DECISION RECORD
FOR
Lance Oil & Gas Company, Inc (LOG)
Kinney Divide Unit Gamma (KDU Gamma)
ENVIRONMENTAL ASSESSMENT – WY-070-EA10-271

DECISION:
BLM's decision is to approve Lance Oil & Gas Company, Inc's (LOG) Kinney Divide Unit Gamma Coal Bed Natural Gas (CBNG) POD Alternative C of the attached Environmental Assessment (EA). Alternative B is the post-onsite proposal based on the operator and BLM working together. Alternative C was created due to wells or other infrastructure that BLM recommended for deletion or deferment where the operator did not agree with and follow the recommendation. Alternative C 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. 9-19.

Well Sites:
The following 39 Applications for Permit to Drill (APDs) and associated infrastructure are authorized

	Lease	Well Name	Well #	TWP	RNG	Sec	QTR
1	WYW146307	KDU GAMMA	12-3	50N	77W	3	SWNW
2	WYW146307	KDU GAMMA	21-3	50N	77W	3	NENW
3	WYW146307	KDU GAMMA	24-3	50N	77W	3	SESW
4	WYW146307	KDU GAMMA	34-3	50N	77W	3	SWSE
5	WYW146307	KDU GAMMA	41-3	50N	77W	3	NENE
6	WYW146307	KDU GAMMA	42-3	50N	77W	3	SENE
7	WYW146307	KDU GAMMA	31-4	50N	77W	4	NWNE
8	WYW146307	KDU GAMMA	32-4	50N	77W	4	SWNE
9	WYW146307	KDU GAMMA	34-4	50N	77W	4	SWSE
10	WYW146307	KDU GAMMA	41-4	50N	77W	4	NENE
11	WYW146307	KDU GAMMA	44-4	50N	77W	4	SESE
12	WYW146313	KDU GAMMA	12-17	51N	77W	17	SWNW
13	WYW146313	KDU GAMMA	23-17	51N	77W	17	NESW
14	WYW146313	KDU GAMMA	41-17	51N	77W	17	NENE
15	WYW146313	KDU GAMMA	11-18	51N	77W	18	NWNW
16	WYW146313	KDU GAMMA	21-18	51N	77W	18	NENW
17	WYW146313	KDU GAMMA	31-18	51N	77W	18	NWNE
18	WYW146313	KDU GAMMA	41-18	51N	77W	18	NENE
19	WYW146313	KDU GAMMA	43-18	51N	77W	18	NESE
20	WYW146313	KDU GAMMA	44-18	51N	77W	18	SESE
21	WYW146313	KDU GAMMA	41-19	51N	77W	19	NENE

	Lease	Well Name	Well #	TWP	RNG	Sec	QTR
22	WYW146312	KDU GAMMA	14-21	51N	77W	21	SWSW
23	WYW146315	KDU GAMMA	14-27	51N	77W	27	SWSW
24	WYW146315	KDU GAMMA	12-28	51N	77W	28	SWNW
25	WYW146315	KDU GAMMA	14-28	51N	77W	28	SWSW
26	WYW146315	KDU GAMMA	21-28	51N	77W	28	NENW
27	WYW146315	KDU GAMMA	24-28	51N	77W	28	SESW
28	WYW146315	KDU GAMMA	31-28	51N	77W	28	NENE
29	WYW146315	KDU GAMMA	32-28	51N	77W	28	SENE
30	WYW146315	KDU GAMMA	43-28	51N	77W	28	NESE
31	WYW146316	KDU GAMMA	41-29	51N	77W	29	NENE
32	WYW146315	KDU GAMMA	21-33	51N	77W	33	NENW
33	WYW146315	KDU GAMMA	32-33	51N	77W	33	SWNE
34	WYW146315	KDU GAMMA	44-33	51N	77W	33	SESE
35	WYW146315	KDU GAMMA	11-34	51N	77W	34	NWNW
36	WYW146315	KDU GAMMA	13-34	51N	77W	34	NWSW
37	WYW146315	KDU GAMMA	21-34	51N	77W	34	NENW
38	WYW146315	KDU GAMMA	23-34	51N	77W	34	NESW
39	WYW146315	KDU GAMMA	44-34	51N	77W	34	SESE

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

Facility Name	NEPA Document	QtrQtr	Sec	T	R	Lease	WDP	QtrQtr	Sec	T	R
Kinney Draw EMIT Water Treatment	Kinney Divide-Highland Unit Adds 1 WY-070-EA06-317	NENE	20	51	77	Fee	018	NWSE	20	51	77
Faddis-Kennedy EMIT Water Treatment	Kinney Divide-Highland Unit Adds 1 WY-070-EA06-317	SESW	31	51	77	Fee	016	NESW	32	51	77

Rights of Way:
The following rights-of-way are authorized with the approval of this POD:

Rights-of-way	Aliquot/Lot	Sec	TWP	RNG	Use/Type	Surface Disturbance (Acres)
WYW-170025	NWSW; 8	4, 5	50N	77W	Engineered road and buried power line	1.860
WYW-170008	NWSW; 8	4, 5	50N	77W	Gas pipeline	1.628

Rights-of-way	Aliquot/Lot	Sec	TWP	RNG	Use/Type	Surface Disturbance (Acres)
WYW-169471	S2NE, SWNW, N2SW; Lots 5,6 SESW; SWNE, E2NW, N2SE	3, 28, 33	51N	77W	Template access road	14.373
WYW-169442 #3	SESE	7	51N	77W	Primitive road, water pipeline and buried power line	0.619
WYW-169443 #2	SESE	7	51N	77W	Gas pipeline	0.488

Denials:
The following 20 APDs and associated infrastructure are denied. Many of the wells had multiple resource concerns. The primary resource issues are listed below by well. Section 4 of the attached EA provides complete analysis of multiple environmental impacts.

Well Name	Well #	Environmental Issue
KDU Fed	43-03-5077	Access and utility corridor impacts raptors, nest is within 1/4 mile. EA Section 4.3.2
KDU Fed	13-04-5077	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	21-04-5077	Access route impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	22-04-5077	Access route impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	42-05-5077	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	43-05-5077	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	11-27-5177	Well location and access/utility corridor impacts raptors, nest is within 1/4 mile. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1 and Section 4.3.2
KDU Fed	21-27-5177	Well location and access/utility corridor are within 1/4 mile raptor nest. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1 and Section 4.3.2
KDU Fed	22-27-5177	Well location and access/utility corridor impacts raptors, nest is within 1/4 mile. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1 and Section 4.3.2
KDU Fed	31-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	32-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1

Well Name	Well #	Environmental Issue
KDU Fed	33-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	34-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	42-29-5177	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	11-33-5177	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	13-33-5177	Access and utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	14-33-5177	Access and utility corridor impacts bald eagles, roost is within 1/2 mile.
KDU Fed	32-34-5177	Slopes >25%, erosive soils, erosion hazard, poor reclamation potential on well location and access route. EA Section 4.3.1
KDU Fed	41-34-5177	The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1
KDU Fed	42-34-5177	Well location in a drainage pathway with erosive soils, erosion hazard, poor reclamation potential, in addition The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1
Access road into the POD from the north in sections 27 and 34 T51N R77W has no approved connection out to a main road. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. The access/utility corridor impacts raptor, nest within 1/4 mile. EA Section 4.3.1		
Utility corridor S4, S5 and S9 T50 R77 is denied. It was not field reviewed. It was added to the map after the onsite. EA Section 4.3.1		
Pump jacks are denied. Pump jacks were not considered during the onsite. EA Section 4.3.1		

Operator Committed Measures:
The operator has incorporated several measures to alleviate resource impacts into the Master Surface Use Plan (MSUP), submitted on February 19, 2008. Refer to the POD's MSUP, Appendices A-E, and separately bound site-specific reclamation plan for complete details of operator committed measures.

Site-Specific Mitigation Measures:
Site-specific Conditions of Approval (COAs) 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 Attachment C 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. The Operator, in their POD, has committed to:
   - Comply with all applicable Federal, State and Local laws and regulations.
   - 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.

   - 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.

   - Provide water analysis from a designated reference well in each coal zone.

2. The Operator has certified that a Surface Use Agreement has been reached with the Landowners.

3. The selected alternative will not result in any undue or unnecessary environmental degradation.

4. It is in the public interest to approve these wells, as this development will help meet the nation's energy needs, and will help to stimulate local economies by maintaining workforce stability.

5. The selected alternative incorporates appropriate local greater sage-grouse research and the best available science from across the species' range in development of the attached conditions of approval.

6. 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 Section 2 in the attached EA.

7. The selected alternative 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 KDU Gamma Project.

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.

Field Manager: _____ Date: 8/26/10

FINDING OF NO SIGNIFICANT IMPACT
FOR
Lance Oil & Gas Company, Inc (LOG)
KDU Gamma (KDU Gamma)
ENVIRONMENTAL ASSESSMENT – WY-070-EA10-271

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 C will not have significant environmental impacts beyond those already addressed in PRB EIS to which the EA is tiered; (2) Alternative C is in conformance with the Buffalo Field Office Resource Management Plan (1985, 2001); and (3) Alternative C 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. The additional CBNG development described in Alternative C is insignificant within the national, regional, and local context.

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

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 selected alternative 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 selected alternative. No species listed under the Endangered Species Act or their designated critical habitat will be adversely affected. The selected alternative 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.

Field Manager: _____ Date: 8/26/10

BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
Lance Oil & Gas Company, Inc (LOG)
KDU Gamma (KDU Gamma)
Plan of Development (POD)
ENVIRONMENTAL ASSESSMENT – WY-070-EA10-271

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 & Gas Company, Inc (LOG) submitted the KDU Gamma (KDU Gamma) POD on February 19, 2008 with 59 Federal APD's. The initial on-sites were conducted over four days on August 3- 8, 2009. The POD encompasses an area on both the east and west sides of the Powder River. The topography of the Powder River Breaks, as they cut in elevation toward Powder River, is steep with deeply incised drainages and highly erosive soils. This portion of the Powder River supplies habitat for many wildlife species including raptors, elk and sage-grouse. Due to steep slopes and good habitat, there were many conflicting issues. The BLM Interdisciplinary team, operator and private surface owners faced challenging circumstances in siting wells and infrastructure. An additional four separate on-site dates (September 15, 2009, September 25, 2009, October 15, 2009 and November 19, 2009) over a four month period were dedicated to look at alternative locations for wells and access roads, to evaluate the proposal and modify it as necessary to alleviate environmental impacts.

The first post on-site deficiencies were sent from BLM to LOG on October 26, 2009. Another onsite was conducted by BLM, LOG and the private surface owner on November 19, 2009 in an attempt to find suitable access to portions of the POD inaccessible due to steep topography. Project modifications designed to avoid or reduce adverse impacts were identified during the on-site. The BLM interdisciplinary team recommended 20 APDs (and associated infrastructure) be removed from consideration by the project proponent prior to final project submittal, see Table 2.1 below.

The project proposal and APDs were considered complete when BLM received the operator's response to the post onsite deficiencies on February 11, 2010. On May 7, 2010 the Governor sent a letter putting a hold on projects in potential sage-grouse connectivity habitat until his Sage-grouse Implementation Team could make recommendations on July 1, 2010. The KDU Gamma POD was in this group of projects that were put on hold. As of July 2010 it was determined that the KDU Gamma POD does not fall within the final connectivity corridor. As a result, the environmental analysis continued and was completed. The proposed COAs were shared with the operator on August 16, 2010.

The recommendations that BLM made to drop/withdraw 20 APDs were not incorporated in the final project proposal as submitted by the Operator, see Table 2.1 below. In the final proposal, in the cover letter from the Operator dated February 11, 2010, LOG offered no applicable mitigation and requested BLM defer, deny or approve the KDU Gamma POD as it was finally submitted. Therefore, in order to

reduce environmental impacts from proposed action the BLM interdisciplinary team recommended denial of 20 APDs and associated infrastructure.

This denial list was sent LOG on August 16, 2010, see Table 2.1 below. In LOG's response e-mail dated August 18, 2010 (response letter is on file at the BFO), LOG requested deferral of well 43-03, and wells in section 27 and 34 until the abutting leases in KDU Epsilon could be planned for future development. No potential mitigation of the proposed access route for the KDU Gamma POD was provided. Based on the limited information provided by LOG, deferral, as described in Onshore Order No. 1, could not be applied. The denial allows LOG to submit APDs for these wells when they have located new access routes to these five wells (31-27, 32-27, 33-27, 34-27, and 41-34).

On the 32-34, LOG concurred there were no other options but to deny this well. The 42-34 was eliminated from consideration at the on-site due slopes greater than 25% and resultant potential failure of the constructed site, site instability due to water velocity from the surrounding watershed and location of the well in the flow path of the surrounding drainages. In reference to the wells with bald eagle issues along the Powder River, LOG suggested coming in through a north or south route. These wells and/or access routes (13-04, 21-04, 22-04, 42-05, and 43-05, 13-33 and 14-33) are within the 0.5 miles buffer near the roost area along the Powder River. The alternative access that LOG suggested using runs parallel (north and south) with the Powder River. The access proposed in LOG's response letter dated August 18, 2010, continues to travel within 0.5 miles of the roost. This mitigation would not be effective because it still impacts bald eagles. The 11-27, 21-27 and 22-27 wells face a raptor nest across Turner Draw. There is no proposed mitigation for these wells. LOG agreed there is no economical alternative to move the 42-29 well outside 0.5 mile of bald eagle roost. LOG said they would likely appeal the 11-33 because it is out of line-sight of the bald eagle roost. Moving a well out of line of sight does not ensure mitigation of impacts to an eagle roost, see EA Section 4.3.2.

The BFO considered a finding of significance but opted to deny the 20 APDs with a FONSI. None of the 20 locations prevents drilling of the entire lease. Each lease would still be capable of production.

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.

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.

1.3. Conformance with Applicable Land Use Plan and Other Environmental Assessments:

The proposed action conforms to the terms and the conditions of the 1985 Buffalo RMP and the 2003 PRB FEIS.

1.4. Issues

This EA addresses resources and resource uses with site-specific impacts that were not disclosed in detail within the PRB FEIS. Appendix A identifies resources and land uses potentially 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. Issues for this project include

concerns with impacts to threatened and endangered species, greater sage-grouse, mountain plover, bald eagles, black-tailed prairie dogs, the Fortification Creek elk herd, migratory birds, and raptors; cultural resources, soils, vegetation, water management, invasive species, minerals, and local economics.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

Three alternatives, A, B and C were evaluated. A brief description of each alternative follows.

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 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 LOG KDU Gamma.

Proposed Action Title/Type: LOG's KDU Gamma for 59 coal bed natural gas well APD`s and associated infrastructure.

Proposed Well Information: There are 59 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 1 coal seam. Proposed well house dimensions are 8 ft wide x 8 ft length x 8 ft height. Once the pumping rate is less than 100 barrels per day, LOG will add pumping units (pump jacks) driven by electric motors. If pump jacks are utilized they will be added when the well has 3-5 years left before it is plugged. Pump jacks are proposed dimensions are 3 ft wide 9.5 ft length x 10.5 ft height. Well house and pump jack color is covert green, selected to blend with the surrounding vegetation. Proposed wells are located as follows:

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1	WYW146307	KDU GAMMA	12-3	50N	77W	3	SWNW
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34	WYW146315	KDU GAMMA	32-27	51N	77W	27	SWNE
35	WYW146315	KDU GAMMA	33-27	51N	77W	27	NWSE
36	WYW146315	KDU GAMMA	34-27	51N	77W	27	SWSE
37	WYW146315	KDU GAMMA	12-28	51N	77W	28	SWNW
38	WYW146315	KDU GAMMA	14-28	51N	77W	28	SWSW
39	WYW146315	KDU GAMMA	21-28	51N	77W	28	NENW
40	WYW146315	KDU GAMMA	24-28	51N	77W	28	SESW
41	WYW146315	KDU GAMMA	31-28	51N	77W	28	NENE
42	WYW146315	KDU GAMMA	32-28	51N	77W	28	SENE
43	WYW146315	KDU GAMMA	43-28	51N	77W	28	NESE
44	WYW146316	KDU GAMMA	41-29	51N	77W	29	NENE
45	WYW146316	KDU GAMMA	42-29	51N	77W	29	SENE
46	WYW146315	KDU GAMMA	11-33	51N	77W	33	NWNW
47	WYW146315	KDU GAMMA	13-33	51N	77W	33	NWSW
48	WYW146315	KDU GAMMA	14-33	51N	77W	33	SWSW
49	WYW146315	KDU GAMMA	21-33	51N	77W	33	NENW
50	WYW146315	KDU GAMMA	32-33	51N	77W	33	SWNE
51	WYW146315	KDU GAMMA	44-33	51N	77W	33	SESE
52	WYW146315	KDU GAMMA	11-34	51N	77W	34	NWNW

	Lease	Well Name	Well #	TWP	RNG	Sec	QTR
53	WYW146315	KDU GAMMA	13-34	51N	77W	34	NWSW
54	WYW146315	KDU GAMMA	21-34	51N	77W	34	NENW
55	WYW146315	KDU GAMMA	23-34	51N	77W	34	NESW
56	WYW146315	KDU GAMMA	32-34	51N	77W	34	SWNE
57	WYW114691	KDU GAMMA	41-34	51N	77W	34	NENE
58	WYW146315	KDU GAMMA	42-34	51N	77W	34	SENE
59	WYW146315	KDU GAMMA	44-34	51N	77W	34	SESE

Water Management Proposal: The following water management infrastructure was proposed for use in association with this POD.

Facility Name	NEPA Document	QtrQtr	Sec	T	R	Lease	WDP	QtrQtr	Sec	T	R
Kinney Draw	Kinney Divide-Highland Unit Adds 1 WY-070-EA06-317	NENE	20	51	77	Fee	018	NWSE	20	51	77
Faddis-Kennedy	Kinney Divide-Highland Unit Adds 1 WY-070-EA06-317	SESW	31	51	77	Fee	016	NESW	32	51	77
Barber Creek	Powder Valley Unit POD WY-070-04-072	NENW	9	50	77	WYW 149359	001	NENW	9	50	77

Rights-of-way

The following rights-of-way were inspected and are required in association with the Master Surface Use Plan for the Kinney Divide Unit Gamma POD. They will fall within the constraints of the appropriate stipulations and conditions of approval of the POD:

Rights-of-way	Aliquot/Lot	Sec	TWP	RNG	Use/Type	Surface Disturbance (Acres)
WYW-170025	NWSW; 8	4, 5	50N	77W	Engineered road and buried power line	1.860
WYW-170008	NWSW; 8	4, 5	50N	77W	Gas pipeline	1.628
WYW-169471	S2NE, SWNW, N2SW; Lots 5,6 SESW; SWNE, E2NW, N2SE	3, 28, 33	51N	77W	Template access road	14.373
WYW-169442 #3	SESE	7	51N	77W	Primitive road, water pipeline and buried power line	0.619
WYW-169443 #2	SESE	7	51N	77W	Gas pipeline	0.488

County: Johnson

Applicant: Lance Oil & Gas Company, Inc

Surface Owners: Juaquin Michelena, Powder River Livestock, Faddis-Kennedy Cattle Co., Powder River Ranch and BLM administered surface

Project Description: The proposed action involves the following:

- Drilling of 59 total federal CBNG wells in the Wall-Coal zone to depths of approximately 2,250 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 may 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. Metering would entail 4-16 visits per month to each well/central metering facility.

- A Water Management Plan (WMP) that utilizes existing infrastructure which includes 3 EMIT water treatment facilities and associated water discharge points into the Powder River. Alternatively, the water produced from this project will be added to any existing pipeline to be transported to Midwest, WY and injected into the Tensleep and Madison formations.

- An unimproved and improved road network.

- No overhead power is proposed. A buried power line network is to be constructed by the operator. If the power line network is not completed before the wells are in production, then temporary diesel generators may be placed at the 21 proposed power drops or at individual wells.

- A storage tank of up to 500 gallon capacity may be located with each diesel generator. Generators are projected to be in operation for up to 24 months. Fuel deliveries are anticipated to be 3 times per week. Noise level is expected to be 100.5 decibels at 3.3 feet distance.

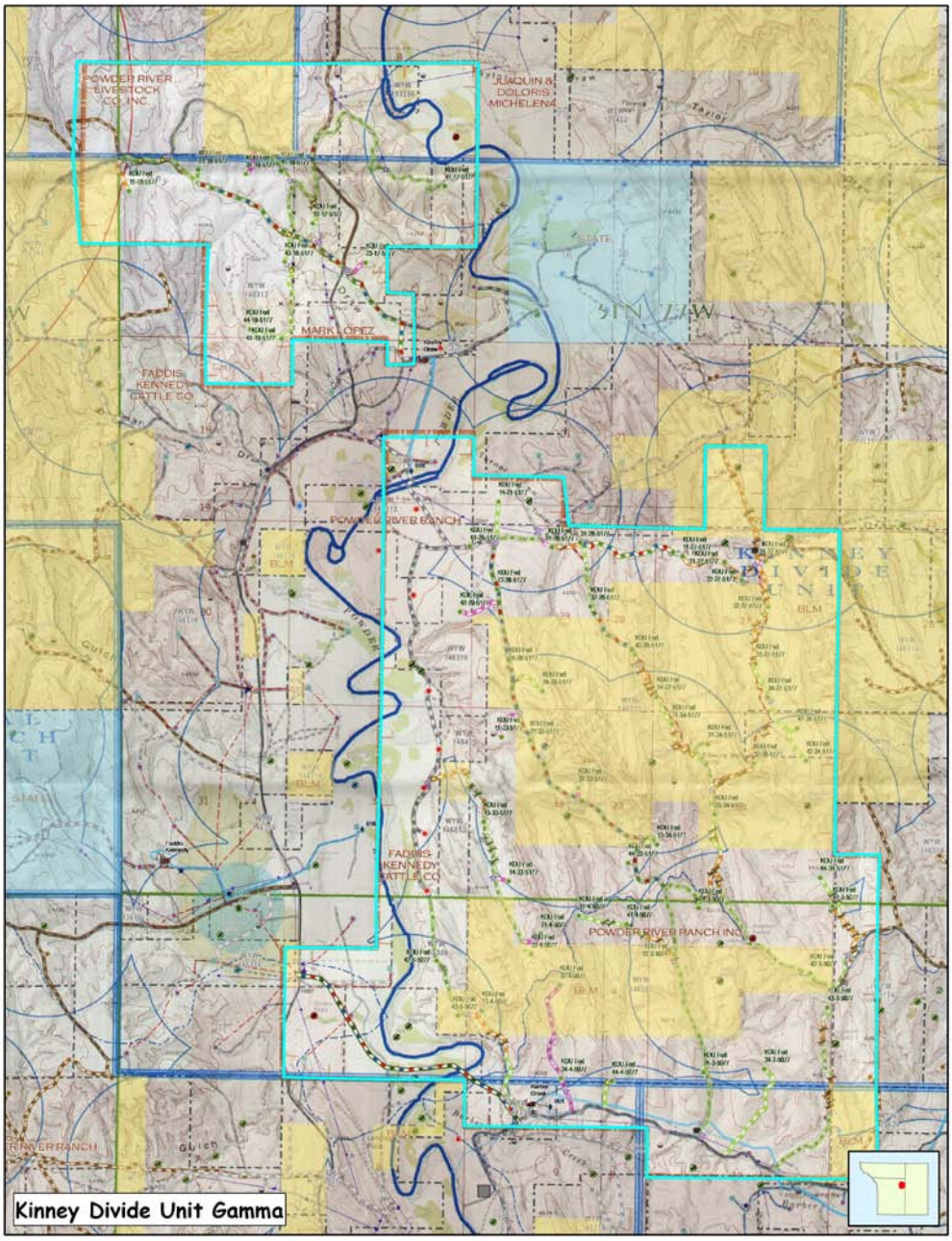
- A buried gas, water and power line network. There are no proposed central gathering/metering facilities or compression facilities.

