DECISION RECORD
FOR
Lance Oil and Gas INC.
NW CROTON
ENVIRONMENTAL ASSESSMENT –WY-070-10-273

DECISION:
BLM's decision is to approve Lance Oil and Gas INC. NW Croton POD Coal Bed Natural Gas (CBNG) POD Alternative B of the attached Environmental Assessment (EA). Alternative B is the Modified Proposed Action, and is the result of collaboration between the Bureau of Land Management and Lance Oil and Gas INC. Alternative B has been analyzed in the attached EA and found to have no significant impacts on the human environment, beyond those described in the Powder River Basin Final Environmental Impact Statement (PRB FEIS) thus an EIS is not required.

Details of the approval are summarized below. The project description, including specific changes made at the onsites, and site-specific mitigation measures, is included in the attached EA, pp. 2-6.

Well Sites:
The following 5 Applications for Permit to Drill (APDs) and associated infrastructure are authorized:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	Floyd L&L Fed	43-23-5376WA	NESE	23	53N	76W	WYW142836
2	R Floyd Fed	21-24-5376WA	NENW	24	53N	76W	WYW141581
3	R Floyd Fed	23-24-5376	NESW	24	53N	76W	WYW146296
4	R Floyd Fed	33-24-5376WA	NWSE	24	53N	76W	WYW146296
5	Federal	34-24-5376WA	SWSE	24	53N	76W	WYW146296

Water Management:
The following water management infrastructure was inspected and approved for use in association with this POD:

	Facility Name / Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (acre feet)	Surface Disturbance (acres)	Lease #
1	Rick's Reservoir	SENW	23	53	76	0.45	1.0	Fee
2	Rick's Little Res'.	SWNW	23	53	76	1.17	3.3	Fee
3	Willow Tree Res'.	NWSW	23	53	76	7.96	3.6	Fee
4	Jason Reservoir	NENE	23	53	76	1.35	2.1	Fee
5	TY Reservoir	NWNW	24	53	76	0.77	2.4	WYW141581
6	Ryan Reservoir	SWNE	24	53	76	0.33	1.2	Fee
7	Boone Reservoir	SENW	25	53	76	12.0	3.4	Fee
8	004 Reservoir	SWNW	25	53	76	9.1	3.7	Fee
9	N & S Lacy Res'.	NESW	25	53	76	13.8	5.4	Fee
10	James Reservoir	NWSW	30	53	76	1.73	2.4	Fee
11	Echeta Road EMIT Pit	NWNW	26	53	76	6.1	1.5	Fee

Operator Committed Measures:
The operator has incorporated several measures to alleviate resource impacts into their Master Surface Use Plan (MSUP), submitted on 08/02/2010 Refer to the MSUP page 3-24for complete details of operator committed measures.

Site-specific Mitigation Measures:
Site-specific Conditions of Approval have been applied to this project, in addition to the programmatic and standard COAs identified in the PRB FEIS, to mitigate the site-specific impacts described in the Environmental Consequences section of the attached EA. For a complete description of all site-specific COA's associated with this approval, see Appendix A in the attached EA.

COMPLIANCE WITH LAWS, REGULATIONS, LAND USE PLANS, AND POLICIES:
This approval is in compliance with all Federal laws, regulations, and policies. This includes, but is not limited to, the Federal Land Policy and Management Act, the National Historic Preservation Act, the Threatened and Endangered Species Act, the Migratory Bird Treaty Act, the Clean Water Act, the Clean Air Act, and the National Environmental Policy Act.

Approval of this alternative is in conformance with the *Powder River Basin Oil and Gas Project Environmental Impact Statement and Proposed Plan Amendment* (PRB FEIS), *Record of Decision and Resource Management Plan Amendments for the Powder River Basin Oil and Gas Project* (PRB FEIS ROD), and the Approved Resource Management Plan (RMP) for the Public Lands Administered by the Bureau of Land Management, Buffalo Field Office (BFO), (1985/2001).

This approval is subject to adherence with all of the operating plans, design features, and mitigation measures contained in the Master Surface Use Plan of Operations, Drilling Plan, Water Management Plan, and information in individual APDs. This approval is also subject to operator compliance with all mitigation and monitoring requirements contained within the Powder River Oil and Gas Project Final Environmental Impact Statement and Resource Management Plan Amendment (PRB FEIS) approved April 30, 2003.

RATIONALE:
The decision to authorize the Selected Alternative, as summarized above, is based on the following:

1. Mitigation measures were included to reduce environmental impacts below the level of significance (FONSI) while still meeting the project's purpose and need. Mitigation is discussed in the environmental consequences section (4.2) of the attached EA. For a complete description of all site-specific COA's associated with this approval, see Appendix A in the attached EA.

2. The Alternative B will help meet the nation's energy needs, and help stimulate local economies by maintaining workforce stability.

3. Alternative B will not result in any undue or unnecessary environmental degradation. Mitigation measures were selected to alleviate environmental impacts and meet the project's purpose and need. Mitigation is discussed in the environmental consequences section of the attached EA. For a complete description of all site-specific COA's associated with this approval, see Appendix A in the attached EA.

4. The Operator, in their POD, has committed to:
   - Comply with all applicable Federal, State, and Local laws and regulations (MSUP pg. 28).

- Obtain the necessary permits from other agencies for the drilling, completion and production of these wells including water rights appropriations, the installation of water management facilities, water discharge permits, and relevant air quality permits (MSUP pg. 28).
- Offer water well agreements to the owners of record for permitted water wells within ½ mile of a federal CBNG producing well in the POD (MSUP pg. 27).
- Provide water analysis from a designated reference well in each coal zone (WMP pg. 30).

5. The Operator has certified that a Surface Use Agreement has been reached with the Landowners submitted on 8/19/2010 as a separate document found in the POD under Self-Certifications section..

6. Alternative B incorporates components of the Wyoming Governor's Sage Grouse Implementation Team's "core population area" strategy, the Governor's executive order, and local research to provide mitigation for sage-grouse, while meeting the purpose and need for the NW CROTON Project.

7. The proposed action is located entirely outside Fortification Creek elk yearlong range and the Fortification Creek Planning Area.

ADMINISTRATIVE REVIEW AND APPEAL: Under BLM regulations, this decision is subject to administrative review in accordance with 43 CFR 3165. Any request for administrative review of this decision must include information required under 43 CFR 3165.3(b) (State Director Review), including all supporting documentation. Such a request must be filed in writing with the State Director, Bureau of Land Management, P.O. Box 1828, Cheyenne, Wyoming 82003, no later than 20 business days after this Decision Record is received or considered to have been received.

Any party who is adversely affected by the State Director's decision may appeal that decision to the Interior Board of Land Appeals, as provided in 43 CFR 3165.4.

ACTING Field Manager: Paul Beels Date: 9/27/10

FINDING OF NO SIGNIFICANT IMPACT
FOR
Lance Oil and Gas INC.
NW CROTON
ENVIRONMENTAL ASSESSMENT –WY-070-10-273

FINDING OF NO SIGNIFICANT IMPACT:
On the basis of the information contained in the EA, and all other information available to me, it is my determination that: (1) the implementation of Alternative B will not have significant environmental impacts beyond those already addressed in PRB EIS to which the EA is tiered; (2) Alternative B is in conformance with the Buffalo Field Office Resource Management Plan (1985, 2001); and (3) Alternative B does not constitute a major federal action having a significant effect on the human environment. Therefore, an environmental impact statement or a supplement to the existing environmental impact statement is not necessary and will not be prepared.

This finding is based on my consideration of the Council on Environmental Quality's (CEQ) criteria for significance (40 CFR '1508.27), both with regard to the context and to the intensity of the impacts described in the EA.

CONTEXT:
Mineral development (coal, oil and gas, bentonite, and uranium) is a long-standing and common land use within the Powder River Basin. More than one fourth of the nation's coal production comes from the Powder River Basin. The PRB FEIS reasonably foreseeable development predicted and analyzed the development of 51,000 CBNG wells and 3,200 oil wells (PRB FEIS ROD pg. 2). The additional CBNG development described in Alternative B is insignificant within the national, regional, and local context.

INTENSITY:
The implementation of Alternative B will result in beneficial effects in the forms of energy and revenue production however; there will also be adverse effects to the environment (EA sec. 4). Design features and mitigation measures have been included within Alternative B to prevent significant adverse environmental effects (EA sec. 2.2.).

The preferred alternative does not pose a significant risk to public health and safety. The geographic area of the POD does not contain unique characteristics identified within the 1985 RMP, 2003 PRB FEIS, or other legislative or regulatory processes.

Relevant scientific literature and professional expertise were used in preparing the EA. The scientific community is reasonably consistent with their conclusions on environmental effects relative to oil and gas development. Research findings on the nature of the environmental effects are not highly controversial, highly uncertain, or involve unique or unknown risks.

CBNG development of the nature proposed with this POD and similar PODs was predicted and analyzed in the PRB FEIS; the Alternative B does not establish a precedent for future actions with significant effects.

There are no cultural or historical resources present that will be adversely affected by the Alternative B (EA sec. 4.2.4). No species listed under the Endangered Species Act or their designated critical habitat will be adversely affected (EA sec. 4.2.2). The Alternative B will not have any anticipated effects that would threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment

ACTING
Field Office Manager: Paul Beels Date: 9/27/10

BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
Lance Oil and Gas INC.
NW CROTON
COALBED NATURAL GAS PLAN OF DEVELOPMENT
WY-070-10-273

1. INTRODUCTION

This site-specific analysis tiers into and incorporates by reference the information and analysis contained in the Powder River Basin Oil and Gas Project Environmental Impact Statement and Resource Management Plan Amendment (PRB FEIS), #WY-070-02-065 (approved April 30, 2003), pursuant to 40 CFR 1508.28 and 1502.21. This document is available for review at the BLM Buffalo Field Office (BFO). This project environmental assessment (EA) addresses site-specific resources and impacts that were not covered within the PRB FEIS.

1.1. Background

Lance Oil and Gas INC. submitted the NW CROTON POD on 11/03/2008 to the BFO with 5 Federal APD's to develop and produce natural gas resources within coal bearing formations of the Powder River Basin (PRB).

Onsite visits were conducted in 2010 on June 25th to evaluate the proposal and modify as necessary to alleviate environmental impacts. BLM sent a post-onsite deficiency on July 7, 2010. The project proposal and APDs were considered complete when BLM received the operator's response to the post onsite deficiencies on 9/2/2010. Proposed COAs were shared with the operator on 9/14/2010.

1.2. Purpose and Need for the Proposed Action

The purpose of the proposed action is to explore, develop and produce oil and gas reserves conducted under the rights granted by a Federal oil and gas lease, as required in 43 CFR 3160, all Onshore Orders, and The Mineral Leasing Act, as amended and supplemented, (30 U.S.C. 181 et seq.).

The need for the action is the requirement to obtain approval for the development of an Oil and Gas Lease through an Application for Permit to Drill (APD) on public lands managed by the Bureau of Land Management under Onshore Order No. 1, pursuant to the authority of the Mineral Leasing Act, as amended and supplemented, (30 U.S.C. 181 et seq.) and prescribed in 43 CFR Part 3160.

1.3. Decision to be Made

Decision to be Made: The BLM will decide whether or not to approve the proposed development of oil and gas resources on the federal leasehold, and if so, under what terms and conditions.

1.4. Conformance with Land Use Plan and Other Applicable Laws, Regulations, and Policies

The proposed action conforms to the terms and the conditions of the 1985 Buffalo RMP and the 2003 PRB FEIS & RMP Amendment. The proposed action is in compliance with all Federal laws, regulations, and policies. This includes, but is not limited to, the Federal Land Policy and Management Act (1976), the National Historic Preservation Act, the Endangered Species Act (1973), the Migratory Bird Treaty Act (1918), the Clean Water Act (1972), the Clean Air Act (1970), and the National Environmental Policy Act (1969).

1.5. Scoping and Issues

External scoping was not conducted for this EA. Extensive external scoping was conducted for the PRB FEIS and is discussed beginning on pg. 15 of the ROD and beginning on pg. 2-1 of the FEIS. This action is similar in scope to the numerous other CBNG PODs that BFO has analyzed; external scoping would be unlikely to identify new issues as was verified by the few POD EAs that were externally scoped such as the Clabaugh POD (WY-070-EA08-134) and Hollcroft/Stotts Draw POD (WY-070-EA07-021).

The BLM interdisciplinary team (ID team) conducted internal scoping by reviewing the proposed development and project location to identify potentially affected resource and land uses. Appendix A identifies those resources and land uses present and affected by the proposed action; those resources and land uses that are either not present, not affected, or were adequately covered by the PRB FEIS will not be discussed in this EA. The ID team identified significant issues for the affected resources to further focus the analysis. This EA addresses those site-specific impacts that were not disclosed within the PRB FEIS that would help in making a reasoned decision or may be related to a potentially significant effect. Issues for this project include:

- Soils and vegetation: site stability, invasive species
- Wildlife: raptor productivity, greater sage-grouse and sharp-tailed grouse lek occupancy and persistence, and burrowing owl nesting.
- Water: ground water depletion, quality and quantity of produced water
- Social and Economic: revenue potential, local economics.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

Two alternatives, A and B, were evaluated. A brief description of each alternative is included in the following sections. Programmatic Mitigation Measures, as determined in PRB FEIS Record of Decision apply to all alternatives, including the No Action Alternative (Alternative A), and are included in Appendix A. Standard Mitigation Measures, Operator-committed Mitigation Measures, and site-specific Conditions of Approval (COAs) would apply only to action alternatives (Alternative B) and also are included in Appendix A.

2.1. Alternative A - No Action

A No Action Alternative was considered in the PRB FEIS, Volume 1, pages 2-54 through 2-62. This alternative would consist of no new federal wells. An oil and gas lease grants the lessee the "right and privilege to drill for, mine, extract, remove, and dispose of all oil and gas deposits" in the lease lands, "subject to the terms and conditions incorporated in the lease." Thus, under this alternative, the operator's proposal would be denied.

2.2. Alternative B- Operator Proposed Action

Alternative B contains complete APDs and is based on the operator and BLM working to reduce environmental impacts. This alternative summarizes the POD as it was finally, after site visits, submitted to the BLM by Lance Oil and Gas INC. on 08/02/2010.

<u>Proposed Action Title/Type</u>: <u>Proposed Action Title/Type</u>: Lance Oil and Gas INC.'s NW CROTON CBNG POD.

<u>Proposed Well Information:</u> There are 5 wells proposed within this POD; the wells are vertical bores proposed on an 80 acre spacing pattern with 1 well per location. Each well will produce from the Wall Coal seams. Proposed skid dimensions are 8 ft wide 8 ft length 8 ft height. The pump jack is 10.5 feet at the upstroke. The base of the pump jack is 9.5 feet by 3 feet. The skid and pump jack color is Covert

Green, selected to blend with the surrounding vegetation. A list of proposed wells are included in Table 2.1.

Table 2.1 Proposed Wells – Alternative B

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	Floyd L&L Fed	43-23-5376WA	NESE	23	53N	76W	WYW142836
2	R Floyd Fed	21-24-5376WA	NENW	24	53N	76W	WYW141581
3	R Floyd Fed	23-24-5376	NESW	24	53N	76W	WYW146296
4	R Floyd Fed	33-24-5376WA	NWSE	24	53N	76W	WYW146296
5	Federal	34-24-5376WA	SWSE	24	53N	76W	WYW146296

Water Management Proposal: Table 2.2 includes the water management infrastructures proposed for use in association with this POD.

Table 2.2 Proposed Water Management Facilities – Alternative B

	Facility Name / Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (acre feet)	Surface Disturbance (acres)	Lease #
1	Rick's Reservoir	SENW	23	53	76	0.45	1.0	Fee
2	Rick's Little	SWNW	23	53	76	1.17	3.3	Fee
3	Willow Tree	NWSW	23	53	76	7.96	3.6	Fee
4	Jason Reservoir	NENE	23	53	76	1.35	2.1	Fee
5	TY Reservoir	NWNW	24	53	76	0.77	2.4	WYW141581
6	Ryan Reservoir	SWNE	24	53	76	0.33	1.2	Fee
7	Boone Reservoir	SENW	25	53	76	12.0	3.4	Fee
8	004 Reservoir	SWNW	25	53	76	9.1	3.7	Fee
9	N & S Lacy Res'.	NESW	25	53	76	13.8	5.4	Fee
10	James Reservoir	NWSW	30	53	76	1.73	2.4	Fee
11	Echeta Road EMIT Pit	NWNW	26	53	76	6.1	1.5	Fee

County: Campbell

Applicant: Lance Oil and Gas INC.

Surface Owners: Rick Floyd, Floyd Land and Livestock LLC, BLM, WY State

Drilling and Construction:

- Wells will be to Wall coal zones to depths of approximately 1,666 feet to 1,977 feet.

- Drilling and construction activities are anticipated to be completed within two years, the term of an APD. Drilling and construction occurs year-round in the PRB. Weather may cause delays lasting several days but rarely do delays last multiple weeks. Timing limitations in the form of COAs and/or agreements with surface owners impose longer temporal restrictions on portions of this POD, but rarely do these restrictions affect an entire POD.

- Well metering shall be accomplished by telemetry/central metering facility/well visitation.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: Delivery of CBNG produced water to 10 discharge points directly draining to 10 stock water reservoirs within the Upper Powder River primary watershed. Once the reservoirs are at capacity, the produced water will be pumped to the Echeta Road EMIT water treatment plant located west of Wild Horse Creek. The treated water will be disposed of from the EMIT plant by either direct discharge to Wild Horse Creek or through a land application irrigation system adjacent to the Echeta Road EMIT plant.

- A road network consisting of 1.05 miles of improved road and 0.13 miles of primitive road.

- If the underground power line network is not completed before the wells are in production, then temporary diesel generators shall be placed at the proposed power drops located in:

ID	Qtr/Qtr	Sec	TWP	RNG
1	NENW	23	53N	76W
2	SESE	23	53N	76W
3	NWNE	25	53N	76W

- A storage tank of 500 gallon capacity shall be located with each diesel generator. Generators are projected to be in operation for 24 months. Fuel deliveries are anticipated to be 3 times per week. Generator noise level is expected to be 100.5 decibels at 1 meter distance.

- A buried gas, water and power line network.

– The 21-24-5376WA well was relocated due to newly installed overhead power preventing drilling operations to take place. The new location requires a pad.

– The 43-24-5376WA well was relocated due to slopes greater than 25% and erosive soils. The new location requires a pad.

– A total of 1 well pads was adjusted (e.g., from slots to constructed pads) for human health and safety

– A total of 2 well pads were adjusted is size to limit surface disturbance or maintain vegetative buffer from headcuts.

– The access road to 34-24 well was relocated per land owner and BLM Wildlife Biologist recommendation.

– The access road to the 43-24-5376WA must have an engineered spot upgrade due to slope greater than 25% and erosive soils.

For a detailed description of design features, construction practices and water management strategies associated with the proposed action, refer to the Master Surface Use Plan (MSUP), Drilling Plan and WMP in the POD and individual APDs. Also see the subject POD for maps showing the proposed well locations and associated facilities described above. More information on CBNG well drilling, production and standard practices also is available in the PRB FEIS, Volume 1, pages 2-9 through 2-40 (January 2003).

Implementation of committed mitigation measures contained in the MSUP, Drilling Program and WMP,

in addition to the Standard COAs contained in the PRB FEIS Record of Decision Appendix A, are incorporated and analyzed in this alternative.

2.3. Alternatives Considered but Not Analyzed in Detail

1. Relocating the 34-24-5376WA well approximately 1000 feet west to avoid a prairie dog town. The alternative was not analyzed in detail because the relocated location would have put the well within 500 feet of an existing fee well.

The original POD for the NW CROTON was submitted by Lance Oil and Gas INC. on 11/03/2008 with 5 Federal APDs. A series of discussions and onsite visits occurred between BLM and Lance Oil and Gas INC. based on the initial project POD:

Operator committed measures as documented in a revised project description provided as Lance Oil and Gas INC.'s response to BLM's deficiency letter, resulted in a refined proposed project, which is discussed in this document as **Alternative** B. The initial POD, the post-onsite deficiency letter, and the company's response to the deficiency letter are included in the Project Administrative Record, available for review at the BLM Buffalo Field Office.

2.4. Summary of Alternatives

A summary of the infrastructure currently existing within the POD area (Alternative A), and the infrastructure proposed by the operator (**Alternative** B).

Facility	**Alternative A (No Action) Existing Number/ Acres/Miles**	**Alternative** B **(Operator Proposal) Proposed Number/ Acres/Miles**
Total CBNG Wells	30	5
Well Locations Nonconstructed Constructed Slotted	6 acres	3.21 acres
Conventional Wells		0
Gather/Metering Facilities Number of Facilities Acreage of Facilities	0 0	0 0
Compressors Number of Compressors	1 compressor/ 5.80 acres	0 0.0
Number of Ancillary Facilities (Staging/Storage Areas)	1 Facility/ 6 acres	0
Acres (Miles) of Template/ Spot Upgrade Roads With Corridor	0	0.66 Miles/ 4.02 acres
Acres (Miles) of Engineered Roads With Corridor	4.64 miles/ 28.10 acres	0.37Miles/ 2.34 acres
Acres (Miles) of Primitive Roads Without Corridor With Corridor	0.07 miles/ 0.28 acres 0.42 miles/ 1.76 acres	0.13 Miles/ 0.53 acres
Miles of Buried Power With Corridor		1.98miles/ 11.52 acres
Miles of Pipeline No Corridor	4.60 miles/ 16.73 acres	0.0

Facility	Alternative A (No Action) Existing Number/ Acres/Miles	Alternative B (Operator Proposal) Proposed Number/ Acres/Miles
With Corridor	4.68 miles/ 19.86 acres	
Miles of Overhead Powerlines	5.22 miles/ 18.97 acres	0.0
Number of Communication Sites	0	0
Number of Monitor Wells	0	0
Acres of Land Application Disposal	0	0
Acres of Subsurface Drip Irrigation	0	0
Number of Treatment Facilities	0	0
Number of Impoundments On-channel Off-channel Lined Unlined	7 / 10.05 acres	0
Water Discharge Points	7 points/ 0.14 acres	0
TOTAL ACRES DISTURBANCE	**113.69 acres**	**21.62 acres**

3. DESCRIPTION OF AFFECTED ENVIRONMENT

This section describes the environment that would be affected by implementation of the alternatives described in Section 2. Aspects of the affected environment described in this section focus on the relevant major issues. A screening of all resources and land uses potentially affected is included in Appendix B.

Resources that would be unaffected, or not affected beyond the level analyzed within the PRB FEIS, are not discussed within the EA.

Applications to drill were received on 11/03/2008. Field inspections of the proposed NW CROTON CBNG project were conducted on 6/25/2010. Personnel attending the field inspections are identified in section 5 Consultation and Coordination.

3.1. Project Area Description

Lance Oil and Gas INC.'s NW Croton POD is located approximately 32 miles west of Gillette, Wyoming on Echeta Road in west central Campbell County. The topography consists of rugged and moderately rugged terrain with ridges, deep draws, and rough breaks. The elevation within the project area ranges from approximately 3991 to 4152 feet above sea level. Livestock grazing has been the primary historic land use within the project area as well as oil development, existing fee CBNG developments, and ranching operations are the current land uses. Development will occur on private, BLM, and State of WY surface.

3.2. Soils, Vegetation, and Ecological Sites

3.2.1. Soils

The Powder River Basin is composed of relatively young soils which have developed in alluvium and residuum derived from the Wasatch Formation. Lithology consists of light to dark yellow and tan siltstone and sandstones with minor coal seams. Soils have surface and subsurface textures of silt loam and fine sandy loam. Soil depths vary from deep on lesser slopes to shallow and very shallow on steeper slopes. Soils are generally productive, though varies with texture, slope and other characteristics. Soils differ with topographic location, slope and elevation. Topsoil depths to be salvaged for reclamation range from 6 to 12 inches.

The map unit symbols for the soils identified above for the identified soil map unit symbols found within the POD boundary are listed in Table 3.1 below. Ecological Site Descriptions are soil and vegetation community descriptions compiled by the Natural Resources Conservation Service (NRCS) for the purpose of resource identification, and providing management and reclamation recommendations.

Table 3.1 Dominant Soils Affected by the Proposed Action

Map Unit	Map Unit Name	Acres	Percent
225	Ucross-Iwait-fairburn loams, 3 to 30 percent slopes	222.0453	13.44
278	Fairburn-Samsil-Badland complex, 10 to 45 percent slopes	430.0983	26.04
317	Silhouette-Ulm clay loams, 0 to 6 percent slopes	177.1244	10.73
327	Ulm-Bidman complex, 0 to 6 percent slopes	442.1323	26.77

Soils within the project area were identified from the North Campbell County Survey Area, Wyoming (WY705).

The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards. Pertinent information for analysis was obtained from the published soil survey and the National Soils Information System (NASIS) database for the area.

