	BLM Natural Areas	Not present as per GIS and RMP review.
PI	Cultural Resources	Potential impact to cultural resources from construction of wells, access roads and dust from construction. Class III surveys required on each site-specific proposed project where additional disturbance areas were not previously surveyed. A third-party monitor will be present during construction activities at various locations to be determined by the BLM.
NI	Environmental Justice	No minority or disadvantaged populations will be disproportionately adversely affected by the proposed action or alternatives.
NP	Farmlands (Prime or Unique)	Prime and unique farmlands are irrigated lands and orchards. No prime or unique farmlands occur on BLM land in the project area.
NI	Floodplains	No mapped or designated floodplains are present in the project area.
NP	Fuels / Fire Management	No ongoing or planned fuel projects within the proposed action project area. No expected impact to fire suppression efforts since the project area is in an area of low fire occurrence.
PI	Geology / Mineral Resources / Energy Production	The ongoing development of oil and gas resources for the proposed action is in accordance with the Casper FO RMP. Gilsonite, tar sands, and oil shale are the other mineral resources that could be affected by the project. Compliance with Onshore Oil and Gas Order No. 2 during drilling and completion operations will protect non-oil and gas mineral resources.
PI	Invasive Plants / Noxious Weeds	Surface disturbance increases weed recruitment from seeds already present in the soil seed reservoir, and from fresh seeds vectored in by wind, animals, vehicles, and heavy equipment. Company is required to prepare a weed control program and, if planning to use pesticides, submit a Pesticide Use Proposal.
PI	Lands / Access	Public lands in the vicinity of the Proposed Action are managed in accordance with the Casper Resource Management Plan (RMP), approved December 2007. Potential impacts to the Sand Hills Special Management

		Area may result from the Proposed Project.
PI	Livestock Grazing	Potential impacts to the range resource include livestock displacement, lost forage, and the Animal Unit Months reduced for each allotment in the project area.
NI	Native American Religious Concerns	Based on data layers of cultural resources areas recorded there are no known concerns.
NI	Paleontology	The Lance Formation underlies the Project Area, and is PFYC Class 5. Accordingly, the Project Area would likely require a paleo survey and/or a paleo monitor during construction.
NP	Recreation	The project area consists of public lands administered by the BLM and private surface. The project area is isolated due to the general lack of public easements (rights-of-way). The Sand Hills Management Area could be directly impacted by the project. One well pad and associated facilities would be located within the Sand Hills Management Area.
NI	Socioeconomics	The economies and quality of life of the residents of Natrona and Converse Counties would not be adversely affected by the proposed project. The proposed project would not result in a significant increase in the local workforce. Potential impacts to the economy of Natrona and Converse Counties are positive though the increased tax revenues.
PI	Soils	Potential impacts to soils from surface disturbing actions, as all of the soils in Project Area are rated poor for reclamation potential.
PI	Threatened, Endangered or Candidate Animal Species (including Special Status Animal Species)	Raptors in General (Nesting) Bald eagle roosting Prairie dogs/Black-footed Ferret Mountain Plover Greater Sage Grouse – Brooding and wintering grounds, outside core area
PI	Threatened, Endangered or Candidate Plant Species (including Special Status Plant Species)	Dependent on well location for Blowout Penstemon, Ute ladies'-tresses, Colorado Butterfly plant
PI	Vegetation	Dependent on well location for Blowout Penstemon, Ute ladies'-tresses, Colorado Butterfly plant
NI	Visual Resources	The project area is within a Class IV VRM designation where changes may subordinate the original composition and character of the basic elements of the landscape, but must reflect what could be a natural occurrence within the characteristic landscape. Impacts are not anticipated because the project area is on private surface removed from public roads within the area of Natrona and Converse Counties, and all above ground structures would be painted a flat, non-reflective color (Carlsbad Canyon) according to the BLM prescribed paint scheme.

NI	Wastes (hazardous or solid)	No chemicals subject to reporting under SARA Title III in amounts greater than 10,000 pounds would be used, produced, stored, transported, or disposed of annually in association with the project. Trash and other waste materials would be cleaned up and removed immediately after completion of operations.
NP	Waters of the U.S.	No jurisdictional Waters of the U.S. are present within the project area.
PI	Water Quality (surface, including hydrologic resources; e.g. stormwater)	Determine potential impacts to Cole Creek, the North Platte River, and other surface water resources.
NI	Wetlands / Riparian Zones	The proposed project has the potential to affect wetland and riparian areas on Cole Creek and other drainages. However, and impacts are anticipated to be minor. No jurisdictional wetlands are present in the project area.
NP	Wild and Scenic Rivers	Not present as per GIS and RMP review.
NP	Wilderness	Not present as per GIS and RMP review.
PI	Wildlife	Potential Big Game Habitat (Mule Deer and pronghorn)