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 is also 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.

Map 2.1 POD Map

KDU Gamma POD Boundary



2.2.1. Operator Committed Measures

The operator has incorporated several measures to alleviate resource impacts into the Master Surface Use Plan (MSUP), submitted on February 19, 2008. Refer to the POD's MSUP, Appendices A-E and separately bound site-specific reclamation plan for complete details of operator committed measures. For a complete listing of changes that were BLM changes that were recommended during the field visits on-

site, see the Post On-site Deficiency Letter in Master KDU Gamma POD book on file at the BLM-Buffalo Field Office.

Additionally, the Operator, in their POD, has committed to:

1. Comply with all applicable Federal, State and Local laws and regulations.
2. Obtain the necessary permits 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.
3. Offer water well agreements to the owners of record for permitted water wells within 0.5 mile of a federal CBNG producing well in the POD
4. Provide water analysis from a designated reference well in each coal zone.
5. The Operator has certified that a Surface Use Agreement has been reached with the landowners.

2.3. Alternative C – Modified Action

Alternative C represents a modification of Alternative B based on BLM developing mitigation measures to reduce environmental effects that the operator chose not to include in their project proposal. The description of Alternative C is the same as Alternative B, with the addition of the following project modifications. The BLM recommended design feature changes at the on-site which included dropping wells and infrastructure from the proposed plan. This would allow future mitigation to be established. Below is a list of wells and infrastructure that the BLM recommended dropping from the POD so that these items could be reviewed at a later date. The Operator responded with a justification letter on February 11, 2010 that offered no additional mitigation requesting the BLM approve, deny or defer the following:

Table 2.1 The following wells and infrastructure are recommended for denial:

Well Name	Well #	Environmental Issue
KDU Fed	43-03-5077	Access and utility corridor impacts raptors, nest is within 1/4 mile. EA Section 4.3.2
KDU Fed	13-04-5077	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	21-04-5077	Access route impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	22-04-5077	Access route impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	42-05-5077	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	43-05-5077	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	11-27-5177	Well location and access/utility corridor impacts raptors, nest is within 1/4 mile. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1 and Section 4.3.2
KDU Fed	21-27-5177	Well location and access/utility corridor are within 1/4 mile raptor nest. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1 and Section 4.3.2
KDU Fed	22-27-5177	Well location and access/utility corridor impacts raptors, nest is within 1/4 mile. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1 and Section 4.3.2

Well Name	Well #	Environmental Issue
KDU Fed	31-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	32-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	33-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	34-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	42-29-5177	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	11-33-5177	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	13-33-5177	Access and utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	14-33-5177	Access and utility corridor impacts bald eagles, roost is within 1/2 mile.
KDU Fed	32-34-5177	Slopes >25%, erosive soils, erosion hazard, poor reclamation potential on well location and access route. EA Section 4.3.1
KDU Fed	41-34-5177	The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1
KDU Fed	42-34-5177	Well location in a drainage pathway with erosive soils, erosion hazard, poor reclamation potential, in addition The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1
Access road into the POD from the north in sections 27 and 34 T51N R77W has no approved connection out to a main road. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. The access/utility corridor impacts raptor, nest within 1/4 mile. EA Section 4.3.1		
Utility corridor S4, S5 and S9 T50 R77 is denied. It was not field reviewed. It was added to the map after the onsite. EA Section 4.3.1		
Pump jacks are denied. Pump jacks were not considered during the onsite. EA Section 4.3.1		

2.4. Alternatives considered but not analyzed in detail

There were five alternatives routes considered to access wells is Sections 27 and 34. Only one route included in the final proposal. All the others were eliminated from further consideration during the on-sites. The other routes are not considered in detail.

2.5. Summary of Alternatives

A summary of the infrastructure currently existing within the POD area (Alternative A), the infrastructure proposed by the operator (Alternative B), and the infrastructure recommended by the BLM (Alternative C) are presented below.

Summary of the Alternatives

Facility	Alternative A (No Action) Existing Number/ Acres/Miles	Alternative B (Original Proposal) Proposed Number/ Acres/Miles	Alternative C (Environmental Alt.) Revised Number/ Acres/Miles
Total CBNG Wells		59	39
Surrounding Well Locations Nonconstructed Constructed Slotted	200 200qty Avg.25ac =50ac	150'x170' 8qty = 4.68ac 30qty = 22.20 ac 21qty = 12.29ac	 7qty = 4.58ac 21qty = 13.20 ac 9qty = 9.94ac
Conventional Wells		0	0
Gather/Metering Facilities Number of Facilities Acreage of Facilities		0 0	
Compressors Number of Compressors		0	
Ancillary (Staging/Storage Areas)	4.0 ac	0	0
Template/ Spot Upgrade Roads No Corridor With Corridor		 4.77 88.04	 4.77 62.16
Engineered Roads No Corridor With Corridor	 112.23	 2.19 30.04	 8.18
Primitive Roads No Corridor With Corridor	 71.54 88.77	 0.22 8.62	 6.00
Buried Power		0	0
Buried Pipeline			
No Corridor With Corridor	.86	21.49	15.00
Overhead Powerlines Power Drops	21.97	 0.08	 0.08
Communication Sites		0	0

Facility	Alternative A (No Action) Existing Number/ Acres/Miles	Alternative B (Original Proposal) Proposed Number/ Acres/Miles	Alternative C (Environmental Alt.) Revised Number/ Acres/Miles
Stock Tanks		0.19	0.19
Land Application Disposal		0	0
Subsurface Drip Irrigation	0	0	0
Treatment Facilities	3	No New	No New
Impoundments On-channel Off-channel Lined Unlined	0	0 0 0	0 0 0
Water Discharge Points	5 0.5 ac	No New	No New
TOTAL ACRES DISTURBANCE	**349.87**	**195.17**	**124.10**

Figures within the action alternatives represent additional facilities and do not include the existing facilities.

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 A. Resources that would be unaffected, or not affected beyond the level analyzed within the PRB FEIS, are not discussed within the EA. The topography in the Powder River Breaks is steep with erosive soils. Issues for this project include concerns with impacts to threatened and endangered species, greater sage-grouse, mountain plover, bald eagles, black-tailed prairie dogs, the Fortification Creek elk herd, migratory birds, and raptors; cultural resources, soils, vegetation, water management, invasive species, minerals, and local economics.

Applications to drill were received on 02/19/2008. Field inspections of the proposed Kinney Divide Unit Gamma CBNG project were conducted over four days on 08/03/09-08/07/09. The BLM interdisciplinary team, operator and landowner faced challenging circumstances in sitting wells and infrastructure due to conflicting resource use issues listed above. An additional five separate dates over a three month period were dedicated to looking at alternative well locations, access routes and infrastructure corridors: 08/26/09, 09/15/09, 09/25/09, 10/15/09 and 11/19/09 by the following personnel:

DATE	NAME	TITLE	AGENCY
08/ 3-7/09, 08/26/09, 09/15/09, 09/25/09, 10/15/09, 11/19/09	Jennifer Spegon	NRS	BLM
08/ 3-7/09, 08/26/09, 09/15/09, 09/25/09, 10/15/09, 11/19/09	Courtney Frost	Biologist	BLM

DATE	NAME	TITLE	AGENCY
08/ 3-7/09, 08/26/09, 09/15/09, 09/25/09, 10/15/09, 11/19/09	Stacy Gunderson	Civil Engineer	BLM
08/ 3-7/09, 09/15/09, 09/25/09, 10/15/09	B J Earle	Archeologist	BLM
08/ 3-7/09, 08/26/09, 09/15/09, 09/25/09, 10/15/09	Joy Kennedy	Permitting	LOG
08/ 3-7/09, 08/26/09, 09/15/09, 09/25/09, 10/15/09	Liz Hunter	Civil Engineer	LOG
08/ 3-7/09, 09/25/09, 10/15/09, 11/19/09	Colt Rodeman	Drilling Sup	LOG
08/ 3-7/09, Conf call 9/25	Ethan Jahnke	Permitting	LOG
Conf call 9/25	Mary Mondragon	Permitting	LOG

3.1. Topographic Characteristics of Project Area

The project area is approximately 24 miles east of Buffalo, Wyoming. It covers an area of approximately 3,244 acres with wells and infrastructure on both the east and west side of the Powder River. The Power River is surrounded by what is termed the "Power River Breaks". The Breaks were formed ancient by geological uplift, followed by an inland sea, which overtime eroded drainage pathways toward the Powder River. These geological processes left the Power River Breaks with rough topographic relief and highly erosive soils broken up by moving headcuts which lead into deeply incised drainages that cut sharply toward many tributaries that lead to the Powder River.

Topography in the KDU POD ranges from 3,700ft to 4,430ft above sea level. It is dissected and gullied with areas of with active erosion and natural head-cutting (see Figure 3.2). 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 naturally mitigated by the thicker vegetation found slighter slopes. Due to rough topography and highly erosive soils, access roads and infrastructure were placed on slighter slopes.

Climates in this region can be extreme. Average precipitation is 10-14 inches. Wide fluctuations can occur in years of drought and years of greater than average precipitation. Temperatures differ greatly between winter lows and summer highs. Winds average 7-10 mph but can be up to 75 mph during extreme storm events. Climate affects reclamation potential.

3.2. Soils & Vegetation

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 differ with topographic location, slope and elevation, Figure 3.1. Erosion potential varies from severe to moderate depending on the soil type, vegetative cover and slope, Figure 3.2. The soils in the KDU POD vary from lowland, loamy, shallow clay, and bedrock, primarily loamy and clayey soil dominate the project area, Figure 3.3. Suitable soil for Reclamation varies in depths ranging from near zero on ridges to twelve inches in bottomlands. The map unit symbols are identified and the associated ecological sites are listed in Figure 3.4. Reclamation potential varies throughout the project area, Figure 3.5. The Figures 3.1 through 3.5 illustrate correlations between slope, erosion hazard, soils, and reclamation suitability.

Soil and vegetative communities, and ecological descriptions are compiled by the Natural Resources

Conservation Service (NRCS). They are field reviewed at the on-site inspection for the purpose of resource identification, and to provide management and reclamation recommendations. Soils within the project area were identified from the South Campbell County Survey Area, Wyoming (WY605).

3.2.1. Soils Susceptible to Erosion

Soils with severe erosion hazard ratings cover 82% of the project area, as shown in Figure 3.1. The project area is 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. An example is one of the existing ranch roads in sections 27 and 34 T51 R77 of this POD. This road is mass wasting away with head cuts and slumping due to poor soils and erosion by the high velocity of water that drains from the surrounding uplands.

Figure 3.1 Severe Erosion Hazard

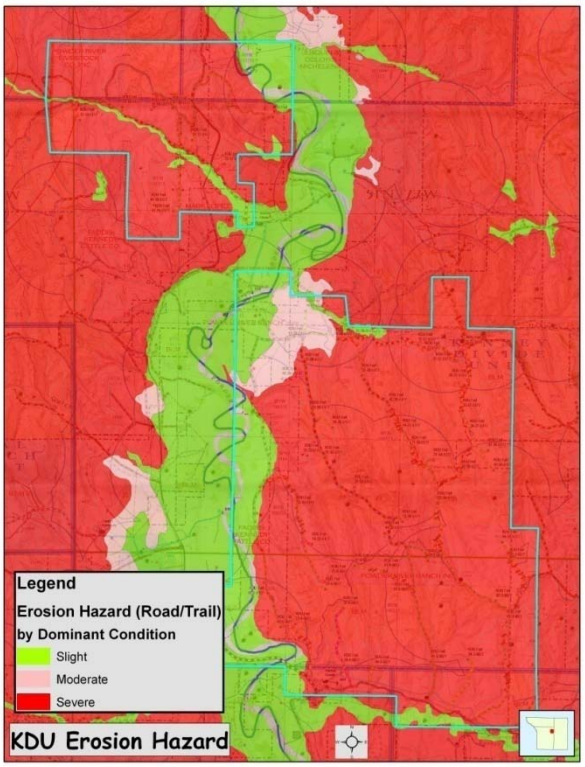


Figure 3.2 Slopes > 25%

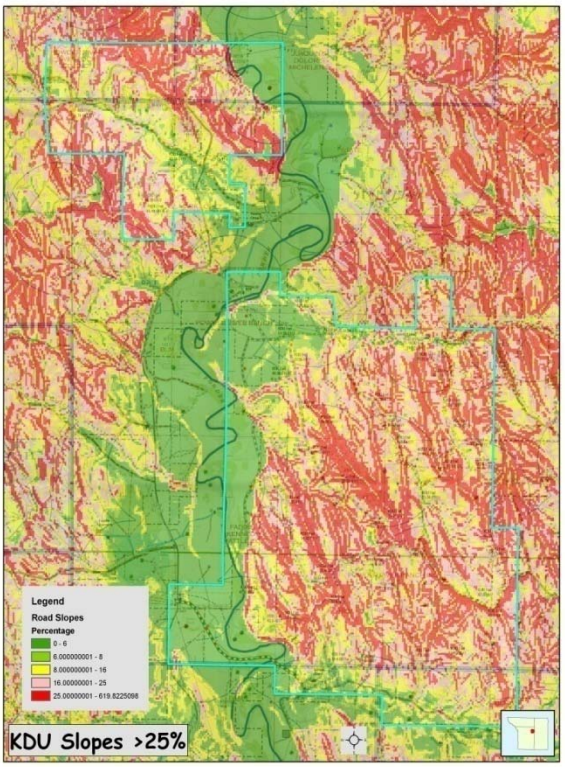


Table 3.1 Percent Severe Erosion Hazard and Slope within the KDU Project Area

Percent Severe Erosion Hazard within the KDU Gamma Project Area				Percent Slope within the KDU Gamma Project Area		
Erosion Hazard	**Acres**	**% of Project Area**		**% of Project Area**	**Acres**	**% Slope**
Slight	438	14%		73%	2352	0-24%
Moderate	105	3%	85%	8%	260	25-35%
Severe	2652	82%		10%	322	> 35%
			28%			

3.2.2. Slope Hazard

Soils stability is greatly affected by the slope on which it occurs. 85% of the project area has a moderate to severe hazard erosion rating; and 28% of the project area has slopes 25% and greater. Greater slopes have increased potential for slumping, landslides and water erosion. Slopes less than 25% may also be prone to high erosion depending on soil type, particle size, texture, or amount of organic matter. 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 (USDA 1993). These factors in combination with slope determine soil stability and the potential for mass soil movement.

3.2.3. Ecological Sites

Soil types are used to provide ecological site descriptions (ESDs). ESDs provide vegetative information used for resource identification, management and reclamation recommendations. To determine the appropriate ESDs, BLM Specialists compared data from the NRCS published soil survey soils with information gathered by site on the field review. Dominant ecological sites and plant communities identified in the KDU POD are 42.8% loamy and 43.3% shallow clayey ecological sites, Figure 3.3.

Figure 3.3 Dominant soils affected by the proposed action

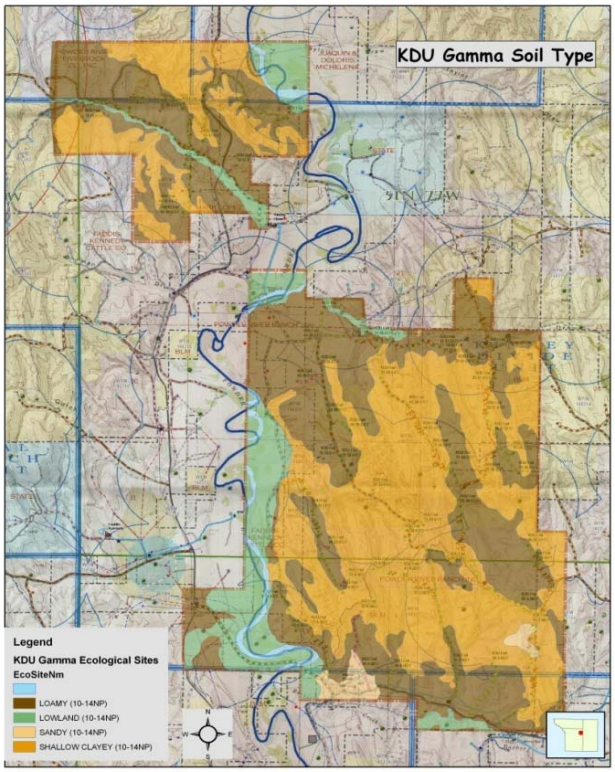
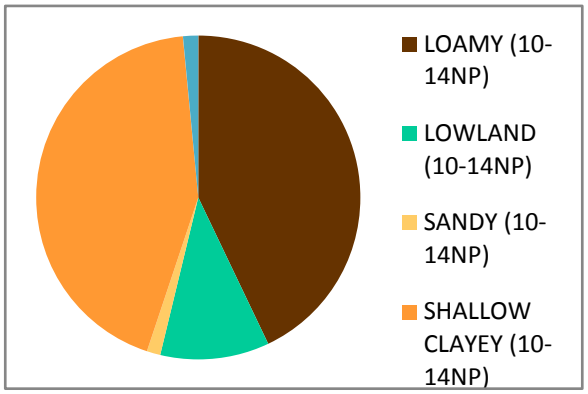


Figure 3.1 Dominant soils affected by the proposed action



Soil by Eco Site in 10-14 " Precipitation	Acres	Percent
Loamy	1392	42.8%
Lowland	353	10.8%
Sandy	44	1.4%
Shallow Clayey	1406	43.3%
Unknown	49	1.5%
Total Acres	**3244**	

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. Loamy sites had slopes from zero to 30% with thicker topsoil and more vegetation. Shallow clayey sites had steeper slopes that ranged up to 60%, had thinner topsoil and sparse vegetation. A summary of the NRCS ecological sites within the project area are listed in Table 3.3 below along with the individual acreage and the percentage of soil type by area identified within the POD boundary.

Loamy sites - Loamy soils are deep to moderately deep (greater than 20" to bedrock), well drained & moderately permeable. Layers of the soil most influential to the plant community vary from 3 to 6 inches thick. These layers consist of the A horizon with very fine sandy loam, loam, or silt loam texture and may also include the upper few inches of the B horizon with sandy clay loam, silty clay loam or clay loam texture. Major Soil Series correlated to this site includes: Bidman, Cambria, Cushman, Forkwood, Kishona, Parmleed, Theedle and Zigweid.

Shallow Clayey - The soils of this site are shallow (less than 20"to bedrock) well-drained soils formed in alluvium or residuum. These soils have moderate to slow permeability and may occur on all slopes. The bedrock is clay shale which is virtually impenetrable to plant roots. The soil textures included in this site are silty clay, clay, and the finer portions of sandy clay loam, clay loam, or silty clay loam. Thin ineffectual layers of other soil textures are disregarded. Layers of the soil most influential to the plant community vary from 3 to 6 inches thick.

3.2.4. Plant Communities

Mixed sagebrush/grass plant communities were identified on both the loamy and clayey sites. Historically, the mixed sagebrush/grass plant community evolved under grazing by bison and a low fire frequency. Currently, it is found under moderate, season-long grazing by livestock in the absence of fire or brush control. Big sagebrush is a significant component of this plant community. Cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Dominant grasses include rhizomatous wheatgrasses, and green needlegrass. Grasses of secondary importance include blue grama, prairie junegrass, and sandberg bluegrass. Forbs, commonly found in this plant community, include Louisiana sagewort (cudweed), plains wallflower, hairy goldaster, slimflower scurfpea, and scarlet globemallow. Sagebrush canopy ranges from 20% to 30%. Fringed sagewort is commonly found. Plains pricklypear and winterfat can also occur. When compared to the Historical Climax Plant Community, big sagebrush and blue grama have increased. Green needlegrass and bluebunch wheatgrass have decreased, often occurring only where protected from grazing by the big sagebrush canopy.

Production of cool-season grasses has also been reduced. Cheatgrass (downy brome) has invaded this state of the plant community. The overstory of big sagebrush and understory of grass and forbs provide a diverse plant community that will support domestic livestock and wildlife such as mule deer and antelope. The total annual production (air-dry weight) of this state is about 675 pounds per acre, but it can range from about 450 lbs./acre in unfavorable years to about 900 lbs./acre in above average years. The state is stable and protected from excessive erosion. The biotic integrity of this plant community is usually intact. However, it can be at risk depending on how far a shift has occurred in plant composition toward blue grama, sagebrush, and/or cheatgrass. The watershed is usually functioning. However, it can become at risk when canopy cover of big sagebrush, blue grama sod, and/or bare ground increases.

Below are the transitions that occur due to reclamation, grazing and environmental pressures. They are based on NRCS ecological site information and illustrate the difference in functional value to animals and wildlife that depend on plant community health.