3.2.1.1. Soils Susceptible to Erosion

Loss in productivity is likely to occur on most soils if erosion continues unchecked. Because soil formation is a very slow process, most soils cannot renew their eroded surface while erosion continues. The development of a favorable rooting zone by the weathering of parent rock is much slower than development of the surface horizon. One estimate of this renewal rate is 0.5 ton per acre per year for unconsolidated parent materials and much less for consolidated materials. These very slow renewal rates support the philosophy that any soil erosion is too much. Loss of organic matter, resulting from erosion and tillage, is one of the primary causes for reduction in production yields. As organic matter decreases, soil aggregate stability, the soil's ability to hold moisture, and the cation exchange capacity decline. (Soil Quality-Agronomy Technical Note #7, USDA, Aug 1998)

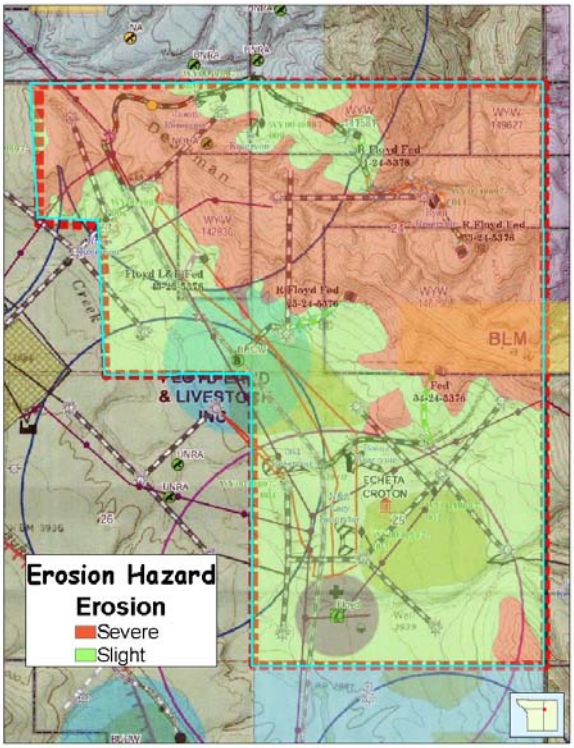
44.62% of the POD has a severe erosion hazard rating. The project has areas that are dissected and gullied with areas of active erosion and head cuts. Areas of slighter slopes and areas near drainages usually have deeper soils. Deeper soils tend to have a higher probability of supporting shrubbrush grassland communities. On surfaces with steep topography, vegetation is sparse or even barren. Barren steep slopes experience higher velocity of water movement during heavy storm events. As this storm water moves down slope the velocity is mitigated by thicker vegetation of the sagebrush grasslands. Road and pipeline construction removes vegetation that mitigates and controls water velocity. This loss of vegetative buffer increases water velocity and head cutting.

The three components of the complex have the lowest rating as a source of topsoil or reclamation material. Paralithic bedrock 10 to 20 inches subsurface of the complex is an extremely weak cemented layer averaging 10 to 50 inches thick with the lowest rating as a construction material source. Table 3.2 and Figure 3.1 shows the relative erosion potential, based on the site specific information discussed above.

Table 3.2 Soils Erosion Potential

Erosion Potential	Acres	% of Project Area
Severe	736.00	44.62
Moderate	0	0
Slight	913.31	55.37

Figure 3.1 Erosion Hazard within the Project Area



3.2.1.2. Slope Hazard

A soil's stability is greatly affected by the slope on which it occurs. In general, the greater the slope, the greater the potential for slumping, landslides and water erosion. Approximately 268.53 acres (16.35%) in the project area have slopes of 25% or more. Slopes greater than 25% are shown on Figure 3.2 below.

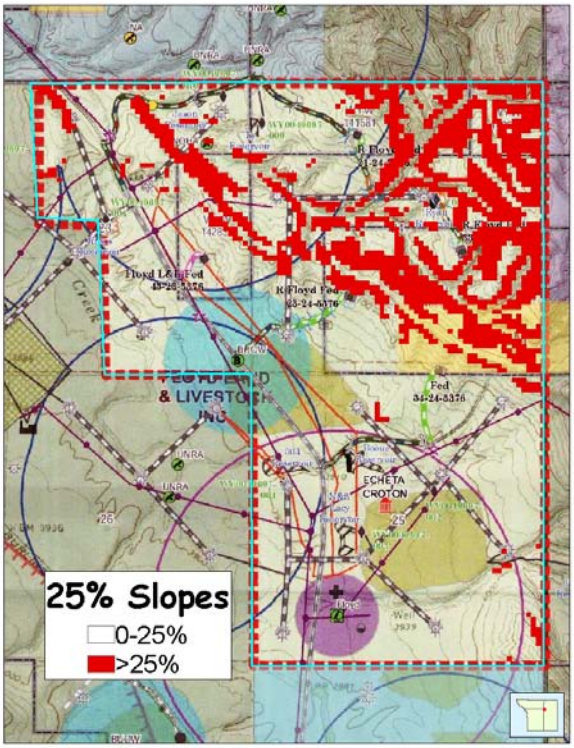
Soils with slopes of less than 25% may also be prone to high erosion because of the soil type, particle size, texture, or amount of organic matter. Soil types in the POD area with severe erosion potential and slopes 25% or greater, as defined by the Natural Resources Conservation Service (NRCS; USDA NRCS 2007), are listed in Tables 3.2 and 3.3, respectively along with the number of acres and percentage of the project area.

Other contributing factors to slope stability include slope length, slope aspect and colluvium. Slope length has considerable control over runoff and potential accelerated water erosion. Slope aspect is the direction which the surface of the soil faces. Slope aspect may affect soil temperature, evapotranspiration, wind contact and soil moisture. Colluvium is poorly sorted debris that has accumulated at the base of slopes, in depressions, or along small streams through gravity, soil creep, and local wash. It consists largely of material that has rolled, slid or fallen down the slope under the influence of gravity. The rock fragments in colluvium are usually angular, in contrast to the rounded, water-worn cobbles and stones in alluvium and glacial outwash. These factors in combination with slope determine soil stability and the potential for mass soil movement.

Table 3.3 Percent Slope within the <POD> Project Area

% Slope	Acres	% of Project Area
0-24%	1373.85	83.65%
Greater than or Equal to 25%	268.53	16.35%

Figure 3.2 Areas of Slopes Exceeding 25% within the Project Area



3.2.2. Ecological Sites

Ecological Site Descriptions (Table 3.4) are used to provide site and vegetation information needed for resource identification, management and reclamation recommendations. To determine the appropriate Ecological Sites for the area contained within this proposed action, BLM specialists analyzed data from onsite field reconnaissance and Natural Resources Conservation Service published soil survey soils information. They are field reviewed at the on-site inspection for the purpose of resource identification, and to provide management and reclamation recommendations.

Table 3.4 Map Units and Ecological Sites:

Map Unit	Ecological Site
278, 335	SHALLOW LOAMY (15-17NP)
327, 317	CLAYEY (10-14NP)
144, 253	LOAMY (10-14NP)
225, 167	LOAMY (15-17NP)
285	LOWLAND (10-14NP)

The on-site field review confirmed that there is not just one prominent plant community for each ecological site. Instead there are many plant communities (states) and transitions identified in the field and verified on the NRCS State and Transitional Model. Steeper slopes in this POD get less moisture and therefore have thinner layers of organic matter in upper layer soil (A horizon). Topsoil is used by plants as a growth medium. This is contrasted with areas in drainages and on slighter slopes which have slightly greater accumulation moisture that lead to deeper organics and a richer layer of nutrients for plants to establish. A summary of the NRCS ecological sites within the project area are listed in Table 3.5 below. The on-site field review also found cheat grass throughout the project area and ongoing livestock grazing and Fee development.

The dominant Ecological Sites and Plant Communities identified in this POD and its infrastructure are Clayey (10-14 NP) and Sites Shallow Loamy (15-17 NP) sites.

Clayey (10-14 NP): Sites occur on nearly level to 30% slopes on landforms which include hill sides, alluvial fans, and stream terraces in the 10-14"precipitation zone. The soils of this site are moderately deep (greater than 20" to bedrock), to very deep, well drained soils that formed alluvium or alluvium over residuum. These soils have slow permeability.

Rhizomatous Wheatgrasses, Green needlegrass

The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. Potential vegetation is about 75% grasses or grass-like plants, 15% forbs, and 10% woody plants. The state is dominated by cool season midgrasses. The major grasses include western wheatgrass, and green needlegrass. Other grasses occurring in this state include Cusick and Sandberg bluegrass, needleleaf sedge, blue grama, and plains reedgrass. Big sagebrush is a conspicuous element of this state, occurs in a mosaic pattern, and makes up 5 to 10% of the annual production. Big sagebrush may become dominant on some areas with absence of fire. Natural fire occurred frequently in this community and prevented big sagebrush from being the dominant landscape. Wildfires are actively controlled in recent times so chemical control using herbicides has replaced the historic role of fire on this site. Recently, controlled burning has regained some popularity.

The state is stable and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allow for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity).

Shallow Loamy (15-17NP): Sites occur on steep slopes and ridge tops, but may occur on all slopes. Shallow Loamy Sites can be found on landforms which include hill sides, ridges, and escarpments in the 15-17 inch precipitation zone. The soils of this site are shallow (less than 20" to bedrock) well drained soils formed in alluvium over residuum or residuum. These soils have moderate permeability and may occur on all slopes. The bedrock may be any kind which is virtually impenetrable to plant roots, except igneous.

Rhizomatous Wheatgrasses, Needleandthread, Blue Grama

The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. Potential vegetation is about 80% grasses or grass-like plants, 10% forbs, and 10% woody plants. The state is dominated by cool season midgrasses. The major grasses include western wheatgrass, bluebunch wheatgrass, needleandthread, sideoats grama, and little bluestem. Other grasses occurring on the state include Canby's and Sandberg bluegrass, blue grama, plains muhly, and prairie junegrass. Big sagebrush is a conspicuous element of this state, occurring in a mosaic pattern, and makes up 5 to 10% of the annual production. Big sagebrush may become dominant on some areas with absence of fire. Natural fire occurred frequently in this community and prevented big sagebrush from being the dominant landscape.

Wildfires are actively controlled in recent times so chemical control using herbicides has replaced the historic role of fire on this state. Recently controlled burning has regained some popularity.

The state is extremely stable and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity). Cheatgrass has invaded the site.

A summary of the ecological sites within the project area are listed in Table 3.5 along with the individual acreage and the percentage of the total area identified within the POD boundary.

Table 3.5 Summary of Ecological Sites

Map Unit	Summary of Ecological Sites	Acres	Percent
278, 335	SHALLOW LOAMY (15-17NP)	430.1	26.04
327, 317	CLAYEY (10-14NP)	623.42	37.74
144, 253	LOAMY (10-14NP)	157.54	9.54
225, 167	LOAMY (15-17NP)	307.17	18.6
285	LOWLAND (10-14NP)	52.43	3.17
	OTHER	81.19	4.91
	TOTAL	**1651.85**	**100**

3.2.2.1. Invasive Species

The following state-listed noxious weeds and/or weed species of concern infestations were discovered by calling The Wyoming Weed and Pest Council at the Campbell County Weed and Pest Control District:

- Leafy Spurge
- Spotted Knapweed
- Diffuse Knapweed
- Black Henbane
- Buffalo Bur
- Cockle Bur
- Wild Licorice
- Canada Thistle

Additionally, the operator or BLM confirmed the following infestations weed species during field investigations:

- Canada Thistle

The state-listed noxious weeds are listed in PRB FEIS Table 3-21 (p. 3-104) and the Weed Species of Concern are listed in Table 3-22 (p. 3-105).

3.2.2.2. Wetlands/Riparian

The project area includes the lower reaches of Wild Horse Creek, approximately 20 stream miles above the confluence with the Upper Powder River. The existing access road to the Echeta EMIT water treatment plant located at the NESW Sec 23 T53N R76W crosses Wild Horse Creek. The floodplain at this point is very broad (~ 2000 feet) and well vegetated with grass and some shrubs. The access road crossing is a low water crossing constructed with concrete blocks to minimize sediment disturbance and allow free flow of water over the road. The broad floodplain in this location has a limited amount of cottonwood or other deciduous trees and is primarily a wide, valley floor covered with grass and sedge vegetation.

3.3. Wildlife

Several resources were consulted to identify wildlife species that may occur in the proposed project area. Resources that were consulted include the BLM Buffalo Field Office (BFO) wildlife database, the PRB FEIS, the Wyoming Game and Fish Department (WGFD) big game and sage-grouse maps, and the Wyoming Natural Diversity Database (WYNDD).

Habitat assessment and wildlife inventory surveys of the Northwest Croton (NWC) plan of development (POD) project area were performed by Big Horn Environmental Consultants (BHEC in 2006 and 2010).

BHEC surveyed for bald eagle nesting and roosting habitat, raptor nest occupancy and productivity, greater sage-grouse and sharp-tailed grouse lek and nesting habitat, black-tailed prairie dog colony delineation, mountain plover breeding and nesting habitat and activity, Blowout Penstemon and Ute ladies'-tresses orchid habitat (BHEC 2006, 2010). All surveys were conducted according to the Powder River Basin Interagency Working Group's protocols, available on the BFO internet website at the following URL:
http://www.blm.gov/wy/st/en/field_offices/Buffalo/wildlife.html.

The BLM biologist conducted field visits in 2010 during July. During that time, the biologist verified the wildlife survey information, evaluated impacts to wildlife resources, and recommended project modifications where wildlife issues arose. Wildlife species common to the habitat types present are identified in the PRB FEIS (pg. 3-114). Species that have been identified in the project area or that have been noted as being of special importance are described below.
Wyoming Game and Fish Department (WGFD) is the agency responsible for management of wildlife populations in the state of Wyoming. WGFD has developed several guidance documents that BLM BFO wildlife staff relies upon in evaluating impacts to wildlife and wildlife habitats. WGFD documents used to analyze the proposed project under the current analysis are referenced in this section. .

3.3.1. Habitat Types

The primary habitat type in the project area is sagebrush grassland, dominated by cheat grass and pasture grasses. In creek and ravine bottoms, silver sagebrush is the primary type of sagebrush. Juniper trees dominate many of the steep draws and their north facing aspects in the south1/2 and east1/2 of Section 24 T53N:R75W. Livestock grazing, existing fee CBNG developments, and ranching operations are the current land uses in the area.

Large-scale development of energy reserves underlying sagebrush ecosystems is placing sagebrush communities and wildlife increasingly at risk (WGFD 2009a). Sagebrush ecosystems support a variety of species, including migratory birds, raptors, big game, reptiles, and small mammals. Several Wyoming BLM sensitive species are associated with sagebrush ecosystems. Sagebrush shrublands and grasslands are considered one of the most imperiled ecosystems in North America (Samson and Knopf 1996, Knick et al. 2003, USFWS 2010). Sagebrush recovery after disturbance depends on the availability of an adjacent seed source and may take decades to occur (USFWS 2010).

3.3.2. Threatened, Endangered, Proposed, and Candidate Species

3.3.2.1. Threatened and Endangered Species

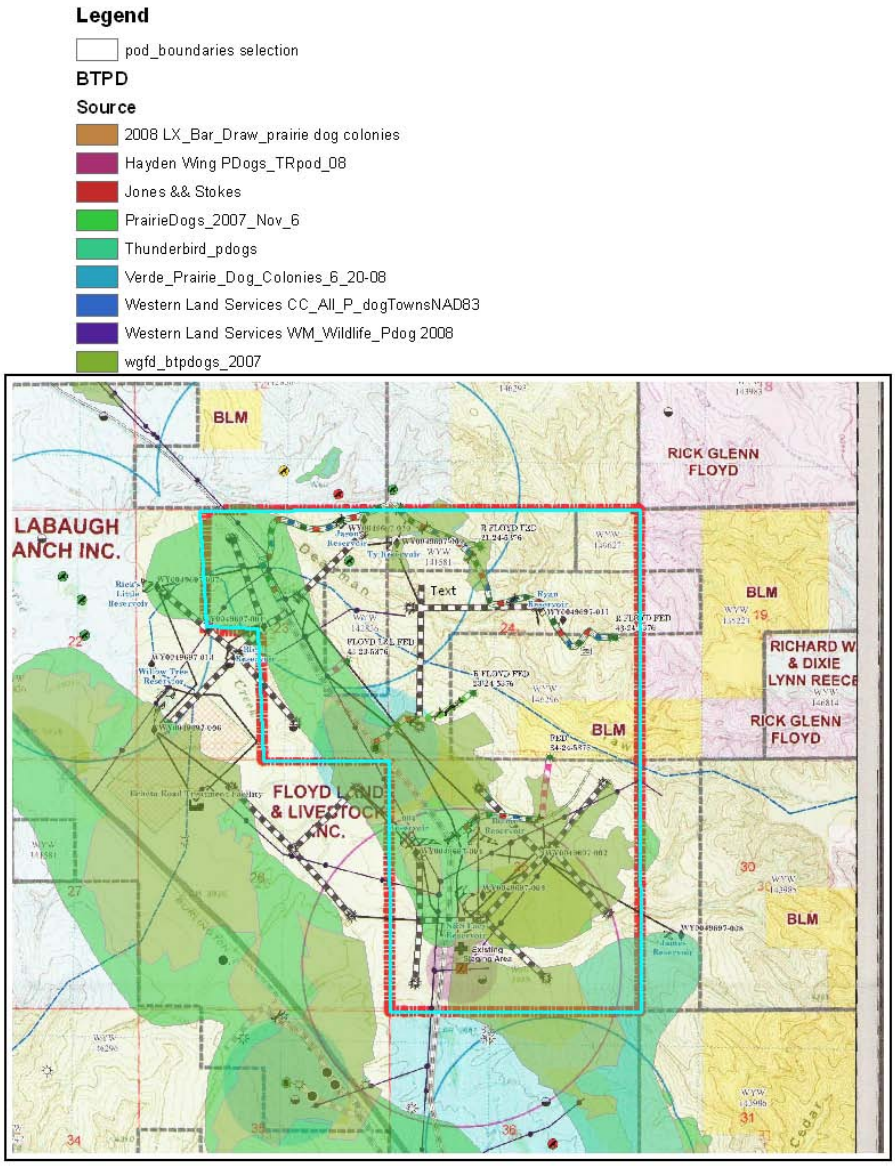
Threatened, Endangered, Candidate and Proposed species that will be impacted beyond the level analyzed within the PRB FEIS are described below.

3.3.2.1.1. Black-footed ferret

The black-footed ferret is listed as Endangered under the ESA. The affected environment for black-footed ferrets is discussed in the PRB FEIS on pg. 3-175. WGFD has identified seven prairie dog complexes, located partially or wholly within the BFO administrative area, as potential black-footed ferret reintroduction sites (Grenier et al. 2004). The NWC project is located 2 miles inside of the Arvada complex border, the nearest potential reintroduction area. However, USFWS has determined that black-footed ferrets do not occur in Wyoming outside of the Shirley Basin, and the species has been block cleared for the rest of the state.

Current science indicates that black-footed ferret population requires at least 1,000 acres of prairie dog colonies for survival (USFWS 1989). The project area intersects a large group of colonies that are within 0.96 mile (1.5 km) of each other and that total approximately 3,500 acres. Four black-tailed prairie dog colonies totaling 249.5 acres were identified within the project boundary by BHEC. Black-footed ferret

habitat is present within the project area. Figure W1 below depicts prairie dog colonies that where delineated WGFD in 2007(shown in green polygon).



3.3.2.1.2. Blowout Penstemon

Blowout penstemon is listed as Endangered under the ESA. It is a regional endemic species with documented populations in the Sand Hills of west-central Nebraska and the northeastern Great Divide Basin of Carbon County, Wyoming. Suitable blowout penstemon habitat consists of sparsely vegetated, early successional, shifting sand dunes and blowout depressions created by wind. In Wyoming, the habitat is typically found on sandy aprons or the lower half of steep sandy slopes deposited at the base of granitic or sedimentary mountains or ridges. The NWC project area does not contain areas with these characteristics, and blowout penstemon is not expected to occur.

3.3.2.1.3. Ute Ladies'-Tresses Orchid

The Ute ladies'-tresses orchid (ULT) is listed as Threatened under the ESA. The affected environment for ULT is discussed in the PRB FEIS on pg. 3-175.

The PRB FEIS reported that only four orchid populations had been documented within Wyoming, but since the writing of that document, five additional sites were located in 2005 and one in 2006 (Heidel pers. comm.). The new locations were in the same drainages as the original populations, with two on the same tributary and within a few miles of an original location. Drainages with documented orchid populations include Wind Creek and Antelope Creek in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County. A WYNDD model predicts undocumented populations may be present particularly within southern Campbell and northern Converse Counties.

In 2006 and 2009, BHEC surveyed for potential Ute ladies'-tresses habitat in the project area and concluded that the area has limited potential to support the species. No perennial streams were located and the ephemeral drainages contain heavy clay soils that immediately rise to upland vegetation, reducing potential for this species.

3.3.2.2. Proposed Species

3.3.2.2.1. Mountain Plover

Mountain plovers are currently being proposed for listing under the Endangered Species Act and are a BLM sensitive species typically associated with high, dry, short grass prairies (BLM 2003). Mountain plover nesting habitat is often associated with heavily grazed areas such as prairie dog colonies and livestock pastures. The affected environment for mountain plover is discussed further in the PRB FEIS on pg. 3-177 to 3-178.

BHEC conducted surveys for breeding mountain plover on 3 and 18 May and 1 June 2010. No known mountain plover were observed in areas of potential habitat within the POD or within a quarter mile buffer of the POD boundary during surveys dating back to 2005 (BHEC). The rolling terrain (> 2% slope) and height of vegetation (>14in) in the project area limits its suitability for mountain plover. Potential mountain plover habitat is present in portions of existing prairie dog colonies (see prairie dog section).

3.3.2.3. Candidate Species

3.3.2.3.1. Greater Sage-grouse

The affected environment for greater sage-grouse (herein referred to as sage-grouse) is discussed in the PRB FEIS (pg. 3-194 to 3-199). On March 23, 2010, the United States Fish & Wildlife Service (hereafter, USFWS) issued a proposed rule, finding that listing the greater sage-grouse as Threatened was warranted, but precluded by other listing priorities (USFWS 2010), and is considered a Candidate species. In addition, the sage-grouse is listed as a BLM sensitive species, and a Wyoming Game and Fish Department Species of Greatest Conservation Need, with a rating of Native Sensitive Species 2. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action.

The best available science describing the range-wide and Powder River Basin current status, habitatneeds, threats, and projections for the species can be found in the USFWS Proposed Rule (USFWS 2010). Of particular interest for the current status of greater sage-grouse as related to the project area are those sections of the Proposed Rule that address habitat characteristics (p.13917), energy development (p. 13942-13949), and projections of future populations (p. 13958-13961).

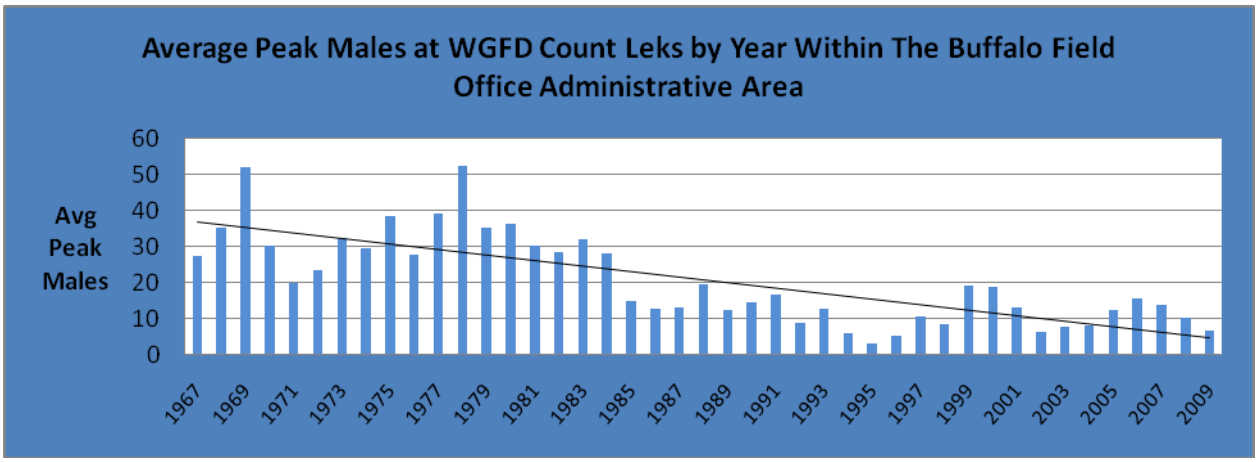
Powder River Basin

The Powder River Basin serves as a link between the Wyoming Basin and central Montana grouse populations. The Powder River Basin is in sage-grouse Management Zone 1, this management zone is predominantly grasslands and represents the periphery of sage-grouse distribution. In the Powder River Basin sagebrush is more heterogeneously distributed, and where found, is at lower densities (less canopy

cover), than it is in other management zones. In the context of habitat structural quality within the Powder River Basin, the project area contains quality habitat.