APPENDIX C: SOIL UNITS

Table C1 Characteristics of Soil Units in the Cole Creek EA Project Area – Converse County

Map Unit Name and Number	Acreage within Project Area	Soil Series Name	Soil Texture	Parent Material	Landforms	Slope	Depth Class	Drainage Class	Alkalinity	Calcium Carbonate Equivalent	Runoff Speed	Erosion Potential (Kw)	Wind Erodability Index (tons/ac/yr)	Reclamation Potential
Absted-Arvada-Bone complex, 0-6% slopes (101)	851.5	Absted	Very fine sandy loam	Slopewash alluvium derived from sodic shale	Alluvial fans, fan remnants, terraces and hillslopes	0 to 25%	Very deep	Well drained	Moderately to very strongly alkaline	6 to 15%	Low to high	0.32	86	Poor
		Arvada	Fine sandy loam	Alluvium and colluvium derived from sodic shale	Alluvial fans, fan remnants, terraces and hillslopes	0 to 25%	Very deep	Well drained	Neutral to very strongly alkaline	3 to 15%	High to very high			
		Bone	Loam	Sediments derived from sodic shales	Slopewash alluvium on alluvial fans, fan aprons, fan piedmonts, and hill backslopes	0 to 20%	Very deep	Well drained	Moderately to very strongly alkaline	---	Low to high			
Bahl-Savageton complex, 0-6% slopes (103)	28.5	Bahl	Clay loam	Alluvium from clay shales	Alluvial fans, fan aprons, hillslopes and terraces	0 to 20%	Very deep	Well drained	Neutral to moderately alkaline	---	Low to high	0.32	86	Poor
		Savageton	Clay loam	Alluvium, colluvium, and residuum derived dominantly from shale	Hills, ridges, fan remnants, fan piedmonts, and fan aprons	0 to 30%	Moderately deep	Well drained	Neutral to strongly alkaline	5 to 14%	Medium to high			
Dwyer-Orpha loamy sands, 3-15% slopes (113)	1802.1	Dwyer	Fine sand	Eolian sand	Dune-like forms on or near the edges of alluvial terraces	0 to 25%	Very deep	Excessively drained	Mildly to strongly alkaline	---	Very low to medium	0.20	134	Poor
		Orpha	Loamy sand	Alluvium or eolian sand from mixed sources	Rolling dunes, hills, terraces, floodplains, uplands, valley side slopes, toeslopes, and footslopes	0 to 45%	Very deep	Excessively drained	Neutral to moderately alkaline	---	High to very high			
Haverdad-Lohmiller complex, 0-6% slopes (120)	58.0	Haverdad	Loam	Stratified alluvium	Flood plains and low terraces	0 to 6%	Very deep	Well drained	Slightly to strongly alkaline	1 to 15%	Low	0.28	86	Fair
		Lohmiller	Silty clay loam	Alluvium	Bottomlands	0 to 8%	Very deep	Well drained	Neutral to moderately alkaline	---	Low to moderately low			
Hiland-Bowbac complex, 6-15% slopes (122)	51.0	Hiland	Fine sandy loam	Alluvium or eolian deposits on relict surfaces	Terraces, fans, fan remnants, pediments, ridges, hills, and stabilized dunes	0 to 20%	Very deep	Well drained	Neutral to strongly alkaline	---	Low to medium	0.24	56	Fair
		Bowbac	Sandy loam	Alluvium, eolian deposits or residuum derived primarily from argillaceous sandstone	Alluvial fans, terraces, dissected fan remnants, fan piedmonts, hillslopes, pediments, plateaus, ridges and buttes	0 to 15%	Moderately deep	Well drained	Neutral to moderately alkaline	6 to 14%	Low to medium			
Keeline-Tassel-Turnback complex, 6-15% slopes (123)	149.9	Keeline	Sandy loam	Alluvium or eolian deposits derived from sandstone	Upland ridgetops, hillslopes, terraces, benches, alluvial fans, and fan remnants	0 to 40%	Very deep	Well drained to excessively drained	Neutral to strongly alkaline	---	Low	0.17	134	Poor
		Tassel	Fine sandy loams	Residuum weathered from sandstone	Uplands	0 to 70%	Very shallow to shallow	Well drained	Slightly to moderately alkaline	---	Low to high			
		Turnback	Loamy fine sand	Alluvium, residuum, and eolian deposits derived dominantly from sandstone	Hillslopes and summits	0 to 20%	Moderately deep	Well to somewhat excessively drained	Slightly to strongly alkaline	4 to 8%	Low			
Kishona-Dwyer-Orpha association, 0-10% slopes (124)	9.9	Kishona	Loam	Alluvium	Fan aprons, alluvial fans, fan remnants, hills, ridges and terraces	0 to 30%	Very deep	Well drained	Neutral to very strongly alkaline	3 to 14%	Low to medium	0.28	134	Poor
		Dwyer	Fine sand	Eolian sand	Dune-like forms on or near the edges of alluvial terraces	0 to 25%	Very deep	Excessively drained	Mildly to strongly alkaline	---	Very low to medium			
		Orpha	Loamy sand	Alluvium or eolian sand from mixed sources	Rolling dunes, hills, terraces, floodplains, uplands, valley side slopes, toeslopes, and footslopes	0 to 45%	Very deep	Excessively drained	Neutral to moderately alkaline	---	High to very high			
Samday-Shingle-Worf complex, 3-15% slopes (129)	9.1	Samday	Clay loam	Residuum, slope alluvium, and colluvial slopewash derived from clay shale	Upland ridgetops, shoulders, and backslope positions of hills	0 to 60%	Very shallow to shallow	Well drained	Neutral to strongly alkaline	4 to 10%	Medium to high	0.37	86	Poor
		Shingle	Clay loam	Residuum and colluvium derived from interbedded shale and sandstone, or in alluvium from mudstone	Bedrock-controlled hillslopes and ridges	0 to 80%	Very shallow to shallow	Well drained	Neutral to strongly alkaline	---	Medium to high			
		Worf	Loam	Residuum and colluvial slopewash weathered from sedimentary rock	Upland hills and ridges	0 to 30%	Very shallow to shallow	Well drained	Slightly to strongly alkaline	3 to 12%	Medium to high			
Tassel-Shingle complex, 2-30% slopes (135)	124.3	Tassel	Fine sandy loams	Residuum weathered from sandstone	Uplands	0 to 70%	Very shallow to shallow	Well drained	Slightly to moderately alkaline	---	Low to high	0.32	86	Poor
		Shingle	Clay loam	Residuum and colluvium derived from interbedded shale and sandstone, or in alluvium from	Bedrock-controlled hillslopes and ridges	0 to 80%	Very shallow to shallow	Well drained	Neutral to strongly alkaline	---	Medium to high			