Figure 3.4 Map Units and Ecological Sites

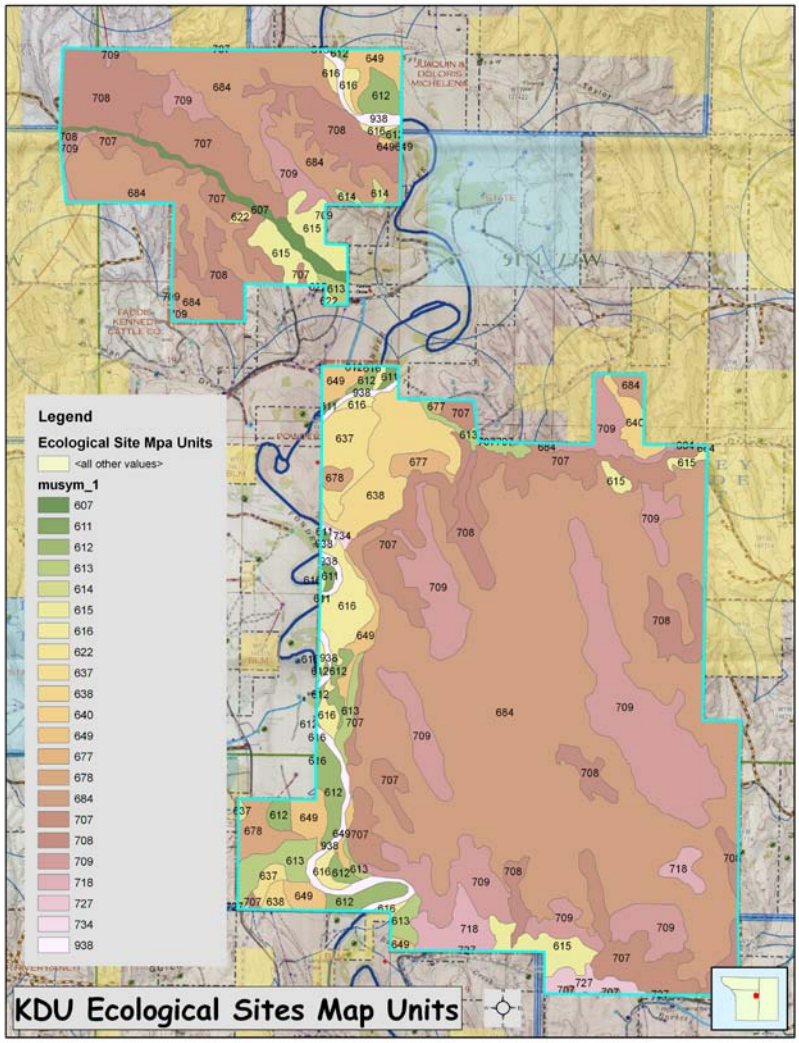


Table 3.2 Summary of Ecological Sites

Soil by Eco Site in Precipitation	Acres	Percent
Loamy	1392	42.8%
Lowland	353	10.8%
Sandy	44	1.4%
Shallow Clayey	1406	43.3%
Unknown	49	1.5%
Total Acres	**3244**	

3.2.5. Ecological Site and Function

According the NRCS ecological site information, ecological functions vary with different plant communities. Plant communities react to disturbance, management and environmental pressure. The grass, forb, shrub ratios determine habitat utilization, season use and cover for wildlife.

Rhizomatous Wheatgrasses, Needleandthread, Blue Grama Plant Community: The predominance of grasses in this plant community favors grazers and mixed-feeders, such as bison, elk, and antelope. Suitable thermal and escape cover for deer may be limited due to the low quantities of woody plants. However, topographical variations could provide some escape cover. When found adjacent to sagebrush dominated states, this plant community may provide brood rearing and /or foraging areas for sage grouse, as well as lek sites. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles. Many grassland obligate small mammals would occur here.

Mixed Sagebrush/Grass Plant Community: The combination of an overstory of sagebrush and an understory of grasses and forbs provide a very diverse plant community for wildlife. The crowns of sagebrush tend to break up hard crusted snow on winter ranges, so mule deer and antelope may use this state for foraging and cover year-round, as would cottontail and jack rabbits. It provides important winter, nesting, brood-rearing, and foraging habitat for sage grouse. Brewer's sparrows' nest in big sagebrush plants and hosts of other nesting birds utilize stands in the 20-30% cover range.

Heavy Sagebrush Plant Community: This plant community can provide important winter foraging for elk, mule deer and antelope, as sagebrush can approach 15% protein and 40-60% digestibility during that time. This community provides excellent escape and thermal cover for large ungulates, as well as nesting and brood rearing habitat for sage grouse.

Western Wheatgrass/Cheatgrass Plant Community: This plant community may be useful for the same large grazers that would use the Historic Climax Plant Community. However, the plant community composition is less diverse, and thus, less apt to meet the seasonal needs of these animals. It may provide some foraging opportunities for sage grouse when it occurs proximal to woody cover. Good grasshopper habitat equals good foraging for birds.

Blue Grama Sod and Go-back Land Plant Communities: These communities provide limited foraging for antelope and other grazers. They may be used as a foraging site by sage grouse if proximal to woody cover and if the Historic Climax Plant Community or the Western Wheatgrass/Cheatgrass Plant Community is limiting. Generally, these are not target plant communities for wildlife habitat management.

3.2.6. Reclamation Potential

According to the NRCS, reclamation potential in the KDU POD is rated 52% fair and 47% poor (Table 3.4). Soils with poor reclamation and re-vegetation potential occur throughout the project area as shown in the table below. Currently, soil conditions in the project area are impacted by CBNG development as well as traditional activities, including livestock grazing and wildlife use. Much of the area is covered with clayey soils and steep slopes that are easily damaged by use or disturbance and are difficult to re-vegetate or otherwise reclaim.

Construction of well pads, impoundments, pipelines, and roads involves breaking through the topsoil, the physical and biological crust. Topsoil is the suitable growth medium salvaged and used in reclamation. It is the result of thousands of years of geological and climatic forces, and is the sum accumulation all organic matter available over time. Roads, linear pipeline scars, and artificial wet areas increase potential for soil erosion. This increased erosion potential can result in higher suspended sediment and turbidity levels in the Powder River. Avoiding areas with limited reclamation potential, minimizing surface disturbance and salvaging surface organic matter (in the form of vegetation, litter and biological crust) are critical to maintaining the integrity and viability of the soil.

Figure 3.5 Reclamation Potential within the KDU Gamma Project Area

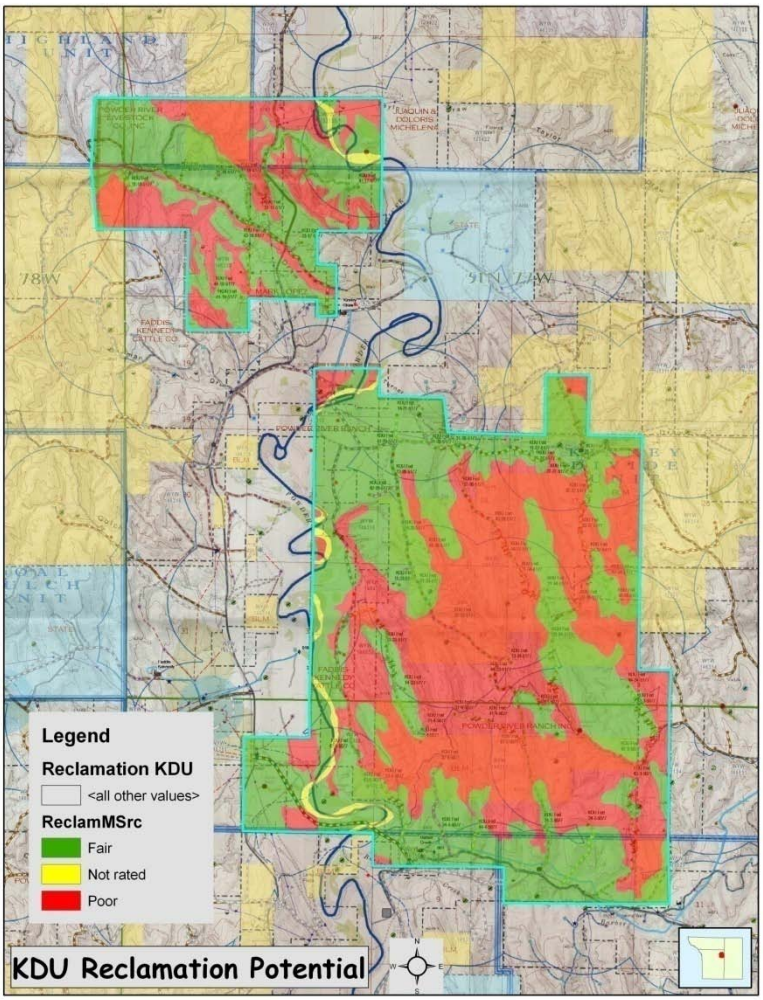


Table 3.3 Summary of Reclamation Potential

Reclamation Potential	Acres	% of Project Area
Not rated	49.4	1.00%
Fair	1674.3	52%
Poor	1520.5	47%

Many of the soils and landforms of this area present distinct challenges for development. The main soil limitations in the project area include: depth of topsoil, low organic matter content, high clay content and high erosion potential especially in areas of steep slopes.

- 28% of the area has slopes greater than 25%
- 43% of the area contains clayey soils
- 47% is in poor reclamation potential
- 82% of the POD has severe erosion hazard

3.2.7. Invasive Species

A database containing invasive species locations and other data is maintained by the Wyoming Energy Resource Information Clearinghouse (WERIC). The WERIC database was created cooperatively by the

University of Wyoming, BLM and county Weed and Pest offices. The following state-listed noxious weeds and/or weed species of concern infestations were discovered by a search of the WERIC database (www.weric.info):

- Leafy spurge
- Russian knapweed
- Whitetop
- Scotch thistle
- Salt cedar
- Russian olive

Additionally, the operator or BLM confirmed the following infestations and/or documented additional weed species during subsequent field investigations:

- Hoary cress
- Scotch thistle
- Canada thistle
- Common cocklebur
- Buffalo bur

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).

3.3. Wildlife

A discussion of wildlife species that occur in the Powder River Basin is provided in the PRB FEIS (pp. 3-113 to 3-206). Information specific to the KDU Gamma POD and/or information not discussed in the PRB FEIS is provided in this section.

A habitat assessment and wildlife inventory surveys of the KDU Gamma project area were performed by Big Horn Environmental Consultants (BHEC) in 2008 and 2009 (BHEC 2008a, 2008b, 2009). BHEC performed surveys for raptors, bald eagle winter roosting, sage-grouse, sharp-tailed grouse, mountain plover, black-tailed prairie dogs, and habitat for Ute ladies'-tresses orchid. 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.

A BLM biologist conducted field visits on 3 August to 7 August, 11 August, 15 September, 25 September, and 15 October, 2009. During those visits, the biologist verified the wildlife survey information, evaluated impacts to wildlife resources, including resources not evaluated by BHEC, and compiled a list of recommended project modifications to mitigate impacts to wildlife.

In addition to the surveys submitted by BHEC and the onsite evaluation, the wildlife biologist also consulted databases compiled and managed by BLM BFO wildlife staff, the PRB FEIS, Wyoming Game and Fish Department (WGFD) datasets, and the Wyoming Natural Diversity Database (WYNDD) to evaluate the affected environment for wildlife species that may occur in the project area.

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 rely 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.

In its *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats* (WGFD 2009a), WGFD developed impact thresholds to evaluate impacts to wildlife from oil and gas

development. For species or habitats discussed in this EA where impact thresholds have been developed, those thresholds will be disclosed and discussed both in relation to the current conditions (Affected Environment) and in relation to reasonable foreseeable development, including development associated with the proposed project (Impacts Analysis). Moderate impacts occur when impairment of habitat function becomes discernable. High impacts occur when impairment of habitat function increases.

Extreme impacts occur where habitat function is substantially impaired. Mitigation for each level of impact is discussed in the guidelines. Thresholds for impacts are generally determined by well densities.

3.3.1. Habitat Types

Habitats present within the vicinity of the project consist mostly of sagebrush shrubland, but also include grassland, riparian, conifer woodland, and isolated rock outcrops. Existing land uses within the project area include livestock grazing, agriculture, and CBNG development. Very little development has taken place within the KDU Gamma project boundary, but within one mile there are approximately 200 existing wells that have already been drilled. About 75% of those wells are currently in production (Wyoming Oil and Gas Conservation Commission [WOGCC] well data 07/2010). Existing wells are generally located along the Powder River and Barber Creek riparian corridors.

Sagebrush shrubland dominates the project 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 (described in Section 3.3.2.4) are associated with sagebrush ecosystems. Sagebrush shrublands are considered one of the most imperiled ecosystems in North America (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).

Within the project area, sagebrush stands are located on all aspects in the rugged terrain that comprises most of the south and east of project area. Stands are broken up by grassland, sparsely scattered sagebrush, patches of conifer, and topography. Sagebrush stands are located throughout the project area, with the most extensive stands located in the northwest portion of the project area along Kinney Draw in S07, S08, S17, S18 T51N R77W; in the northeastern portion of the project area along Turner Draw in S27, S28 T51N R77W; on the bench that slopes into the Powder River in S28, S29 T51N R77W; and in S S04 T50N R77W.

Grassland patches are scattered throughout the project area. Large, intact grassland patches are located in the cultivated bottomland of Kinney Draw in S17 T51N R77W; and on the bench that slopes into the Powder River and Turner Draw in S20, S21, S28, and S29 T51N R77W.

Riparian habitat dominated by cottonwood trees is located along the Powder River. Vegetation along Turner Draw consists of perennial grasses, rushes, and salt cedar, indicating the presence of soils that are seasonally saturated. Kinney Draw is dominated by basin big sagebrush in S12, S13, S07, S18 T51N R77W. In S17, the draw is cultivated for hay.

Small patches of conifer woodlands are present throughout the project area. Ponderosa pine dominates in some areas, particularly on north-facing slopes in the more rugged portions of the project area, while scattered patches of juniper and individual encroaching juniper trees are present throughout.

Unvegetated rock outcrops are scattered throughout the project area.

In its *Strategic Habitat Plan* (WGFD 2009b), WGFD outlined goals to address habitat values and issues

facing Wyoming's wildlife. Goal 1 was to "conserve and manage wildlife habitats that are crucial for maintaining terrestrial and aquatic wildlife populations for the present and future". WGFD designated priority habitats under this goal that were considered crucial to conserving and maintaining populations based on significant biological and ecological values. WGFD considers these crucial habitats to have the highest biological values and stated that they should be protected and managed to maintain healthy, viable populations of terrestrial and aquatic wildlife. The project area is located within three of these crucial areas: one designated for aquatic wildlife values – Prairie Stream and Riparian Corridors, and two designated for terrestrial wildlife values – Powder and Tongue River Riparian and Sagebrush/Mixed Grass Habitats. The project area is located adjacent to another crucial area designated for terrestrial wildlife values: Crucial Elk Winter Ranges.

Goal 2 in the Strategic Habitat Plan (WGFD 2009) is to "Enhance, improve and manage priority wildlife habitats that have been degraded". To meet this goal, WGFD designated enhancement areas to prioritize important wildlife areas that can or should be actively enhanced or improved if opportunities exist. The project area is located within two enhancement areas designated for terrestrial wildlife value: Powder and Tongue River Riparian and Sagebrush/Mixed Grass Habitats. These enhancement areas are also designated as crucial areas, as described above.

The Prairie Stream and Riparian Corridors crucial habitat area was designated because these areas are important for storing water, contributing woody debris, resisting flood damage and invasive species, and providing shade and habitat for aquatic species. Functional riparian corridors affect habitat quality downstream. The Powder and Tongue River Riparian crucial/enhancement area is considered by WGFD to represent one of the most important ecosystems for wildlife in Wyoming, based on wildlife diversity and density. The Sagebrush/Mixed Grass Habitats crucial/enhancement areas were delineated because these habitats support a number of sagebrush obligate species, and sagebrush habitats have been demonstrated to be a critical food source for species such as greater sage-grouse, pronghorn, and mule deer, particularly during the fall, winter, and spring. Sagebrush also provides cover (nesting, resting, and escape) for a wide variety of species. Figure 1 depicts the crucial and enhancement areas in relation to the project boundary.

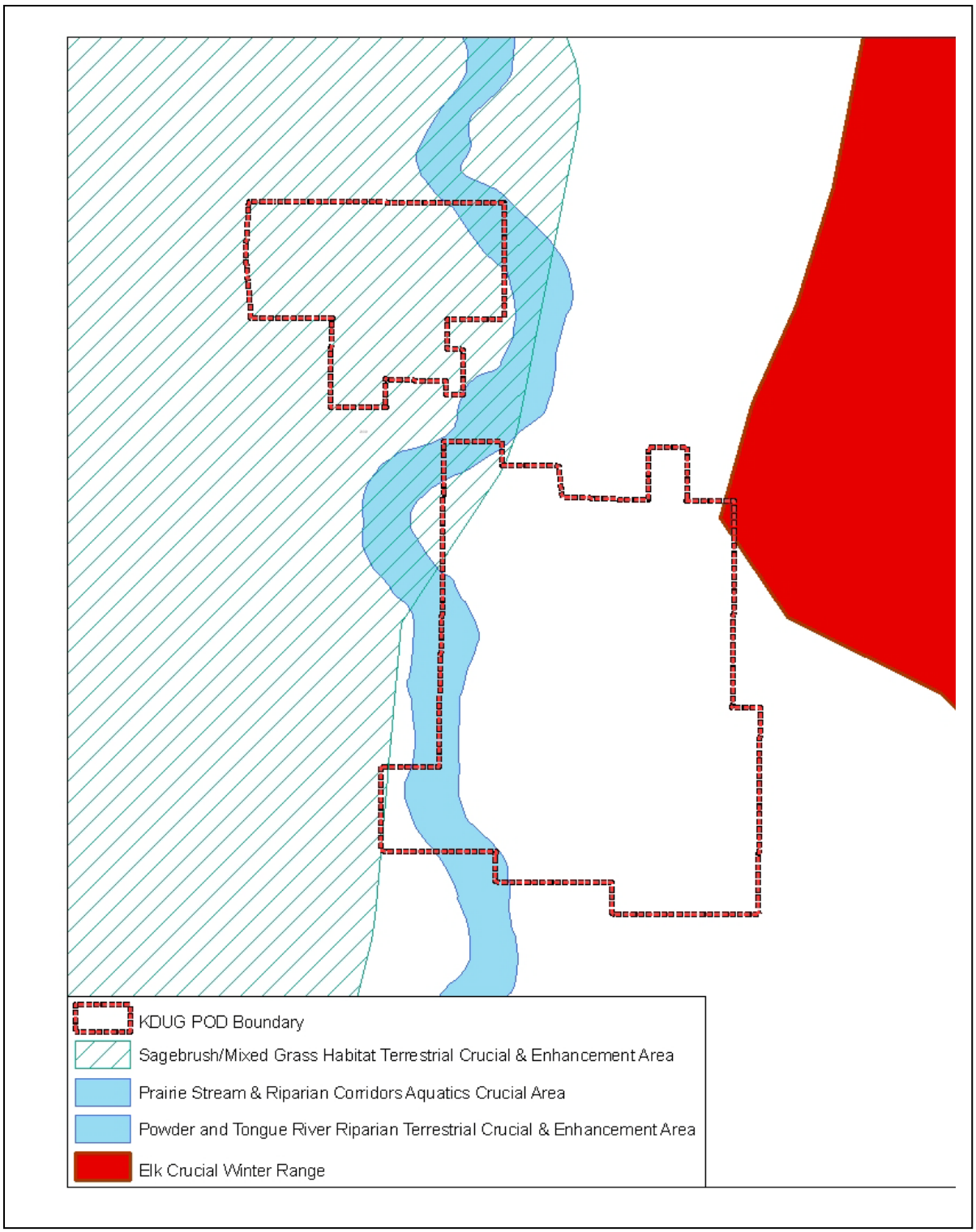


Figure 1 WGFD Crucial and Enhancement Areas in proximity of the KDU Gamma project boundary

3.3.2. Threatened, Endangered, Proposed, Candidate, and BLM Sensitive Species

3.3.2.1. Threatened and Endangered Species

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. Additional information regarding the affected environment for black-footed ferret is discussed here.

Active reintroduction efforts have reestablished populations in Mexico, Arizona, Colorado, Montana, South Dakota, Utah, and Wyoming. In 2004, the WGFD identified six prairie dog complexes (Arvada, Sheridan, Pleasantdale, Four Corners, Linch, Kaycee, and, Thunder Basin National Grasslands) partially or wholly within the BLM Buffalo Field Office administrative area as potential black-footed ferret reintroduction sites (Grenier et al. 2004). 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 a black-footed ferret population requires at least 1,000 acres of black-tailed prairie dog colonies for survival (USFWS 1989). The project area is located approximately five miles south of the Arvada prairie dog complex, the nearest potential reintroduction area. The project area intersects five black-tailed prairie dog colonies, averaging 16 acres in size and totaling approximately 100 acres. Two colonies in the S07 T51N R77W are within a group of colonies that are less than 1.5 km away from each other, and that, when totaled in size, cover approximately 1,400 acres. Black-footed ferret habitat is present within the project area.

3.3.2.1.2. Blowout Penstemon

Blowout penstemon is listed as Endangered under the ESA. The project area does not contain habitats suitable to support blowout penstemon.

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. Areas proposed for development under the KDU Gamma project will not impact habitat suitable to support Ute ladies'-tresses.

3.3.2.2. Proposed Species

3.3.2.2.1. Mountain Plover

The affected environment for mountain plover is discussed in the PRB FEIS on pg. 3-177 to 3-178. Additional information regarding the affected environment for mountain plover is discussed here.

At the time the PRB FEIS was written, the mountain plover was proposed for listing as a threatened species under the ESA. USFWS withdrew the proposal in 2003 but reinstated it again in 2010. USFWS will submit a final listing determination in 2011. Mountain plover is a WGFD Species of Greatest Conservation Need (SGCN), because population status and trends are unknown but are suspected to be stable, habitat is vulnerable without ongoing significant loss, and the species is sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a species with highest conservation priority, indicating they are clearly in need of conservation action. They are also listed by USFWS as a Bird of Conservation Concern (BCC) for Region 17, which includes the project area. BCCs are those species that represent USFWS's highest conservation priorities, outside of those that are already listed under ESA. The goal of identifying BCCs is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions.