The sage-grouse population within northeast Wyoming has been exhibiting a steady long term downward trend, as measured by lek attendance (WGFD 2008b). The following figure illustrates a ten-year cycle of periodic highs and lows. Each subsequent population peak is lower than the previous peak. Research suggests that these declines may be a result, in part, of CBNG development in this region of Wyoming and that the leks within the project area are experiencing similar declines (USFWS 2010).

Figure W-2 Average number of male sage-grouse per active lek within the WGFD Sheridan region, 1967-2009



Research has shown that declines in lek attendance are correlated with oil and gas development. In a typical landscape in the Powder River Basin, energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87% to 5% percent (Walker et al. 2007). Several studies have shown that well density can be used as a metric for evaluating impacts to sage-grouse, as measured by declines in lek attendance (Braun et al. 2002, Holloran et al. 2005, and Walker et al. 2007). These studies indicated that oil or gas development exceeding approximately one well pad per square mile, resulted in calculable impacts on breeding populations, as measured by the number of male sage-grouse attending leks (State Wildlife Agencies' Ad Hoc Committee for Sage-Grouse and Oil and Gas Development 2008).

Declines in lek attendance associated with oil and gas development may be a result of a suite of factors; however, fragmentation of habitat is the predominant issue (USFWS 2010). The State of Wyoming has adopted a Core Area concept that protects the largest populations of sage-grouse. The BLM has adopted this concept and added Focus areas in the Buffalo Field Office Area to supplement the Core concept. Sage-grouse Core/Focus Areas assume those sufficient amounts of good quality sage-grouse habitat remains un-fragmented by energy or other man-made infrastructure. These basic concepts for management are based on the assumptions that sufficient "islands" of undisturbed (by human infrastructure) sage-grouse habitat would remain to sustain a large enough sage-grouse population for the long-term.

State-wide, Core Population areas are probably sufficient since they encompass approximately 70 percent of the sage-grouse population; however, in the Buffalo Field Office the Core Population/ Focus Areas capture approximately 25 percent of the sage-grouse population. To address this inadequacy of Core/Focus areas in the Powder River Basin, the BLM, in coordination with the State of Wyoming have

identified areas (between Core Areas in Wyoming and Montana) as Connectivity habitat in an effort to maintain a viable greater sage-grouse population in the Powder River.

Project Area

There are approximately 1,649 acres within NWC POD boundary, of which 45 acres (0.027%) are modeled as high quality nesting habitat and 80 acres (0.05%) are modeled as high quality winter habitat. Currently, there are 11 existing CBNG wells, 6 water impoundments, one staging area, and approximately 5 miles of overhead power within the NWC POD.

During on-site visits, BLM Wildlife Biologist confirmed habitat models to be consistent with site specific habitats. Much of the project area contains small isolated stands of sagebrush separated by drainages and steep topography.

Impacts to sage-grouse leks due to oil and gas development are discernible to a distance of four miles, and some leks may be extirpated within this distance (Walker et al. 2007, Walker 2008). WGFD records indicate that no sage-grouse leks occur within four miles of the project area.

Wyoming BLM policy guidelines for sage-grouse requires an effects analysis of 11 miles to include impacts on all seasonal habitats from energy projects (BLM 2010). There are 17 occupied leks within 11 miles of the NWC project area.

3.3.3. BLM Sensitive Species

Wyoming BLM has prepared a list of sensitive species on which management efforts should be focused towards maintaining habitats under a multiple use mandate. The goals of the policy are to:

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

The authority for the sensitive species policy and guidance comes from the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and the Department Manual 235.1.1A. BLM Wyoming sensitive species that will be impacted beyond the level analyzed within the PRB FEIS are described below.

3.3.3.1. Bald Eagle

The affected environment for bald eagles is described in the PRB FEIS on pg. 3-175. At the time the PRB FEIS was written, the bald eagle was listed as a threatened species under the ESA. Due to successful recovery efforts, it was removed from the ESA on 8 August 2007. The bald eagle remains under the protection of the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

In addition to being listed as a Wyoming BLM sensitive species, bald eagles are a WGFD SGCN with a NSS2 rating, due to populations being restricted in numbers and distribution, ongoing loss of habitat, and sensitivity to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region17.

Habitat for bald eagles to nest, or to roost in winter is limited within the project area due to the lack of suitable trees and open water sources the bald eagle typically frequent. No bald eagle nests were found during aerial or ground surveys. No breeding bald eagles were observed in the area during raptor nest surveys in 2010. The closest bald eagle winter roost occurs approximately 5 miles northwest of the NWC

POD. Bald eagle use within the project area is limited to a minimal amount of daytime foraging and roosting.

BHEC included the NWC POD and associated one-mile TLS buffer in surveys for wintering bald eagles on 12 December 2009, 13 January, and 2February 2010. Table W-3 below lists all bald eagle observations for the winter 2009-2010 survey seasons.

Table W-3. Bald eagle winter flight data, NWC POD, 2009-10.

DATE	TIME	BAEATOTAL	UTME	UTMN	HABITAT	BEHAVIOR
12/12/2009	0805	2	423526	4932782	RIPARIAN	PERCHED
2/2/2010	0819	1	423877	4932445	RIPARIAN	PERCHED

3.3.3.2. Brewer's Sparrow

The affected environment for Brewer's sparrow is discussed in the PRB FEIS on pg. 3-200. In addition to being listed as a BLM Wyoming sensitive species, Brewer's sparrows are a WGFD SGCN, with a rating of NSS4 because populations are declining, habitat is vulnerable with no ongoing loss, and the species is not sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17.

The Brewer's sparrow is dependent on shrub-dominated plant communities that provide protective cover, song perches, and nest sites. The Brewer's sparrow nests in sagebrush throughout the species' range. It is expected for Brewer's sparrow to be common within the project because habitat is present throughout the project area as described in the following two sections; habitat type and greater sage grouse.

3.3.3.3. Loggerhead Shrike

The affected environment for loggerhead shrike is discussed in the PRB FEIS on pg. 3-187. In addition to being listed as a Wyoming BLM sensitive species, loggerhead shrikes are listed by USFWS as a BCC for Region 17. The Wyoming Bird Conservation Plan rates them as a Level II species, indicating they are in need of monitoring. Loggerhead shrike habitat is present throughout the project area as described in the following two sections; habitat type and greater sage grouse. A loggerhead shrike was observed on 24 May 2009 in the SESW of section 25 T53N, R76W (BHEC 2010).

3.3.3.4. Sage Sparrow

The affected environment for sage sparrow is discussed in the PRB FEIS on pg. 3-200 to 3-201. Sage sparrows are a WGFD SGCN, with a rating of NSS3, because populations are restricted in distribution, habitat is restricted but not undergoing substantial loss, and they are sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17. Considered a sagebrush-obligate, the sage sparrow inhabits prairie and foothills shrub habitat where sagebrush is present. It prefers tall shrubs and low grass cover, where sagebrush is clumped in a patchy landscape. Also, it is area-sensitive requiring large blocks of unfragmented habitat to successfully breed and survive. The project area supports sage sparrow habitat as described in the following two sections; habitat type and greater sage grouse. It is expected the species may occur within the project. The affected environment for sage sparrow is discussed further in the PRB FEIS on pg. 3-200 to 3-201.

3.3.3.5. Sage Thrasher

The affected environment for sage thrasher is discussed in the PRB FEIS on pg. 3-199 to 3-200. In addition to being listed as a Wyoming BLM sensitive species, sage thrashers are a WGFD SGCN, with a rating of NSS4, because populations are declining, habitat is vulnerable but not undergoing loss, and the

species is not sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level II species, indicating the action and focus should be on monitoring and because Wyoming has a high percentage of and responsibility for the breeding population. They are also listed by USFWS as a BCC for Region 17. This species is considered a sagebrush obligate. Sage Thrasher abundance is generally positively correlated with the amount of sage cover and negatively correlated with grass cover. The project area supports sage thrasher habitat as described in the following two sections; habitat type and greater sage grouse. It is expected the species may occur within the project.

3.3.3.6. Western Burrowing Owl

The burrowing owl is a small, long-legged owl found throughout open landscapes of North and South America. Burrowing owls can be found in grasslands, rangelands, agricultural areas, deserts, or any dry open area with low vegetation where abandoned burrows dug by mammals such as ground squirrels (*Spermophilus spp*.), prairie dogs (*Cynomys spp.),* and badgers (*Taxidea taxus*) are available. Black-tailed prairie dog colonies provide the primary habitat for burrowing owls (Klute et al. 2003).

Current population estimates for the United States are not well known but trend data suggest declines throughout the burrowing owl range (McDonald et al. 2004). Primary threats are habitat loss and fragmentation, mostly due to intensive agricultural and urban development, and habitat degradation, due to declines in populations of colonial burrowing mammals (Klute et al. 2003).

In addition to being listed as a Wyoming BLM sensitive species, burrowing owls are a WGFD SGCN, with a rating of NSS4. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action, and they are also a USFWS BCC in Region 17. Additional information regarding western burrowing owl (herein after referred to as burrowing owl) is available in the PRB FEIS on pg. 3-186.

Multiple active prairie dog colonies within the project area provide nesting opportunity for burrowing owls. The BFO database and BHEC indicates that one burrowing owl nests is present within the NWC POD (See Raptor Section).

3.3.3.7. Black-tailed Prairie Dog

The affected environment for black-tailed prairie dogs is discussed in the PRB FEIS (pg 3-179). At the time the PRB FEIS was written, the black-tailed prairie dog was added to the list of candidate species for federal listing in 2000 (USFWS 2000). It was removed from the list in 2004. Wyoming BLM considers black-tailed prairie dogs a sensitive species and continues to afford this species the protections described in the PRB FEIS. The black-tailed prairie dog is a WGFD SGCN, with a rating of NSS3, because populations are declining, and habitat is vulnerable but not undergoing significant loss.

The black-tailed prairie dog is considered common in Wyoming, although its abundance fluctuates with activity levels of Sylvatic plague and the extent of control efforts by landowners. Comparisons with 1994 aerial imagery indicated that black-tailed prairie dog acreage remained stable from 1994 through 2001, but aerial surveys conducted in 2003 indicated that approximately 47% of the prairie dog acreage was impacted by Sylvatic plague and/or control efforts (Grenier et al. 2004). Due to human-caused factors, black-tailed prairie dog populations are now highly fragmented and isolated (Miller et al. 1994). Most colonies are small and subject to potential extirpation due to inbreeding, population fluctuations, and other problems that affect long term population viability, such as landowner poisoning and disease (Primack 1993, Meffe and Congaree oll 1994, Noss and Cooperrider 1994).

Four black-tailed prairie dog colonies totaling 249.5 acres were identified by BHEC in the NWC POD area. In 2007, WGFD delineated prairie dog colonies within the NWC POD (see black footed ferret section, Figure W1).

3.3.3.8. Big Game

3.3.3.8.1. Mule deer and Pronghorn

The affected environment for pronghorn and mule deer is discussed in the PRB FEIS on pp. 3-117 to 3-122 and pp. 3-127 to 3-132, respectively. Both pronghorn and mule deer were observed during field visits to the project area. WGFD data indicate that the project area contains yearlong range for pronghorn and for mule deer yearlong and winter-yearlong. Winter-yearlong use occurs when animals make general use of habitat on a year-round basis. However, there is a significant influx of additional animals into the area from other seasonal ranges during the winter months. Yearlong use is when a population of animals make general use of habitat within the range on a year-round basis. Animals may leave the area under severe conditions. No crucial big game habitat is known to occur in the area. Populations of pronghorn within the hunt area are above the WGFD objective. Mule deer are at the WGFD objective. The most current big game range maps are available from WGFD.

3.3.3.8.2. Elk

Elk effective habitat exists within the NWC project in Section 24 T53N:R73W where steep terrain covered in dense stands of mature juniper trees dominate the landscape. Mineral development is occurring to the north and to the east of the project area of known elk use, limiting the effective habitat available for use. None of the project area is within any identified ranges for the Fortification Creek elk herd. The NWC project area is located 0.9 miles to the east of the Fortification Creek elk herd yearlong range. Telemetry data from 2009 GPS collars (frequency #'s 330523, 335360, and 330479) indicates that three elk cows utilized the northeast portion of the NWC project area during the months of March, May, and June.

Because the PRB FEIS did not consider impacts of CBNG development on the isolated Fortification Creek elk herd, alternatives for management are currently being analyzed for in an amendment to the RMP. This project is not included in the amendment due to its location outside of the Fortification Creek Planning Area.

3.3.3.9. Upland Game Birds

3.3.3.9.1. Plains Sharp-tailed Grouse

The affected environment for plains sharp-tailed grouse is discussed in the PRB FEIS on pp. 3-148 to 3-150. Sharp-tailed grouse inhabit short and mixed-grass prairie, sagebrush shrublands, woodland edges, and river canyons. In Wyoming, this species is common where grasslands are intermixed with other shrublands, especially wooded draws, shrubby riparian areas, and wet meadows. The NWC project area is suited for sharp-tailed grouse breeding, nesting, and wintering grounds. Habitats within the project include grasslands, sagebrush-grasslands, cottonwoods, junipers, and sumac, which have the potential to support sharp-tailed grouse throughout the year.

BHEC did surveys for sharp-tailed grouse. No sign of sharp-tailed grouse was found (BHEC). One known lek, the Floyd sharp-tailed lek, is located within the NWC POD in SESW Section 25 T53N:R76W, however surveys since 2006 indicate sharp-tailed grouse have not used the lek. There is an existing staging area located approximately 250ft north of the Floyd lek.

3.3.4. Aquatic Species

The project area is within the Wild Horse Creek watershed which is tributary to the Upper Powder River watershed. The Powder River Basin ecosystem and fishery is discussed in further detail in the PRB FEIS (pp. 3-153 to 3-166).

3.3.4.1. Migratory Birds

The affected environment for migratory birds is discussed in the PRB FEIS (pp. 3-150 to 3-153). Migratory birds are those that migrate for the purpose of breeding and foraging at some point in the year.

According to Instruction Memorandum No. 2008-050, BLM must include migratory birds in every NEPA analysis of actions that have the potential to affect migratory bird species of concern in order to fulfill its obligations under the Migratory Bird Treaty Act.

The WGFD Wyoming Bird Conservation Plan (Nicholoff 2003) identified three groups of high-priority bird species in Wyoming: Level I – those that clearly need conservation action, Level II – species where the focus should be on monitoring, rather than active conservation, and Level III – species that are not otherwise of high priority but are of local interest. Habitat that occurs in the project area includes steep ephemeral drainages to rough broken terrain (BHEC). The primary vegetation throughout the project area is sagebrush grassland with a few dispersed cottonwood trees in steep draws. Many species that are of high management concern use these areas for their primary breeding habitats (Saab and Rich 1997).

Nationally, grassland and shrubland birds have declined more consistently in the last 30 years than any other ecological association of birds (WGFD 2009). Species that may occur in these vegetation types in northeast Wyoming, according to the Wyoming Bird Conservation Plan, are listed in Table W-4 and are grouped by Level as identified in the Plan.

Table W-4 High priority bird species that occur in the major vegetation type within the NWC POD project area

Level	Species	Wyoming BLM Sensitive
Level I	Brewer's sparrow	Yes
	Ferruginous hawk	Yes
	Greater sage-grouse	Yes
	Long-billed curlew	Yes
	McCown's longspur	No
	Mountain plover	Yes
	Sage sparrow	Yes
	Short-eared owl	No
	Upland sandpiper	No
	Western burrowing owl	Yes
Level II	Black-chinned hummingbird	No
	Bobolink	No
	Chestnut-collared longspur	No
	Dickcissel	No
	Grasshopper sparrow	No
	Lark bunting	No
	Lark sparrow	No
	Loggerhead shrike	Yes
	Sage thrasher	Yes
	Vesper sparrow	No
Level III	Common poorwill	No

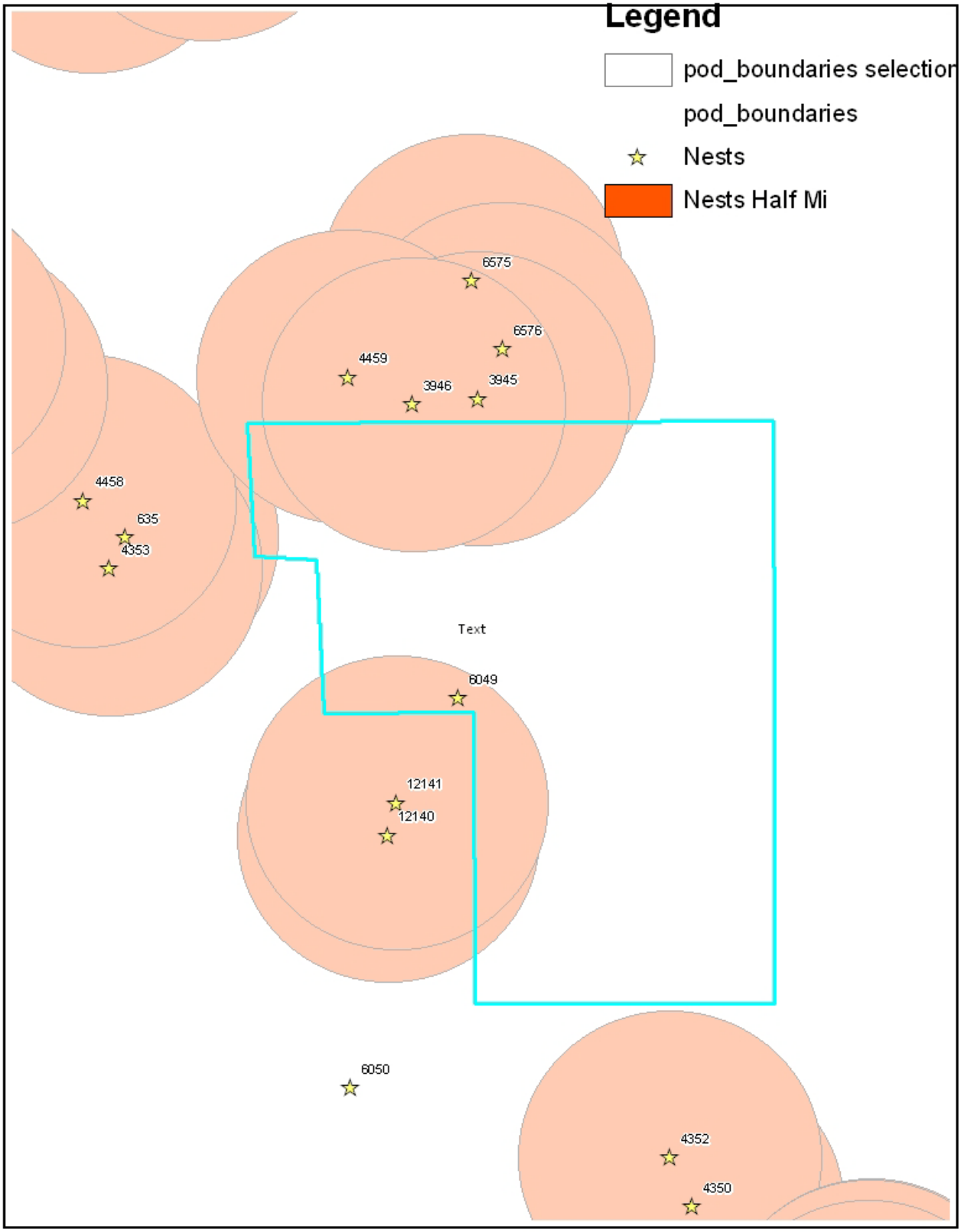
3.3.5. Raptors

The affected environment for raptors is discussed in the PRB FEIS on pp. 3-141 to 3-148. Nine raptor nests have been documented to occur within 0.5 miles of the project boundary. These nests are listed in the 2010 NWC POD wildlife report (BHEC 2010). Of the twelve nests listed, one Canada goose nest was active in 2010 and activity status is unknown for one nest because ground access was denied during the current survey season. Most raptor species nest in a variety of habitats including but not limited to; native and non-native grasslands, agricultural lands, live and dead trees, cliff faces, rock outcrops, and tree cavities. Recommendations for management include restricting human activities near nests during peak

breeding season; protecting, enhancing, and restoring prey populations; and protecting known nesting territories.

Figure W-3 illustrates 9 raptor nests within the NWC POD area of which 7 (3945, 3946, 4459, 6675, 6576, 12410, and 12141) are within 0.5 ,miles of roads, wells, power drops, and pipelines. The POD boundary is depicted in red. The circles are ½ mile buffers around raptor nests and nest #6049 depicts a burrowing owl nest.

Fig W-3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3.3.6. West Nile Virus

West Nile virus (WNv) is a mosquito-borne disease that can cause encephalitis or brain infection. Mosquitoes spread this virus after they feed on infected birds and then bite people, other birds, and animals. WNv is not spread by person-to-person contact, and there is no evidence that people can get the virus by handling infected animals.

Since its discovery in 1999 in New York, WNv has become firmly established and spread across the United States. Birds are the natural vector host and serve not only to amplify the virus, but to spread it. Though less than 1% of mosquitoes are infected with WNv, they still are very effective in transmitting the virus to humans, horses, and wildlife. *Culex tarsalis* appears to be the most common mosquito to vector, WNv.

The human health issues related to WNv are well documented and continue to escalate. Historic data collected by the CDC and published by the USGS at www.westnilemaps.usgs.gov are summarized in Table 3.6. Reported data from the Powder River Basin (PRB) includes Campbell, Sheridan and Johnson counties.

Table 3.6 Historical West Nile Virus Information

Year	Total WY Human Cases	Human Cases PRB	Equine Cases PRB	Bird Cases PRB
2001	0	0	0	0
2002	2	0	15	3
2003	392	85	46	25
2004	10	3	3	5
2005	12	4	6	3
2006	65	0	2	2
2007	155	22	Unk	1
2008	10	0	0	0
2009	10	1	1	No record

Source: Wyoming Department of Health, www.badskeeter.org/detections.html.

Human cases of WNv in Wyoming occur primarily in the late summer or early fall. There is some evidence that the incidence of WNv tapers off over several years after a peak following initial outbreak (Litzel and Mooney, personal conversations). If this is the case, occurrences in Wyoming are likely to increase over the next few years, followed by a gradual decline in the number of reported cases.

Although most of the attention has been focused on human health issues, WNv has had an impact on vertebrate wildlife populations. At a recent conference at the Smithsonian Environmental Research Center, scientists disclosed WNv had been detected in 157 bird species, horses, 16 other mammals, and alligators (Marra et al 2003). In the eastern US, avian populations have incurred very high mortality, particularly crows, jays and related species. Raptor species also appear to be highly susceptible to WNv. During 2003, 36 raptors were documented to have died from WNv in Wyoming including golden eagle, red-tailed hawk, ferruginous hawk, American kestrel, Cooper's hawk, northern goshawk, great-horned owl, prairie falcon, and Swainson's hawk (Cornish et al. 2003). Actual mortality is likely to be greater. Population impacts of WNv on raptors are unknown at present. The Wyoming State Vet Lab determined 22 sage-grouse in one study project (90% of the study birds), succumbed to WNv in the PRB in 2003. While birds infected with WNv have many of the same symptoms as infected humans, they appear to be more sensitive to the virus (Rinkes 2003).

Mosquitoes can potentially breed in any standing water that lasts more than four days. In the Powder River Basin, there is generally increased surface water availability associated with CBNG development. This increase in potential mosquito breeding habitat provides opportunities for mosquito populations to increase. Preliminary research conducted in the Powder River Basin indicates WNv mosquito vectors were notably more abundant on a developed CBNG site than two similar undeveloped sites (Walker et al. 2003). Reducing the population of mosquitoes, especially species that are apparently involved with bird-to-bird transmission of WNv, such as *Culex tarsalis*, can help to reduce or eliminate the presence of virus in a given geographical area (APHIS 2002). The most important step any property owner can take to control such mosquito populations is to remove all potential man-made sources of standing water in which mosquitoes might breed (APHIS 2002).

The most common pesticide treatment is to place larvicidal briquettes in small standing water pools along drainages or every 100 feet along the shoreline of reservoirs and ponds. It is generally accepted that it is not necessary to place the briquettes in the main water body because wave action prevents this environment from being optimum mosquito breeding habitat. Follow-up treatment of adult mosquitoes with malathion may be needed every 3 to 4 days to control adults following application of larvicide (Mooney, personal conversation). These treatment methods seem to be effective when focused on specific target areas, especially near communities, however they have not been applied over large areas nor have they been used to treat a wide range of potential mosquito breeding habitat such as that associated with CBNG development.

The WDEQ and the Wyoming Department of Health sent a letter to CBNG operators on June 30, 2004. The letter encouraged people employed in occupations that require extended periods of outdoor labor, be provided educational material by their employers about WNv to reduce the risk of WNv transmission. The letter encouraged companies to contact either local Weed and Pest Districts or the Wyoming Department of Health for surface water treatment options.