Map Unit Name and Number	Acreage within Project Area	Soil Series Name	Soil Texture	Parent Material	Landforms	Slope	Depth Class	Drainage Class	Alkalinity	Calcium Carbonate Equivalent	Runoff Speed	Erosion Potential (Kw)	Wind Erodability Index (tons/ac/yr)	Reclamation Potential
				mudstone										
Tassel-Tullock-Vonalee association, 6-30% slopes (137)	596.1	Tassel	Fine sandy loams	Residuum weathered from sandstone	Uplands	0 to 70%	Very shallow to shallow	Well drained	Slightly to moderately alkaline	---	Low to high	0.17	134	Poor
		Tullock	Loamy sand	Residuum, alluvium or eolian deposits derived from sandstone	Dunes, hills and ridges	0 to 45%	Moderately deep	Excessively drained	Neutral to moderately alkaline	---	High			
		Vonalee	Fine sandy loam	Alluvium or eolian deposits derived from sandstone	Upland ridges and hills, alluvial fans, fan remnants, and high terrace positions	0 to 30%	Very deep	Well drained	Neutral to slightly alkaline	---	Medium to high			
Theedle-Kishona loams, 6-15% slopes (141)	21.8	Theedle	Loam	Residuum and slope alluvium weathered from soft sandstone	Hills, ridges and fan remnants	0 to 75%	Moderately deep	Well drained	Neutral to strongly alkaline	5 to 14%	Low to high	0.32	86	Fair
		Kishona	Loam	Alluvium	Fan aprons, alluvial fans, fan remnants, hills, ridges and terraces	0 to 30%	Very deep	Well drained	Neutral to very strongly alkaline	3 to 14%	Low to medium			
Worf-Shingle-Tassel complex, 3-30% slopes (149)	293.3	Worf	Loam	Residuum and colluvial slopewash weathered from sedimentary rock	Upland hills and ridges	0 to 30%	Very shallow to shallow	Well drained	Slightly to strongly alkaline	3 to 12%	Medium to high	0.24	86	Poor
		Shingle	Clay loam	Residuum and colluvium derived from interbedded shale and sandstone, or in alluvium from mudstone	Bedrock-controlled hillslopes and ridges	0 to 80%	Very shallow to shallow	Well drained	Neutral to strongly alkaline	---	Medium to high			
		Tassel	Fine sandy loams	Residuum weathered from sandstone	Uplands	0 to 70%	Very shallow to shallow	Well drained	Slightly to moderately alkaline	---	Low to high			
Zigweid-Bahl association, 0-6% slopes (150)	93.3	Zigweid	Loam	Alluvium from mixed sedimentary sources	Fan aprons, alluvial fans, fan piedmonts, fan remnants, terraces, ridges and hill	0 to 20%	Very deep	Well drained	Neutral to strongly alkaline	5 to 14%	Medium to fast	0.32	86	Fair
		Bahl	Clay loam	Alluvium from clay shales	Alluvial fans, fan aprons, hillslopes and terraces	0 to 20%	Very deep	Well drained	Neutral to moderately alkaline	---	Low to high			
Zigweid-Cambria association, 0-6% slopes (151)	24.6	Zigweid	Loam	Alluvium from mixed sedimentary sources	Fan aprons, alluvial fans, fan piedmonts, fan remnants, terraces, ridges and hill	0 to 20%	Very deep	Well drained	Neutral to strongly alkaline	5 to 14%	Medium to high	0.32	48	Fair
		Cambria	Loam	Alluvium and slope alluvium	Fan remnants, alluvial fans, fan piedmonts, terraces, ridges and hills	0 to 15%	Very deep	Well drained	Neutral to strongly alkaline	<15%	Low to medium			
Zigweid-Cambria-Theedle association, 6-15% slopes (152)	28.2	Zigweid	Loam	Alluvium from mixed sedimentary sources	Fan aprons, alluvial fans, fan piedmonts, fan remnants, terraces, ridges and hill	0 to 20%	Very deep	Well drained	Neutral to strongly alkaline	5 to 14%	Medium to high	0.32	86	Fair
		Cambria	Loam	Alluvium and slope alluvium	Fan remnants, alluvial fans, fan piedmonts, terraces, ridges and hills	0 to 15%	Very deep	Well drained	Neutral to strongly alkaline	<15%	Low to medium			
		Theedle	Loam	Residuum and slope alluvium weathered from soft sandstone	Hills, ridges and fan remnants	0 to 75%	Moderately deep	Well drained	Neutral to strongly alkaline	5 to 14%	Low to high			
Water (215)	29.5	---	---	---	---	---	---	---	---	---	---	---	---	---