Potential mountain plover habitat is present in SW S21 and NE S29 T51N R77W. While the current grass cover is likely to preclude mountain plover from using these areas, disturbances such as intensive grazing, drought, or wildfire would make these areas suitable for mountain plover.

3.3.2.3. Candidate Species

3.3.2.3.1. Greater Sage-grouse

The affected environment for greater sage-grouse (sage-grouse) is discussed in the PRB FEIS (pg. 3-194 to 3-199). Additional information regarding the affected environment for sage-grouse is discussed here.

In 2010, USFWS determined that the sage-grouse was warranted for federal listing across its range, but the listing was precluded by other higher priority listing actions. Sage-grouse are listed as a WGFD SGCN because populations are declining, and they are experiencing ongoing significant loss of habitat.

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 sage-grouse population within northeast Wyoming has been exhibiting a steady long term downward trend, as measured by lek attendance (WGFD 2008). Research suggests that these declines may be a result, in part, of CBNG development, as discussed in detail in USFWS (2010).

Sagebrush communities occur throughout and surrounding the KDU Gamma project area. Continuous stands between 15 and 25% canopy cover on moderately flat terrain are located in the northwest portion of the project area along Kinney Draw in S07, S08, S17, S18 T51N R77W; in the northeastern portion of the project area along Turner Draw in S27, S28 T51N R77W; on the bench that slopes into the Powder River in S28, S29 T51N R77W; and in S S04 T50N R77W. Sage-grouse sign was noted NW S18 T41N R77W.

Sage-grouse habitat models indicate that approximately 56% of the project area contains high quality sage-grouse nesting habitat (Doherty 2008). Kinney Draw, Turner Draw, and Barber Creek contain the highest quality modeled winter habitat. Telemetry data indicate that grouse captured at the Coal Gulch lek, which is located seven miles to the west, were relocated in SW S03, NW S10, NE S09 T50N R77W during the months of May and June, indicating that habitat in these areas and in similar areas likely supports nesting and brood-rearing behavior. According to a statewide population density model that was developed based on lek attendance (Doherty 2008), the portions of the project area in S07, S08, S17, S18, S19, and S20 T51N R77W are partially contained in an area, that when combined with other similar areas, is predicted to contain 85% of the state's sage-grouse population.

The State Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas Development Effects to Nesting Habitat (2008) recommended that impacts be considered for leks within four miles of oil and gas developments. WGFD records indicate that four sage-grouse leks occur within four miles of the project area. These four lek sites are identified in Table 3.4.

Table 3.4 Sage-grouse leks within 4 miles of the KDU Gamma project area

Lek Name	Legal Location	Distance from Project Area (mi)	Occupied?	WGFD Category of Impact
Kinney Draw I	SESE S04 T51N R78W	< 3 mi	yes	High
Kinney Draw II	SWNW S10 T51N R78W	< 3 mi	yes	High
Kinney Draw III	NWSW S11 T51N R78W	< 2 mi	yes	Extreme
Nurse Draw	NWSW S03 T51N R78W	< 3 mi	yes	Moderate

There are currently 203 wells (Wyoming Oil and Gas Conservation Commission [WOGCC] 07/2010) within four miles of the four leks listed above, an area of 76 square miles. This amounts to a density of approximately 2.7 wells per square mile, which exceeds the effects threshold of one well pad per square mile described by the State Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas

Development Effects to Nesting Habitat. According to WGFD impact thresholds for oil and gas development, impacts to the Kinney Draw III lek are categorized as extreme.

3.3.2.4. 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 project area contains habitats suitable for supporting the following BLM Wyoming sensitive species: Baird's sparrow, bald eagle, Brewer's sparrow, ferruginous hawk, loggerhead shrike, long-billed curlew, sage sparrow, sage thrasher, trumpeter swan, western burrowing owl, yellow-billed cuckoo, black-tailed prairie dog, fringed myotis, long-eared myotis, and Townsend's big-eared bat. The affected environments for these species are discussed in the PRB FEIS (pp. 3-113 to 3-206). During internal scoping, the impacts of the proposed project on bald eagles and black-tailed prairie dogs were identified as potential issues, and those species are therefore discussed in more detail below.

3.3.2.4.1. Bald Eagle

The affected environment for bald eagles throughout the entire Powder River Basin Oil and Gas Project Area is described in the PRB FEIS on pg. 3-175. Additional information regarding bald eagles and site-specific information is provided here.

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.

Mature cottonwood galleries that provide nesting and roosting habitat are present along the entire length of the Powder River within one mile of the project area. Buffalo BLM created a habitat model to identify groups of trees that have been used by bald eagles on more than one occasion in order to identify potential roosting areas. According to the model, roosts are located in NE S08, W S16, E S20, S S29, S32 T51N R77W; and in SE S05, NE S08, SW S09, NW S16, and NE S17. CBNG development has already taken place within 0.5 miles of these identified roosts where privately owned surface overlies privately held sub-surface rights. Seventy-eight wells are currently located within 0.5 miles of a bald eagle roost and 0.5 miles of the project boundary. Twenty-two of these are classified as gas shut-in wells, while 56 are producing gas wells. Roosting bald eagles can be sensitive to human disturbance (Brown and Stevens 1997, Buehler et al. 1992, Chester et al. 1990) and the existing fee development within 0.5 miles of roosting areas may therefore be approaching a threshold above which a decrease in productivity may result. Figure 2 depicts the modeled roosts, bald eagle winter observations, and existing wells in the vicinity of the project boundary. Bald eagle observations are symbolized on a size gradient to indicate the number of eagles seen, where larger circles indicate more birds in a single observation.

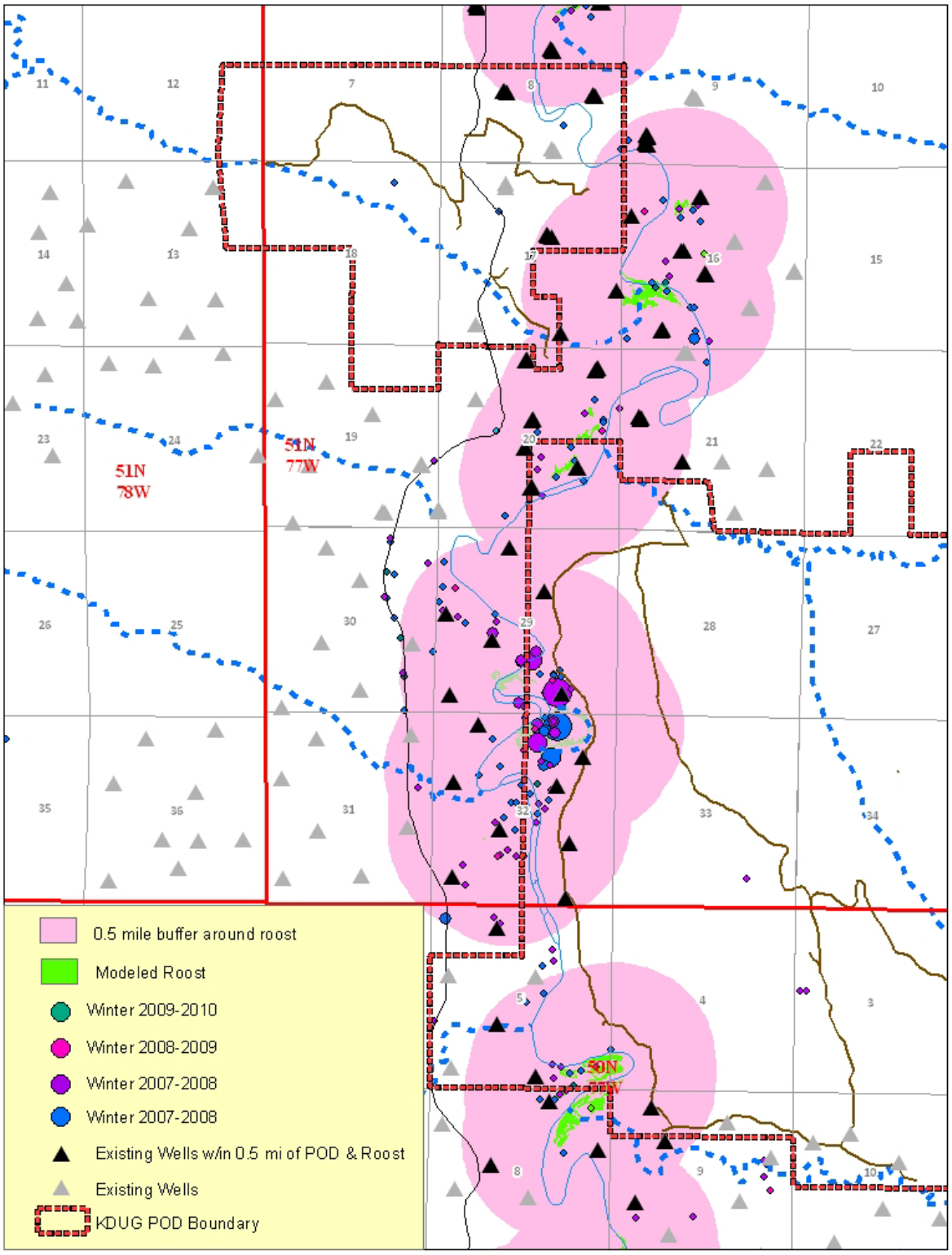


Figure 2 Bald Eagle observations, modeled roosts, and existing CBNG wells in the vicinity of the KDU Gamma project area. Size of the symbol indicates the number of birds observed, with larger circles indicating a higher number of birds.

3.3.2.4.2. Black-tailed Prairie Dog

The affected environment for black-tailed prairie dogs is discussed in the PRB FEIS (pg 3-179). Additional site-specific information or information that has changed since the time the PRB FEIS was written is provided here.

At the time the PRB FEIS was written, the black-tailed prairie dog was a candidate species for federal listing, but it was removed from the list in 2004. 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).

The project area intersects five black-tailed prairie dog colonies, averaging 16 acres in size and totaling approximately 100 acres.

3.3.2.5. Big Game

Big game species expected to occur within the KDU Gamma project area consist of elk, mule deer, pronghorn, and white-tailed deer. The affected environment for these species is discussed in the PRB FEIS on pp. 3-116 to 3-141. Additional information not discussed in the PRB FEIS and site-specific information regarding these species is discussed here.

Table 3.5 indicates the delineated seasonal ranges for each big game species that occur within the project area, the herd units affected by the project, the WGFD population objective, and the WGFD current population estimate for each species. The Fortification Creek elk herd was identified as an issue for impact evaluation during internal scoping for the KDU Gamma project, so elk will be given additional consideration in this section.

Table 3.5 Big Game species, seasonal ranges, herd units, population objectives, and population estimates for big game species likely to occur in the KDU Gamma Project Area

Species	Seasonal Range in Project Area	Herd Unit	WGFD Population Objective	WGFD Population Estimate	Year of WGFD Report
Mule Deer	Yearlong, winter yearlong	319 - Powder River	52,000*	50,500*	2009
Pronghorn	Yearlong	351 - Gillette	11,000	16,823	2007
		353 - Ucross	11,000	9,905	2007
White-Tailed	Yearlong	303 - Powder River	8,000	13,575	2007
Elk	Yearlong, winter yearlong	320 - Fortification	150	183	2009
* Personal communication with Heather O'Brien, Wildlife Biologist, WGFD					

3.3.2.5.1. Pronghorn, Mule Deer, and White-tailed Deer

The Powder River mule deer and Ucross pronghorn herds are currently below population objectives. The Gillette pronghorn and Powder River white-tailed deer herds are currently above objectives.

Figure 3 depicts the locations of the seasonal ranges within and adjacent to the project area for each big game species. As depicted in these figures, most of the project contains mule deer winter yearlong range, with only a small portion in the northeast corner that contains yearlong range. The northwest portion of the project area along Kinney Draw contains yearlong pronghorn range, along with small portions in the southeast portion centering along a tributary of Turner Draw and along Barber Creek. White-tailed yearlong range is located along the Powder River. Elk yearlong and winter yearlong range are located in the southeast portion of the project area.

CBNG development has already taken place in proximity of the project area, and is likely to have impacted big game use of the area. In a literature review conducted to summarize the effects of energy development on ungulates, Hebblewhite (2008) concluded that pronghorn, elk, and mule deer show definitive avoidance responses to energy development, particularly during the construction phases.

Research on white-tailed deer was not evaluated in the review. Road and well densities were positively correlated with avoidance behaviors. Impacts occurred year-round, with measurable effects of energy development on spring calving ranges, winter ranges, during summer, and in migration corridors. Results from a multi-year study on the Pinedale Anticline demonstrated that mule deer avoided well pads, even after three years of drilling activity (Sawyer et al. 2006). After seven years, deer use continued to be 30% lower than pre-development, and the entire herd was 10% smaller in size. This study suggests that indirect effects of energy development may persist well into the post-construction phase and may result in long-term losses of habitat.

Sawyer et al. (2006) demonstrated that mule deer showed lower probabilities of use within 2.7 km of well pads. Within the project area, 98% of the delineated mule deer seasonal range falls within 2.7 km of existing CBNG wells. Assuming that white-tailed deer are similar in behavior to mule deer, application of a 2.7 km buffer around existing wells indicates that all of the white-tailed deer yearlong range is within 2.7 km of existing wells. Very little is known how oil and gas development affect pronghorn behaviorally or demographically (Hebblewhite 2008). Given that other ungulate species have been shown to display avoidance behaviors in response to energy development, it is likely that pronghorn display a similar response, and that almost all of the delineated pronghorn range within the project boundary has been impacted. Figure 3 depicts the existing wells within 2.7 km of the project area and the extent of a 2.7 km avoidance buffer around those wells for pronghorn, mule deer, and white-tailed deer. Impacts to elk are discussed below.

Given the existing development along the Powder River and Barber Creek and the research described above, pronghorn, mule deer, and white-tailed deer herds that use the project area likely avoid areas impacted by current CBNG development. These species may have altered their spatial, diurnal, or seasonal patterns of use in the project area to reduce encounters with existing wells, roads, and human activities associated with the development, increasing the importance and habitat value of remaining undeveloped areas.

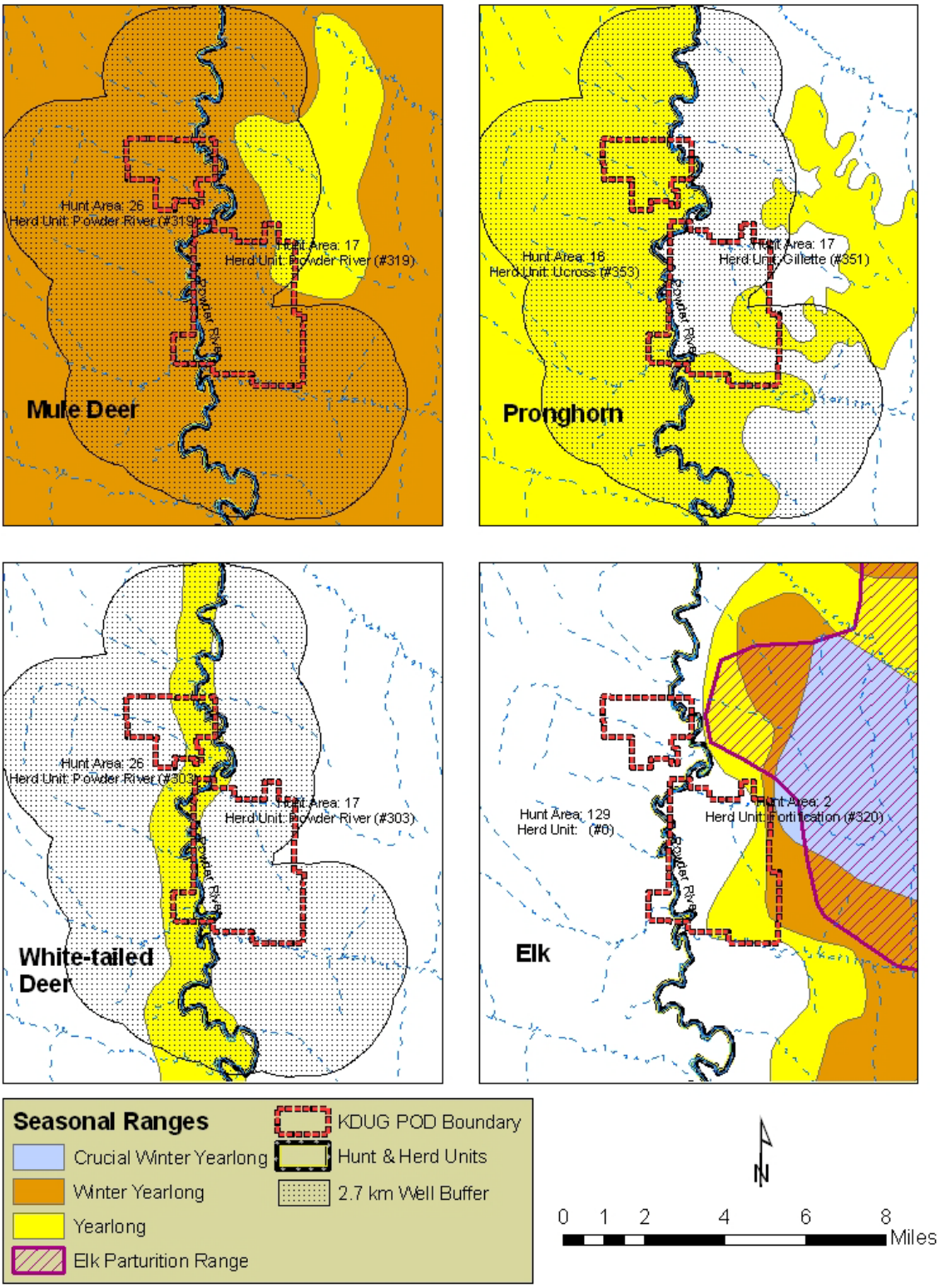


Figure 3 Seasonal Ranges and Hunt/Herd Units for Big Game Species in the KDU Gamma Project Area. A buffer around existing wells within 2.7 miles of the project is depicted to show avoidance areas for mule deer, pronghorn, and white-tailed deer.

3.3.2.5.2. Fortification Creek Elk

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 another amendment to the RMP. The KDU Gamma project will affect habitats used by the elk herd and therefore the herd was identified as an issue for evaluation in this environmental assessment.

The KDU Gamma project area contains portions of areas delineated by WGFD as yearlong and winter yearlong seasonal ranges for the Fortification Creek elk herd. The herd is currently above population objectives (Table 3.5). WGFD has defined two types of important elk habitats within the yearlong range: crucial winter range (CWR) and parturition range (PR). Both provide important seasonal habitat functions during sensitive periods for elk. The CWR was also designated as a WGFD Crucial Habitat Area. It is important to note that these crucial ranges overlap each other on the landscape and these areas are commonly referred to as "dual crucial" range. Table 3.6 lists the acreages of these delineated areas and Figure 4 depicts the location of the project area in relation to the seasonal ranges. As depicted in Figure 4, the KDU Gamma POD intersects a small portion of CWR.

Table 3.6 Fortification Creek Elk Ranges

Range	Size (Acres)
Yearlong	122,930
Crucial Winter	38,233 (31% of Yearlong Range)
Parturition	59,291 (48% of Yearlong Range)
Dual Crucial	25,770 (21% of Yearlong Range)

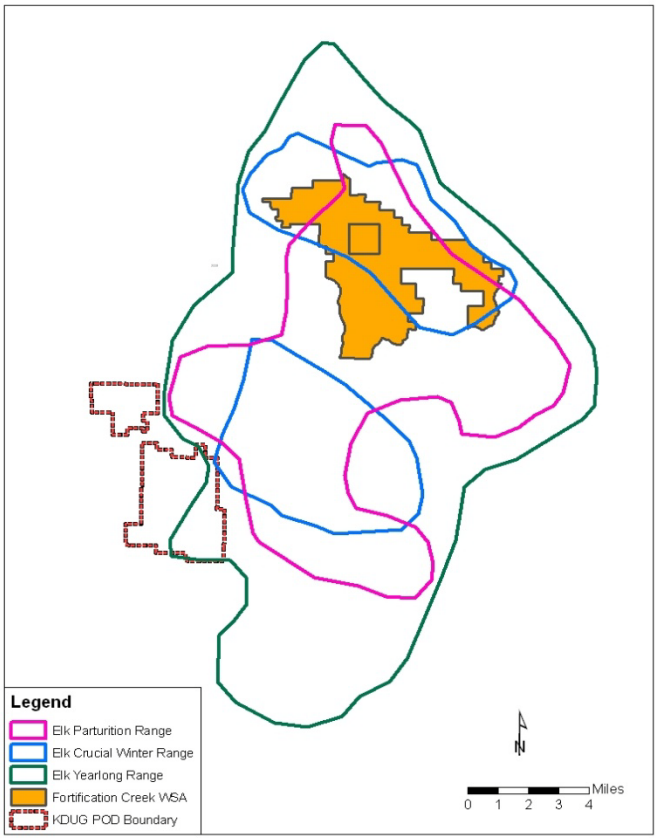


Figure 4 Elk Season Ranges in Relation to KDU Gamma POD Boundary

In its 2007 *Environmental Report: Coalbed Natural Gas Effects on the Fortification Creek Area Elk Herd*, BLM used elk relocation data (gathered prior to 2008) and a viewshed model to model elk habitat within the Fortification Creek area based on elk avoidance of oil and gas wells and roads. Two types of habitat were considered in the model: effective and security habitat. Effective habitat includes those areas greater than 0.5 miles from roads, or less than 0.5 miles from a road but not visible from a road. It generally refers to the available habitat during nonhunting conditions, particularly summer and fall (Lyon 1983). Vegetation and other factors affecting habitat suitability were not included.