3.4. Water Resources

The project area is within the Upper Powder River drainage system. The NW Croton POD is located on the east slopes of Wild Horse Creek, a tributary to the Powder River. Wild Horse Creek is a low gradient, moderately sinuous, well vegetated stream with a well defined low flow channel. The flood plain is well developed creating a wide valley bottom. The tributaries to Wild Horse Creek are typically dendritic, deeply incised, ephemeral draws with sparse vegetation on the creek slopes. Once the ephemeral draws reach the valley floor of the Wild Horse Creek watershed, their channels become well vegetated and their stream gradient considerably decreases.

The Wyoming Department of Environmental Quality (WDEQ) has assumed primacy from United States Environmental Protection Agency for maintaining the water quality in the waters of the state. The Wyoming State Engineer's Office (WSEO) has authority for regulating water rights issues and permitting impoundments for the containment of surface waters of the state. The Wyoming Oil and Gas Conservation Commission (WYOGCC) has the authority for permitting and bonding off channel pits that are located over State and fee mineral leases.

3.4.1. Groundwater

The groundwater in this project area has historically been used for stock water or domestic purposes. A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 11 registered stock and domestic water wells within one mile of a federal CBNG producing well in the POD with depths ranging from 115 to 1,050 feet. Static water levels recorded for these 11 wells ranged from artesian flowing at the surface of the well casing when it was drilled to 140 feet below ground surface (bgs). For additional information on water, please refer to the PRB FEIS (January 2003), Chapter 3, Affected Environment pages 3-1 through 3-36 (groundwater).

WDEQ water quality parameters for groundwater classifications (Chapter 8 – Quality Standards for Wyoming Groundwater) define the following general limits for Total Dissolved Solids (TDS): 500 mg/l TDS for Drinking Water (Class I), 2000 mg/l for Agricultural Use (Class II) and 5000 mg/l for Livestock Use (Class III). For additional water quality limits for groundwater, please refer to the WDEQ web site.

The ROD includes a Monitoring, Mitigation and Reporting Plan (MMRP). The objective of the plan is to monitor those elements of the analysis where there was limited information available during the preparation of the EIS. The MMRP called for the use of adaptive management where changes could be made based on monitoring data collected during implementation.

Specifically relative to groundwater, the plan identified the following (PRB FEIS ROD page E-4):

- The effects of infiltrated waters on the water quality of existing shallow groundwater aquifers are not well documented at this time;

- Potential impacts will be highly variable depending upon local geologic and hydrologic conditions;

- It may be necessary to conduct investigations at representative sites around the basin to quantify these impacts;

- Provide site specific guidance on the placement and design of CBM impoundments, and

- Shallow groundwater wells would be installed and monitored where necessary.

The production of CBNG necessitates the removal of some degree of the water saturation in the coal zones to temporarily reduce the hydraulic head in the coal. The Buffalo Field Office has been monitoring coal zone pressures as expressed in depth to water from surface since the early 1990s in the PRB (Figure 3.3).

There are several CBNG wells in the surrounding area already permitted and approved for production. The ten existing reservoirs to be used for produced water disposal in the NW Croton POD were already permitted by the WDEQ for the potential disposal of produced water from 77 wells located on state and private lands (WMP Att.L). As a result of CBNG production, the target coal zone pressure may have been reduced through off set water production. BLM has been monitoring the ground water levels and gas pressures in the deep coal zones and overlying sandstone formations for several years. As part of the Cooperative Agreement between the BLM and the CBNG operators, a series of 111 monitoring wells have been installed by the operators in the Powder River Basin to assist in this monitoring effort (PRB FIES). The Williams Cedar Draw groundwater monitoring well is located in the NWSW Sec. 15, T53N, R75W and is approximately 3.9 miles to the northeast of the closest, proposed natural gas well in the NW Croton POD. The Williams Cedar Draw groundwater monitoring well was installed by Williams Production RMT Company as a part of the BLM deep groundwater monitoring program. The initial water level in the Gates Coal, which is indicative of the pressure in the coal zone, was recorded at 216.5 feet below ground level on April 12, 2007. The most recent measurement, dated September 10, 2009 recorded the water level at 340.0 feet below ground level, for a decline of 123.5 feet since the well was completed. Since the reading of the water level on September 10, 2009 the gas pressure inside the well casing has been too high to safely and accurately retrieve water level measurements.

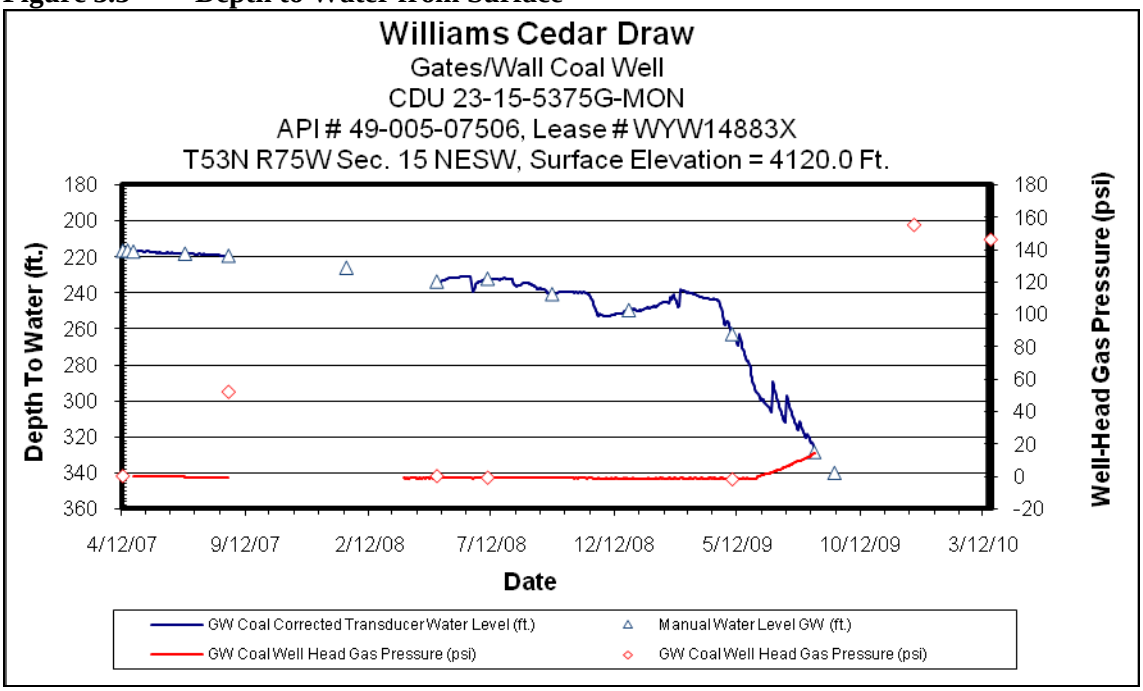
There are 3 existing groundwater monitoring wells drilled to the Wyodak-Anderson and Wall coal zones located in proximity to the NW Croton POD, as listed in the table below.

Monitor Well Name	QtrQtr	Sec	T N	R W	Distance from Lancer 1 POD, mi	Total Depth, ft	Initial WL, ft depth from surface	Most Recent WL, ft depth from surface	Drilled by	Date Installed
Williams Cedar Draw	NESW	15	53	75	3.9	1368	216.5	340.2	Williams	3-14-2006
Bull Creek	SESW	12	52	77	7.1	1672	215	233.5	Pennaco	9-17-2004
Echeta Coal	NESW	02	51	75	6.4	1679	245.9	389.9	Petro-Canada	8/4/2004

The initial water level in these monitoring wells was recorded between 215 and 246 feet below ground level prior to the majority of drilling and production in the area. In the most recent measurements, dated April 2010, the water level ranged between 234 and 390 feet below ground level.

This level of depressurization is within the potential predicted in the PRB FEIS which was determined through the Regional Groundwater Model for that document. For additional information, please refer to the PRB FEIS Chapter 4 Groundwater and the Wyoming State Geological Survey's Open File Report 2009-10 titled "1993-2006 Coalbed Natural Gas (CBNG) Regional Groundwater Monitoring Report: Powder River Basin, Wyoming" which is available on their website at http://www.wsgs.uwyo.edu.

Figure 3.3 Depth to Water from Surface



3.4.2. Surface Water

The project area is within the Wild Horse Creek watershed which is tributary to the Upper Powder River watershed. Most of the drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt) to intermittent (flowing only at certain times of the year when it receives water from alluvial groundwater, springs, or other surface source – PRB FEIS Chapter 9 Glossary). The channels are primarily well vegetated grassy swales, without defined bed and bank.

The PRB FEIS presents the historic mean Electrical Conductivity (EC, in µmhos/cm) and Sodium Adsorption Ratio (SAR) by watershed at selected United States Geological Survey (USGS) Gauging Stations in Table 3-11 (PRB FEIS page 3-49). These water quality parameters "illustrate the variability in ambient EC and SAR in streams within the Project Area. The representative stream water quality is used in the impact analysis presented in Chapter 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM produced water of varying chemical composition to surface drainages within the Project Area" (PRB FEIS page 3-48). For the Upper Powder River watershed, the EC ranges from 1,797 at Maximum monthly flow to 3,400 at Low monthly flow and the SAR ranges from 4.76 at Maximum monthly flow to 7.83 at Low monthly flow. These values were determined at the USGS station located at Arvada, WY. (PRB FEIS page 3-49).

There are 10 existing, on-channel impoundments being used for disposal of some of the produced water within the area. These impoundments are also being used for livestock watering for Floyd Land and Livestock, Inc. Each of the existing reservoirs use half tire stock tanks for the initial outfall. The stock tanks utilize an interior overflow PVC pipe to connect the stock tanks to a limestone rip rap aeration trough which in turn drains the discharge water to the reservoir. These 10 reservoirs are permitted to hold from 1.35 to 13.8 acre feet of water within their embankments and range from 1.0 to 5.4 acres of area disturbed within the drainages (Attachments F & L – WMP NW Croton). Some of these on-channel impoundments have been permitted by the WSEO to have less than 5 feet of freeboard between the average standing water level and the emergency overflow spillway elevation.

There is an existing land application of treated EMIT water being used for produced water disposal. Currently, approximately 76 acres are being irrigated for crop production using the land application disposal method. The CBNG produced water that is not disposed of into the 10 impoundments or treated and used for irrigation in the land application disposal method, is released to Wild Horse Creek after treatment at the Echeta EMIT plant (WPYDES Permit #WY0049697).

For more information regarding surface water, please refer to the PRB FEIS Chapter 3 Affected Environment pages 3-36 through 3-56.

3.5. Cultural Resources

A Class III cultural resource inventory was performed for the NW Croton POD prior to on-the-ground project work (BFO project no. 70070043). North Platte Archaeological Services conducted a block and linear class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (48CFR190) and the Wyoming State Historic Preservation Office Format, Guidelines, and Standards for Class II and III Reports. Clint Crago, BLM Archaeologist, reviewed the report for technical adequacy and compliance with Bureau of Land Management (BLM) standards, and determined it to be adequate. The results of the inventory are summarized in Table 3.7.

Table 3.7 NW Croton POD Cultural Resources Inventory Results

Site Number	Site Type	National Register Eligibility
48CA6355	Historic Homestead	Not Eligible
48CA6356	Historic Ranching Structure and Artifact Scatter	Not Eligible
48CA6368	Croton Townsite	Not Eligible
48CA6369	Historic Ranching Features	Not Eligible
48CA6370	Historic Homestead	Not Eligible

3.6. Air Quality

Existing air quality throughout most of the Powder River Basin is in attainment with all ambient air quality standards. Although specific air quality monitoring is not conducted throughout most of the Powder River Basin, air quality conditions in rural areas are likely to be very good, as characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations.

Existing air pollutant emission sources within the region include following:

- Exhaust emissions (primarily CO and nitrogen oxides [NO_X]) from existing natural gas fired compressor engines used in production of natural gas and CBNG; and, gasoline and diesel vehicle tailpipe emissions of combustion pollutants;
- Dust (particulate matter) generated by vehicle travel on unpaved roads, windblown dust from neighboring areas and road sanding during the winter months;
- Transport of air pollutants from emission sources located outside the region;
- Dust (particulate matter) from coal mines;
- NO_X, particulate matter, and other emissions from diesel trains; and
- SO_2 and NO_X from power plants.

For a complete description of the existing air quality conditions in the Powder River Basin, please refer to the PRB Final EIS Volume 1, Chapter 3, pages 3-291 through 3-299.

4. ENVIRONMENTAL CONSEQUENCES

This section describes the environmental consequences of the proposed action, The Selected Alternative. The effects analysis addresses the direct and indirect effects of implementing the proposed action, the cumulative effects of the proposed action combined with reasonably foreseeable Federal and non-federal actions, identifies and analyzes mitigation measures (COAs), and discloses any residual effects remaining following mitigation.

4.1. Alternative A

The No Action Alternative was analyzed as Alternative 3 in the PRB FEIS, and is incorporated by reference into this EA. Information specific to resources for this alternative is included within the PRB Final EIS on pages listed in Table 4.1.

Table 4.1 Location of Discussion of the No Action Alternative in the PRB FEIS

Resource		Type of Effect	Page(s) of PRB FEIS
Project Area Description	Geologic Features and Mineral Resources	Direct and Indirect Effects	4-164 and 4-134
		Cumulative Effects	4-164 and 4-134
Soils, Vegetation, and Ecological Sites	Soils	Direct and Indirect Effects	4-150
		Cumulative Effects	4-152
	Vegetation	Direct and Indirect Effects	4-163
		Cumulative Effects	4-164
	Wetlands/Riparian	Direct and Indirect Effects	4-178
		Cumulative Effects	4-178

Wildlife	Sensitive Species - Greater Sage-Grouse	Direct and Indirect Effects	4-271
		Cumulative Effects	4-271
	Aquatic Species	Direct and Indirect Effects	4-246
		Cumulative Effects	4-249
	Migratory Birds	Direct and Indirect Effects	4-234
		Cumulative Effects	4-235
	Waterfowl	Direct and Indirect Effects	4-230
		Cumulative Effects	4-230
	Big Game	Direct and Indirect Effects	4-186
		Cumulative Effects	4-211
	Raptors	Direct and Indirect Effects	4-224
		Cumulative Effects	4-225
Water	Ground Water	Direct and Indirect Effects	4-63
		Cumulative Effects	4-69
	Surface Water	Direct and Indirect Effects	4-77
		Cumulative Effects	4-69
Economics and Recovery of CBNG Resources		Direct and Indirect Effects	4-362
		Cumulative Effects	4-370
Cultural Resources		Direct and Indirect Effects	4-286
Air Quality		Direct and Indirect Effects	4-386
		Cumulative Effects	4-386
Visual Resources		Direct and Indirect Effects	4-313
		Cumulative Effects	4-314

4.2. Alternative B

4.2.1. Soils Direct and Indirect Effects

The impacts listed below, singly or in combination, would increase the potential for valuable soil loss due to increased water and wind erosion, invasive plant establishment, and increased sedimentation and salt loads to the watershed system.

The effects to soils resulting from well pad, access roads and pipeline construction include:

- Mixing of horizons – occurs where construction on roads, pipelines or other activities take place. Mixing may result in removal or relocation of organic matter and nutrients to depths where it would be unavailable for vegetative use. Soils which are more susceptible to wind and water erosion may be moved to the surface. Soil structure may be destroyed, which may impact infiltration rates. Less desirable inorganic compounds such as carbonates, salts or weathered materials may be relocated and have a negative impact on revegetation. This drastically disturbed site may change the ecological integrity of the site and the recommended seed mix.

- Loss of soil vegetation cover, biologic crusts, organic matter and productivity.

- Soil erosion would also affect soil health and productivity. Erosion rates are site specific and are dependent on soil, climate, topography and cover.

- Soil compaction – the collapse of soil pores results in decreased infiltration and increased erosion potential. Factors affecting compaction include soil texture, moisture, organic matter, clay content and type, pressure exerted, and the number of passes by vehicle traffic or machinery.

- Alteration of surface runoff characteristics.

- An important component of soils in Wyoming's semiarid rangelands, especially in the Wyoming big sagebrush cover type, are biological soil crusts, or cryptogamic soils that occupy ground area not covered with vascular plants. Biological soil crusts are important in maintaining soil stability, controlling erosion, fixing nitrogen, providing nutrients to vascular plants, increasing precipitation infiltration rates, and providing suitable seed beds (BLM 2003). They are adapted to growing in severe climates; however, they take many years to develop (20 to 100) and can be easily disturbed or destroyed by surface disturbances associated with construction activities.

Direct effects to vegetation would occur from ground disturbance caused by construction of well pads, compressor stations, ancillary facilities, associated pipelines and roads. Short term effects would occur where vegetated areas are disturbed but later reclaimed within 1 to 3 years of the initial disturbance.

Long-term effects would occur where well pads, compressor stations, roads, water-handling facilities or other semi-permanent facilities would result in loss of vegetation and prevent reclamation for the life of the project. 44.62% of the project area is in severe erosion potential areas and 16.35% in the project area have slopes of 25% or more. There is however existing fee infrastructure that directly ties into the proposed federal development that will minimize the overall impacts.

Sagebrush does not come back easily after human disturbance such as urban or agricultural development, or even after natural occurrences such as wildfire. It takes years, maybe lifetimes, for sagebrush to fully grow back. Sagebrush still hasn't returned to some areas of the Columbia Basin burned by a large fire 40 years ago (Pacific Northwest National Laboratory Shrub Steppe Ecology Series May 2010).

4.2.1.1. Severe Erosion Hazard

Soils with severe erosion hazard ratings cover 44.62% of the project area. Erosion rates are site specific and are dependent on soil, climate, topography and vegetative cover. Effects would be loss of soil vegetation cover, biologic crusts, organic matter and productivity. Soil compaction, the collapse of soil pores results in decreased infiltration and increased erosion potential. Factors affecting compaction include soil texture, moisture, organic matter, clay content and type, pressure exerted, and the number of passes by vehicle traffic or machinery.

In addition, soils which are more susceptible to wind and water erosion may be moved to the surface. Soils susceptible to erosion may be exposed to increased sedimentation. Effects would be erosion, increased gullies, and sedimentation. Soil erosion would also affect soil health and productivity. Impacts from erosion will be reduced with use of BLM applied mitigation.

Specifically, severe erosion hazard affect the NW Croton POD in these locations:

- R Floyd Fed 33-24-5376WA road, pipelines, and wells pad,
- R Floyd Fed 21-24-5376WA road and pipelines,
- R Floyd Fed 23-24-376WA well pads.

4.2.1.2. Slopes Hazard

Approximately 25% of the project area is on slopes >25%. Roads, pipelines, and wells pads were placed in the flattest areas possible. Due to the rough topography impacts of side slopes greater than 25% could not be avoided on the following engineered road sections:

- Engineered Road R Floyd Fed STA 10+00 to 30+39.36

Expectations for successful reclamation, of the above listed road sections, is enhanced by incorporating

the design features LOG proposed in NW Croton POD. Impacts to soils and vegetation from surface disturbance will be reduced by following with use of BLM applied mitigation.

4.2.1.2.1. Cumulative Effects

The designation of the duration of disturbance is defined in the PRB FEIS (pg 4-1 and 4-151). Most soil disturbances would be short term impacts with expedient interim reclamation and site stabilization, as committed to by the operator in their POD Surface Use Plan and as required by the BLM in COAs.

Geomorphic effects of roads and other surface disturbance range from chronic and long-term contributions of sediment into waters of the state to catastrophic effects associated with mass failures of road fill material during large storms. Roads can affect geomorphic processes primarily by: accelerating erosion from the road surface and prism itself through mass failures and surface erosion processes; directly affecting stream channel structure and geometry; altering surface flow paths, leading to diversion or extension of channels onto previously unchannelized portions of the landscape; and causing interactions among water, sediment, and debris at road-stream crossings.

These impacts, singly or in combination, could increase the potential for valuable soil loss due to increased water and wind erosion, invasive/noxious/poisonous plant spread, invasion and establishment, and increased sedimentation and salt loads to the watershed system.

4.2.1.2.2. Mitigation Measures

- Impacts to soils and vegetation from surface disturbance will be reduced by following the BLM applied mitigation. Required, interim and final reclamation practices will help stabilize the disturbed areas and start to return desired vegetation in 1 to 3 years.

- Due to poor severely erosive soils and slopes greater than 25 percent, the engineer's section of the access road (Engineered Road R Floyd Fed STA 10+00 to 30+39.36) to the 33-24-5376WA well, will be stabilized during and within 30 days of the start of construction.

- The access road to the Well # 23-24 location in sections 25 has an existing active head cut. A COA to maintain a 20' vegetative buffer near the head cut on the access road will be implemented in order to maintain a vegetative buffer which would prevent an increase in water velocity and head cutting.

- The operator will follow the guidance provided in the Wyoming Policy on Reclamation (IM WY-90-231). 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.

- Compaction would be remediated by plowing or ripping.

4.2.1.2.3. Residual Effects

Residual Effects were identified in the PRB FEIS at page 4-408 such as the loss of vegetative cover, despite expedient reclamation, for several years until reclamation is successfully established.

4.2.1.2.4. Invasive Species

4.2.1.2.4.1. Direct and Indirect Effects

The use of existing facilities along with the surface disturbance associated with construction of proposed access roads, pipelines, water management infrastructure, produced water discharge points and related facilities would present opportunities for weed invasion and spread.

4.2.1.2.4.2. Cumulative Effects

Produced CBNG water would likely continue to modify existing soil moisture and soil chemistry regimes in the areas of water release and storage. The activities related to the performance of the proposed project would create a favorable environment for the establishment and spread of noxious weeds/invasive plants

4.2.1.2.4.3. Mitigation Measures

The operator has committed to the control of noxious weeds and species of concern using the following measures identified in their Integrated Pest Management Plan (IPMP):

1. Control Methods include physical, biological, and chemical methods:

   Physical methods include mowing during the first season of establishment, prior to seed formation, and hand pulling of weeds (for small or new infestations). Biological methods include the use of domestic animals, or approved biological agents. Chemical methods include the use of herbicides, done in accordance with the existing Surface Use Agreement with the private surface owner.

2. Preventive practices:

   Certified weed-free seed mixtures will be used for re-seeding, and vehicles and equipment will be washed before leaving areas of known noxious weed infestations. Specifically, a small infestation of Canada thistle was found during the onsite at the R Floyd Fed 21-24-5376WA well location.

3. Education:

   The company will provide periodic weed education and awareness programs for its employees and contractors through the county weed districts and federal agencies. Field employees and contractors will be notified of known noxious weeds or weeds of concern in the project area.

4.2.1.2.4.4. Residual Effects

Control efforts by the operator are limited to the surface disturbance associated the implementation of the project. Cheatgrass and other invasive species that are present within non-physically disturbed areas of the project area are anticipated to continue to spread unless control efforts are expanded. Cheat grass and to a lesser extent, Japanese brome (*B. japonicus*) are found in such high densities and numerous locations throughout NE Wyoming that a control program is not considered feasible at this time; these annual bromes would continue to be found within the project area.

4.2.1.2.5. Wetlands/Riparian

4.2.1.2.5.1. Direct and Indirect Effects

Re-surfacing water from the impoundments will potentially allow for wetland-riparian species establishment. Continuous high stream flows into wetlands and riparian areas would change the composition of species and dynamics of the food web. The shallow groundwater table would rise closer to the surface with increased and continuous stream flows augmented by produced water discharges. Vegetation in riparian areas, such as cottonwood trees, that cannot tolerate year-round inundated root zones would die and would not be replaced. Other plant species in riparian areas and wetland edges that favor inundated root zones would flourish, thus changing the plant community composition and the

associated animal species. A rise in the shallow ground groundwater table would also influence the hydrology of wetlands by reducing or eliminating the seasonal drying periods that affect recruitment of plant species and species composition of benthic and water column invertebrates. These changes to the aquatic food web base would affect the higher tropic levels of fish and waterfowl abundance and species richness for wetlands and riparian areas." (PRB FEIS Page 4-175).

"As water production decreases toward the end of the project, wetland/riparian areas would contract, returning to the pre-project sizes. Areas of excessive erosion or sediment deposition may cease to function as wetland/riparian areas. All of these changes in the extent of wetland/riparian areas would provide opportunities for aggressive species, including noxious weeds, to invade disturbed areas." (PRB FEIS Page 4-406)

The PRB FEIS identified effects to gallery forests of mature cottonwood trees stating that "(they) may be lost by bank undercutting caused by the increased surface water flows in channels." Included in the ROD is programmatic mitigation "which may be appropriate to apply at the time of APD approval if site specific conditions warrant."(ROD page A-30). One of the conditions included in that section addresses the impact to trees in A.5.8-2: "To reduce adverse effects on existing wetlands and riparian areas, water discharge should not be allowed if increased discharge volumes or subsequent recharge of shallow aquifers will inundate and kill woody species, such as willows or cottonwoods."(ROD Page A-32).