Table C2 Characteristics of Soil Units in the Cole Creek EA Project Area – Natrona County

Map Unit Name and Number	Acreage within Project Area	Soil Series Name	Soil Texture	Parent Material	Landforms	Slope	Depth Class	Drainage Class	Alkalinity	Calcium Carbonate Equivalent	Runoff Speed	Erosion Potential (Kw)	Wind Erodability Index (tons/ac/yr)	Reclamation Potential
Amodac-Keyner complex, 2-12% slopes (109)	36.9	Amodac	Fine sandy loam	Material weathered from sodic shale	Convex slopes of rolling uplands	2 to 12%	Deep	Well drained	Moderately to very strongly alkaline	---	Medium to high	0.37	86	Poor
		Keyner	Loamy sand	Moderately coarse sediments weathered from calcareous, sodic sandstone interbedded with shale	Relict alluvial terraces and fans	0 to 15%	Very deep	Well drained	Neutral to very strongly alkaline	6 to 14%	Low to medium			
Bowbac-Hiland-Worf complex, 3-15% slopes (133)	33.5	Bowbac	Sandy loam	Alluvium, eolian deposits or residuum derived primarily from argillaceous sandstone	Alluvial fans, terraces, dissected fan remnants, fan piedmonts, hillslopes, pediments, plateaus, ridges and buttes	0 to 15%	Moderately deep	Well drained	Neutral to moderately alkaline	6 to 14%	Low to medium	0.24	134	Poor
		Hiland	Fine sandy loam	Alluvium or eolian deposits on relict surfaces	Terraces, fans, fan remnants, pediments, ridges, hills, and stabilized dunes	0 to 20%	Very deep	Well drained	Neutral to strongly alkaline	---	Low to medium			