Security habitat is a subset of effective habitat. Elk often retreat when disturbance in their usual range is intensified, such as during the hunting season, appearing to be most comfortable or secure within effective habitat areas of a minimum size (Lyon 1983). A security area is defined as "any area that will hold elk during periods of stress because of geography, topography, vegetation, or a combination of those features" (Lyon and Christensen 1992). Hillis et al. (1991) quantified security areas as nonlinear blocks of hiding cover at least 250 acres in size and at least 0.5 miles away from any open road. Elk vulnerability increases when less than 30% of an analysis unit is comprised of security areas (Canfield 1991, Hillis et al 1991). WGFD uses this definition in *A Rocky Mountain Elk Habitat Conservation Plan for the WGFD Sheridan Region* (WGFD 2004). Security habitats were defined in the Fortification Area as those portions of effective habitats that are at least 250 acres in size.

Figure 4 depicts the locations of modeled security habitat available to the Fortification Creek herd prior to any development in the yearlong range, and the location of the project boundary in relation to these habitats.

Table 3.7 summarizes the acreages of seasonal ranges and important habitats contained by the KDU Gamma POD boundary.

Table 3.7 Elk Habitats within the KDU Gamma POD

Range/Habitat	Size (Acres)	Percent Area of the KDU Gamma POD
Yearlong	2,302	29%
Crucial Winter	16	<1%
Security	1,086	14%
Effectiveness	1,334	17%

WGFD submitted a letter to BFO dated 29 December 2009 as a public comment on a modification to the Augusta Unit Zeta Environmental Assessment (WY-070-08-154). In that letter, WGFD commented on the importance of security habitat and made recommendations for maintaining portions of security habitats remaining in Fortification Creek elk seasonal ranges.

WGFD recommended that 50% of the security habitat be retained in yearlong range outside CWR and PR. Approximately 20,500 acres of this habitat were identified at that time. Subsequent drilling activities resulted in the loss of 4,200 acres (20%) of that security habitat, based on an estimate derived from buffering new oil and gas roads by 0.5 miles. This estimate does not include areas within 0.5 miles of roads that are not visible, therefore this is likely a slight over-estimate of the loss of security habitat.

Approximately 15,800 acres of security habitat were identified in PR. Using the same methodology described in the previous paragraph, subsequent development was estimated to have resulted in the loss of approximately 5,100 acres (32%). Approximately 740 acres (14%) of the 5,200 acres of CWR are estimated to have been lost due to development. WGFD recommended that 75% of these areas be retained. Finally, it was estimated that approximately 2,200 acres (12%) of the 18,000 acres of dual

critical range have been lost. WGFD recommended that all of these areas be retained. Table summarizes these findings.

Table 3.8 WGFD Recommendations for retaining elk habitats and estimates of the actual losses to date

Range	Original Acreage	Acres Lost Since Recommendation	WGFD Recommended Retention	Percent Currently Remaining	# Additional Wells Approved
Yearlong outside CWR & PR	20,500	4,200	50%	80%	127
PR only	15,800	5,100	75%	68%	13
CWR only	5,200	740	75%	86%	54
Dual	18,000	2,200	100%	88%	47

Figure 4 depicts the security habitat lost from development that has occurred since WGFD wrote the recommendation letter cited above.

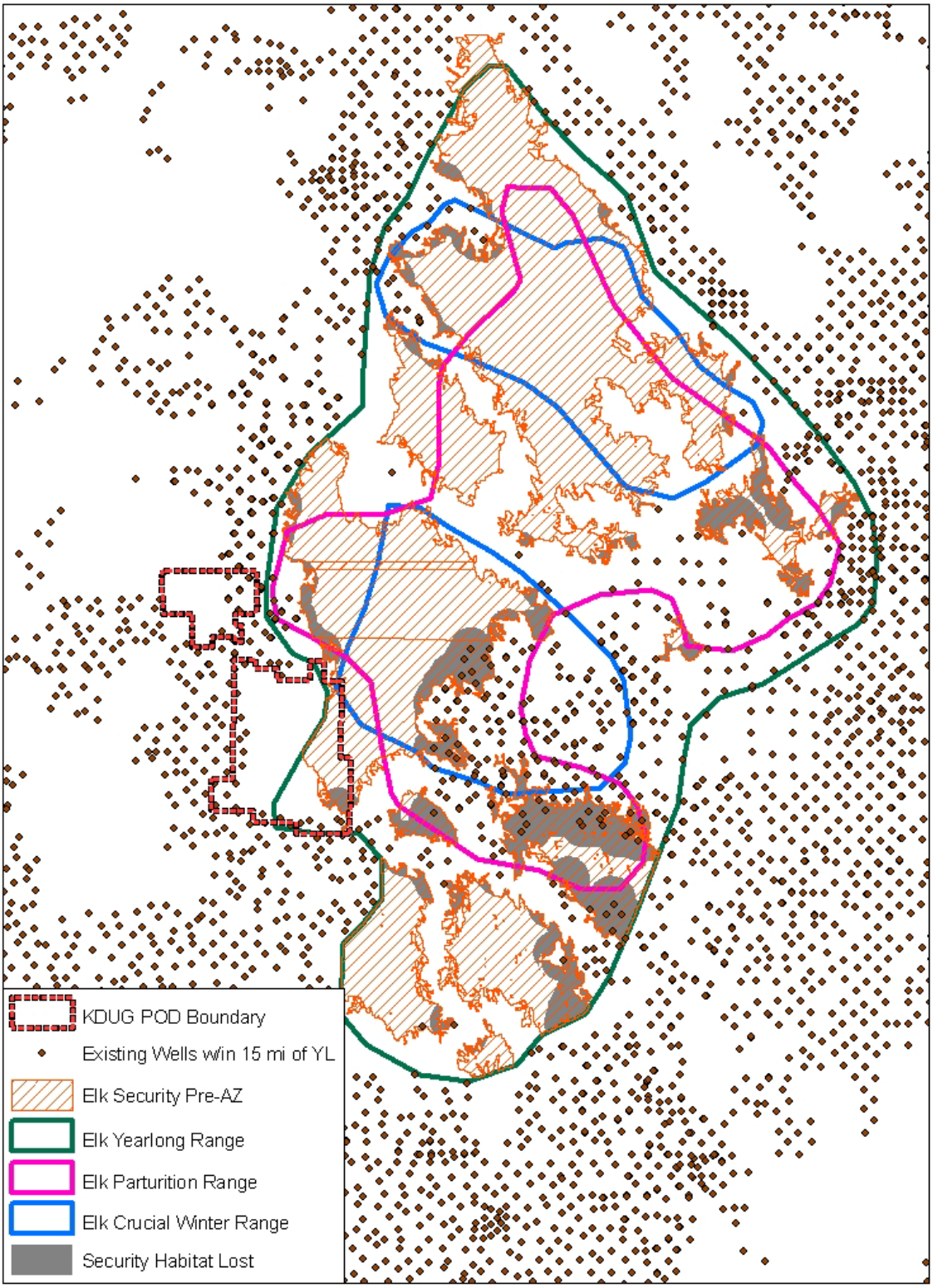


Figure 4 Initial modeled elk security habitat, seasonal ranges, existing wells within 15 miles, and estimates of security habitat that has been lost to development since the WGFD recommendation letter.

Radio-telemetry (VHS) and GPS collaring data collected by BLM and WGFD since 2005 have shown that the Fortification elk tend to avoid oil and gas development by moving to less developed areas (BLM 2007). The literature consistently shows a correlation between elk avoidance response and the level of human activity associated with roads including those servicing oil and gas development (Gusey 1986, WGFD 2004, Sawyer et al. 2005, Hayden Wing Associates 1990).

Data from 7 GPS collars recorded 474 elk observations within the KDU Gamma POD project area over a 16 month window from December 2008 to March 2010. Almost 90% of the data points are from the winter season (December through March). The elk that use the project area appear to limit their use to the eastern portion. The ephemeral drainage that runs S-N into Turner Draw represents the westernmost boundary for most of the elk use within the project area. The area to the west of this drainage is more fragmented and experiences more human activity. Figure 5 depicts the elk relocations within the KDU Gamma project symbolized by season of use.

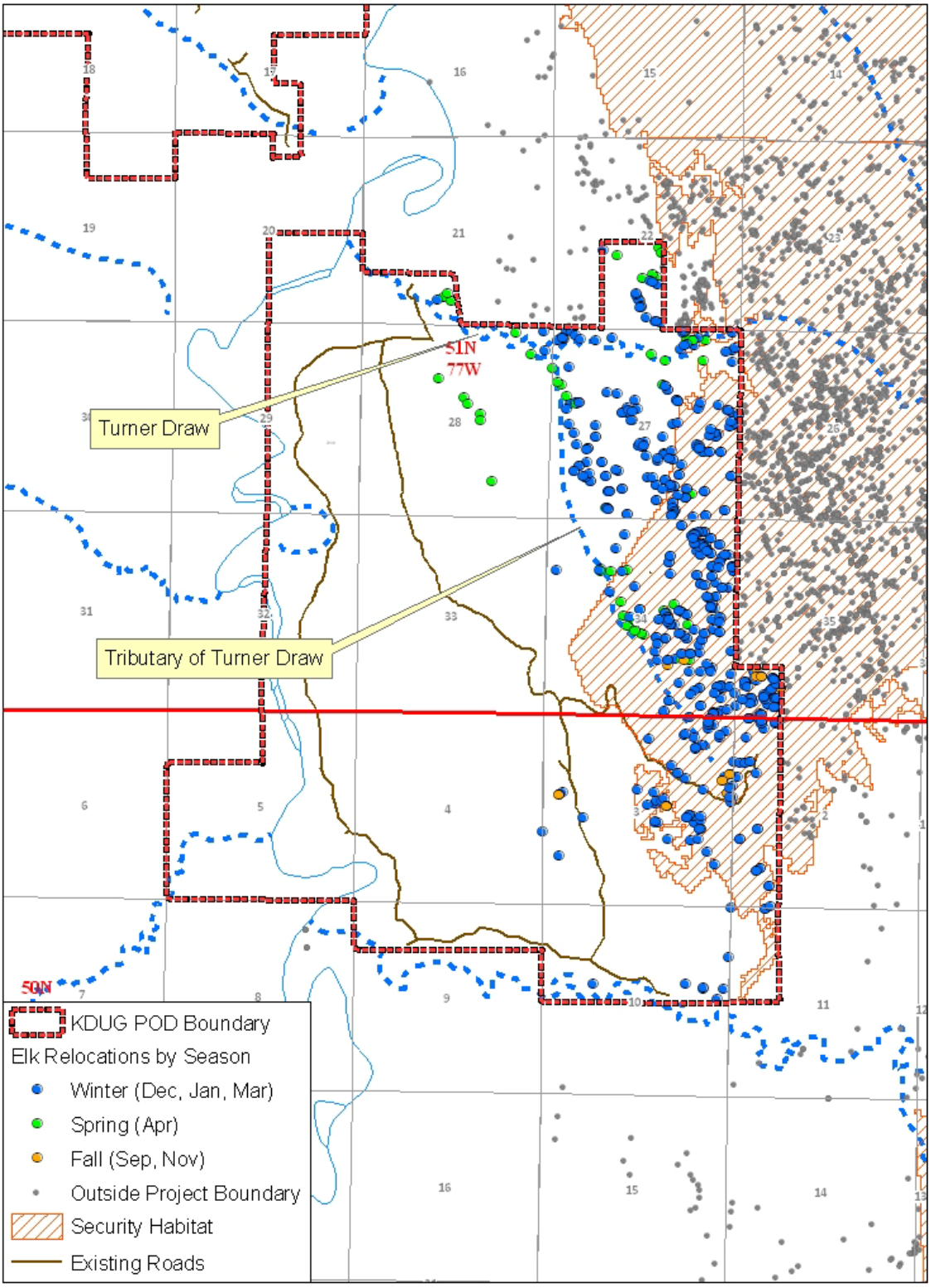


Figure 5 Elk Relocation points in relation to the KDU Gamma project boundary

The WGFD 2009 Job Completion Report indicates that the 2008 post-season population estimate for the Fortification Creek elk herd is 219, down from 272 in 2002. The current WGFD objective for the herd is 150 (WGFD 2009).

The elk population occupying the Fortification Creek area is both locally and regionally important (Jahnke 2006). As measured by hunting use, elk hunts in this area are destination hunts and this area is a highly sought after elk hunting area with relatively few licenses issued annually, although access is largely limited by the land ownership pattern.

Prairie elk herds, such as the Fortification Creek herd, while not uncommon, are somewhat unique in the sense that this type of non-mountainous range does not provide a great deal of security for the animals, and these populations are generally quite vulnerable to disturbance. There are other prairie elk herds in this region (e.g., Tisdale Mtn. portion of the Powder River herd, Pine Ridge herd, Rochelle Hills herd, and Custer NF herd across the Montana border), but wherever these prairie elk herds are found, they are usually locally prized and often protected by the local and regional residents (BLM 2006).

3.3.2.6. Aquatics

Aquatic invertebrate communities likely to inhabit the project area are discussed in the PRB FEIS (pp. 3-153 to 3-154). The Powder River Basin ecosystem and fishery is discussed in the PRB FEIS (pp. 3-155 to 3-166). Additional information and site-specific information regarding aquatics is discussed here.

The project area is located along the Powder River corridor, within the Upper Powder River subbasin (4th Code HUC 10090202), one of eight subbasins that make up the Powder River Basin. Three tributaries of the Powder River drain the project area: Kinney Draw, Turner Draw, and Barber Creek. The project area intersects the Powder and Tongue River Riparian crucial aquatic habitat priority area designated by WGFD.

Amphibian and reptile species (herpetiles) occur throughout the Basin. WYNDD has completed the first year of a three-year herpetile study in the Power River Basin in order to detect impacts from CBNG development (Griscom et al. 2009), and their findings indicate that at least 14 species occur in the Powder River Basin.

CBNG development currently exists along the Powder River and Barber Creek riparian corridors in the project area. WGFD recommends a no surface occupancy zone extending 500 feet from the outermost perimeter of riparian corridors to maintain habitat effectiveness and functional integrity (WGFD 2009b).They go on to state that this is a conservative distance and that a 500 foot buffer provides minimal protection to wetland/riparian dependent or associated species. Using an estimate that the riparian corridor extends 50 feet from the Powder River and Barber Creek on each side, there are currently 11 CBNG well pads within 500 feet of the riparian corridor along the Powder River between the north and south boundaries of the project and 6 CBNG well pads along Barber Creek between the east and west boundaries of the project. According to WGFD recommendations, the habitat effectiveness and functional integrity of these riparian corridors have already been compromised from existing fee CBNG development.

3.3.2.7. Migratory Birds

The affected environment for migratory birds is discussed in the PRB FEIS (pp. 3-150 to 3-153).

3.3.2.8. Raptors

The affected environment for raptors is discussed in the PRB FEIS on pp. 3-141 to 3-148. Additional information not discussed in the PRB FEIS and site-specific information regarding raptor species is provided here.

Seven raptor species are known to have used nests within 0.5 miles of the project area: American kestrel, barn owls, golden eagles, great-horned owls, long-eared owls, prairie falcons, and red-tailed hawks.

The following information regarding golden eagles is in addition to what was described in the affected environment section for raptors in the PRB FEIS. Golden eagles are listed as a Bird of Conservation Concern (BCC) by USFWS for Region 17, which encompasses the project area. Golden eagles are sensitive to extensive human activity around nest sites and are threatened by loss of nesting habitat to industrial development, powerline executions, and other factors (Nicholoff 2003). The WGFD Wyoming Bird Conservation Plan habitat objectives for golden eagles include maintaining open country to provide habitat for small mammals as a food source. Recommendations for management include restricting human activities near nests during peak breeding season; protecting, enhancing, and restoring prey populations; and protecting known nesting territories. Nest 4361 was determined to be a golden eagle nest based on its large size.

Twenty-nine raptor nest sites occur within 0.5 mile of the project boundary. These are listed in Table 3.9.

Table 3.9 Documented raptor nests within the Triangle CBNG Unit Addition 1 project area

BLM ID	UTMs	Legal	Substrate[1]	Years active	Species' that have occupied nest[2]
1306	408084E 4911680N	S32 T51N R77W	CTL	unknown	unknown
2026	408015E 4911869N	S32 T51N R77W	CTD	unknown	unknown
2028	408898E 4914929N	S20 T51N R77W	CTL	2008, 2007, 2006, 2004, 2003	RETA
2348	411058E 4908312N	S10 T50N R77W	CTL	2009	unknown
3676	408970E 4917391N	S8 T51N R77W	CTL	2009, 2008, 2007, 2006	RETA
4361	410697E 4911884N	S34 T51N R77W	POL	unknown	GOEA
4363	411451E 4914483N	S22 T51N R77W	POL	2008, 2006	RETA
4366	411295E 4909956N	S3 T50N R77W	POL	2007	RETA
4367	411906E 4913862N	S27 T51N R77W	CKB	2008, 2006	PRFA, GRHO
4368	411893E 4913849N	S27 T51N R77W	CKB	2007, 2006	unknown
4962	409953E 4911409N	S33 T51N R77W	ROC	unknown	unknown
4963	408553E 4909555N	S5 T50N R77W	CTL	unknown	unknown
5093	410176E 4908258N	S9 T50N R77W	CKB	2007, 2006	RETA
5119	411336E 4913816N	S27 T51N R77W	CKB	2008, 2007	GRHO, PRFA
5155	408448E 4909460N	S5 T50N R77W	CTL	unknown	unknown

BLM ID	UTMs	Legal	Substrate[1]	Years active	Species' that have occupied nest[2]
5158	408669E 4908748N	S8 T50N R77W	CTL	unknown	unknown
5159	408609E 4909096N	S5 T50N R77W	CTL	unknown	unknown
5194	412308E 4909402N	S2 T50N R77W	CTL	2008, 2007	LOOW, RETA
5198	411647E 4908157N	S10 T50N R77W	CTL	2008, 2007	RETA
6216	413026E 4909774N	S2 T50N R77W	POL	unknown	unknown
6218	412707E 4909696N	S2 T50N R77W	CLF	unknown	unknown
6219	412673E 4909800N	S2 T50N R77W	POL	2008	LOOW
6239	408586E 4912746N	S29 T51N R77W	CTL	unknown	unknown
6240	408663E 4912689N	S29 T51N R77W	CLF	2008	GRHO
6254	409616E 4914187N	S21 T51N R77W	CKB	2009	BAOW
6449	412060E 4911501N	S34 T51N R77W	POL	unknown	unknown
6450	411299E 4910281N	S3 T50N R77W	POL	2008	RETA
6633	410484E 4908408N	S9 T50N R77W	CTL	unknown	unknown
8035	411579E 4910331N	S3 T50N R77W	CKB	2009	AMKE

Notes
1 CLF = Cliff, CKB = Creek bank, CTD = Dead cottonwood, CTL = Live cottonwood, POL = Live ponderosa, ROC = Rock cavity
2 AMKE = American kestrel, BAOW = Barn owl, GOEA = Golden eagle, GRHO = Great-horned owl, LOOW = Long-eared owl, PRFA = Prairie falcon

3.4. 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 below. Reported data from the Powder River Basin (PRB) includes Campbell, Sheridan and Johnson counties.

Table 3.10 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.

3.5. Water Resources

The project area is within the Upper Powder River drainage system.

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 authority for permitting and bonding off channel pits that are located over State and fee minerals.

3.5.1. Groundwater

A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 45 registered stock and domestic water wells within ½ mile of a federal CBNG producing well in the POD with depths ranging from 80 to 1793feet. For additional information on water, please refer to the PRB FEIS (January 2003), Chapter 3, Affected Environment pages 3-1 through 3-36 (groundwater).

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, and provide site specific guidance on the placement and design of CBNG impoundments. Shallow groundwater wells would be installed and monitored where necessary.
- A battery of 35 new groundwater monitoring well locations would be installed throughout the project area.

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 1990's in the PRB.

The areas to the south and west of the KDU Gamma POD have been intensely developed with CBNG production. As a result, the target coal zone pressure may have been reduced through off set water

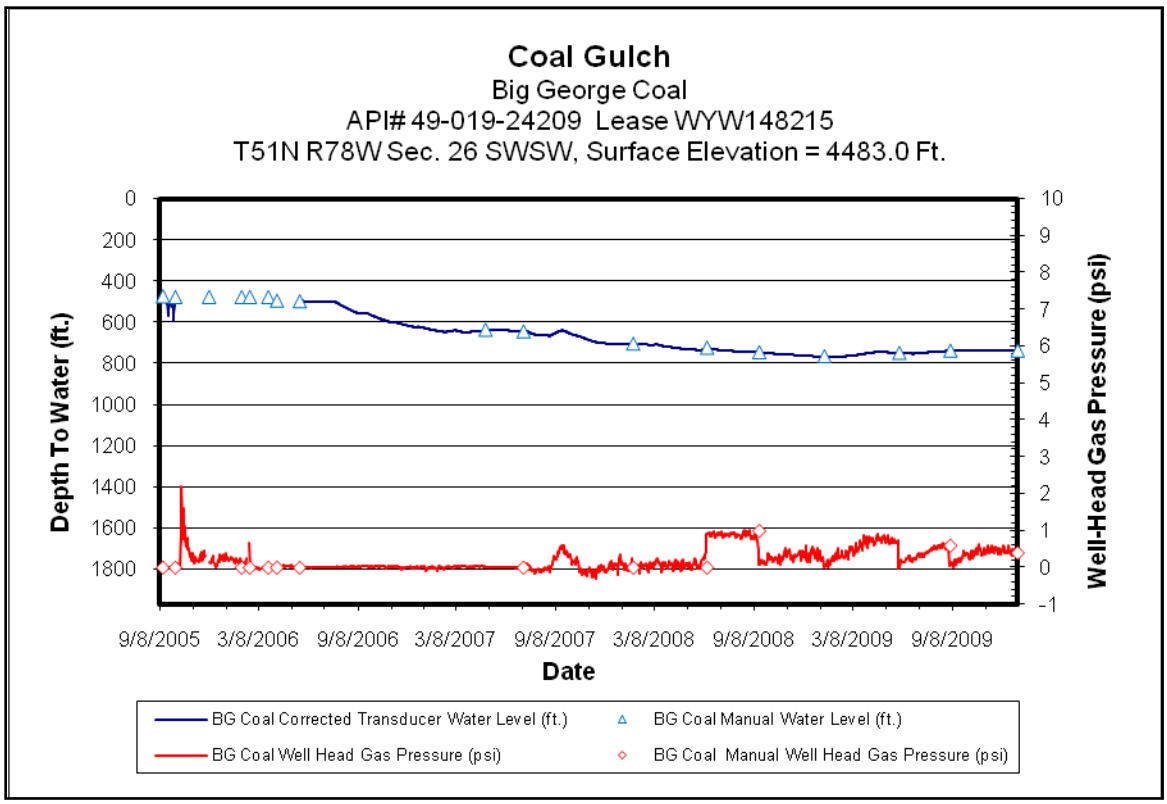
production. There are 3 BLM groundwater monitoring wells which are located within six miles of the KDUG POD boundaries, as listed in the table below.