4.2.1.2.5.2. Cumulative Effects

Potential cumulative effects to the wetland and riparian areas are adequately covered in Chapter 4, pages 4-178 to 179 of the PRB FEIS.

4.2.1.2.5.3. Mitigation Measures

Mitigation measures that will help to protect the riparian and wetland habitat potentially affected by the activities described in this EA include, but are not limited to, the control of noxious weeds, adherence to the WPDES permit requirements for the water quality and quantity monitoring of the discharges tied to this POD development, road crossing maintenance, and enforcement of the COA's and BMP's associated with this CBNG development.

4.2.1.2.5.4. Residual Effects

There will be changes to wetland and riparian areas through alterations in volume, velocity, timing and quality of the stream flow due to direct discharge. Turbidity and solids loading in the streams would probably increase due to erosion of project disturbed areas and sediment transport to the associated drainages. These impacts would be mitigated by expediently stabilizing the disturbance and reducing the amount of sediment reaching the streams.

4.2.2. Wildlife

4.2.2.1. Habitat Types

4.2.2.1.1. Direct and Indirect Effects

The NWC project will result in minimal direct loss of sagebrush. Sage brush stands are limited within the project. Fragmentation of sage brush will be minimal, because an existing access road travels through a stand of sage brush (largest quality sage-grouse nesting habitat within the POD) located in the North ½ of Section 23 T53N:R73W. The dominate vegetation through most of the project is cheat grass Fragmentation of habitats is one of the primary threats to wildlife (USFWS 2010, Nicholoff 2003, Hebblewhite 2008). Fragmentation of shrubsteppe habitat is a major disruption that has consequences for sagebrush-obligate species (Braun et al. 1976; Rotenberry & Wiens 1980). In fragmented habitats, suitable habitat area remains only as remnants surrounded by unusable environments (Urban and Shugart 1984; Fahrig and Paloheimo 1988).

When sagebrush habitats are lost or fragmented, sagebrush-obligate species decline through several mechanisms: areas of suitable habitat decrease (Temple & Cary 1988), lower reproduction rates ensue, and/or higher mortality occurs in remaining habitats (Robinson 1992; Porneluzi et al. 1993). Density of sagebrush-obligate birds within 100m of roads constructed for natural gas development in Wyoming was 50% lower than at greater distances (Ingelfinger 2001). Fragmentation of shrubsteppe has the further potential to affect the conservation of sagebrush-obligate species because of the permanence of disturbance (Knick and Rotenberry 1995). Several decades are required to reestablish ecologically functioning, mature sagebrush communities. Due to this, sagebrush obligate species may not return for many years after reclamation activities are completed.

4.2.2.1.2. Cumulative Effects

Cumulative effects would include impacts associated with additional fee development and ongoing livestock grazing. Fee development in the vicinity would further exacerbate loss of sagebrush habitat through direct loss and effects of additional fragmentation and degradation of habitat quality. Appropriate levels of livestock grazing would not contribute to loss of sagebrush habitat, but inappropriate grazing can cause detrimental impacts to sagebrush habitats through alterations in understory communities, relative abundance of species, and changes in structure of the sagebrush canopy. Areas treated to eliminate sagebrush in order to favor herbaceous growth for livestock can result in direct loss of sagebrush habitat.

4.2.2.1.3. Mitigation Measures

No additional mitigation measures are proposed.

4.2.2.1.4. Residual Effects

Because no mitigation measures are proposed, there are no residual effects.

4.2.2.2. Threatened, Endangered, Proposed, and Candidate Species

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Endangered				
Black-footed ferret (*Mustela nigripes*)	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NS	NLAA	Species is not suspected to occur in area
Blowout penstemon (*Penstemon haydenii*)	Sparsely vegetated, shifting sand dunes	NP	NE	No suitable habitat present.
Threatened				
Ute ladies'-tresses orchid (*Spiranthes diluvialis*)	Riparian areas with permanent water	NP	NE	No suitable habitat present.
Proposed				
Mountain plover (*Charadrius montanus*)	Short-grass prairie with slopes < 5%	NP	NLJ	No suitable habitat present.
Candidate				
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	K	NLAA	Sagebrush cover will be affected. Human presence and traffic will increase.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Presence **K -** Known, documented observation within project area. **S -** Habitat suitable and species suspected, to occur within the project area. **NS -** Habitat suitable but species is not suspected to occur within the project area. **NP -** Habitat not present and species unlikely to occur within the project area. **Project Effects** **LAA -** Likely to adversely affect **NE -** No Effect **NLAA -** May Affect, not likely to adversely affect individuals or habitat. **NLJ –** Not likely to jeopardize species existence.				

4.2.2.2.1. Threatened and Endangered Species

4.2.2.2.1.1. Black-Footed Ferret

4.2.2.2.1.1.1. Direct and Indirect Effects

Direct and indirect effects to black-footed ferret are discussed in the PRB FEIS. Prairie dog colonies will be impacted by proposed activities as depicted by Figure W1. Suitable habitat is of sufficient size to support a black-footed ferret population and the project area is in the Arvada prairie-dog complex, identified by WGFD as a potential black-footed ferret reintroduction site. It is extremely unlikely that black-footed ferrets are present in the project area. However, if any become present, the proposed action will most likely make portions of the project area unsuitable for ferret inhabitance. Implementation of the proposed development "*may affect, but is not likely to adversely affect*" the black-footed ferret.

4.2.2.2.1.1.2. Cumulative Effects

The cumulative effects to black-footed ferrets are discussed in the PRB FEIS (pg. 4-251).

4.2.2.2.1.1.3. Mitigation Measures

No mitigation measures are proposed.

4.2.2.2.1.1.4. Residual Effects

Because no mitigation measures will be applied, no residual effects will remain.

4.2.2.2.1.2. Blowout penstemon

4.2.2.2.1.2.1. Direct and Indirect Effects

Suitable habitat is not present within the project area. Implementation of the proposed coal bed natural gas project will have no effect on blowout penstemon.

4.2.2.2.1.2.2. Cumulative Effects

The proposed project will have no effect on blowout penstemon.

4.2.2.2.1.2.3. Mitigation Measures

No mitigation measures are proposed with **Alternative** B.

4.2.2.2.1.2.4. Residual Effects

Because no mitigation measures will be applied, no residual effects will remain.

4.2.2.2.1.3. Ute Ladies'-Tresses Orchid

4.2.2.2.1.3.1. Direct and Indirect Effects

Suitable habitat is not present within the project area. Implementation of the proposed coal bed natural gas project will have **no effect** on Ute ladies'-tresses.

4.2.2.2.1.3.2. Cumulative Effects

The proposed project will have no effect on ULT.

4.2.2.2.1.3.3. Mitigation Measures

No mitigation measures are proposed with **Alternative** B.

4.2.2.2.1.3.4. Residual Effects

Because no mitigation measures will be applied, no residual effects will remain.

4.2.2.2.2. Proposed Species

4.2.2.2.2.1. Mountain Plover

4.2.2.2.2.1.1. Direct and Indirect Effects

An analysis of direct and indirect impacts to mountain plover due to oil and gas development is included in the PRB FEIS (pp. 4-254 to 4-255).

Mountain plovers have been forced to seek habitat with similar qualities that may be poor quality habitat when loss or alteration of their natural breeding habitat (predominantly prairie dog colonies) occurs, such as heavily grazed land, burned fields, fallow agriculture lands, roads, oil and gas well pads and pipelines. These areas could become reproductive sinks. Adult mountain plovers may breed there, lay eggs and hatch chicks; however, the young may not reach fledging age due to the poor quality of the habitat. Recent analysis of the USWFS Breeding Bird Survey (BBS) data suggests that mountain plover populations have declined at an annual rate of 3.7 % over the last 30 years which represents a cumulative decline of 63% during the last 25 years (Knopf and Rupert 1995).

Use of roads and pipeline corridors by mountain plovers may increase their vulnerability to vehicle collision.

4.2.2.2.2.1.2. Cumulative Effects

The cumulative impacts to mountain plovers are discussed in the PRB FEIS.

4.2.2.2.2.1.3. Mitigation Measures

Mountain plovers undetected by surveys that may use the area will receive some protection from raptor and sage-grouse timing limitations.

4.2.2.2.2.1.4. Residual Effects

There is a potential for plovers to be impacted by project related traffic outside the project boundary.

4.2.2.2.3. Candidate Species

4.2.2.2.3.1. Greater Sage-grouse

4.2.2.2.3.1.1. Direct and Indirect Effects

Impacts to sage-grouse associated with energy development are discussed in detail in the *12-Month Findings for Petitions to List the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered* (USFWS 2010). An existing two-track road that services two existing fee wells and two existing water impoundments in the north ½ of section 23 and north ½ of section 24, T53N, R76W travels through high quality nesting habitat. With the addition of two proposed wells (#21-24-5376 and #43-24-

5376) associated with the NWC POD, increase traffic and improved road maintenance will directly impact sage-grouse habitat.

Indirect effects include habitat fragmentation (i.e., habitat partitioning trending toward isolation) and degradation associated with: 1) human-caused displacement; 2) auditory disturbance; 3) infrastructure avoidance; 4) changes in predator species composition, abundance, and efficacy; 5) facilitated infestation and spread of noxious weeds; and 6) spread of west Nile virus. These effects are difficult to quantify but are related to disturbance arrangement, intensity, and extent. Indirect effects may extend for some distance; reducing habitat effectiveness in zones surrounding CBNG developments (WGFD 2009).

Project designs to reduce impacts to sage-grouse applied by LOG and BLM for the NWC project included; moving wells and infrastructure out of high quality habitat, consolidation of utilities and access into corridors (see design features (table 1.1), burying overhead power, utilizing existing water impoundments, and the use of monitored through telemetry, thereby reducing the number of visits needed to wells in sage-grouse habitat. Further information regarding direct and indirect impacts to sage-grouse is provided in the PRB FEIS on pg. 4-257 to 4-273. Impacts to sage-grouse are generally a result of loss and fragmentation of sagebrush habitats associated with roads and infrastructure. Fragmented sagebrush stands increase hunting opportunity for predators.

4.2.2.2.3.1.2. Cumulative Effects

Energy development began in the PRB in the late 1800's, but development accelerated after the 1960's and has included mainly coal mining, conventional oil, and development of CBNG (BLM 2005). Energy-related surface disturbance in the PRB was projected to increase from 220,257 acres in 2003 to 514,732 acres by 2020 (BLM 2005). While reclamation measures have been, or will be applied to most of this area, habitat function for sage-grouse will not recover for many decades. Sage-grouse have re-occupied disturbed areas following ecological recovery (Braun 1998). However, energy-related disturbances are occurring at much greater rates than ecosystem recovery. Consequently, energy-related impacts to sage-grouse accrue as disturbance advances across the landscape.

Generally declining trends in sage-grouse lek attendance attributable to CBNG development in the PRB occur due to the effects of decreasing lek-to-well distance, and increasing well density that manifest over time following development (Harju et al. 2010). Recent research suggests that the combined effects of past, current, and foreseeable CBNG development within the vicinity of the project area are likely to impact the local sage-grouse population, cause declines in lek attendance, and may result in local extirpation.

The PRB FEIS (BLM 2003) states that "the synergistic effect of several impacts would likely result in a downward trend for the sage-grouse population, and may contribute to the array of cumulative effects that may lead to its federal listing. Local populations may be extirpated in areas of concentrated development, but viability across the Project Area (Powder River Basin) or the entire range of the species is not likely to be compromised (pg. 4-270).

4.2.2.2.3.1.3. Mitigation Measures

Based on the summary of research describing the impacts of energy development on sage-grouse, efforts to reduce habitat loss and fragmentation are likely to be the most effective in ensuring long-term lek persistence. Design features specifically included in the proposed action under Alternative B to minimize impacts to sage-grouse include:

- Bury 3-phase power from power drops to wells. (Reduce vertical intrusions on landscape)
- Most of the proposed wells are located near or within existing roads, (Reduce fragmentation to sage brush patch size)

- LOG will incorporate remote monitoring telemetry. (Reduce human visitation once wells are producing)
- Mosquito larvae will be treated in water impoundments. (Reduce potential for West Nile virus).

4.2.2.2.3.1.4. Residual Effects

Recent research suggests more effective mitigation strategies include, at a minimum, burying power lines (Connelly et al. 2000 b); minimizing road and well pad construction, vehicle traffic, and industrial noise (Lyon and Anderson 2003, Holloran 2005); and managing produced water to prevent the spread of mosquitoes with the potential to vector West Nile virus in sage grouse habitat (Walker et al 2007).

The multi-state recommendations presented to the WGFD for identification of core sage grouse areas acknowledges there may be times when development in important sage grouse breeding, summer, and winter habitats cannot be avoided. In those instances they recommend, "…infrastructure should be minimized and the area should be managed in a manner that effectively conserves sagebrush habitats (State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development 2008)

4.2.2.3. Sensitive Species

BLM will take necessary actions to meet the policies set forth in sensitive species policy (BLM Manual 6840). BLM Manual 6840.22A states that "The BLM should obtain and use the best available information deemed necessary to evaluate the status of special status species in areas affected by land use plans or other proposed actions and to develop sound conservation practices. Implementation-level planning should consider all site-specific methods and procedures which are needed to bring the species and their habitats to the condition under which the provisions of the ESA are not necessary, current listings under special status species categories are no longer necessary, and future listings under special status species categories would not be necessary."

4.2.2.3.1. Direct and Indirect

The Sensitive Species Worksheet in the Appendix summarizes the habitat requirements and potential impacts of the NWC POD project on all Wyoming BLM sensitive species that occur in the BFO administrative area. Some sensitive species are of particular concern in the project area, due to their demonstrated or suspected sensitivity to CBNG development or because they were recently considered for listing under the ESA and are discussed further. The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.2.3.2. Sensitive Species Cumulative Effects

The cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS (pp. 4-257 to 4-273).

4.2.2.3.3. Mitigation Measures

No further mitigation measure applied.

4.2.2.3.4. Residual Impacts

None identified.

4.2.2.3.5. Bald Eagle

4.2.2.3.5.1. Direct and Indirect Effects

Impacts to bald eagles are discussed in the PRB FEIS on pg. 4-251 to 4-253. A more recent study completed in 2004 suggests that two-tracks and improved project roads pose minimal collision risk to bald eagles. In one year of monitoring road-side carcasses the BLM BFO reported 439 carcasses, 226 along Interstates (51%), 193 along paved highways (44%), 19 along gravel county roads (4%), and 1 along an improved CBNG road (<1%) (Bills 2004). No road-killed eagles were reported; bald and golden

eagles were observed feeding on 16 of the reported road-side carcasses (<4%). The risk of big-game vehicle-related mortality along CBNG project roads is so insignificant or discountable that when combined with the lack of bald eagle mortalities associated with highway foraging leads to the conclusion that CBNG project roads do not affect bald eagles.

Activities associated with the NWC POD project may impact bald eagles by disturbing birds foraging in the area. The project will not impact any identified nests or winter roost concentration areas.

4.2.2.3.5.2. Cumulative Effects

The cumulative effects for bald eagles associated with Alternative B are described in the PRB FEIS (pp. 4-251 to 4-253).

4.2.2.3.5.3. Mitigation Measures

No further mitigation measure applied.

4.2.2.3.5.4. Residual Effects

There will be increased traffic in the general area resulting from this project which may increase disturbance to foraging bald eagles in the NWC POD area.

4.2.2.3.6. Brewer's Sparrow

4.2.2.3.6.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Expected project impacts are discussed in the greater sage-grouse section and habitat types section.

4.2.2.3.6.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.2.3.6.3. Mitigation Measures

No further mitigation measure applied.

4.2.2.3.6.4. Residual Effects

None identified.

4.2.2.3.7. Loggerhead Shrike

4.2.2.3.7.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Expected project impacts are discussed in the greater sage-grouse section and habitat types section.

4.2.2.3.7.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.2.3.7.3. Mitigation Measures

No further mitigation measure applied.

4.2.2.3.7.4. Residual Effects

None identified.

4.2.2.3.8. Sage Sparrow

4.2.2.3.8.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Expected project impacts are

discussed in the greater sage-grouse section and habitat types section.

4.2.2.3.8.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.2.3.8.3. Mitigation Measures

No further mitigation measure applied.

4.2.2.3.8.4. Residual Effects

None identified.

4.2.2.3.9. Sage Thrasher

4.2.2.3.9.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Expected project impacts are discussed in the greater sage-grouse section and habitat types section.

4.2.2.3.9.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.2.3.9.3. Mitigation Measures

No further mitigation measure applied.

4.2.2.3.9.4. Residual Effects

None identified.

4.2.2.3.10. Western Burrowing Owl

4.2.2.3.10.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Nest # 6049 is a burrow nest located next to a county road and a proposed access road for the #23-24-5376 well. The nest was reported inactive during 2006 and 2010 nesting season. Due to the location of the nest next to a county road that receives traffic associated with CBNG development and agricultural use, it is more than likely that additional use from one CBNG well will not impact the nesting pair if the pair should utilize the nest in the future. Federal CBNG related surface disturbing activities will not be allowed within 0.25 miles from the nest if the nest becomes active in the future. Use of roads and pipeline corridors may increase owl vulnerability to vehicle collision. See prairie dog direct and indirect section. For site specie direct effects to burrowing owl habitat.

4.2.2.3.10.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. A condition of approval will reduce possible impacts to nesting burrowing owls during breeding season.

4.2.2.3.10.3. Mitigation Measures

The Thunder Basin National Grasslands in Campbell County, WY, who cooperated with the BLM in the creation of the 2003 PRB EIS, recommends a 0.25 mile timing restriction buffer zone for burrowing nest locations during their nesting season (April 15 to August 31). Instruction Memorandum No. 2006-197, directs the field offices to “use the least restrictive stipulations that effectively accomplish the resource objectives or uses.” Alteration of the general raptor nest timing limitation (Feb 1 to July 31) to a more specific burrowing owl nesting season timing limitation will effectively reduce the vulnerability of owls to collision while shortening the timing restriction period to four and one half months (See Chapter 3 for

breeding, nesting, and migration chronology) from six and one half months and from 0.5 mile to 0.25 mile.

4.2.2.3.10.4. Residual Effects

None identified.

4.2.2.3.11. Black-tailed Prairie Dog

4.2.2.3.11.1. Direct and Indirect Effects

Impacts to black-tailed prairie dogs are discussed in the PRB FEIS on pg. 4-255 to 4-256.

An existing two-track road proposed for improvement passes through a prairie dog colony in (0.25miles) NW and (0.20 miles) SESE of section 23, (0.70 miles) NW Section 24, and (0.25 miles) NENW Section 25 T53N, R76W. Because they are existing roads on private surface, and re-routing would cause greater resource impacts, no attempt was made to re-route the roads except for the access road to the 34-24 well. This road was moved west and out an active prairie dog to reduce impacts to prairie dogs and the landowners hay field. There will be direct habitat loss associated with the road construction, and vehicle traffic will increase prairie dog mortality along approximately 1.2 miles of road.

4.2.2.3.11.2. Cumulative Effects

During construction of those facilities mentioned above in the direct and indirect section, there is the possibility that many of the prairie dogs within these colonies may be killed as a direct result of the earth moving equipment. Constant noise and movement of equipment and the destruction of burrows puts considerable stress on the animals and will cause an increase in prairie dog mortalities. During the construction of these facilities individuals are exposed more frequently to predators and have less protective cover.

Individuals that survive the excavation process will likely be displaced. As the prairie dog town grows in size, prairie dogs move from an area of high population density to an area of low population density. The expansion of the colony/town is from the center out to the edges. Male prairie dogs resort to either long-distance dispersal to new colonies (mostly as yearlings, rarely as adults) or short distance within the home colony. Female prairie dogs disperse over long distances to other colonies (as either yearlings or adults). Short-distance dispersal of females within the home colony almost never occurs (Hoogland 1995). Dispersal of prairie dogs occurs as single individuals. Both male and female prairie dogs prefer to move into an existing colony or one that has been abandoned rather than start a completely new colony. Coterie (small family group within the colony) members resist attempted invasions by conspecifics including immigrants. Dispersing prairie dogs have increased stress levels, higher exposure to predators, and are unlikely to be accepted by other colonies if they even encounter one. Both males and females actively protect their coterie territories from invading males and females (Hoogland 1995).

The well house and nearby power poles may provide habitats for mammal and avian predators increasing prairie dog predation. Mineral related traffic on the adjacent road may result in prairie dog road mortalities. The cumulative effects for black-tailed prairie dogs associated with Alternative B are described in the PRB FEIS (pp. 4-255 to 4-256).

4.2.2.3.11.3. Mitigation Measures

No further mitigation measure applied.

4.2.2.3.11.4. Residual Effects

None identified.

4.2.2.4. Big Game

4.2.2.4.1. Direct and Indirect Effects

Under Alternative B winter yearlong range for mule deer and yearlong range for pronghorn would be directly impacted by the construction of wells, roads and other infrastructure related to mineral development, see Table 2.1 Summary of the Alternatives for direct disturbance proposed within the NWC POD.

In addition to the direct habitat loss and potential vehicle collisions big game would likely be displaced from the project area during drilling and construction (Hiatt and Baker 198). The amount of anticipated big game habitat disturbance warrants effective reclamation efforts designed to facilitate re-establishment of diverse plant community assemblages including sagebrush, grass, and food-forbs. Further information regarding direct and indirect effects to big game is provided in the PRB FEIS on pp. 4-181 to 4-215.

Elk within the project area are part of the Fortification herd unit. The following is an example of recent elk response to CBNG development based on three of the Fortification Creek elk collared in March 2008 (not the same three elk utilizing the NW Croton project area): The three collared elk were located, between April 8th and April 18th, within 0.5 miles of proposed non-federal CBNG development. Beginning in May 2008, multiple well drilling operations were initiated within the immediate area and no collared elk locations have been recorded in the area since. Two elk moved northeast approximately 6 and 16 miles respectively and the third moved south approximately 7 miles. All three elk have continued to seek areas without CBNG development.

Extrapolation of this scenario would indicate that elk using the northeast portion of the POD will likely become displaced during construction and maintenance activities. These elk will likely return to the Fortification Creek SMA; however they may move further away from the SMA. Elk will likely move through the project area after construction and forage within it on occasion. However because current elk use is so light, the additional impacts resulting from this alternative are considered to be minimal.

4.2.2.4.2. Cumulative Effects

The project area is located entirely outside of the Fortification Creek elk yearlong range, and therefore, not included in the Cumulative Impacts Assessment Area incorporated in the analysis of recently permitted projects' impacts. For a description of the cumulative effects of CBNG development on the Fortification elk herd within the Cumulative Impacts Assessment Area, see the Williams Draw Unit Gamma and Delta PODs EA (WY-070-08-042).

The project area located entirely outside of the Fortification Creek elk planning area, which is currently being analyzed in an RMP amendment; therefore, the cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, pg. 4-181 to 4-215.

4.2.2.4.1. Mitigation Measures

No timing restrictions are typically applied specifically to protect elk, deer, and pronghorn outside of crucial ranges. Within the NW Croton project area, when and where raptor nesting and/or sharp-tailed grouse breeding and nesting timing limitations are applied, big game animals will also receive protection.

4.2.2.4.2. Residual Impacts

While big game animals are expected to return to the project area following construction, continued human-caused disturbance associated with operation and maintenance may result in reduced local populations because big game may fail to habituate to the new disturbances (Lustig 2003). Habitat effectiveness for big game is anticipated to be reduced in the project area.

4.2.2.5. Upland Game Birds

4.2.2.5.1. Plains Sharp-tailed Grouse

4.2.2.5.1.1. Direct and Indirect Effects

An existing staging area located approximately 250ft north of the Floyd sharp-tailed lek will be used for a staging area in NWC project. Surveys will be conducted before the staging area will be utilized. Although the staging has been utilized for fee CBNG activity in the past, it is likely grouse have already been impacted if they did breed the historic 41-Floyd lek.

4.2.2.5.1.2. Cumulative Effects

Increase traffic from this project may cause mortality along access roads and increase predation. Surveys will identify known leks, however activity outside of leks will not have stipulations that will reduce human activity, ground disturbing activity (plowing and mowing), and design feature that reduce predation.

4.2.2.5.1.3. Mitigation Measures

In the event the Floyd sharp-tailed lek should become active during breeding season, then a 0.25 mile avoidance buffer will be applied to lek during the spring breeding season, from April 1 through May 31.

4.2.2.5.1.4. Residual Impacts

Similar to those impacts described in sag-grouse section.

4.2.2.6. Aquatic Species

4.2.2.6.1. Direct and Indirect Effects

Most of the produced water from CBNG wells in the NWC POD will be piped to existing water impoundments. Due to the land owner request, some amount of produced water will be stored in two stock tanks for domestic livestock and wildlife use.

4.2.2.6.2. Cumulative Effects

The cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, (pp. 4-247 to 4-249).

4.2.2.6.3. Mitigation Measures

No further mitigation measure applied.