Map Unit Name and Number	Acreage within Project Area	Soil Series Name	Soil Texture	Parent Material	Landforms	Slope	Depth Class	Drainage Class	Alkalinity	Calcium Carbonate Equivalent	Runoff Speed	Erosion Potential (Kw)	Wind Erodability Index (tons/ac/yr)	Reclamation Potential
		Worf	Loam	Residuum and colluvial slopewash weathered from sedimentary rock	Upland hills and ridges	0 to 30%	Very shallow to shallow	Well drained	Slightly to strongly alkaline	3 to 12%	Medium to high			
Dune land (175)	74.3	---	Fine sand	Eeolian sands	Dunes	---	Very deep	Excessively drained	---	---	---	---	---	---
Hiland loamy sand, 2-15% slopes (199)	1279.0	Hiland	Fine sandy loam	Alluvium or eolian deposits on relict surfaces	Terraces, fans, fan remnants, pediments, ridges, hills, and stabilized dunes	0 to 20%	Very deep	Well drained	Neutral to strongly alkaline	---	Low to medium	0.20	134	Poor
Orpha loamy sand, 10-30% slopes (229)	3083.9	Orpha	Loamy sand	Alluvium or eolian sand from mixed sources	Rolling dunes, hills, terraces, floodplains, uplands, valley side slopes, toeslopes, and footslopes	0 to 45%	Very deep	Excessively drained	Neutral to moderately alkaline	---	High to very high	0.17	134	Poor
Vonalee loamy sand, 3-10% slopes (300)	535.8	Vonalee	Fine sandy loam	Alluvium or eolian deposits derived from sandstone	Upland ridges and hills, alluvial fans, fan remnants, and high terrace positions	0 to 30%	Very deep	Well drained	Neutral to slightly alkaline	---	Medium to high	0.24	134	Poor
Dwyer-Orpha loamy sands, 3-15% slopes (318)	689.6	Dwyer	Fine sand	Eolian sand	Dune-like forms on or near the edges of alluvial terraces	0 to 25%	Very deep	Excessively drained	Mildly to strongly alkaline	---	Very low to medium	0.20	134	Poor
		Orpha	Loamy sand	Alluvium or eolian sand from mixed sources	Rolling dunes, hills, terraces, floodplains, uplands, valley side slopes, toeslopes, and footslopes	0 to 45%	Very deep	Excessively drained	Neutral to moderately alkaline	---	High to very high			
Worf-Shingle-Tassel complex, 3-30% slopes (320)	84.7	Worf	Loam	Residuum and colluvial slopewash weathered from sedimentary rock	Upland hills and ridges	0 to 30%	Very shallow to shallow	Well drained	Slightly to strongly alkaline	3 to 12%	Medium to high	0.24	86	Poor
		Shingle	Clay loam	Residuum and colluvium derived from interbedded shale and sandstone, or in alluvium from mudstone	Bedrock-controlled hillslopes and ridges	0 to 80%	Very shallow to shallow	Well drained	Neutral to strongly alkaline	---	Medium to high			
		Tassel	Fine sandy loams	Residuum weathered from sandstone	Uplands	0 to 70%	Very shallow to shallow	Well drained	Slightly to moderately alkaline	---	Low to high			
Keeline-Tassel-Turnback complex, 6-15% slopes (323)	87.2	Keeline	Sandy loam	Alluvium or eolian deposits derived from sandstone	Upland ridgetops, hillslopes, terraces, benches, alluvial fans, and fan remnants	0 to 40%	Very deep	Well drained to excessively drained	Neutral to strongly alkaline	---	Low	0.17	134	Poor
		Tassel	Fine sandy loams	Residuum weathered from sandstone	Uplands	0 to 70%	Very shallow to shallow	Well drained	Slightly to moderately alkaline	---	Low to high			
		Turnback	Loamy fine sand	Alluvium, residuum, and eolian deposits derived dominantly from sandstone	Hillslopes and summits	0 to 20%	Moderately deep	Well to somewhat excessively drained	Slightly to strongly alkaline	4 to 8%	Low			
Tassel-Tullock-Vonalee association, 6-30% slopes (325)	140.6	Tassel	Fine sandy loams	Residuum weathered from sandstone	Uplands	0 to 70%	Very shallow to shallow	Well drained	Slightly to moderately alkaline	---	Low to high	0.17	134	Poor
		Tullock	Loamy sand	Residuum, alluvium or eolian deposits derived from sandstone	Dunes, hills and ridges	0 to 45%	Moderately deep	Excessively drained	Neutral to moderately alkaline	---	High			
		Vonalee	Fine sandy loam	Alluvium or eolian deposits derived from sandstone	Upland ridges and hills, alluvial fans, fan remnants, and high terrace positions	0 to 30%	Very deep	Well drained	Neutral to slightly alkaline	---	Medium to high			