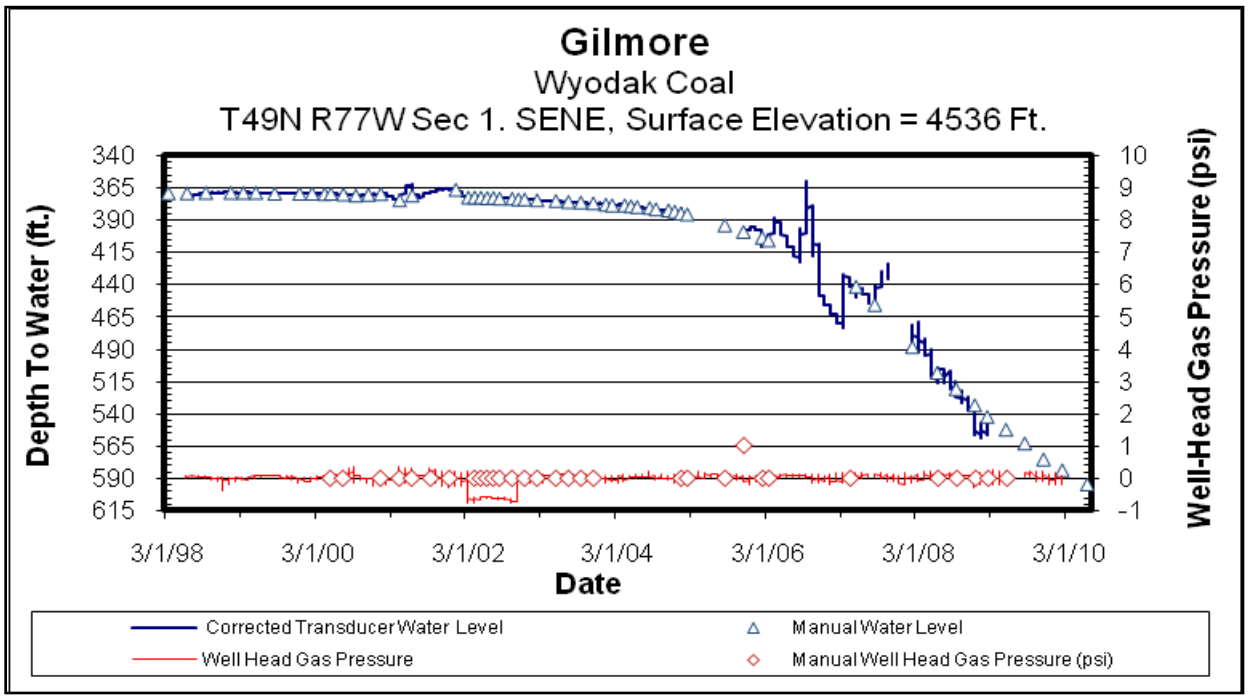
Monitor Well Name	QtrQtr	Sec	T N	R W	Distance from KDUG POD, mi	Total Depth, ft	Initial WL, ft depth from surface	Most Recent WL, ft depth from surface	Drilled by	Date Installed
Coal Gulch –Big George	SWSW	26	51	78	3.3 W	1970	473	739	Lance	9-8-05
Gilmore – Big George	SENE	1	49	77	5.3 SE	1375	NA	595	Gilmore Oil & Gas	8-20-90
Rose Draw-Wall	SESE	19	52	77	3.7 N	1986	0	72	Lance	2008

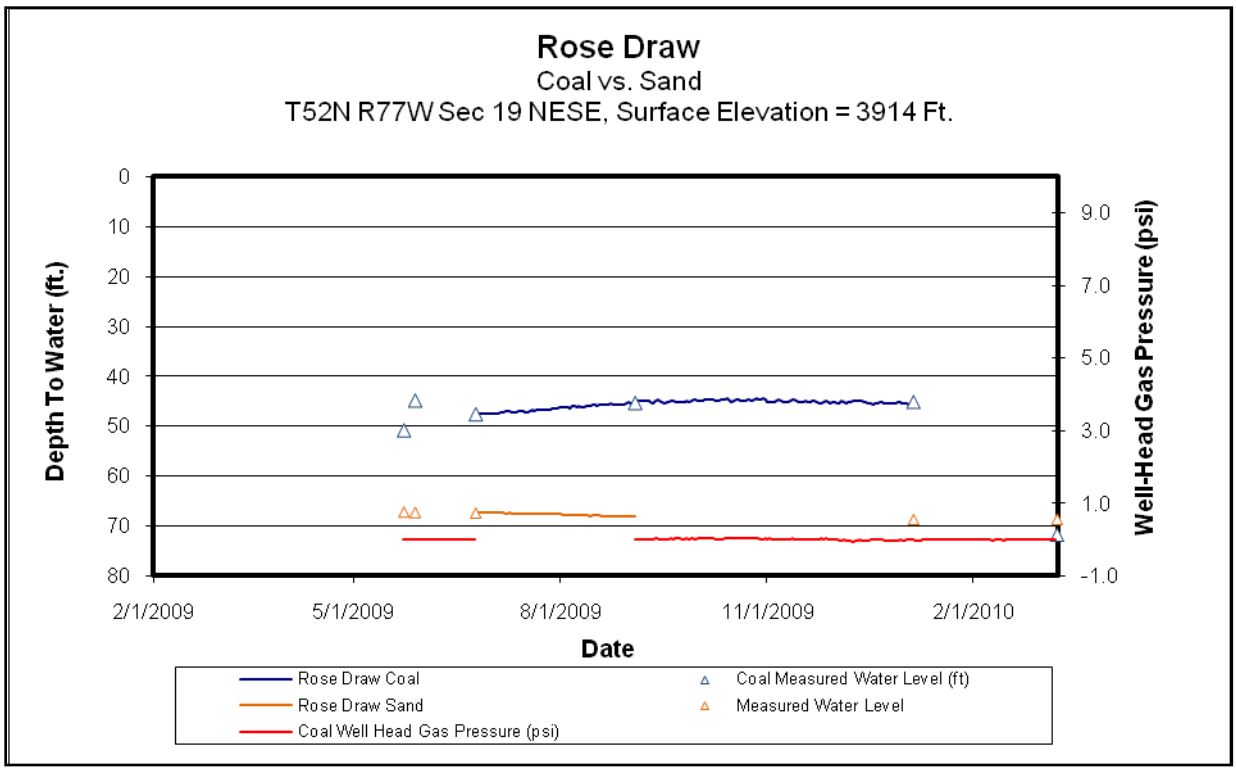
The Coal Gulch Groundwater monitoring well initial water level, which is indicative of the pressure in the coal zone, was recorded at 473 feet below ground level. The most recent measurement recorded the water level at 739 feet below ground level, for a decline of 266 feet since the well was completed in September, 2005. The Gilmore well was originally drilled as a producing well to the Ft. Union formation and converted to a monitoring well in 1998. The water level maintained at around 370 feet from the time it was converted through 2003. Since that time, the water level has dropped by over 200 feet to 585 feet below surface. The history of these wells, which are located outside the KDU Gamma POD boundaries, may suggest that the pressure in the coal zone in the project area may have been reduced by the surrounding production.

Another issue identified as a potential problem in the PRB FEIS is the hydraulic connectivity between the coal beds in the basin and shallower Wasatch formation sandstone aquifers. At many monitoring locations, wells were completed in shallower sands to track any changes in water levels. The only monitoring location with a well drilled to a sand zone in this area is at the Rose Draw location. Because monitoring began at this location in mid 2009, the interpretation of the data and any prediction of potential trends at this location would be premature.

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.


Coal Gulch
Big George Coal
API# 49-019-24209 Lease WYW148215
T51N R78W Sec. 26 SWSW, Surface Elevation = 4483.0 Ft.
Depth To Water (ft.)
Well-Head Gas Pressure (psi)
0
200
400
600
800
1000
1200
1400
1600
1800
10
9
8
7
6
5
4
3
2
1
0
-1
9/8/2005
3/8/2006
9/8/2006
3/8/2007
9/8/2007
3/8/2008
9/8/2008
3/8/2009
9/8/2009
Date
BG Coal Corrected Transducer Water Level (ft.)
BG Coal Manual Water Level (ft.)
BG Coal Well Head Gas Pressure (psi)
BG Coal Manual Well Head Gas Pressure (psi)


Gilmore
Wyodak Coal
T49N R77W Sec 1. SENE, Surface Elevation = 4536 Ft.
Depth To Water (ft.)
Well-Head Gas Pressure (psi)
340
365
390
415
440
465
490
515
540
565
590
615
10
9
8
7
6
5
4
3
2
1
0
-1
3/1/98
3/1/00
3/1/02
3/1/04
3/1/06
3/1/08
3/1/10
Date
Corrected Transducer Water Level
Manual Water Level
Well Head Gas Pressure
Manual Well Head Gas Pressure (psi)



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.

3.5.2. Surface Water/Wetlands/Riparian

The project area is within 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.

Due to continuous discharge of CBNG produced water from existing production within and above the project area, the flow in Barber Creek has become perennial in the lower portions of the drainage. Barber Creek has a well defined, steeply incised channel in the lower reaches which broadens closer to the confluence with the Powder River. There are spreader dikes installed along the lower reaches for flood plain irrigation. For the Kinney Draw drainages, the flow at present is ephemeral and the channels in this POD area are primarily sinuous and well defined. The landowner has developed the flood plain area for hay production. Most of the CBNG produced water from existing wells in this vicinity is treated and discharged directly to the Powder River under approved Wyoming Pollutant Discharge Elimination System (WYPDES) permits issued by the WDEQ.

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 CBNG produced water of varying chemical composition to surface drainages within the Project Area" (PRB FEIS page 3-48). For the Upper Powder River, 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).

The operator has not identified any natural springs within this POD boundary.

The Powder River flood plain contains wetland and riparian areas, as well as continuous cottonwood galleries invaded by salt cedar. Barber Creek and Kinney Draw contain sporadic cottonwood stands and isolated riparian areas along their courses. Due to the discharge of CBNG produced water upstream and in the project area, the flow in Barber Creek has become perennial.

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

3.6. Economics and Recovery of CBNG Resources

Revenue from mineral development contributes to Wyoming's economy, and allows for improvements in state funded programs such as infrastructure and education. The development also provides local revenue by employing workers in the area to build the roads and project infrastructure, drill wells, and maintain and monitor projects. This pool of individuals employed to work on CBNG projects results in an increase in demand for goods and services from nearby communities, primarily those of the Powder River Basin area in Wyoming.

3.7. Cultural Resources

Class III cultural resource inventory was performed for LOG for the Kinney Divide Unit Gamma POD prior to on-the-ground project work (BFO project no. 70080113). North Platte Archaeological Services conducted a block 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*. BJ Earle, BLM Archaeologist, reviewed the report for technical adequacy and compliance with Bureau of Land Management (BLM) standards, and determined it to be adequate. Most sites were field checked in spring of 2009. The following resources are located in or near the project area.

Table 3.11 Cultural Resources Inventory Results

Site Number	Site Type	National Register Eligibility
48 JO 476	Prehistoric site	Not eligible
48 JO 1901	Prehistoric site	Not eligible
48 JO 1902	Prehistoric site	Not eligible
48 JO 1903	Historic site	Not eligible
48 JO 1904	Prehistoric site	Not eligible
48 JO 1905	Historic site	Not eligible
48 JO 1907	Prehistoric site	Not eligible
48 JO 1908	Prehistoric site	Not eligible

Site Number	Site Type	National Register Eligibility
48 JO 1912	Prehistoric site	Not eligible
48 JO 1913	Prehistoric site	Not eligible
48 JO 1918	Prehistoric site	Not eligible
48 JO 1933	Historic site	Not eligible
48 JO 1935	Historic site	Not eligible
48 JO 2582	Historic site	Not eligible
48 JO 2585	Historic Linear Resource	Not eligible
48 JO 2721	Historic site	Not eligible
48 JO 2722	Historic site	Not eligible
48 JO 2724	Prehistoric site	Not eligible
48 JO 2725	Prehistoric site	Not eligible
48 JO 2726	Historic site	Not eligible
48 JO 2727	Prehistoric site	Not eligible
48 JO 2728	Historic site	Not eligible
48 JO 4031	Prehistoric site	Eligible: D
48 JO 4032	Prehistoric site	Eligible: D
48 JO 4130	Prehistoric site	Eligible: D
48 JO 4131	Prehistoric site	Not eligible
48 JO 4132	Prehistoric site	Eligible: D
48 JO 4133	Prehistoric site	Eligible: D

During onsites for associated projects in summer of 2009, it was noted that visibility was inadequate to conduct Class III inventory within drainages, due to heavy vegetation. When a project is constructed in an area with a high potential for buried cultural material, archaeological monitoring is included as a condition of approval. Construction monitoring is performed by a qualified archeologist working in unison with construction crews. If buried cultural resources are located by the archeologist, construction is halted and the BLM consults with the State Historic Preservation Office (SHPO) on mitigation or avoidance.

3.8. 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 [NOx]) 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;
- NOx, particulate matter, and other emissions from diesel trains and,
- SO2 and NOx 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

The following environmental consequences section addresses effects. To "affect" means to influence or cause a reaction or alteration in behavior; the term "effects" can be interpreted to mean, results of the proposed action or alternative action to this and other resources.

The effects analysis addresses:

- Direct and indirect effects
- Cumulative effects (combined effects of this proposed action with other reasonably foreseeable Federal and non-federal actions)
- Mitigation measures
- Residual effects

Design features and mitigation measures are both intended to reduce impacts to resources. For the purpose of this environmental analysis, the two terms differ in that one is part of the proposed action and the other becomes a condition of approval (COA). "Design features" have been incorporated into the proposed action or alternative. "Mitigation measures" have not been incorporated into the proposed action or alternative, they are analyzed, and if identified as reducing impacts, they are incorporated as COAs. "COAs" are mitigation measures that reduce impacts; they are monitored to ensure implementation of applied mitigation. "Residual effects" are the impacts that remain after applying design features and mitigation measures.

Effects to resources are analyzed below. Section 4.1 is the No Action Alternative, Section 4.2 Alternative B describes the environmental consequences of the proposed action. It is followed by an analysis Alternative C in Section 4.2. Alternative C is the proposed action with additional BLM mitigation.

4.1. 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.

4.2. Alternative B

Alternative B contains complete proposals based on the Operator and BLM working to reduce environmental impacts. This alternative summarizes the POD as it was finally, after site visits changes, submitted to the BLM by LOG. Impacts are listed and analyzed by resource below.

Two items were added to the proposal after the on-site; pump jacks at each well location, and a utility line that crosses through the bald eagle roost near the Powder River. These two items are recommended for denial:

- Recommended denial of pump jacks. Pump jacks were not considered during the onsite. With potential improvements in technology and changes in environmental conditions, analysis and approval is better suited to be analyzed by sundry closer in time to the proposed action.
- Recommend denial of the utility corridor in sections 4 and 5 and 9 of T50 R77 near the Powder River that crosses through the bald eagle roost. It was not field reviewed, it was added to the map after the onsite.

4.2.1. Soils Direct and Indirect Effects

According to the NRCS soil data and field verification, a portion of the KDU Gamma project, was leased in an area of the Powder River Breaks which has soils and topographic relief that is not suitable for construction of well pads, access roads or other structures. Construction is further thwarted by steep slopes and drainage features from the surrounding watershed.

- 28% of the area has slopes greater than 25%
- 43% of the area contains clayey soils
- 47% is in poor reclamation potential
- 82% of the POD has severe erosion hazard

Direct effect of construction is the loss of topsoil and removal of the biological and physical crust. 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.

An indirect effect of construction is caused by the removal of the biological and physical crust that mitigates and controls water velocity. 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). These biological and physical crusts 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.

The effects to soils resulting from well pad, access roads and pipeline construction are amplified by highly erosive soils, slope hazards and reclamation potential. Direct and indirect effects to soils associated with construction and production include:

- Increased hazards from erosion
- Increased susceptibility to erosion
- Modification of ecological site composition
- Reduction of ecological function
- Potential for unsuccessful reclamation
- Increased potential for weeds

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

4.2.1.1. Slopes Hazard

Approximately 28% of the project area is on slopes >25%. Roads, pipelines, and wells pads were placed in the flattest areas possible. Contiguous linear segments did not exist for all roadways. Due to the rough topography impacts of side slopes greater than 25% could not be avoided on the following engineered road sections:

a. Eng #2 STA 2+50 to 4+50
b. Eng #4 STA 1+00 to 5+00
c. Eng #6 STA 0+00 to 5+00 & 5+50 to 7+00 & 8+00 to 14+00
d. Eng #7 STA 2+00 to 3+00
e. Eng #8 STA 3+00 to 5+00 & 11+00 to 12+00 & 18+50 to 23+00 & 25+00 to 28+00
f. Eng #9A STA 7+00 to 8+00
g. Eng #9B STA 2+00 to 5+00
h. Eng #10 STA 3+50 to 4+50 & 6+50 to 7+00 & 14+00 to 16+00
i. Eng #11 STA 2+00 to 3+00 & 3+50 to 4+00 & 8+00 to 8+50 & 10+00 to 10+50
j. Eng #12 STA 4+00 to 5+00
k. Eng #13 STA 1+50 to 4+00
l. Eng #18 STA 3+00 to 4+00
m. Eng #20 STA 1+00 to 4+00 & 21+00 to 22+00 & 23+00 to 26+00
n. Eng #22 STA 2+00 to 4+00

Expectations for successful reclamation, of the above listed road sections, is enhanced by incorporating the design features LOG proposed in KDU Gamma POD. Impacts to soils and vegetation from surface disturbance will be reduced by following the reclamation plan that was submitted by LOG, and with use of BLM applied mitigation.

4.2.1.2. Severe Erosion Hazard

Soils with severe erosion hazard ratings cover 82% 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 by following the reclamation plan that was submitted by LOG, and with use of BLM applied mitigation.

4.2.1.3. Ecological Sites

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 soil composition and revegetation. Mixing of horizons, which 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.

This disturbance indirectly changes the chemical composition and the ecological integrity of the site and

therefore may change the recommended seed mix. There will be shifts in the plant communities. This impacts ecological function and net primary production, effecting range and wildlife values through ecosystem degradation. Impacts to ecological sites and ecological function will be reduced by minimizing surface disturbance, following the master surface use plan and reclamation plan submitted by LOG, and with use of BLM applied mitigation**.**

4.2.1.4. Reclamation Potential

Direct effects to vegetation would occur from ground disturbance caused by construction of well pads, compressor stations, ancillary facilities, associated pipelines and roads. Effects are both short term and long term. Short term effects would occur where vegetated areas are disturbed but 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. It takes centuries for sagebrush to fully grow back. Sagebrush does not come back easily after human disturbance such as agricultural development or after natural occurrences such as wildfire.

4.2.1.5. Cumulative Effects

The designation of 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 by the operator in their POD Surface Use Plan and as required by the BLM in COAs. Road engineering sections (items a-n) listed above are mitigated by proper engineering, short distances, and the LOG site specific reclamation plan submitted with the KDU Gamma POD.

Structural stability of the road crossing Turner Draw to access sections 27 and 34 would be compromised by the poor soil stability and excessive soil movement. 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. The access road is sections 27 and 34 has side slopes are greater than 25%, there is poor reclamation potential and there are numerous existing active head cuts less than 20’ from the proposed road centerline. 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.

4.2.1.6. Mitigation Measures

- Steep Grade signs will be installed to inform travelers of the potential hazard on two of the constructed roads: Engineered Road #6: road grade is greater than 12% for 700 linear feet. Engineered Road #10: road grade is greater than 12% for 900 linear feet. Per BLM Manual 9113 .28. Signs and Markers- Signs and markers placed on or adjacent to the roadway to regulate, inform, or guide vehicle occupants must conform to the requirements of BLM Manual 9131 and the Federal Highway Administrations Manual of Uniform Traffic Control Devices.
- In areas where there are steep slopes and/or fragile soils, improved roads used in conjunction with accessing federal wells must be fully built (including all water control structures such as wingditches, culverts, relief ditches, low water crossings, surfacing, etc.) and functional to BLM standards as outlined in the BLM Manual 9113 prior to drilling of the well. Specifically for this POD: All

approved engineered roads. The remaining roads in this POD, not constructed prior to drilling, will be fully built within 30 days of completion of the well they are used to access.

- The Wyoming Reclamation Policy applies to all surface disturbing activities. The operator will follow the guidance provided in the Wyoming Policy on Reclamation (IM WY-90-231).
- BLM reclamation goals include the short-term goal of quickly stabilizing disturbed areas to protect both disturbed and adjacent undisturbed areas from unnecessary degradation.
- Authorizations for surface disturbing actions are based on 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 approximates pre-disturbance conditions.
- NRCS Ecological Sites will be used to measure success of reclamation.
- Compaction will be remediated by plowing or ripping.
- Mitigation includes 30-day soil stabilization and reclamation methods listed in LOGs site specific reclamation plan for the KDU POD. The following well locations and access road/corridor in the project area have been identified to have limited reclamation potential that will require disturbed areas to be stabilized (stabilization efforts may include mulching, matting, soil amendments, etc.) in a manner which eliminates accelerated erosion until a self-perpetuating native plant community has stabilized the site in accordance with the Wyoming Reclamation Policy. Stabilization efforts shall be finished within 30 days of the initiation of construction activities:

Township/Range	Section	Wells and Infrastructure
T51N R77W	27	21-27 just access road, 32-27 both well and access road
	28	21-28 and 31-28 just access road, 43-28 well location
	33	32-33 well location
	34	11-34 just access road, 21-34 and 23-34 both well and access road
T50N R77W	3	21-3 and 41-3 just access road, 42-3 and 43-3 both well and access road
	4	31-4 and 44-4 both well and access road, 44-4 well location
	5	42.5 just access road

4.2.1.7. Residual Effects to Soils and Vegetation

Ten wells, the 11-27, 21-27, 22-27, 31-27, 32-27, 33-27, 34-27, 32-34, 41-34 and 42-34 in T51 R77, are proposed to be accessed through a route that crosses Turner Draw. This route does not meet BLM road standards due to impacts of steep 30-65% side slopes, erosive soils and potential mass wasting. Actual drill sites locations are not the problem for six of these ten wells, the problem is the access getting to the sites in and out of Turner Draw, and crossing deeply incised drainages all along the route through sections 27 and 34. Three of these wells 11-27, 21-27, 22-27, have additional issues with raptors. Two, the 32-34 and 42-34, have issues topography and soils on the proposed pad locations.