4.2.2.6.4. Residual Impacts

None identified.

4.2.2.7. Migratory Birds

4.2.2.7.1. Direct and Indirect Effects

Direct and indirect effects to migratory birds are discussed in the PRB FEIS (pp. 4-231 to 4-235).

Disturbance of habitat within the project area is likely to impact migratory birds. Native habitats will be lost directly with the construction of wells, roads, and pipelines. Reclamation and other activities that occur in the spring may be detrimental to migratory bird survival. Prompt re-vegetation of short-term disturbance areas should reduce habitat loss impacts. Activities will likely displace migratory birds farther than the immediate area of physical disturbance. Drilling and construction noise can be troublesome for songbirds by interfering with the males' ability to attract mates and defend territory, and the ability to recognize calls from conspecifics (BLM 2003).

Habitat fragmentation will result in more than just a quantitative loss in the total area of habitat available; the remaining habitat area will also be qualitatively altered (Temple and Wilcox 1986). Ingelfinger (2004) identified that the density of breeding Brewer's sparrows declined by 36% and breeding sage sparrows

declined by 57% within 100 m of dirt roads within a natural gas field. Effects occurred along roads with light traffic volume (<12 vehicles per day). The increasing density of roads constructed in developing natural gas fields exacerbated the problem creating substantial areas of impact where indirect habitat losses through displacement were much greater than the direct physical habitat losses.

Those species that are edge-sensitive will be displaced further away from vegetative edges due to increased human activity, causing otherwise suitable habitat to be abandoned. If the interior habitat is at carrying capacity, then birds displaced from the edges will have no place to relocate. One consequence of habitat fragmentation is a geometric increase in the proportion of the remaining habitat that is near edges (Temple 1986). In severely fragmented habitats, all of the remaining habitat may be so close to edges that no interior habitat remains (Temple and Cary 1988). Over time, this leads to a loss of interior habitat species in favor of edge habitat species. Other migratory bird species that utilize the disturbed areas for nesting may be disrupted by the human activity, and nests may be destroyed by equipment.

Migratory bird species within the Powder River Basin nest in the spring and early summer and are vulnerable to the same effects as sage-grouse and raptor species. Though no timing restrictions are typically applied specifically to protect migratory bird breeding or nesting, where sage-grouse or raptor nesting timing limitations are applied, nesting migratory birds are also protected. Where these timing limitations are not applied and migratory bird species are nesting, migratory birds remain vulnerable.

4.2.2.7.2. Cumulative Effects

The cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, pg. 4-235. No additional mitigation measures are required. See Habitat types for further effects to habitat.

4.2.2.7.3. Mitigation Measures

Migratory bird species within the Powder River Basin nest in the spring and early summer and are vulnerable to the same effects as sage-grouse and raptor species. Though no timing restrictions are typically applied specifically to protect migratory bird breeding or nesting, where raptor nesting timing limitations will be applied, nesting migratory birds will also receive protection.

A Condition of Approval requiring all stock tanks to be equipped and maintained with effective wildlife escape devices that will reduce potential bird mortality from drowning.

4.2.2.7.4. Residual Effects

Protections around active raptor nests (Feb 1- July 31) extend past most migratory bird nesting seasons. Only a percentage of known nest are active any given year, so the protections for migratory birds from June 15-July 31 will depend on how many raptor nests are active, otherwise these area will not be protected. It is more than likely that nesting pairs of song birds in the project area will have their nest destroyed by human activity (mowing or plowing) or predation.

4.2.2.8. Raptors

4.2.2.8.1. Direct and Indirect Effects

Human activities in close proximity to active raptor nests may interfere with nest productivity. Romin and Muck (1999) indicate that activities within 0.5 miles of a nest are prone to cause adverse impacts to nesting raptors. If mineral activities occur during nesting, they could be sufficient to cause adult birds to remain away from the nest and their chicks for the duration of the activities. This absence can lead to overheating or chilling of eggs or chicks and can result in egg or chick mortality. Prolonged disturbance can also lead to the abandonment of the nest by the adults. Routine human activities near these nests can also draw increased predator activity to the area and resulting in increased nest predation.

To reduce the risk of decreased productivity or nest failure, the BLM BFO requires a 0.5 mile radius timing limitation during the breeding season around active raptor nests and recommends all infrastructure requiring human visitation be located in such a way as to provide adequate biologic buffer for nesting raptors. A biologic buffer is a combination of distance and visual screening that provides nesting raptors with security such that they will not be flushed by routine activities. According to BLM data base, the following seven nests are within 0.5 miles of the NWC POD; 3945, 3946, 4459, 6675, 6576, 12410, and 12141.

Nest #3945 was reported gone in 2007, 2008 (BFO), and in 2009. Nest # 6675 was reported gone in 2010; therefore these nests will not be impacted by this project.

Nest # 3946 was active in 2006-2007 by a long-eared owl. In 2008 a Cooper's hawk occupied the nest. In 2009-2010 the nest was reported inactive. The nest is approximately 0.1 mile and out of line of sight from the access road that services the following two proposed wells in this project; well # 21-24-5376, and well #43-24-5376. There is an existing fee well located approximately 0.13 miles south of the nest, therefore it is likely that the nesting pair have become habituated to CBNG associated activities, or that the nesting pair has been impacted by the before mentioned activity which may be the reason for no nesting activity in the last two years. The nest is reported in good condition in 2010 and was active within the last three years

Nest # 4459 is located approximately 964 ft north and out of line of sight from the access road that services the following two proposed wells in this project; well # 21-24-5376, and well #43-24-5376. The nest was reported active by a great horned owl in 2007. The nest is reported inactive and in good condition during 2009 nesting season. Ground access was denied during 2010 nesting season (BHEC), therefore nest activity and condition is unknown..

Nest # 6576 was reported inactive and in fair condition 2009 and 2010 nesting seasons. The nest is located 0.25mi north and out of line of sight from the access road that services the following two proposed wells in this project; well # 21-24-5376, and well #43-24-5376. An existing fee well is located south 0.27 miles and out of line of sight. It is more than likely the nesting pairs have already been impacted or habituated to CBNG activities. If the nest becomes active, then federal CBNG related surface disturbing activities will not be allowed during nesting season as a COA.

Nest # 12140 and nest # 12141 are just within 0.5 miles and out of line of sight from an existing access road. It is more than likely the nesting pairs have already been impacted or habituated to CBNG activities. If the nest becomes active, then federal CBNG related surface disturbing activities will not be allowed during nesting season as a COA.

Additional direct and indirect impacts to raptors, from oil and gas development, are analyzed in the PRB FEIS (pp. 4-216 to 4-221).

4.2.2.8.2. Cumulative Effects

The cumulative effects associated with Alternatives B are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, pg. 4-221.

4.2.2.8.3. Mitigation Measures

To reduce the risk of decreased productivity or nest failure (PRB FEIS, p. 4-218), the BLM BFO requires a 0.5 mile radius timing limitation during the breeding season around active raptor nests. In addition, well metering, maintenance, and other site visits within 0.5 mile of raptor nests should also be minimized during the breeding season around active nests. In order to further understand the degree of potential

population effects to raptor species (PRB FEIS, p. 4-219 to 4-220), annual surveys for new raptor nests and nest occupancy checks shall be completed.

4.2.2.8.4. Residual Impacts

In spite of design by LOG and BLM during project planning and mitigation measures applied as COAs by BLM, there will be an increase in traffic, construction activity and human presence in the area throughout the life of the project which will the quality of the area for nesting raptors. Timing limitations during the construction phase of the project will protect nests from disturbance**,** but there will be disturbance during well operation and fee related activities that may discourage raptors from using the nest locations.

4.2.2.9. West Nile Virus

4.2.2.9.1. Direct and Indirect Effects

This project is likely to result in standing surface water which may potentially increase mosquito breeding habitat. BLM has consulted with applicable state agencies, County Weed and Pest and the State Health Department, per above mitigation in the PRB ROD page 18, regarding the disease and the need to treat. BLM has also consulted with the researchers that are studying the dynamics of WNv species and its effects in Wyoming.

4.2.2.9.2. Cumulative Effects

There are many sources of standing water, beyond CBM discharge, throughout the PRB that would add to the potential for mosquito habitat. Sources include; natural flows, livestock watering facilities, coal mining operations, and outdoor water use and features in and around communities.

4.2.2.9.3. Mitigation Measures

There is no evidence that treatment, either through the use of larvicides or malithion, on a site specific or basin-wide scale will have any effect on the overall spread of the disease. The State agencies have not instituted state-wide treatment for mosquitoes due to WNv, nor are they requiring any mitigation specific to permitting for CBM operations.

BLM will keep monitoring this issue by continuing to consult with the State agencies and the researchers working in the area in order to stay abreast of the most current developments and any need to apply mitigation.

4.2.2.9.4. Residual Effects

None identified.

4.2.3. Water Resources

The operator has submitted a comprehensive WMP for this project. It is incorporated-by-reference into this EA pursuant to 40 CFR 1502.21. The WMP incorporates sound water management practices, monitoring of downstream impacts within the Upper Powder River watershed and the commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Qualified hydrologists, in consultation with the BLM, developed the water management plan. Adherence with the plan, in addition to BLM applied mitigation (in the form of COAs), would reduce project area and downstream impacts from proposed water management strategies.

The maximum water production is predicted to be 7.5 gpm per well or 37.5 gpm (0.08 cubic feet per second (cfs) or 60.5 acre-feet per year) for this POD. The PRB FEIS projected the total amount of water that was anticipated to be produced from CBNG development per year (Table 2-8 Projected Amount of

Water Produced from CBM Wells Under Alternatives 1, 2A and 2B pg 2-26). For the Upper Powder River drainage, the projected volume produced within the watershed area was 60,319 acre-feet in 2010 (maximum production is estimated in 2006 at 171,423 acre-feet). As such, the volume of water resulting from the production of these wells is 0.1% of the total volume projected for 2010. This volume of produced water is within the predicted parameters of the PRB FEIS.

4.2.3.1. Groundwater

4.2.3.1.1. Direct and Indirect Effects

The PRB FEIS predicts an infiltration rate of 40% to groundwater aquifers and coal zones in the Upper Powder River drainage area (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 15 gpm will infiltrate at or near the discharge points and impoundments (23 acre feet per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, "the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater." (PRB FEIS pg 4-54). Therefore, the chemical nature and the volume of the discharged water may not degrade the groundwater quality.

The PRB FEIS predicts that one of the environmental consequences of coal bed natural gas production is possible impacts to the groundwater. "The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers." (PRB FEIS page 4-1). In the process of dewatering the coal zone to increase natural gas recovery rates, this project may have some effect on the static water level of wells in the area. The permitted water wells produce at the time they were drilled from depths which range from flowing at the top of the casing to 140 feet compared to depths of 800 to 1,600 feet to the Wall, Anderson and Werner coal seams targeted for production in this POD. The operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence (½ mile of a federal CBNG producing well) of the proposed wells.

Recovery of the coal bed aquifer was predicted in the PRB FEIS to "…resaturate and repressurize the areas that were partially depressurized during operations. The amount of groundwater stored within the Wasatch - Tongue River sand and coals, and sands units above and below the coals is almost 750 million acre-feet of recoverable groundwater are (PRB FEIS Table 3-5). Redistribution is projected to result in a rapid initial recovery of water levels in the coal. The model projects that this initial recovery period would occur over 25 years." (PRB FEIS page 4-38).

4.2.3.1.2. Cumulative Effects

As stated in the PRB FEIS, "The aerial extent and magnitude of drawdown effects on coal zone aquifers and overlying and underlying sand units in the Wasatch Formation also would be limited by the discontinuous nature of the different coal zones within the Fort Union Formation and sandstone layers within the Wasatch Formation." (PRB FEIS page 4-64).

Development of CBNG through 2018 (and coal mining through 2033) would remove 4 million acre-feet of groundwater from the coal zone aquifer (PRB FEIS page 4-65). This volume of water "…cumulatively represents 0.5 percent of the recoverable groundwater stored in the Wasatch – Tongue River sands and coals (nearly 750 million acre-feet, from Table 3-5). All of the groundwater projected to be removed during reasonably foreseeable CBNG development and coal mining would represent less than 0.3 percent of the total recoverable groundwater in the Wasatch and Fort Union Formations within the PRB (nearly 1.4 billion acre-feet, from Table 3-5)." (PRB FEIS page 4-65).

4.2.3.1.1. Mitigation Measures

Adherence to the drilling COAs, the setting of casing at appropriate depths, following safe remedial

procedures in the event of casing failure, and utilizing proper cementing procedures should protect any fresh water aquifers above the target coal zone. This will ensure that ground water will not be adversely impacted by well drilling and completion operations.

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ has developed a guidance document, "Compliance Monitoring and Sitting Requirements for Unlined Impoundments Receiving Coalbed Methane Produced Water" (November, 2008). For all new WYPDES permits, the WDEQ requires that the proponent investigate the shallow groundwater at the proposed impoundment locations. Drilling at proposed impoundments began in the spring of 2004. Based on information received from the WDEQ, as of April, 2010, approximately 2006 impoundment sites have been investigated with more than 2289 borings. Of these impoundments, 272 met the criteria to require "compliance monitoring" if constructed and used for CBNG water containment. Only 144 impoundments requiring monitoring are presently being used. As of the fourth quarter of 2009, only 22 of those monitored impoundments (15.2%) caused a change in the "Class of Use" of any parameter in the underlying aquifer water.

4.2.3.1.2. Residual Effects

As described in Chapter 3.4.1, the production of CBNG in this project area has already removed some of the water saturation in the coal zones for the production of gas. There are already 77 wells permitted to release produced water to the 10 impoundments located within the NW Croton POD infrastructure. The addition of 5 more wells will impact the groundwater by a smaller percentage than what is already permitted. There is a potential that the wells will not produce the volume of CBNG water estimated due to the dewatering history in the area.

4.2.3.2. Surface Water

4.2.3.2.1. Direct and Indirect Effects

Produced Water Quality

Table 4.2 shows the average values of EC and SAR as measured at selected USGS gauging stations at high and low monthly flows as well as the Wyoming groundwater quality standards for TDS and SAR for Class I to Class III water (there is no current standard for EC). It also shows constituent limits for TDS, SAR and EC detailed in the project area WYPDES permit, and the concentrations found in the POD's representative water sample.

Table 4.2 Comparison of Regulated Water Quality Parameters to Predicted Water Quality

Sample location or Standard	TDS mg/l	SAR	EC µmhos/cm
Primary Watershed at Arvada, WY Gauging Station			
Historic Data Average at Maximum Flow		4.76	1,797
Historic Data Average at Minimum Flow		7.83	3,400
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8)			
Drinking Water (Class I)	500		
Agricultural Use (Class II)	2,000	8	
Livestock Use (Class III)	5,000		
WDEQ Water Quality Requirement for WYPDES Permit # 049697			
At discharge point	AC*	AC* <7.10 x EC-2.48	2560
At Irrigation Compliance point (IMP1-IMP9)	NR*		<2800
Predicted Produced Water Quality			
Anderson, Werner	1010	17.1	1580
Gates	1270	18.2	2000

AC* = Assimilative Capacity Requirements

NR* = Not Reported
Based on the analysis performed in the PRB FEIS, the primary beneficial use of the surface water in the Powder River Basin is the irrigation of crops (PRB FEIS pg 4-69). The water quality projected for this POD ranges from 1010 to 1270 mg/l TDS which is the WDEQ criteria for agricultural use (2000 mg/l TDS).

The quality for the water produced from the Wall, Anderson and Werner target coal zones from these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of 7.5 gallons per minute (gpm) is projected is to be produced from these 5 wells, for a total of 37.5 gpm for the POD.

The proposed method for surface discharge provides passive treatment through the aeration supplied by the energy dissipation configuration at each discharge point outfall. Aeration adds dissolved oxygen to the produced water which can oxidize susceptible ions, which may then precipitate. This is particularly true for dissolved iron. Because iron is one of the key parameters for monitoring water quality, the precipitation of iron oxide near the discharge point will improve water quality at downstream locations.

The operator has obtained a Wyoming Pollutant Discharge Elimination System (WYPDES # WY00049697) permit for the discharge of water produced from this project from the WDEQ.

Permit effluent limits were set at (WMP Att. B, WYPDES Part 1A):

Chlorides	150 mg/l
Dissolved iron	1000 µg/l max
pH	6.5 to 9.0
Specific Conductance	2560 µmhos/cm max
Sulfates	3000 mg/l max (EMIT DP 013)
Dissolved Copper	6 ug/l max
Total Recoverable Arsenic	8.4 µg/l max
Total Recoverable Barium	1800 µg/l max
TDS	Varies per month(EMIT DP 013)

The WYPDES permit also addresses existing downstream concerns, such as irrigation use, in the COA for the permit. The irrigation monitoring points identified for this permit are IMP1-IMP9 located in Sections 23. 25, 26, and 36, T53N, R76W (WMP Att B. Permit WY00049697 pgs. 16-17).

In order to determine the actual water quality of the producing formations in this POD and to verify the water analysis submitted for the pre-approval evaluation, the operator has committed to designate a reference well to each coal zone within the POD boundary. The reference well will be sampled at the wellhead for analysis within sixty days of initial production. A copy of the water analysis will be submitted to the BLM Authorized Officer.

For more information, please refer to the WMP included in this POD.

Produced Water Control
There are 12 discharge points proposed for this project. The EMIT plant has two discharge points, the land application and the direct discharge to Wild Horse Creek, and there are 10 on-channel impoundments proposed for produced water discharge. They have been appropriately sited and utilize appropriate water energy dissipation designs. Existing and proposed water management facilities were evaluated for compliance with best management practices during the onsite.

To manage the produced water, 10 on-channel impoundments (1.35 to 13.8 acre feet) have been already constructed, of which, seven impoundments are within the POD boundary. These impoundments disturb approximately 28.5 acres including the dam structures. The ten, half tire stock tanks and aeration outfalls connected to the reservoirs disturb approximately 0.22 acre. The on-channel impoundments would result in evaporation and infiltration of CBNG water. The impoundments are to be filled with produced water to assist in providing water for the Floyd Ranch livestock. Once the on-channel reservoirs are filled to permitted capacity, the water will be diverted to the Echeta EMIT water treatment plant. The produced water once treated at the EMIT station will be disposed of directly to Wild Horse Creek at outfall WY0049697-013, or through an existing land application irrigation system that encompasses approximately 76 acres of crop production. All water management facilities were evaluated for compliance with best management practices during the onsite.

Produced Water Quantity

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Consequently, the volume of water produced from these wells may result in the addition of 0.012 cfs below the lowest reservoir (after infiltration and evapotranspiration losses). The operator has committed to monitor the condition of channels and address any problems resulting from discharge. Phased reclamation plans for the impoundments will be submitted and approved on a site-specific, case-by-case basis as they are no longer needed for disposal of CBNG water, as required by BLM applied COAs.

Alternative (2A), the approved alternative in the Record of Decision for the PRB FEIS, states that the peak production of water discharged to the surface will occur in 2006 at a total contribution to the mainstem of the Upper Powder River of 135 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 5 wells is anticipated to be a total of 37.5 gpm or 0.08 cfs to impoundments. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and full containment, the produced water re-surfacing in Wild Horse Creek from this action (0.08 cfs) may add a maximum 0.01cfs to the Upper Powder River flows, or 0.01% of the predicted total CBNG produced water contribution For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

In the WMP portion of the POD, the operator provided an analysis of the potential development in the watershed above the project area (WMP Response to deficiencies). Based on the area of the 230 square miles of watershed above the POD, and an assumed density of 1wells per location every 80 acres, the potential exists for the development of 1,840 wells which could produce a maximum flow rate of 13,800 gpm (31 cfs) of water. The BLM agrees with the operator that this is not expected to occur because:

1. Some of these wells have already been drilled and are producing.
2. New wells will be phased in over several years, and
3. A decline in well discharge generally occurs after several months of operation.

The potential maximum flow rate of produced water within the watershed upstream of the project area, 31 cfs, is much less than the volume of runoff estimated from the 2-year storm event of 715 cfs of the drainage (WMP Att.G).

Springs

There were no natural springs identified by the operator for the NW Croton POD or within ½ mile radius of the POD boundary.

In-channel downstream impacts are addressed in the WMP for the NW CROTON POD prepared by WWC Engineering of Sheridan, Wyoming for Lance Oil and Gas Inc. The monitoring offered by Lance and required by the WDEQ and BLM of water quality and stream geomorphology adequately covers these impacts to mobilize mitigation if necessary.

4.2.3.2.2. Cumulative Effects

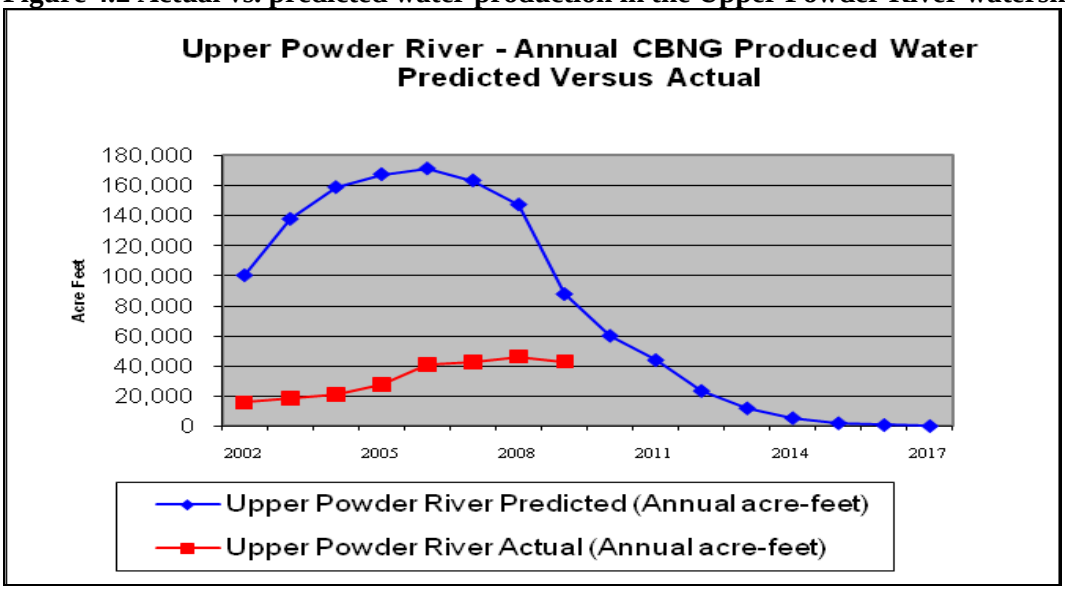
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the Upper Powder River watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of December 2009, all producing CBNG wells in the Upper Powder River watershed have discharged a cumulative volume of 255,531 acre-ft of water compared to the predicted 1,135,567acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.1 and Table 4.3 following. This volume is 22.5 % of the total predicted produced water analyzed in the PRB FEIS for the Upper Powder River watershed.

Table 4.3 Actual vs. predicted water production in the Upper Powder River watershed *2009 Data Update 04-06-10*

Year	Upper Powder River Predicted (Annual acre-feet)	Upper Powder River Predicted (Cumulative acre-feet from 2002)	Upper Powder River Actual (Annual acre-feet)		Upper Powder River Actual (Cumulative acre-feet from 2002)	
			A-ft	% of Predicted	A-Ft	% of Predicted
2002	100,512	100,512	15,846	15.8	15,846	15.8
2003	137,942	238,454	18,578	13.5	34,424	14.4
2004	159,034	397,488	20,991	13.2	55,414	13.9
2005	167,608	565,096	27,640	16.5	83,054	14.7
2006	171,423	736,519	40,930	23.9	123,984	16.8
2007	163,521	900,040	42,112	25.8	166,096	18.5
2008	147,481	1,047,521	45,936	31.1	212,522	20.3
2009	88,046	1,135,567	43,009	48.8	255,531	22.5
2010	60,319	1,195,886				
2011	44,169	1,240,055				
2012	23,697	1,263,752				
2013	12,169	1,275,921				
2014	5,672	1,281,593				
2015	2,242	1,283,835				
2016	1,032	1,284,867				
2017	366	1,285,233				
Total	**1,285,233**		**255,531**			

Figure 4.2 Actual vs. predicted water production in the Upper Powder River watershed



The PRB FEIS identified downstream irrigation water quality as the primary issue for CBNG produced water. Electrical Conductivity (EC) and SAR are the parameters of concern for suitability of irrigation water. The water quality analysis in the PRB FEIS was conducted using produced water quality data, where available, from existing wells within each of the ten primary watersheds in the Powder River Basin. These predictions of EC and SAR can only be reevaluated when additional water quality sampling is available.

As referenced above, the PRB FEIS did disclose that cumulative impacts may occur as a result of discharged produced CBNG water. The cumulative effects relative to this project are within the analysis parameters and impacts described in the PRB FEIS for the following reasons:

1. They are proportional to the actual amount of cumulatively produced water in the Upper Powder River drainage, which is approximately 22.5% of the total predicted in the PRB FEIS.