The 32-34-5177 well location has slopes >25%, erosive soils, high erosion hazard, and poor reclamation potential on the well location. Well location 42-34-5177 has the same soils issues; and it is surrounded by steep slopes in a drainage pathway with erosive soils. Even with the site specific reclamation plans that were proposed with the POD, these two wells are not expected to maintain stability. Expectations for reclamation are poor, and final reclamation could be expected to incur substantial erosion and sedimentation.

The 32-34-5177 is located on the original main access route proposed to come in from the south to travel north through section 34 to end at Turner Draw in section 27. This main access route would have connected the rest of the KDU project to the wells is sections 27 and 34 (Note, this access between the

32-34-5177 and 42-34-5177 was eliminated from further consideration during the on-site due to poor soils and steep slopes, it did not meet BLM road standards. The operator did not propose this access route in the final project proposal). Instead the only other option was to access this area through Turner Draw. Turner Draw incurs large floods events. According to the landowner testimony and evidence of soil movement, the channel is not stable. LOG proposed a thirty inch culvert covered by thirty one feet of fill to bring the channel up to an approachable grade between the up-slopes surrounding this drainage. There is no confidence this amount of fill over such a small culvert would retain integrity over multiple years of storm events.

4.2.2. Invasive Species

4.2.2.1. 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.

4.2.2.2. 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 such as leafy spurge, Russian knapweed, whitetop, Scotch thistle, salt cedar and Russian olive.

4.2.2.3. Mitigation Measures

The operator has committed to the control of noxious weeds and species of concern (hoary cress, Scotch thistle, Canada thistle, Common cocklebur and Buffalo bur) using the following measures identified in their Integrated Pest Management Plan (IPMP):

- 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.
- 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.
- 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.

4.2.2.4. Residual Effects

Control efforts by the operator are limited to the surface disturbance associated the implementation of the project. Cheat grass 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. Cheatgrass 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.

4.2.3. Wildlife

For the purposes of this analysis, all road and utility corridor disturbance was considered new if the disturbance was not along an existing improved route. Ranch two-track roads were not considered existing disturbance due to their difficulty to distinguish on the landscape and their limited levels of use. Figure 6 (pg. 77) depicts new disturbance and existing disturbance associated with this analysis and an overview of Alternatives B & C.

4.2.3.1. Habitat Types

4.2.3.1.1. Direct and Indirect Effects

Alternative B would result in direct loss of sagebrush shrublands. With the exception of the new road to well 14-21, all new roads and pipelines would directly impact stands of sagebrush, representing approximately 16 miles of linear disturbance in sagebrush shrublands. Fragmentation would increase, as measured by smaller and more frequent patches with an increased amount of edge. 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.

Direct impacts to sagebrush shrublands would include the following (refer to Figure 6, pg. 77):

- The road to well 32-4 would introduce 3,110 feet (0.6 mi) of new disturbance and fragment a 500-acre intact patch of ground into smaller patches that would be approximately 380 acres and 120 acres in size, with a total of 5 miles of edge. (Amount of edge and number of patches are measures of fragmentation. Increases in both would result in an increase in the impacts described above for fragmentation.)
- Well 43-3 would be located approximately 0.1 of a mile from an existing road, but the access road would come in from the opposite direction and create 6,060 feet (1.1 mi) of new disturbance through sagebrush stands.
- Inclusion of well 43-3 would fragment a patch on the landscape approximately 800 acres in size into two patches of 230 acres and 570 acres and create 7.7 miles of edge. The larger patch would be fragmented by the inclusion of well 34-3.
- The road to well 11-18 would result in the loss of 970 feet (0.2 mi) of intact sagebrush shrubland.
- The roads/utility corridors for wells 11-27, 21-27, and 22-27 would result in the loss of 6,800 feet (1.3 mi) of linear disturbance in sagebrush shrublands.

Direct impacts would also occur to grasslands, but grasslands are generally easier to reclaim and re-establishment would occur more quickly.

Increased traffic on the proposed road that parallels the Powder River would impact riparian habitat. Impacts would include increased sediment and erosion and increased risk of establishment of invasive species.

Direct losses to conifer woodlands and rock outcrops would not occur. Habitat quality of these areas could be impaired by increased traffic, noise, dust, and proximity to human activities.

Alternative B would result in 2.7 miles of new linear disturbance in the WGFD Sagebrush/Mixed Grass

Habitat crucial/enhancement area. Habitat quality would decline due to increased fragmentation, impacts from increased dust which affects photosynthetic capability, and increased risk of establishment of invasive species. Risk of fire may also occur from increased human activities in the areas. Impacts associated with use of the road along the Powder River, as described above, would occur within the WGFD Powder and Tongue River Riparian crucial/enhancement areas. Alternative B may negatively affect WGFD's ability to achieve the goals set for in its *Strategic Habitat Plan* for these crucial and enhancement areas.

4.2.3.1.2. 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. 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. Livestock grazing can imperil riparian habitats if not managed properly.

4.2.3.1.3. Mitigation Measures

No mitigation measures are proposed with Alternative B.

4.2.3.1.4. Residual Effects

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

4.2.3.2. Threatened, Endangered, Proposed and Candidate Species

4.2.3.2.1. Threatened and Endangered Species

Potential project effects on Threatened and Endangered Species were analyzed and a summary is provided in 4.1.

Table 4.1 Summary of Threatened and Endangered Species Habitat and Project Effects

Common Name (scientific name)	Habitat	Project Effects	Rationale
Endangered			
Black-footed ferret	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NLAA	Potential habitat will be reduced due to construction of new road through prairie dog colony.
Blowout penstemon (*Penstemon haydenii*)	Sparsely vegetated, shifting sand dunes	NE	No suitable habitat present.
Threatened			
Ute ladies'-tresses orchid (*Spiranthes diluvialis*)	Riparian areas with permanent water	NE	No suitable habitat present.
Project Effects **LAA** - Likely to adversely affect **NE** - No Effect **NLAA** - May Affect, not likely to adversely affect individuals or habitat.			

4.2.3.2.1.1. Black-Footed Ferret

4.2.3.2.1.1.1. Direct and Indirect Effects

Direct and indirect effects to black-footed ferret are discussed in the PRB FEIS. A road is proposed through a prairie dog town that is on the edge of a group of colonies that are large enough to provide

habitat for black-footed ferret. USFWS has block cleared projects proposed in Wyoming outside the Shirley Basin; however, if black-footed ferrets were to be reintroduced to Wyoming, this area of potential habitat would be lost due to the installation of a road. Because this area occurs on the edge of the potential habitat and it represents only 700 feet of linear disturbance through a small prairie dog colony (<10 acres in size), the project will not result in the loss of an amount of habitat that will impact the ability to reintroduce black-footed ferrets. The project, therefore, may affect, but is not likely to adversely affect individuals or habitat.

4.2.3.2.1.1.2. Cumulative Effects

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

4.2.3.2.1.1.3. Mitigation Measures

No mitigation measures are proposed with Alternative B.

4.2.3.2.1.1.4. Residual Effects

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

4.2.3.2.1.2. Blowout penstemon

4.2.3.2.1.2.1. Direct and Indirect Effects

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

4.2.3.2.1.2.2. Cumulative Effects

The proposed project will have no effect on blowout penstemon.

4.2.3.2.1.2.3. Mitigation Measures

No mitigation measures are proposed with Alternative B.

4.2.3.2.1.2.4. Residual Effects

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

4.2.3.2.1.3. Ute Ladies'-Tresses Orchid

4.2.3.2.1.3.1. Direct and Indirect Effects

Suitable habitat will not be impacted by the proposed KDU Gamma project. Implementation of the proposed coal bed natural gas project will have **no effect** on the Ute ladies'- tresses orchid.

4.2.3.2.1.3.2. Cumulative Effects

The proposed project will have no effect on the Ute ladies'-tresses orchid.

4.2.3.2.1.3.3. Mitigation Measures

No mitigation measures are proposed with Alternative B.

4.2.3.2.1.3.4. Residual Effects

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

4.2.3.2.2. Proposed Species

4.2.3.2.2.1. Mountain Plover

4.2.3.2.2.1.1. Direct and Indirect Effects

Impacts to mountain plover are discussed in the PRB FEIS (pages 4-254 to 4-255). Mineral development has mixed effects on mountain plovers. Disturbed ground, such as buried pipeline corridors and roads,

may provide suitable nesting habitat for plovers. On the other hand, increased traffic, construction, and human activities within one-quarter mile may be disruptive to nesting behaviors.

4.2.3.2.2.1.2. Cumulative Effects

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

4.2.3.2.2.1.3. Mitigation Measures

To reduce impacts to nesting mountain plovers, BFO will require a 0.25 mile timing limitation on surface-disturbing activities for potential nesting habitat during the nesting season.

4.2.3.2.2.1.4. Residual Effects

Even with timing limitations on surface-disturbing activities, mountain plovers may be displaced by other activities associated with development. Traffic and construction activities that are not prohibited by the timing limitations may degrade habitat quality sufficiently to render the area unsuitable for some mountain plovers. Timing limitations do nothing to mitigate habitat loss, therefore drilling and construction that takes place outside of nesting season will still result in habitat loss for this species. The timing limitation will result in some decrease in direct mortalities that would occur with increased drilling traffic during the breeding season. Mortalities associated with maintenance and non-surface-disturbing activities will still occur.

4.2.3.2.3. Candidate Species

4.2.3.2.3.1. Greater Sage-grouse

4.2.3.2.3.1.1. 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 Threathened or Endangered* (USFWS 2010). Impacts to sage-grouse are generally a result of loss and fragmentation of sagebrush habitats associated with roads and infrastructure. Research indicates that sage-grouse hens avoid nesting in developed areas.

Implementation of Alternative B will adversely impact nesting and winter habitat through loss, fragmentation, and avoidance of habitats. With approval of Alternative B, large, intact sagebrush stands that meet the habitat requirements of sage-grouse will be fragmented by the access road to well 32-4; wells 11-27, 21-27, 22-27 and associated road and pipeline corridor in W S27 and E S28 T51N R77W; and well 11-18 and its associated access road.

4.2.3.2.3.1.2. Cumulative Effects

Recent research suggests that the cumulative and synergistic effects of 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 cumulative impact assessment area for this project encompasses the project area and the area that is encompassed by a four mile radius around the four sage-grouse leks that occur within four miles of the project boundary. Analysis of impacts up to four miles was recommended by the State Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas Development Effects to Nesting Habitat (2008) and the Governor of Wyoming's Sage-Grouse Implementation Team (2010).

Excluding the KDU Gamma project, there are approximately 143 proposed federal wells (Automated Fluid Minerals Support System [AFMSS] 05/2010) within the cumulative effects analysis area. With the addition of these wells, well density would increase to 4.8 wells per square mile. With approval of Alternative B (60 proposed well locations) well density would increases to 5.6 wells per square mile, well above the one well per square mile recommendation by the State Wildlife Agencies' Ad Hoc Committee

for Sage-Grouse and Oil and Gas Development. With the approval of Alternative B, all four leks would exceed the WGFD threshold category for extreme impacts.

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:

- The Operator eliminated well 32-18 and associated 0.3 miles of linear disturbance from the project plan that were located in suitable sage-grouse nesting habitat
- The Operator moved well 34-18 to the 44-18 location and relocating 0.5 miles of linear disturbance to corridor with an existing fence line, which reduced fragmentation of intact, suitable sage-grouse nesting habitat
- The Operator relocated the access road to well 21-18, which eliminated 0.3 miles of linear disturbance through suitable sage-grouse nesting habitat.

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)." Based on the impacts described in the Powder River Basin Oil and Gas Project FEIS and the findings of more recent research, the proposed action may contribute to a decline in male attendance at the four leks that occur within four miles of the project area, and, potentially, extirpation of the local grouse population.

4.2.3.2.3.1.3. Mitigation Measures

In order to reduce the likelihood that activities associated with noise, construction, and human disturbance will disturb sage-grouse, BLM will implement a timing limitation on all surface-disturbing activities within and adjacent to identified nesting habitat across the project area. Because nesting grouse have been shown to avoid infrastructure by up to 0.6 miles, the intent of this timing restriction is to decrease the likelihood that grouse will avoid these areas and increase habitat quality by reducing noise and human activities during the breeding season.

4.2.3.2.3.1.4. Residual Effects

A timing limitation does nothing to mitigate loss and fragmentation of habitat or changes in disease mechanisms. Suitability of the project area for sage-grouse will be negatively affected due to habitat loss and fragmentation and proximity of human activities associated with CBNG development.

4.2.3.3. 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."

The PRB FEIS discusses impacts to the sensitive species (Baird's sparrow, bald eagle, Brewer's sparrow, ferruginous hawk, loggerhead shrike, long-billed curlew, sage sparrow, sage thrasher, trumpeter swan, western burrowing owl, yellow-billed cuckoo, black-tailed prairie dog, fringed myotis, long-eared myotis,

and Townsend's big-eared bat) that may occur in the project area on pp. 4-257 to 4-273. During the issues identification process, bald eagles and black-tailed prairie dogs were determined to warrant further evaluation in this environmental assessment. Impacts to these species are discussed here.

4.2.3.3.1. Bald Eagle

4.2.3.3.1.1. Direct and Indirect Effects

Impacts to bald eagles are discussed in the PRB FEIS on pg. 4-251 to 4-253. Additional site-specific information is provided here.

Human activities, traffic, and construction may displace winter roosting, nesting, or foraging eagles. The closer those activities occur to a roost, the less impacts from those activities can be mitigated by ensuring that they occur out of line-of-sight of roosting eagles In other words, closer activities may not be mitigated by moving out of line-of-sight. Adequate mitigation is achieved through a relationship between distance and visibility. A well may be visible but at an adequate distance, visible but too close, not visible and at an adequate distance, or not visible and too close. Alternative B would result in 11 wells within 0.5 miles of bald eagle roosts: 41-17, 14-21, 42-29, 14-28, 11-33, 21-33, 13-33, 42-5, 43-5, 13-4, and 34-4. Of the 11, six wells are mitigated (but four of these six have access roads that are not mitigated) and five of the wells are not mitigated.

- Mitigated Wells: Impacts of wells 34-4 and 13-33 are mitigated by their placement out of line-of-sight of the roost areas. Impacts of wells 14-28 and 21-33 are mitigated by their location along an improved access road that already experiences oil and gas traffic. Impacts of well 14-21 are mitigated because the access road for this well, branches off an existing oil and gas road, and the direction of traffic to the well is parallel to the riparian corridor, which may be perceived as less threatening to roosting bald eagles than traffic that is traveling directly towards the roosting area. Impacts of well 41-17 are mitigated because the well is located just at 0.5 miles from a roost area. The well is lower in elevation than the roost area, and the access road to the well is not visible from the roost area.

- Non-mitigated Wells: Wells 42-5, 43-5, and 13-4 are located within 0.5 miles of, along a two-track road that has not been used for oil and gas traffic, and above line-of-sight of a roost area. Wells 42-29 and 11-33 are located within 0.5 miles of and direct line-of-sight of bald eagle roosts. These wells would require construction of new access roads and utility corridors. Traffic along these access roads would travel directly toward the roost areas.

- Non-mitigated Access: Access to wells 13-33, 14-33, 21-4, and 22-4 would require travel within 0.5 miles of and parallel to a bald eagle roosting area. Traffic and human activities associated with these wells and roads may cause bald eagles to abandon use of the winter roost area or may interfere with feeding or sheltering behavior to such a degree that a decrease in productivity may result in the subsequent breeding seasons. Such a decrease in productivity would represent a violation of the Bald and Golden Eagle Protection Act.

4.2.3.3.1.2. Cumulative Effects

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

4.2.3.3.1.3. Mitigation Measures

To reduce the risk of disruption to the winter roosting activities of bald eagles, BFO will require a 0.5 mile disturbance-free buffer and a 1.0 mile radius timing limitation on all winter roost habitat between 1 Nov. and 1 Apr., annually.

To reduce the risk of disruption to nesting bald eagles, BFO will implement a 0.5 mile disturbance-free

buffer around all nests and a 1.0 mile radius timing limitation of all bald eagle nesting habitat between 1 Feb. and 15 Aug., annually.

4.2.3.3.1.4. Residual Effects

Even with timing limitations, habitat quality may be degraded to a point that the area no longer provides habitat requirements for wintering bald eagles. A 0.5 mile buffer may not be sufficient to protect bald eagles from disturbance. A 1.0 mile timing restriction on construction activities does nothing to protect valuable habitats from disturbance, and habitat may be degraded over time to such an extent that productivity of bald eagles may be reduced, potentially resulting in a violation of the Bald and Golden Eagle Protection Act.

4.2.3.3.2. Black-tailed Prairie Dogs

4.2.3.3.2.1. Direct and Indirect Effects

Impacts to black-tailed prairie dogs are discussed in the PRB FEIS (pp. 4-255 to 4-256).

The road to 31-18 will directly impact a black-tailed prairie dog colony, resulting in approximately 700 feet of linear disturbance through the colony. LOG will locate the road on the edge of the colony in order to minimize impacts to prairie dogs.

4.2.3.3.2.2. Cumulative Effects

The cumulative effects for prairie dogs are described in the PRB FEIS (pp. 4-251 to 4-253).

4.2.3.3.2.3. Mitigation Measures

No mitigation measures are proposed with Alternative B.

4.2.3.3.2.4. Residual Effects

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

4.2.3.4. Big Game

4.2.3.4.1. Direct and Indirect Effects

Impacts to big game are discussed in the PRB FEIS on pp. 4-181 to 4-215. As discussed in that document, impacts would occur through alterations in hunting and/or poaching, increased vehicle collisions, harassment and displacement, increased noise, increased dust, alterations in nutritional status and reproductive success, increased fragmentation, loss or degradation of habitats, reduction in habitat effectiveness. Impacts to pronghorn would also occur through addition of barbed wire fences on the landscape. Declines in all populations of big game species are expected to occur as a result of CBNG development.

Big game would likely increase their avoidance behavior throughout the project area due to the fragmentation associated with the road distribution and well density. A viewshed model was run to determine areas that would not be visible from the road (effective habitat). In order to limit this analysis to areas of a meaningful size, only areas greater than 20 acres in size were analyzed. According to the model, effective habitat in the northeast portion of the project area would be fragmented into two patches totaling 302 acres in size. The road and wells in the northeast portion of the project area would create a barrier between the remaining effective habitat patches and intact habitats and seasonal ranges to the east.

Increased CBNG development would create continued concern for WGFD's regarding big game herds, as expressed in their Job Completion Reports.

Alternative B would result in the most fragmentation and loss of habitats for big game species. Approximately 1,320 acres of security habitat would be eliminated in elk yearlong range, based on a 0.5

mile buffer from roads. This would result in the loss of an additional 6% of security habitat in yearlong range, for a total loss of 26%, since the time WGFD made the recommendation to retain 50%.

The portion of the project area that shows the highest amount of use by elk, as indicated by telemetry data, would likely be avoided by elk and rendered ineffective for supporting elk populations. Approximately 700 acres of effective habitat in S27 and S34 would be eliminated because those areas would be visible from a road. Implementation of Alternative B would sever the connection between the northeast portion of the project area and the rest of the elk seasonal ranges to the east. It would also cut off the direction connection between the northeast portion of the project area and crucial winter range to the east.

4.2.3.4.2. Cumulative Effects

The cumulative effects associated with Alternative B described in the PRB FEIS (pp. 4-181 to 4-215).

4.2.3.4.3. Mitigation Measures

No mitigation measures are proposed with Alternative B.

4.2.3.4.4. Residual Effects

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

4.2.3.5. Aquatics

4.2.3.5.1. Direct and Indirect Effects

Impacts to aquatics are discussed in the PRB FEIS on pp. 4-235 to 4-247.

No new infrastructure will directly impact the Powder River and Barber Creek riparian corridors, and no infrastructure is proposed within 500 feet of the riparian corridors. No additional impacts are expected to occur in the WGFD Powder and Tongue River Riparian crucial aquatic habitat priority area.

4.2.3.5.2. Cumulative Effects

The cumulative effects associated with Alternative B are described in the PRB FEIS (pp. 4-247 to 4-249).

4.2.3.5.3. Mitigation Measures

No mitigation measures are proposed with Alternative B.

4.2.3.5.4. Residual Effects

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

4.2.3.6. Migratory Birds

4.2.3.6.1. Direct and Indirect Effects

Direct and indirect effects to migratory birds are discussed in the PRB FEIS (pp. 4-231 to 4-235). More recent research further confirms the findings described in the PRB FEIS. Ingelfinger (2004) identified that the density of some breeding bird species declined within 100 m of dirt roads within a natural gas field. In the study, the density of Brewer's sparrows declined by 36%, and the density of breeding sage sparrows declined by 57%. 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.

Alternative B would result in the most fragmentation and loss of habitats for migratory birds. Figure 9 depicts the difference in avoidance areas between alternatives. Implementation of Alternative B will result

in approximately 870 acres within 100 meters of roads that might represent avoidance areas for migratory birds.

4.2.3.6.2. Cumulative Effects

Cumulative impacts to migratory birds are discussed in the PRB FEIS (pg. 4-235).

4.2.3.6.3. 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 sage-grouse or raptornesting timing limitations are 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 will reduce potential bird mortality from drowning.