Refer to the PRB FEIS, Volume 2, page 4-115 – 117 and table 4-13 for cumulative effects relative to the watershed and page 117 for cumulative effects common to all sub-watersheds.

4.2.3.2.3. Mitigation Measures

Channel crossings by road and pipelines will be constructed perpendicular to flow. Culverts will be installed at appropriate locations for streams and channels crossed by roads as specified in the BLM Manual 9112-Bridges and Major Culverts and Manual 9113-Roads. Streams will be crossed perpendicular to flow, where possible, and all stream crossing structures will be designed to carry the 25-year discharge event or other capacities as directed by the BLM. Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.

The operator has also committed to monitor and mitigate the discharge points and erosion stabilization measures and schedule any remedial work if necessary to protect the hydrologic features within the project infrastructure boundary.

Groundwater monitoring and mitigation will be completed by the operator per the water well agreement with each landowner and as included in the Surface Use Agreement with the individual landowners.

4.2.3.2.4. Residual Effects

"Streams enhanced by large volumes of CBM produced water may begin to establish meander patterns on longer wavelengths in response to increased flows. Stream drainages would readjust to their existing natural flows at the end of the project's life. Downcutting (stream erosion) and sediment deposition (aggradation) are natural processes that occur as stream drainages age through time. Downcutting occurs within the upper reaches of a drainage system as the stream channel becomes incised through erosion, until the slope of the stream and its velocity are reduced and further erosion is limited. Sediment is deposited within the lower, slower reaches of a stream.

Surface drainages could be degraded from erosion caused by increased surface flow, unless rates of CBM discharge and outfall locations are carefully controlled. Increased flows could cause downcutting in fluvial environments, resulting in increased channel capacity over time within the upper and middle reaches of surface drainages." (PRB FEIS pg 4-118).

4.2.4. Cultural Resources

4.2.4.1. Direct and Indirect Effects

Non eligible site(s) 48CA6355, 48CA6368, 48CA6369 will be impacted by the proposed project. No historic properties will be impacted by the proposed project. Following the Wyoming State Protocol Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 9/14/2010 that no historic properties exist within the APE.

4.2.4.2. Cumulative Effects

Construction and development of oil and gas resources impacts cultural resources through ground disturbance, unauthorized collection, and visual intrusion of the setting of historic properties. This results in fewer archaeological resources available for study of past human life-ways, changes in human behavior through time, and interpreting the past to the public. Additionally, these impacts may compromise the aspects of integrity that make a historic property eligible for the National Register of Historic Places. Recording and archiving basic information about archaeological sites in the proposed project areas serve to partially mitigate potential cumulative effects to cultural resources.

Fee actions constructed in support of federal actions can result in impacts to historic properties. Construction of large plans of coalbed natural gas development on split estate often include associated infrastructure that is not permitted through BLM. Project applicants may connect wells draining fee minerals, or previously constructed pipelines on fee surface with a federal plan of development. BLM has no authority over such development which can impact historic properties. BLM has the authority to modify or deny approval of federal undertakings on private surface, but that authority is limited to the extent of the federal approval. Historic properties on private surface belong to the surface owner and they are not obligated to preserve or protect them. The BLM may go to great lengths to protect a site on private surface from a federal undertaking, but the same site can be legally impacted by the landowner at any time. The cumulative effect of numerous federal approvals can result in impacts to historic properties. Archeological inventories reveal the location of sites and although the BLM goes to great lengths to protect site location data, that information can potentially get into the wrong hands. BLM authorizations that result in new access can inadvertently lead to impacts to sites from increased visitation by the public.

4.2.4.3. Mitigation Measures

If any cultural values [sites, artifacts, human remains (Appendix L PRB FEIS)] are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Field Manager notified. Further discovery procedures are explained in the *Standard COA* (General)(A)(1).

4.2.4.4. Residual Effects

During the construction phase, there will be numerous crews working across the project area using heavy construction equipment without the presence of archaeological monitors. Due to the extent of work and the surface disturbance caused by large vehicles, it is possible that unidentified cultural resources can be damaged by construction activities. The increased human presence associated with the construction phase can also lead to unauthorized collection of artifacts or vandalism of historic properties.

4.2.5. Air Quality

4.2.5.1. Direct and Indirect Effects

In the project area, air quality impacts would occur during construction (due to surface disturbance by earth-moving equipment, vehicle traffic fugitive dust, well testing, as well as drilling rig and vehicle engine exhaust) and production (including non-CBM well production equipment, booster and pipeline compression engine exhaust). The amount of air pollutant emissions during construction would be controlled by watering disturbed soils, and by air pollutant emission limitations imposed by applicable air quality regulatory agencies. Air quality impacts modeled in the PRB FEIS concluded that projected oil & gas development would not violate any local, state, tribal or federal air quality standards.

4.3. Summary of Effects

Table 4.4 Provides a comparison of the cumulative effects associated with the alternatives.

Resource/Species	**Alternative A**	**Alternative** B
Wetlands/Riparian Areas	No existing wetlands/riparian areas would be disturbed.	No additional disturbance to wetland/riparian areas.
Wildlife		
Big Game	No habitat loss or fragmentation. Would likely see increased traffic passing through due to surrounding mineral development	Greatest habitat loss.
		Greatest habitat fragmentation.
Raptors	No habitat loss.	Greatest foraging habitat fragmentation.
	No wells authorized near nests.	
Migratory Birds	No habitat loss.	Greatest habitat loss.
		Greatest habitat fragmentation.
	No habitat fragmentation.	
		Overhead electric poses predation & collision risk.
Threatened and Endangered Species		
Bald eagle	No habitat loss	Overhead electricity increasing mortality risk from electrocution.

Resource/Species	Alternative A	Alternative B
Sensitive Species		
Greater Sage Grouse	No habitat loss.	Greatest habitat loss.
	No decision on overhead electricity. Overhead power could be routed through project area on private surface without BLM discretion increasing predation and collision risk. Grouse may avoid overhead power lines.	Greatest predation and collision risk associated with overhead power lines.
West Nile Virus	No Impact	likely to have effect on the overall spread of WNV.

5. CONSULTATION & COORDINATION

Agencies summarized in Table 5.1 were consulted on the proposed project to confirm compliance with applicable laws and regulations.

Table 5.1 Consultations

NAME	TITLE	AGENCY
Meleah Corey	NRS	BLM
Keith Anderson	Hydrologist	BLM
Stacy Gunderson	Civil Engineer	BLM
Scott Jawors	Wildlife Biologist	BLM
Clint Crago	Archeologist	BLM
Pauline Schuette	Fish and Wildlife Biologist	BLM
Joe DeCelle	Surveyor	LSI
Joy Kennedy	Permitting	APC
Don(Bub)Lara	Construction	APC
Tim Gimbel	Drilling	APC
Jerry Geer	L.O.R.	APC
Carol Chadwick	Civil Engineer	APC
Kendall Cox	Floyd Land man	Rick Floyd
Colt Rodeman	Sr. Foreman	APC
Jack Harbison	Drilling Ops Manager	APC

6. OTHER PERMITS REQUIRED

A number of other permits are required from Wyoming State and other Federal agencies. These permits are identified in Table A-1 in the PRB FEIS Record of Decision.

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8. LIST OF INTERDISCIPLINARY TEAM PREPARERS AND REVIEWERS

Meleah Corey, Natural Resource Specialist
Casey Freise, Supervisory Natural Resource Specialist
Keith Anderson, Hydrologist
Victor Xaun, Petroleum Engineer
Christine Tellock, Legal Instruments Examiner
Clint Crago, Archaeologist
Scott Jawors, Wildlife Biologist
Kerry Aggen, Geologist
Chris Durham, Assistant Field Manager, Resources
Paul Beels if applicable, Associate Field Manager, Minerals & Lands
Duane W. Spencer, Field Manager

Interdisciplinary Team Lead: Meleah Corey

APPENDIX A: CONDITIONS OF APPROVAL FOR THE APPLICATION FOR PERMIT TO DRILL

POD Name: NW CROTON

Operator Name: Lance Oil and Gas INC.

Field Office: Buffalo Field Office
Address: 1425 Fort Street
Buffalo, Wyoming 82834

Office Telephone Number: 307-684-1100

List of Wells:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	Floyd L&L Fed	43-23-5376WA	NESE	23	53N	76W	WYW142836
2	R Floyd Fed	21-24-5376WA	NENW	24	53N	76W	WYW141581
3	R Floyd Fed	23-24-5376	NESW	24	53N	76W	WYW146296
4	R Floyd Fed	33-24-5376WA	NWSE	24	53N	76W	WYW146296
5	Federal	34-24-5376WA	SWSE	24	53N	76W	WYW146296

List of Impoundments:

	Facility Name / Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (acre feet)	Surface Disturbance (acres)	Lease #
1	Rick's Reservoir	SENW	23	53	76	0.45	1.0	Fee
2	Rick's Little Res'.	SWNW	23	53	76	1.17	3.3	Fee
3	Willow Tree Res'.	NWSW	23	53	76	7.96	3.6	Fee
4	Jason Reservoir	NENE	23	53	76	1.35	2.1	Fee
5	TY Reservoir	NWNW	24	53	76	0.77	2.4	WYW141581
6	Ryan Reservoir	SWNE	24	53	76	0.33	1.2	Fee
7	Boone Reservoir	SENW	25	53	76	12.0	3.4	Fee
8	004 Reservoir	SWNW	25	53	76	9.1	3.7	Fee
9	N & S Lacy Res'.	NESW	25	53	76	13.8	5.4	Fee
10	James Reservoir	NWSW	30	53	76	1.73	2.4	Fee
11	Echeta Road EMIT Pit	NWNW	26	53	76	6.1	1.5	Fee

SITE SPECIFIC

General

1. All changes agreed to at the pre-approval on site will be followed. The agreed-upon changes have been incorporated into the operator's APD package and the EA.

2. All proposed access roads, pads, and other locations where engineered construction will occur will be completely slope staked for the pre-construction meeting.

Surface Use

1. Engineered Road R Floyd FED 33-24-5376WA access road STA 10+00 to 30+39.36 will be stabilized during and within 30 days of the start of construction.

2. All permanent above-ground structures (e.g., production equipment, tanks, etc.) not subject to safety requirements will be painted to blend with the natural color of the landscape. The paint used will be a color which simulates "Standard Environmental Colors." The color selected for the NW Croton POD is Covert Green.

3. Maintain a minimum 20-foot undisturbed vegetative border between disturbance areas of the access road to the well # 23-24 location and the nearby head cut

4. The operator will drill seed on the contour to a depth of 0.5 inch, followed by cultipaction to compact the seedbed, preventing soil and seed losses. To maintain quality and purity, the current years tested, certified seed with a minimum germination rate of 80% and a minimum purity of 90% will be used. On BLM surface or in lieu of a different specific mix desired by the surface owner, use the following:

   10-14" Precipitation Zone
   Clayey Ecological Site

   Seed Mix

Species	% in Mix	Lbs PLS*
Western Wheatgrass (Pascopyrum smithii)	35	4.2
Green needlegrass (Nassella viridula)	40	4.8
Bluebunch wheatgrass (Pseudoroegneria spicata ssp. Spicata)	10	1.2
Prairie coneflower (Ratibida columnifera)	5	0.6
White or purple prairie clover (Dalea candidum, purpureum)	5	0.6
Rocky Mountain beeplant (Cleome serrulata)/or ***American vetch***(Vicia americana)	5	0.6
Chapter 1 Chapter 2 Totals	**100%**	**12 lbs/acre**

*PLS = pure live seed
*Northern Plains adapted species
*Double this rate if broadcast seeding

This is a recommended seed mix based on the native plant species listed in the NRCS Ecological Site descriptions, U.W. College of Ag., and seed market availability. A site-specific inventory will allow the resource specialist to suggest the most appropriate species, percent composition, and seeding rate for reclamation purposes.

Wildlife

Raptors:

The following conditions will alleviate impacts to raptors:

1. No surface disturbing activity shall occur within 0.5 mile of all identified raptor nests from February 1 through July 31, annually, prior to a raptor nest occupancy survey for the current breeding season. This timing limitation will affect the following:

Township/Range	Section	Wells and Infrastructure
T53N, R76W	23	Well 43-23, and access/utility corridors.
	24	Well 21-24, and their access/utility corridors

2. Surveys for new raptor nests shall be conducted, annually, within 0.5 miles of the POD boundary on or after 15 April, and prior to or during the first nest occupancy check. A seasonal timing restriction (February 1 through July 31) will be added to surface disturbing activities within 0.5 miles of any new nests discovered.

3. Nests occupancy checks shall be completed for all raptor nests identified within a 0.5 mile of any infrastructure associated with the POD for as long as the POD is under construction. Once construction of the POD has ceased, nest occupancy checks shall continue for the first five years on all identified nests within a 0.5 mile of the POD boundary. Survey results will be submitted to a Buffalo BLM biologist in writing no later than 31 July of each survey year.

4. If an undocumented raptor nest is located during project construction or operation, the Buffalo Field Office (307-684-1100) shall be notified within 24 hours.

5. Well metering, maintenance and other site visits within 0.5 miles of raptor nests should be minimized during the breeding season (February 1 – July 31).

Burrowing Owls

The following conditions will alleviate impacts to burrowing owls:

1. No surface disturbing activity shall occur within 0.25 miles of the identified prairie dog colony (see table below) from April 15 to August 31, annually, prior to a burrowing owl nest occupancy survey for the current breeding season. A 0.25 mile buffer will be applied if a burrowing owl nest is identified. This condition will be implemented on an annual basis for the duration of surface disturbing activities within the prairie dog town(s). This timing limitation will be in effect unless surveys determine the nest(s) to be inactive.

Location in T53N:R76W	Well and /or Infrastructure
NW and SESE Section 23	Access roads and well 43-23
NW Section 24	Access road
NENW 25	Access road
NE Section 25	Access road and well 34-24

Sharp-tailed grouse

The following conditions will minimize impacts to sharp-tail-grouse:

A survey is required for sharp-tailed grouse inside and within 0.5 mile of the entire project area between April 1 and May 7, annually, and results shall be submitted to a BLM biologist. This condition will be implemented on an annual basis for the duration of surface disturbing activities.

a. If an active lek is identified during the survey, the 0.64 mile timing restriction (March 1-June 15) will be applied and surface disturbing activities will not be permitted until after the nesting season. The required sharp-tailed grouse survey will be conducted by a biologist following WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.
b. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the 0.5 mile buffer until the following breeding season (April 1).

PROGRAMMATIC

Programmatic Mitigation Measures Identified in the PRB FEIS ROD

The following programmatic mitigation measures are listed in Appendix A-5 of the PRB FEIS ROD.

Programmatic mitigation measures are those, determined through analysis, which may be appropriate to apply at the time of APD approval if site specific conditions warrant. These mitigation measures can be applied by BLM, as determined necessary at the site-specific NEPA APD stage, as COAs and will be in addition to stipulations applied at the time of lease issuance and any standard COA.

Surface Water

1. Channel Crossings:
   - Channel crossings by road and pipelines will be constructed perpendicular to flow. Culverts will be installed at appropriate locations for streams and channels crossed by roads as specified in the BLM Manual 9112-Bridges and Major Culverts and Manual 9113-Roads. Streams will be crossed perpendicular to flow, where possible, and all stream crossing structures will be designed to carry the 25-year discharge event or other capacities as directed by the BLM.
   - Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.
2. Low water crossings will be constructed at original streambed elevation in a manner that will prevent any blockage or restriction of the existing channel. Material removed will be stockpiled for use in reclamation of the crossings.

Soils

1. The Companies, on a case by case basis depending upon water and soil characteristics, will test sediments deposited in impoundments before reclaiming the impoundments. Tests will include the standard suite of cations, ions, and nutrients that will be monitored in surface water testing and any trace metals found in the CBM discharges at concentrations exceeding detectable limits.
2. Where feasible, gas and water pipelines and electrical cables will be installed in disturbance corridors. Disturbance corridors combine two or more utility lines (water, gas, electric) in common trenches, usually within access roadways.

Wetland/Riparian

1. To reduce adverse effects on existing wetlands and riparian areas, water discharge should not be allowed if increased discharge volumes or subsequent recharge of shallow aquifers will inundate and kill woody species, such as willows or cottonwoods.

Wildlife

1. For any surface-disturbing activities proposed in sagebrush shrublands, the Companies will conduct clearance surveys for sage grouse breeding activity during the sage grouse's breeding season before initiating the activities. The surveys must encompass all sagebrush shrublands within 0.5 mile of the proposed activities. The Companies will locate compressor stations so that noise from the stations at any nearby sage grouse or sharp-tailed grouse display grounds does not exceed 49 decibels (10 dBA above background noise) at the display ground.

Threatened, Endangered, or Sensitive Species

1. The companies will conduct clearance surveys for threatened, endangered or other special-concern species at the optimum time. Inventory for special concern species, other than federally listed species below, is contingent upon landowner concurrence. This will require coordination with the BLM before November 1 annually to review the potential for disturbance and to agree on inventory parameters.

Transportation

1. The companies will provide georeferenced spatial data depicting as-built locations of all facilities, wells, roads, pipelines, power lines, reservoirs, discharge points, and other related facilities to the BLM upon completion of POD construction and development.

Visual Resources

1. Use buried power lines to each well, where feasible, to reduce the linear element in the landscape.

Air Quality

A number of mitigation options for CBM are part of WDEQ's normal regulatory procedure. For instance, in the permitting of compressors, the agency always requires the application of BACT. The theory here is simply that given the air resource available, within technological and financial feasibility, the number of operations that can be allowed is maximized.

1. During construction, emissions of particulate matter from well pad and resource road construction will be minimized by application of water, or other dust suppressants, with at least 50 percent control efficiency. Roads and well locations constructed on soils susceptible to wind erosion could be appropriately surfaced or otherwise stabilized to reduce the amount of fugitive dust generated by traffic or other activities, and dust inhibitors (surfacing materials, non-saline dust suppressants, and water) could be used as necessary on unpaved collector, local and resource roads that present a fugitive dust problem. The use of chemical dust suppressants on BLM surface will require prior approval form the BLM authorized officer.

   - A variety of potential emission reduction measures (BLM 1999d) are available to further limit NOx and other air pollutant emissions. The evaluation was not intended to rank or identify a required emission reduction measure; the appropriate level of control will be determined and required by the applicable air quality regulatory agencies during the pre-construction permit process.

     BLM will also continue to cooperate with existing visibility and atmospheric deposition impact monitoring programs. The need for, and the design of, additional monitoring could include the involvement of the EPA Region 8 Federal Leadership Forum and applicable air quality regulatory agencies. Based upon future recommendations, operators could be required to cooperate in the implementation of a coordinated air quality monitoring program. Oil and gas lease terms (Section 6) require the lessee, within the lease rights granted, to take measures deemed necessary

by the lessor for the conduct of operations in a manner that minimizes adverse impacts to air quality, as well as other resources.

2. Table A-1 and Table A-2 below present mitigation options for particulate matter and nitrogen oxide emissions.

Fugitive Dust Mitigation Measures (PM10), Effectiveness and Cost

	Dust Sources					
	Disturbed Areas			**Unpaved Roads[1]**		
Mitigation Options	Establish plant cover for all disturbed lands by certain time (re-vegetation)	Water roads to attain certain percent moisture[2]	Apply soil stabilizer	Set and enforce speed limit	Gravel roads	Paved road
Effectiveness	Level proportional to percentage of land cover	0-50% reduction in uncontrolled dust emissions	33 to 100% control efficiency	80% for 15 mph 65% for 20 mph 25% for 30 mph	30% reduction	90% reduction
Estimated Cost	$/acre	$4000/mile	$2,000 to $4,000/mile per year	Unknown	$9,000/mile	$11,000 to $60,000/mile

Note:
1. Improved and County roads
2. Wetting of construction roads during the construction period. Wetting of construction roads not required for once a month maintenance trips to well pads.
3. Reductions assume 40 mile per hour base speed.

Nitrogen Oxides (NO_x) Mitigation Measures Efficiency

	NO_x Emissions Sources			
	Field Compressors	**Sales Compressors**	**Temporary Diesel Generators[1]**	**Heavy Equipment**
Mitigation Options Efficiency	Implement Best Available Control Technology[2] Typically results in a NO_x emission rate of about 1 g/bhp-hr	Implement Best Available Control Technology[2] Typically results in a NO_x emission rate of about 1 b/bhp-hr	Register with State; will regulate as appropriate	Voluntary use of diesel engines

Notes:
1. Wyoming is currently registering these generators to determine NO_x emissions
2. BACT could include electric compression.

Geology

Inadvertent release to the atmosphere of the methane resource will be controlled through WOGCC requirements and APD conditions of approval that address well control, casing, ventilations, and plugging procedures appropriate to site-specific CBM development plans.

STANDARD

General

1. All contractors/operators will have a complete copy of the approved APD/POD, including COAs, at the drill site, during the construction of the roads and drill pad, the drilling of the well, completion of the well, and all other related construction activities.

2. A pre-construction field meeting shall be conducted prior to beginning any dirt work approved under this POD. The operator shall contact the BLM Authorized Officer NRS Meleah Corey @ 307-684-1070 Phone number Here at least 4-days prior to beginning operations so that the meeting can be scheduled. The operator is responsible for having all contractors present (dirt contractors, drilling contractor, pipeline contractor, project oversight personnel, etc.) including the overall field operations superintendent, and for providing all contractors copies of the approved POD, project map and BLM Conditions of Approval pertinent to the work that each will be doing.

3. Approval of this APD does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease that would entitle the applicant to conduct operations thereon. In addition, approval of this APD does not imply that the operator has legal access to the drilling location. When crossing private surface 43 CFR 3814 regulations must be complied with and when crossing public surface off-lease the operator must have an approved right-of-way.

4. Confine all equipment and vehicles to the access road(s), pad(s), and area(s) specified in the approved APD or POD.

5. The approval of this project does not grant authority to use off lease Federal lands. No surface disturbing activity, or use of off-lease federal lands, is allowed on affected leases until right-of-way grants become effective which is the date signed by the authorized officer.

6. This POD is valid for two years from the date of approval or until the oil and gas lease expires/terminates, whichever occurs first. If this well intends to earn a lease extension, diligent operations (actual drilling) must be in progress over the lease expiration date, advance lease rentals must have been paid, and a letter stating drilling operations were in progress must be submitted to this office no later than five days past the expiration date. If the APD terminates, any surface disturbance created under the application must be reclaimed according to an approved plan.

7. The operator will be in compliance with all applicable local, state and/or federal laws, regulations, and/or statutes.

8. A progress report must be filed a minimum of once a month starting with the month the well was spudded continuing until the well is completed. The report must be filed by the 25th of each month on a Sundry Notice (Form 3160-5). The report will include the spud date, casing information such as size, grade, weight, hole size, and setting depth, amount and type of cement used, top of cement, depth of cementing tools, casing test method, intervals tested, perforated, acidized, fractured and results obtained and the dates all work done.

9. In the event abandonment of the hole is desired, an oral request may be granted by this office but must be timely followed within 5 days with a "Notice of Intention to Abandon" (Form 3160-5). The "Subsequent Report of Abandonment" (Form 3160-5) must be submitted within 30 days after the actual plugging of the well bore, reporting where the plugs were placed, and the current status of the surface restoration.

10. Whether the well is completed as a dry hole or as a producer, two copies of all logs run, core descriptions, core analysis, well-test data, geologic summaries, sample descriptions, and all other surveys or data obtained and compiled during the drilling, work over, and/or completion operations will be filed with Form 3160-4. A gamma ray log shall be run from T.D. to ground surface.

11. The operator is responsible for informing all persons associated with this project that they shall be subject to prosecution for damaging, altering, excavating or removing any archaeological, historical, or vertebrate fossil objects on site. If archaeological, historical, or vertebrate fossil materials are discovered, the operator is to suspend all operations that further disturb such materials and immediately contact the Authorized Officer. Operations are not to resume until written authorization to proceed is issued by the Authorized Officer.

12. Within five (5) working days, the Authorized Officer will evaluate the discovery and inform the operator of actions that will be necessary to prevent loss of significant cultural or scientific values.

13. The operator is responsible for the cost of any mitigation required by the Authorized Officer. The Authorized Officer will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the Authorized Officer that the required mitigation has been completed, the operator will be allowed to resume operations.
    a. If any cultural values [sites, artifacts, human remains (Appendix L FEIS)] are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Field Manager notified. The authorized officer will conduct an evaluation of the cultural values to establish appropriate mitigation, salvage or treatment. The operator is responsible for informing all persons in the area who are associated with this project that they will be subject to prosecution for knowingly disturbing historic or archaeological sites, or for collecting artifacts. If historic or archaeological materials are uncovered during construction, the operator is to immediately stop work that might further disturb such materials, and contact the authorized BLM officer (AO). Within five working days the AO will inform the operator as to:

        - whether the materials appear eligible for the National Register of Historic Places;
        - the mitigation measures the operator will likely have to undertake before the site can be used (assuming in situ preservation is not necessary); and,
        - a time-frame for the AO to complete an expedited review under 36 CFR 800.11 to confirm, through the State Historic Preservation Officer, that the findings of the AO are correct and that mitigation is appropriate. The AO will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the AO that the required mitigation has been completed, the operator will then be allowed to resume construction measures.

    b. If paleontological resources, either large or conspicuous, and/or a significant scientific value are discovered during construction, the find will be reported to the Authorized Officer immediately. Construction will be suspended within 250 feet of said find. An evaluation of the paleontological discovery will be made by a BLM approved professional paleontologist within five (5) working days, weather permitting, to determine the appropriate action(s) to prevent the potential loss of any significant paleontological values. Operations within 250 feet of such a discovery will not be resumed until written authorization to proceed is issued by the Authorized Officer. The applicant will bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils of significant scientific interest discovered during the operation.

14. The operator shall be responsible for the prevention of fires on public lands caused by its employees,

contractors or subcontractors. During conditions of extreme fire danger, surface use operations may be limited or suspended in specific areas.

15. All survey monuments found within the area of operations shall be protected. Survey monuments include, but are not limited to: General Land Office and Bureau of Land Management Cadastral Survey Corners, reference corners, witness points, U. S. Coast and Geodetic benchmarks and triangulation stations, military control monuments, and recognizable civil (both public and private) survey monuments. In the event of obliteration or disturbance of any survey monuments, the incident shall be reported in writing to the Authorized Officer.

16. If any time the facilities located on public lands authorized by the terms of the lease are no longer included in the lease (due to a contraction in the unit or other lease or unit boundary change) the BLM will process a change in authorization to the appropriate statute. The authorization will be subject to appropriate rental, or other financial obligation determined by the authorized officer.

17. Gas produced from this well may not be vented or flared beyond an initial authorized test period of 30 days or 50 MMCF following its completion, whichever first occurs, without the prior written approval of the authorized officer. If gas is vented or flared without approval beyond the test period authorized above, you may be directed to shut-in the well until the gas can be captured or approval to continue venting or flaring as uneconomic is granted. You shall be required to compensate the lessor for that portion of the gas vented or flared without approval which is determined to have been avoidably lost.

18. The first producing well drilled to each targeted coal zone will be designated as the POD "Reference Well". Reference wells will not be required for PODs within a 6 mile radius of the first reference well designated by the operator, nor for co-mingled coal zones. The designated reference well must be equipped to be sampled at the well head. A reference well sample will be collected from the wellhead and submitted for analysis; using the list of analytes identified in WDEQ WYPDES Application for Permit to Surface Discharge Produced Water from CBM New Discharges, Renewals, or Major Modifications, within 30 to 60 days of initial water production. Results of the analysis will be submitted to the BFO-BLM authorized Officer as they become available and will include the following information: Operator Name, POD Name, Well Name and location and Date Sampled.

19. By November 1 each year, companies will submit the following information, attached to a Sundry Form 3160-5, where construction and development have taken place in the last year.

    - Georeferenced spatial data depicting as-built locations of all facilities, wells, roads, pipelines, power lines, reservoirs, discharge points, and other related facilities to the BLM for all PODs.
    - Two as-built copies of Map D.

20. If any dead or injured threatened, endangered, proposed, or candidate species is located during construction or operation, the U.S. Fish and Wildlife Service's Wyoming Field Office (307-772-2374), their law enforcement office (307-261-6365), and the BLM Buffalo Field Office (307-684-1100) shall be notified within 24 hours. If any dead or injured sensitive species is located during construction or operation, the BLM Buffalo Field Office (307-684-1100) shall be notified within 24 hours.
21. Operators shall comply with all other conservation measures and terms and conditions identified in the Powder River Basin Oil and Gas Project Biological Opinion (ES-6-WY-07-F012).

22. If an undocumented raptor nest is located during project construction or operation, the Buffalo Field Office (307-684-1100) shall be notified within 24 hours.

DRILLING AND PRODUCTION OPERATIONS

1. The spud date will be reported electronically, (see website location above) to the Authorized Officer 24 HOURS BEFORE SPUDDING, unless otherwise required in site specific conditions of approval.

   Spud Notice Site:
   http://www.wy.blm.gov/minerals/og/og_notices/spud_notice.php

2. The operator shall complete coal bed natural gas wells (case, cement and under ream) as soon as possible, but no later than 30 days after drilling operations, unless an extension is given by the BLM Authorized Officer.

Well Control Equipment

1. The well control equipment approved in this project lists the minimum requirements.

2. The flow line shall be a minimum of 30 feet from the well bore and securely anchored. The 30-foot length of line is a minimum and operators must make consideration for increasing this length for topography and/or wind direction.

3. The flow line shall be a straight run.

4. The flow line must be constructed from non-flammable material.

5. All cuttings and circulating medium shall be directed to and contained in a reserve pit.

6. The nearest edge of the pits shall be a minimum of 25' from the rig.

7. A minimum of 2' of freeboard shall be maintained in the pits at all times.

8. The authorized officer may modify these requirements at any time if it is determined that increased pressure control is deemed necessary.

9. Verbal notification shall be given to the Authorized Officer at least 24 hours before formation tests, BOP tests, running and cementing casing, and drilling over lease expiration dates.

Casing Program

1. The minimum requirement for casing centralizers is as follows: all casing strings will have centralizers on the bottom three joints (i.e. a minimum of one centralizer per joint starting with the shoe joint).

2. In addition, the production casing string shall be centralized with API approved centralizers using the following specifications:

   - One centralizer per~120'(specifically every third or fourth joint depending on joint length).

   - One centralizer 25' above surface casing shoe.

3. Surface casing length shall follow current requirements set forth by the WOGCC. Increased surface casing may be required so that the surface casing shoe may be set into a competent formation.

Cement Program

1. If there are indications of inadequate primary cementing of the surface, intermediate, or production casing strings; such as but not limited to no returns to surface, cement channeling, fallback or mechanical failure of equipment, the operator will evaluate the adequacy of the cementing operations. This evaluation will consist of running a cement bond log (CBL) or an alternate method approved by the Authorized Officer (AO) no sooner than 12 hours and no later than 24 hours from the time the cement was first pumped.

2. If the evaluation indicates inadequate cementing, the operator shall contact a BLM Buffalo Field Office Petroleum Engineer for approval of remedial cementing work. Remedial cementing will consist of, but may not be limited to:

   - Perforating and squeezing cement to ground surface should the top of cement (TOC) be below the surface casing shoe. This shall be done within 36 hours of the completion of pumping the primary cement job.

   - One-inching cement to ground surface should the top of cement (TOC) be above the surface casing shoe.

   - Fallback that is found to be less than 30' from ground surface may be topped off with cement slurry.

3. The adequacy of the remedial cementing operations shall be verified by a cement bond log (CBL) or an alternate method approved by the Authorized Officer (AO). All remedial work shall be completed and verified prior to drilling out the casing shoe or perforating the casing for purposes other than remedial cementing.

4. The cement mix water used must be the same water used to develop the cement program and be of adequate quality, so as not to degrade the setting properties. Waters containing high carbonates or bicarbonates (greater than 2,000 ppm) should be avoided.

Production Equipment

1. All gas measurement equipment that deviates from Onshore Order #5 (or WY NTL 2004-1 in the case of electronic flow computers) shall be approved via a Notice of Intent sundry (Form No. 3160-5) prior to installation and use. This includes any type of primary device other than a standard orifice plate meter. Requests for a variance from the minimum standards of Onshore Order #5 must list:

   The specific type of equipment.

   How this equipment will meet or exceed the requirements of Onshore Order #5.

   The location, specific well and lease number where the equipment will be used.

2. An appropriate pressure gauge is required to be installed on each casing annulus to monitor this pressure.

3. Other actions such as off-lease measurement, commingling, allocation, etc. shall be approved via a Notice of Intent sundry (Form No. 3160-5). Submission of additional information in the POD shall not be construed as permission for these items. If the operator wishes to utilize off-lease gas measurement for wells approved in this POD, they are required to obtain approval via a Notice of Intent sundry (Form No. 3160-5) prior to any gas production. A map shall be attached to the sundry

that delineates where the individual wells will be measured for federal royalty. Unless this POD is committed to a Federal Oil & Gas Unit or Agreement, the production from all Federal wells shall be measured for Federal royalty prior to being combined with production from any other Federal, Indian, or non-Federal leases.

Well and POD Building Identification

1. From the time a well pad is constructed or a well is spudded (if no well pad needed), until abandonment, all well locations must be properly identified with a legible sign. The sign will include the well name and number, operator name, lease number, and the surveyed location.

2. At each POD building site where federal wells are metered, the operator is required to maintain a legible sign displayed in a conspicuous place. This sign is required to be in place at the time metering goes online. The sign shall include: POD name, Operator, Federal well names and numbers, Federal lease numbers being metered at the POD building, and surveyed location of the building.

Protection of Fresh Water Resources

1. All oil and gas operations shall be conducted in a manner to prevent the pollution of all freshwater resources. All fresh waters and waters of present or probable future value for domestic, municipal, commercial, stock or agricultural purposes will be confined to their respective strata and shall be adequately protected. Special precautions will be taken to guard against any loss of artesian water from the strata in which it occurs and the contamination of fresh water by objectionable water, oil, condensate, gas or other deleterious substance to such fresh water.

Miscellaneous Conditions

1. Any changes to the approved drilling plan and/or these conditions of approval shall be approved by the BLM-Buffalo Field Office Petroleum Engineer prior to being implemented.

   After hour's numbers:

Petroleum Engineer: Mike Worden	Home Telephone: 307-217-2995
Petroleum Engineer: Matthew Warren	Home Telephone: 307-620-0103
Petroleum Engineer: James Evans	Home Telephone: 307-331-5421

2. If any cores are collected, a copy of all analysis performed shall be submitted to the BLM-Buffalo Field Office Petroleum Engineer.

SURFACE USE STANDARD

A. Construction

1. Prior to construction, the operator will remove all staking (engineered road, pads, well stakes, etc.) for those areas which were not approved with the POD/APD.

1. All roads, well pads, rig slots, culverts, spot upgrades and locations where engineered construction will occur will be completely slope staked for review prior to construction.

2. Topsoil will be segregated for all excavation including the entire disturbance area for constructed pads and excavated areas for rig leveling, reserve pits, constructed roads, spot upgrades, reservoir upgrades, outfalls and utility trenches and redistributed for interim reclamation activities. This requirement will not be applied for pipelines installed with wheel trenchers.

3. The operator will not push soil material and overburden over side slopes or into drainages. All soil material disturbed will be placed in an area where it can be retrieved without creating additional undue surface disturbance and where it does not impede watershed and drainage flows.

4. Maintain a minimum 20-foot undisturbed vegetative border between disturbance areas and the edge of adjacent drainages, unless otherwise directed by the BLM Authorized Officer.

5. Reserve pits will be adequately fenced during and after drilling operations until pit is reclaimed so as to effectively keep out wildlife and livestock. Adequate fencing, in lieu of more stringent requirements by the surface owner, is defined as follows:

   - Construction materials will consist of steel or wood posts. Three or four strand wire (smooth or barbed) fence or hog panel (16-foot length by 50-inch height) or plastic snow fence must be used with connectors such as fence staples, quick-connect clips, hog rings, hose clamps, twisted wire, etc. Electric fences will not be allowed.
   - Construction standards: Posts shall be firmly set in ground. If wire is used, it must be taut and evenly spaced, from ground level to top wire, to effectively keep out animals. Hog panels must be tied securely into posts and one another using fence staples, clamps, etc. Plastic snow fencing must be taut and sturdy. Fence must be at least 2-feet from edge of pit. 3 sides fenced before beginning drilling, the fourth side fenced immediately upon completion of drilling and prior to rig release. Fence must be left up and maintained in adequate condition until pit is closed.

6. The reserve pit will be oriented to prevent collection of surface runoff. After the drilling rig is removed, the operator may need to construct a trench on the uphill side of the reserve pit to divert surface drainage around it. If constructed, the trench will be left intact until the pit is closed.

7. The reserve pit will be lined with an impermeable liner if permeable subsurface material is encountered. An impermeable liner is any liner having permeability less than 10-7 cm/sec. The liner will be installed so that it will not leak and will be chemically compatible with all substances that may be put in the pit. Liners made of any man-made synthetic material will be of sufficient strength and thickness to withstand normal installation and pit use. In gravelly or rocky soils, a suitable bedding material such as sand will be used prior to installing the liner.

8. The reserve pit will be constructed so that at least half of its total volume is in solid cut material (below natural ground level).

9. The culvert locations will be staked prior to construction. The culvert invert grade and finished road grade will be clearly indicated on the stakes. Culverts will be installed on natural ground, or on a designed flow line of a ditch. The minimum cover over culverts will be 12" or one-half the diameter whichever is greater. Drainage laterals in the form of culverts or waterbars shall be placed according to the following spacing:

Soil Type	Road Grade 2-4%	Road Grade 5-8%	Road Grade 9-12%	Road Grade 13-16%
Highly erosive Granitic or sandy	240	180	140	100
Intermediate Erosive clay or load	310	260	200	150
Low erosive shale or gravel	400	325	250	175

10. Provide 4" of aggregate where grades exceed 8%. Surface material must meet requirements set forth in Wyoming Supplement to BLM Road Manual 9113.

11. The minimum diameter for culverts will be 18 inches. However, all culverts will be appropriately sized in accordance with standards in BLM Manual 9113 or at the discretion of the Authorized Officer.

12. Maximum speed on all operator-constructed and maintained roads will not exceed 25 miles per hour.

13. Pipeline construction shall not block nor change the natural course of any drainage. Pipelines shall cross perpendicular to drainages. Suspended pipelines shall provide adequate clearance for maximum runoff.

14. During construction, emissions of particulate matter from well pad and road construction would be minimized by application of water or other non-saline dust suppressants with at least 50 percent control efficiency. Dust inhibitors (surfacing materials, non-saline dust suppressants, and water) will be used as necessary on unpaved roads that present a fugitive dust problem. The use of chemical dust suppressants on public surface will require prior approval from the BLM Authorized Officer.

15. All overhead power lines will be constructed to Avian Power Line Interaction Committee (2006 edition or most recent edition) by the standards and additional standards identified in the PRB FEIS Biological Opinion (Volume 3, Appendix K, page 43).

B. Operations/Maintenance

1. All waste, other than human waste and drilling fluids, will be contained in a portable trash cage. This waste will be transported to a State approved waste disposal site immediately upon completion of drilling operations. No trash or empty barrels will be placed in the reserve pit or buried on location. Operators and their contractors will comply with all state and local laws and regulations pertaining to disposal of human and solid waste will be complied with.

2. Sewage shall be placed in a self-contained, chemically treated porta-potty on location.

3. The operator and their contractors shall ensure that all use, production, storage, transport and disposal of hazardous and extremely hazardous materials associated with the drilling, completion and production of these wells will be in accordance with all applicable existing or hereafter promulgated federal, state and local government rules, regulations and guidelines. All project-related activities

involving hazardous materials will be conducted in a manner to minimize potential environmental impacts. In accordance with OSHA requirements, a file will be maintained onsite containing current Material Safety Data Sheets (MSDS) for all chemicals, compounds and/or substances which are used in the course of construction, drilling, completion and production operations.

4. Produced fluids shall be put in test tanks on location during completion work. Produced water will be put in the reserve pit during completion work per Onshore Order #7.

5. The only fluids/waste materials which are authorized to go into the reserve pit are RCRA exempt exploration and production wastes. These include:
   - drilling muds & cuttings
   - rigwash
   - excess cement and certain completion & stimulation fluids defined by EPA as exempt

   It does not include drilling rig waste, such as:
   - spent hydraulic fluids
   - used engine oil
   - used oil filter
   - empty cement, drilling mud, or other product sacks
   - empty paint, pipe dope, chemical or other product containers
   - excess chemicals or chemical rinsate

   Any evidence of non-exempt wastes being put into the reserve pit may result in the BLM Authorized Officer requiring specific testing and closure requirements.

6. Reserve pits will be closed as soon as possible, but no later than 90 days from time of drilling/well completion, unless the BLM Authorized Officer gives an extension. Pits must be dry of fluids or they must be removed via vac-truck or other environmentally acceptable method prior to backfilling, re-contouring and replacement of topsoil. Mud and cuttings left in pit must be buried at least 3-feet below re-contoured grade. The operator will be responsible for re-contouring any subsidence areas that develop.

7. The fluids and mud must be dry in the reserve pit before re-contouring pit area. The operator will be responsible for re-contouring of any subsidence areas that develop from closing a pit before it is completely dry. The plastic pit liner (if any) will be cut off below grade and properly disposed of at a state authorized landfill before beginning to re-contour the site.

8. The operator will be responsible for prevention and control of noxious weeds and weeds of concern on all areas of surface disturbance associated with this project (well locations, roads, water management facilities, etc.) Use of pesticides shall comply with the applicable Federal and State laws.

9. Prior to the use of pesticides on public land, the holder shall obtain from the BLM authorized officer a pesticide use permit (PUP). The PUP must include a written approval of a plan showing the type and quantity of material to be used, pest(s) to be controlled, method of application, location of storage and disposal of containers, and any other information deemed necessary by the authorized officer to such use.

C. Producing Well

1. Landscape those areas not required for production to the surrounding topography as soon as possible.

The fluids and mud must be dry in the reserve pit before re-contouring pit area. The operator will be responsible for re-contouring and reseeding of any subsidence areas that develop.

2. Any spilled or leaked oil, produced water or treatment chemicals must be reported in accordance with NTL-3A and immediately cleaned up in accordance with BLM requirements. This includes clean-up and proper disposition of soils contaminated as a result of such spills/leaks.

3. Distribute stockpiled topsoil evenly over those areas not required for production (ie.,cut/fill slopes, road ditches, pipelines, etc.) and reseed with approved seed mix.

4. Upgrade and maintain access roads and drainage control (e.g., culverts, drainage dips, ditching, crowning, surfacing, etc.) as necessary and as directed by the BLM Authorized Officer to prevent soil erosion and accommodate safe, environmentally-sound access.

D. Reclamation/Dry Hole

1. BLM will not release the performance bond until all disturbed areas associated with the APD/POD have been successfully revegetated (evaluation will be made after the second complete growing season) and has met all other reclamation goals of the surface owner and surface management agency.

2. A Notice of Intent to Abandon and a Subsequent Report of Abandonment must be submitted for abandonment approval.

3. For performance bond release approval, a Final Abandonment Notice (with a surface owner release letter on split-estate) must be submitted prior to a final abandonment evaluation by BLM.

4. Phased reclamation plans will be submitted to BLM for approval prior to individual POD facility abandonment via a Notice of Intent (NOI) Sundry Notice. Individual facilities, such as well locations, pipelines, discharge points, impoundments, etc. need to be addressed in these plans as they are no longer needed. Individual items that will need to be addressed in reclamation plans include:

   - Configuration of reshaped topography, drainage systems, and other surface manipulations
   - Waste disposal
   - Revegetation methods, including specific seed mix (pounds pure live seed/acre) and soil treatments (seedbed preparation, fertilization, mulching, etc.). On private surface, the landowner should be consulted for the specific seed mix.
   - Other practices that will be used to reclaim and stabilize all disturbed areas, such as water bars, erosion fabric, hydro-mulching, etc.
   - An estimate of the timetables for beginning and completing various reclamation operations relative to weather and local land uses.
   - Methods and measures that will be used to control noxious weeds, addressing both ingress and egress to the individual well or POD.
   - Decommissioning/removal of all surface facilities
   - Closure and reclamation of areas utilized or impacted by produced CBNG water, including discharge points, reservoirs, off-channel pits, land application areas, livestock/wildlife watering facilities, surface discharge stream channels, etc.
   - Refer to BLM Impoundment Reclamation Guidance for further information on reclaiming impoundments.
   - Refer to the Wyoming Reclamation Policy for further guidance on reclamation.

5. All disturbed lands associated with this project, including the pipelines, access roads, water

management facilities, etc will be reclaimed and reseeded within 180 days of well plugging. The reclamation work must be in accordance with the surface use plan and any pertinent site-specific COAs.

6. Disturbed lands will be re-contoured back to conform with existing undisturbed topography. No depressions will be left that trap water or form ponds.

7. The fluids and mud must be dry in the reserve pit before re-contouring pit area. The operator will be responsible for re-contouring of any subsidence areas that develop from closing a pit before it is completely dry. The plastic pit liner (if any) will be cut off below grade and properly disposed of at a state authorized landfill before beginning to re-contour the site.

8. Before the location has been reshaped and prior to redistributing the topsoil, the operator will rip or scarify the drilling area and access road on the contour to 4" below the compacted layer. The rippers are to be no farther than 24 inches apart.

9. Distribute the topsoil evenly over all disturbed areas. Prepare the seedbed and seed with approved seed mix.

10. Soil fertility testing and the addition of soil amendments may be required to stabilize some disturbed lands.

11. Any mulch utilized for reclamation needs to be certified weed free.

12. Waterbars are to be constructed at least one (1) foot deep, on the contour with approximately two (2) feet of drop per 100 feet of waterbar to ensure drainage, and extended into established vegetation. All waterbars are to be constructed with the berm on the downhill side to prevent the soft material from silting in the trench. The initial waterbar should be constructed at the top of the backslope. Subsequent waterbars should follow the following general spacing guidelines:

Slope (percent)	Spacing Interval (feet)
< 2	200
2 - 4	100
4 - 5	75
> 5	50

Appendix A. Affected Resources Worksheet

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Air quality	Yes	Yes	Yes	PRB FEIS: 3-291-298, 4-404-406, 4-377-386
Cultural	Yes	Yes	No	PRB FEIS: 3-206-228, 4-273-288, 4-394
Native American religious concerns	No	No	Yes	PRB FEIS: 3-218-219, 3-228, 4-277-278
Traditional Cultural Properties	No	No	Yes	PRB FEIS: 3-218-219, 4-277-278
Mineral Potential				PRB FEIS: 3-66-70, 3-230, 4-127-129
Coal	No	No	Yes	PRB FEIS: 3-66
Fluid Minerals	Yes	Yes	Yes	PRB FEIS: 3-68-69
Locatable Minerals	Yes	Yes	No	Add in EA
Other leasables	No	No	NA	
Salable minerals	No	No	NA	
Paleontology				PRB FEIS: 3-65-66, 4-125-127
PFYC 3	Yes	No	Yes	PRB FEIS: 3-65-66, 4-125-127
PFYC 5	Yes	No	Yes	PRB FEIS: 3-65-66, 4-125-127
Rangeland management				Not in PRB FEIS
Existing range improvements	No	No	NA	
Proposed range improvements	No	No	NA	
Recreation				PRB FEIS: 3-263-273, 4-319-328
Developed site	No	No	Yes	PRB FEIS: 3-266, 4-326
Walk-in-Area	No	No	Yes	
Social & Economic	Y	No	Yes	PRB FEIS: 3-275-289, 4-336-370
Soils & Vegetation	Yes	Yes	No	Addressed in EA. PRB FEIS: 3-78-107, 4-134-152, 4-153-164, 4-393-394, 4-406
Erosion Hazard	Yes	No	No	Addressed in EA. PRB FEIS: 3-82, 4-135
Poor Reclamation Potential	Yes	Yes	Yes	Addressed in EA. PRB FEIS: 3-86, 4-149-152
Slope hazard	Yes	Yes	No	Addressed in EA. PRB FEIS: 3-81, 4-135
Forest products	No	No	Yes	
Invasive Species	Yes	Yes	No	Addressed in EA. PRB FEIS: 3-103-108, 4-153-172
Wetlands/Riparian	Yes	No	Yes	PRB FEIS: 4-117 to 124 3-108-113, 4-172-178, 4-406
Special Designations	No	No	No	
Proposed ACEC	No	No	No	
Wild & Scenic River	No	No	No	PRB FEIS: 3-273
Wilderness	No	No	No	

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Characteristics/Citizen Proposed				
WSA	No	No	No	
Visual Resources	No	No	No	PRB FEIS: 3-252-263, 4-302-314, 4-403
Class II	No	No	No	
Class III	No	No	No	
Water				PRB FEIS: 3-1-56, 4-1-122, 4-135, 4-33, 4-405
Floodplains	No	No	Yes	
Ground water	Yes	Yes	No	PRB FEIS: 3-1-30, 4-1-69, 4-392, 4-405
Surface water	Yes	Yes	No	PRB FEIS: 4-85 to 86, 4-117 to 124 3-36-56, 4-69-122, 4-393, 4-405
Drinking water	No	No	Yes	PRB FEIS: 3-52, 4-50-52
Wildland Urban Interface	No	No	Yes	
Wildlife				PRB FEIS: 3-113-153, 4-179, 4-247, 4-397
ESA listed, proposed, or candidate species	Yes	Yes	Yes	
BLM sensitive species	Yes	Yes	Yes	
General wildlife	Yes	Yes	Yes	
West Nile virus potential	Yes	No	No	