4.2.3.6.4. Residual Effects

Those species and individuals that are nesting in areas not protected by sage-grouse timing limitations or raptor timing limitations may have nests destroyed, or be disturbed, by construction activities. This is also the case for migratory birds that are still nesting after sage-grouse timing limitations are over (after 15 June). Protections around active raptor nests (Feb 1- July 31) extend past most migratory bird nesting seasons, but only a small portion of known nests are active in any given year, so the protections for migratory birds from June 15 - July 31 will only be in place for those that are nesting within 0.5 miles of that small portion of active nests.

4.2.3.7. Raptors

4.2.3.7.1. Direct and Indirect Effects

Direct and indirect effects to raptors are discussed in the PRB FEIS (pp. 4-216 to 4-221).

Alternative B would result in the most disturbances in proximity of nesting raptors, including direct loss of foraging habitats and indirect losses associated with declines in habitat effectiveness. Implementation of Alternative B would result in eight wells with infrastructure located within 0.25 miles of eight nests. Under Alternative B, effects to five nests are mitigated, while effects to the remaining three nests are not.

- Mitigated Nests: Nest 2348 already has a well-traveled improved road within 0.25 miles. The additional roads to wells 34-3 and 24-3 are minimal in comparison and are not likely to increase the impacts on this nest to a level that would cause abandonment. Impacts to nest 4361 are mitigated because the well is out of line of sight of the nest, and the pair has foraging opportunities to the northwest and southeast. Well 31-27 is proposed within 0.25 miles of nests 4367 and 4368. Impacts are mitigated, because the well is out of line of sight of the nests, and the raptors that use these nests would still have foraging opportunities in the opposite direction to the north and east. Well 32-33 is proposed within 0.25 miles of nest 4962, but impacts are mitigated because the well and road/utility are out of line of sight of the nest. The pair would still have foraging opportunities in the opposite direction to the south. Timing limitations for surface disturbance are sufficient to protect the raptor pairs.

- Non-mitigated Nests: Wells 11-27, 22-27, 21-27 are proposed within 0.25 miles, within line of sight, and above nest 5119. The prairie falcons that have used this nest would likely abandon it due to the increased activities associated with this level of development, especially because the wells are directly in line of sight of and above the nest. Well 43-3 is proposed within 0.25 miles of nest 5194. The access road/utility corridor travels within approximately 370 feet of the nest (0.06 miles). Traffic along the road may cause birds to abandon the nest, as they are not accustomed to the levels of traffic

and activities associated with oil and gas development. A road/utility corridor is proposed directly adjacent (<0.1 mi) to nest 4363. Traffic along this road may cause the pair that has used this nest to abandon it, as the pair is not accustomed to the levels of traffic associated with oil and gas. Timing limitations for surface disturbance are not sufficient to protect the raptor pairs. Operations and maintenance may disrupt breeding.

Table 4.2 Proposed and existing infrastructure within 0.5 mile of documented raptor nests within the KDU Gamma project area

BLM ID	Infrastructure w/in 0.25 miles	Infrastructure w/in 0.5 miles
1306		Access roads/utility corridors
2026		Access roads/utility corridors
2028		Utility corridor
2348	Access roads/utility corridors	
3676		Well 41-17 and access roads/utility
4361	Well 11-34	Wells 14-27, 21-34, 23-34, 13-34, 32-33, access roads/utility corridors
4363	Access roads/utility corridors	Access roads/utility corridors
4366		Well 42-3, 12-3, access roads/utility corridors
4367	Well 31-27, access roads/utility corridors	Wells 21-27, 22-27, 32-27, access roads/utility corridors
4368	Well 31-27, access roads/utility corridors	Wells 21-27, 22-27, 32-27, access roads/utility corridors
4962	Well 32-33, access roads/utility corridors.	Wells 44-33, 14-33, 13-33, 21-33, access roads/utility corridors
4963		Wells 42-5, 43-5, 13-4; access roads/utility corridors
5093		Access roads/utility
5119	Wells 11-27, 22-27, 31-27, access roads/utility corridors	Well 32-27
5155		Wells 42-5, 43-5, 13-4; access roads/utility corridors
5158		Access roads/utility corridors
5159		Wells 43-5, 13-4; access roads/utility corridors
5194	Well 43-3; access roads/utility corridors.	Access roads/utility corridors
5198		Access roads/utility corridors
6216		Well 43-3, access roads/utility corridors
6218		Well 43-3, well 42-3, access roads/utility corridors
6219		Well 43-3, well 42-3, access roads/utility corridors
6239		Well 42-29, roads, utility corridors
6240		Well 42-29, roads, utility corridors
6254		
6449		Wells 41-34, 42-34, 32-34, 44-34, access roads/utility corridors
6450		Wells 21-3, 12-3, access roads/utility
6633		Well 44-4, access roads/utility
8035		Well 44-34, 41-3, 21-3, 12-3, access roads/utility corrridors

4.2.3.7.2. Cumulative Effects

Cumulative impacts to raptors are discussed in the PRB FEIS. (pg. 4-221).

4.2.3.7.3. Mitigation Measures

To reduce the risk of decreased productivity or nest failure, BFO will require a 0.5 mile radius timing limitation during the breeding season around active raptor nests.

4.2.3.7.4. Residual Impacts

Even with a timing limitation, raptors may abandon nests due to alteration in foraging habitats associated with development or because of sensitivity to well or infrastructure placement. Declines in breeding populations of some species that are more sensitive to human activities may occur.

4.2.4. West Nile Virus

4.2.4.1. 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.

4.2.4.2. Cumulative Effects

There are many sources of standing water, beyond CBNG 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.

4.2.4.3. 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 CBNG 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.

4.2.4.4. Residual Effects

Residual effects include areas of small untreated puddles such as hoof tracks around stock tanks. These areas are normally not treated but may hold water during wet periods.

4.2.5. 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 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 WMP for this project area includes the transport through pipeline to one of 3 previously permitted existing EMIT water treatment facilities within the Upper Powder River watershed. The treated CBNG produced water will be discharged directly into the Upper Powder River or its tributary, Barber Creek.

Alternatively, untreated water would be added to the existing pipeline to be transported to the Salt Creek Field in Midwest for injection into the Madison formation.

The WDEQ has assumed primacy from United States Environmental Protection Agency for maintaining the water quality in the waters of the state. The WSEO has authority for regulating water rights issues and permitting impoundments for the containment of surface waters of the state.

The maximum water production is predicted to be 20 gpm per well or 1180 gpm (2.63cfs or 1,903 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 CBNG 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 3.2% of the total volume projected for 2010. This volume of produced water is within the predicted parameters of the PRB FEIS.

4.2.5.1. Groundwater

4.2.5.1.1. Direct and Indirect Effects

The PRB FEIS predicts an infiltration rate of 40% to groundwater aquifers and coal zones in the Upper Powder River watershed (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 472 gpm will infiltrate at or near the discharge points (761 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 CBNG 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 from depths which range from 80 to 1,793 feet compared to 2,000 to 2,400 feet to the Big George coal.

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 storage within the coals and sands units above and below the coals is enormous. Almost 750 million acre-feet of recoverable groundwater are stored within the Wasatch - Tongue River sand and coals (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).

4.2.5.1.2. 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). No additional mitigation is necessary.

4.2.5.1.3. Mitigation Measures

Adherence to the drilling plan, the setting of casing at appropriate depths, following safe remedial procedures in the event of casing failure, and utilizing proper cementing procedures will protect any potential 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.

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.

4.2.5.1.4. Residual Effects

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 1990's in the PRB.

The areas to the north, south and west of the KDU Gamma POD have been intensly developed with CBNG production. As a result, the target coal zone pressure may have been reduced through off set water production.

4.2.5.2. Surface Water/Wetland/Riparian

4.2.5.2.1. Direct and Indirect Effects

The following table shows Wyoming proposed numeric limits for the watershed for SAR, and EC, the average value measured at selected USGS gauging stations at high and low monthly flows, and Wyoming groundwater quality standards for TDS and SAR for Class I to Class III water. It also shows constituent limits for TDS, SAR and EC detailed in the WDEQ's WYPDES permit, and the concentrations found in the POD's representative water sample.

Table 4.3 Comparison of Regulated Water Quality Parameters to Predicted Water Quality

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** μmhos/cm
Upper Powder River 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 # WY0056081			
At discharge point	NA	NA	7,500
Predicted Produced Water Quality			
Big George Coal	2,370	27.9	3,750

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 is 2,370 mg/l TDS which/is not within the WDEQ criteria for agricultural use (2000 mg/l TDS). However direct land application is not included in this proposal. If at any future time the operator entertains the possibility of irrigation or land application with the water produced from these wells, the proposal must be submitted as a sundry notice for separate environmental analysis and approval by the BLM.

The quality for the water produced from the target coal zone from these wells is predicted to be similar to the sample water quality collected from a location near the POD. For more information, please refer to the WMP included in this POD.

There are 3 existing water discharge points (WDP) proposed to be used for this project. One of the discharge points, WY0051276-001, will not be approved for use associated with this project. The WDEQ, in correspondence dated December, 2005, prohibited the use of that discharge point and it was subsequently removed from the WYPDES permit (personal communication WDEQ 4-27-2010). No other discharge points from the Barber Creek treatment facility were included in the water management plan. There will be a condition of approval added that the operator will not be allowed to add the water from this project to the Barber Creek EMIT treatment facility.

The other two discharge points associated with the Kinney Draw and Faddis Kennedy EMIT treatment facilities have been inspected and have been found to be appropriately sited and utilize appropriate water erosion dissipation designs. Existing and proposed water management facilities were evaluated for compliance with best management practices during the onsite.

No new impoundments are proposed to be constructed for this project.

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 of 68 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 59 wells is anticipated to be a total of 1180 gpm or 2.63cfs which will be added directly to the Powder River. This volume is 4% 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).

The potential maximum flow rate of produced water within the watershed upstream of the project area, 2.63 cfs, is much less than the volume of runoff estimated from the 2-year storm event in the watershed area for Upper Powder River (5,941 cfs).

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

Permit effluent limits were set at (WYPDES Permit WY0056081 at page 2):

pH	6.5 to 9.0
Specific Conductance, EC	7500 mg/l max
Sulfates	3000 mg/l max
Total Recoverable Radium 226 + 228	1 pCi/l max
Dissolved Iron	300 µg/l max
Dissolved Copper	6 µg/l max
Total Barium	1800 µg/l max
Total Arsenic	8.4 µg/l max
Chlorides	150 mg/l

The WYPDES permit also addresses existing downstream concerns, such as irrigation use, in the Total Actual Monthly Load Limits for the permit. The operator, through the Assimilative Capacity Program, is permitted to discharge specific amounts of Total Dissolved Solids and Dissolved Sodium per month. The load, set in pounds and found on pg 2-3 of the permit, is calculated to meet water quality targets for the Powder River taken at the Montana border. The quantities fluctuate by the month based on irrigation potential. There will be no discharge permitted to the Powder River during the months of August and September.

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.

As stated previously, the operator has committed to offer water well agreements to properly permitted domestic and stock water wells within the circle of influence of the proposed CBNG wells.

In-channel downstream impacts are addressed in the WMP for the KDU Gamma POD prepared by WWC Engineering for LOG.

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 trophic levels of fish and waterfowl abundance and species richness for wetlands and riparian areas." (PRB FEIS Page 4-175).

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).

4.2.5.2.2. Cumulative Effects

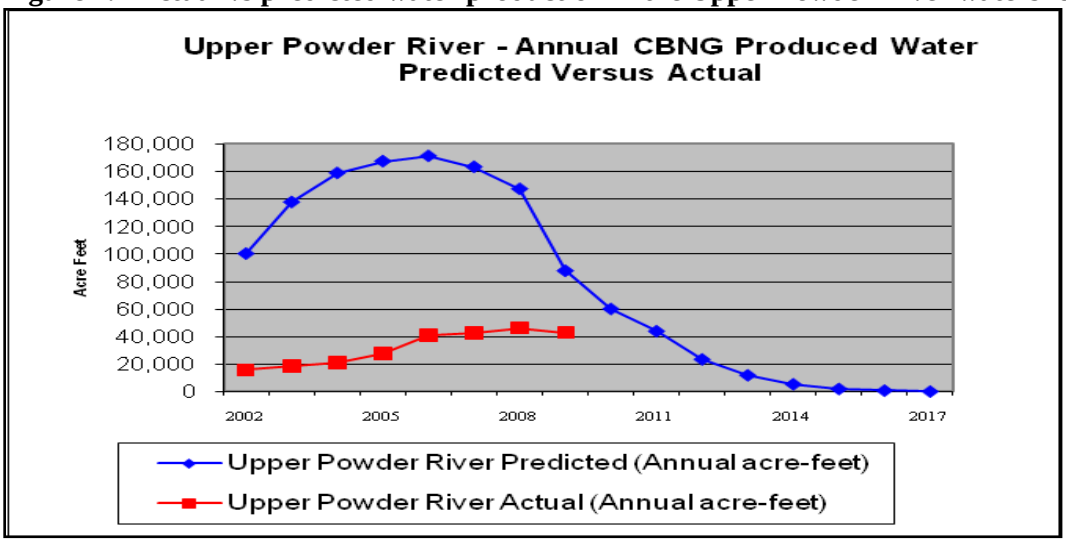
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the Upper Powder River watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of December 2009, all producing CBNG wells in the Upper Powder River watershed have discharged a cumulative volume of 255,531acre-ft of water compared to the predicted 1,135,537acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.1 and Table 4.4 following. This volume is 22.5 % of the total predicted produced water analyzed in the PRB FEIS for the Upper Powder River watershed.

Table 4.4 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.

The PRB FEIS states, "Cumulative effects to the suitability for irrigation of the Powder River would be minimized through the interim Memorandum of Cooperation (MOC) that the Montana and Wyoming DEQ's (Departments of Environmental Quality) have signed. This MOC was developed to ensure that designated uses downstream in Montana would be protected while CBNG development in both states continued. However, this MOC has expired and has not been renewed. The EPA has approved the Montana Surface Water Standards for EC and SAR and as such the WDEQ is responsible for ensuring that the Montana standards are met at the state line under the Clean Water Act (CWA). Thus, through the implementation of in-stream monitoring and adaptive management, water quality standards and interstate agreements can be met." (PRB FEIS page 4-117)

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 drainage, which is approximately 22.5% of the total predicted in the PRB FEIS.
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
3. The commitment by the operator to monitor the volume of water discharged.

The increase in surface water flow resulting from continuous discharge from treatment facilities could affect existing wetlands and riparian areas. "The major effects to be expected may include (1) increased erosion of channels and floodplains; (2) loss of riparian streambank vegetation; (3) changes to the composition and physical structure of the vegetation community in the wetlands and riparian areas; and (4) raising of shallow groundwater in floodplains. Erosion of channels an floodplains would increase turbidity in the water column, thus adversely affecting plankton and macroinvertebrate production and growth rates that are the basis of aquatic food chains in the prairie streams of the Project Area." (PRB FEIS pg 4-174).

4.2.5.2.3. 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 committed to monitor the water discharge points and the channels downstream for stability. If erosion is noted, the operator will be required to repair and stabilize the area using selected mitigation techniques.

- The operator has also committed to expediently stabilize and revegetate disturbance within channel and floodplain associated with this project.

4.2.5.2.4. Residual Effects

"Streams enhanced by large volumes of CBNG 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 CBNG 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).

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.

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

4.2.6. Economics and Recovery of CBNG Resources

4.2.6.1. Direct and Indirect Effects

Development of this project would have effects on the local, state, and national economies. Based on the estimates in the BLM's 2009 Reasonably Foreseeable Development Scenario, the drilling of the 59 proposed wells in the KDU Gamma POD will generate approximately 0.23 billion cubic feet of gas (BCFG) per well, over the life of the well. Actual revenue from this amount of gas is difficult to calculate, as there are several variables contributing to the price of gas at any given time. Regardless of the actual dollar amount, the royalties from the gas produced in the KDU Gamma POD would have several benefits. The federal government collects 12.5% of the royalties from all federal wells, which helps offset the costs of maintaining the federal agencies that oversee permitting. In addition to generating federal income, approximately 49% of the royalties from the KDU Gamma POD wells would return to the State of Wyoming. This revenue from mineral development contributes to Wyoming's economy, and allows for improvements in state funded programs such as infrastructure and education. The development of the KDU Gamma POD would also provide local revenue by employing workers in the area to build the roads and project infrastructure, drill the wells, and maintain and monitor the project area. This pool of individuals employed to work on the KDU Gamma POD would also result in an increase in demand for goods and services from nearby communities, primarily those of the Powder River Basin area in Wyoming.

4.2.6.2. 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, please refer to the referenced PRB FEIS, Volume 2, Chapter 4.

4.2.6.3. Residual 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, please refer to the referenced PRB FEIS, Volume 2, Chapter 4.

4.2.7. Cultural Resources

4.2.7.1. Direct and Indirect Effects

When a project is constructed in an area with a high potential for buried cultural material, archaeological monitoring is often included as a condition of approval. Construction monitoring is performed by a

qualified archeologist working in unison with construction crews. If buried cultural resources are located by the archeologist, construction is halted and the BLM consults with the State Historic Preservation Office (SHPO) on mitigation or avoidance. No historic properties will be impacted by the proposed project. Following the Wyoming State Protocol Section VI(A)(1) the Bureau of Land Management notified the Wyoming State Historic Preservation Officer (SHPO) on 5/6/2010 that no historic properties will be affected within the APE. 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).

4.2.7.2. Mitigation Measures

Due to the presence of alluvial deposits and the presence of heavy vegetation, the operator will be required to have an archeologist monitor earth moving activities associated with certain construction, as described in the following site specific COA's:

- Well #41-17-5177 has been moved fifty meters south of its original location to place it outside the part of site 48 JO 4031 contributing to site eligibility. However, the existing access roads pass through a non-contributing portion of the site. Since improvement or development of the access road has potential to affect the site, the developer is required to have a qualified archaeologist monitor the roadway through the site at the time disturbance occurs.

- While no direct impacts are planned to affect site 48 JO 4133, development of adjacent well #43-5-5077 may result in inadvertent disturbance of the site. The developer will place a temporary fence along the south or southwest side of the well pad to restrict trespass over the site area.

4.2.7.3. Residual Effects

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).

4.2.8. Air Quality

4.2.8.1. 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-CBNG 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. Alternative C

Alternative C incorporates analysis of project modifications designed to avoid or reduce adverse impacts. Project modifications were identified during the on-site. The BLM interdisciplinary team recommended 20 APDs (and associated infrastructure) be removed from consideration by the project proponent prior to final project submittal. These BLM recommendations were not incorporated in final project proposal. In the final proposal, in the cover letter from the Operator dated February 11, 2010, LOG offered no mitigation and requested BLM defer, deny or approve the APDs. Therefore, in order to reduce environmental impacts from proposed action the BLM interdisciplinary team recommends denial of the wells and infrastructure. This denial list was sent LOG. LOG's response e-mail dated August 18, 2010, requested deferral of well 43-03, and wells in section 27 and 34 until the abutting leases in KDU Epsilon could be planned for future development. No potential mitigation of the proposed access route for the

KDU Gamma POD was provided. A deferral was not appropriate. The denial allows LOG to resubmit APDs when they have located a new access route or additional engineering to access these wells (31-27, 32-27, 33-27, 34-27, and 41-34). On the 32-34, LOG concurred there were no other options. The 42-34 was eliminated from consideration at the on-site due to potential failure of the constructed site, site instability due to water velocity from the surrounding watershed and location of the well in the flow path of the surrounding drainages. In reference to the wells with bald eagle issues along the Powder River, LOG suggested coming in through a north or south route. These wells and/or access routes (13-04, 21-04, 22-04, 42-05, and 43-05, 13-33 and 14-33) are within the 0.5 miles buffer near the roost area along the Powder River. The alternative access that LOG suggested using runs parallel (north and south) with the Powder River. The access proposed in LOG's response letter dated August 18, 2010, continues to travel within 0.5 miles of the roost. This mitigation would not be effective because it still impacts bald eagles. The 11-27, 21-27 and 22-27 wells face a raptor nest across Turner Draw. There is no proposed mitigation for these wells. LOG agreed there is no option to move the 42-29 well. LOG would likely appeal the 11-33 because it is out of line-sight. Moving a well out of line of sight does not ensure mitigation of impacts, see EA Section 4.3.2, it depends on other features on the landscape and distance from the roost.

The following wells and infrastructure are recommended for denial:

Table 4.5 Wells and infrastructure Recommend for Denial in Alternative C

Well Name	Well #	Environmental Issue
KDU Fed	43-03-5077	Access and utility corridor impacts raptors, nest is within 1/4 mile. EA Section 4.3.2
KDU Fed	13-04-5077	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	21-04-5077	Access route impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	22-04-5077	Access route impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	42-05-5077	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	43-05-5077	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	11-27-5177	Well location and access/utility corridor impacts raptors, nest is within 1/4 mile. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1 and Section 4.3.2
KDU Fed	21-27-5177	Well location and access/utility corridor are within 1/4 mile raptor nest. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1 and Section 4.3.2
KDU Fed	22-27-5177	Well location and access/utility corridor impacts raptors, nest is within 1/4 mile. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1 and Section 4.3.2
KDU Fed	31-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	32-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1

Well Name	Well #	Environmental Issue
KDU Fed	33-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	34-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	42-29-5177	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	11-33-5177	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	13-33-5177	Access and utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	14-33-5177	Access and utility corridor impacts bald eagles, roost is within 1/2 mile.
KDU Fed	32-34-5177	Slopes >25%, erosive soils, erosion hazard, poor reclamation potential on well location and access route. EA Section 4.3.1
KDU Fed	41-34-5177	The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1
KDU Fed	42-34-5177	Well location in a drainage pathway with erosive soils, erosion hazard, poor reclamation potential, in addition The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1
Access road into the POD from the north in sections 27 and 34 T51N R77W has no approved connection out to a main road. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. The access/utility corridor impacts raptor, nest within 1/4 mile. EA Section 4.3.1		
Utility corridor S4, S5 and S9 T50 R77 is denied. It was not field reviewed. It was added to the map after the onsite. EA Section 4.3.1		
Pump jacks are denied. Pump jacks were not considered during the onsite. EA Section 4.3.1		

4.3.1. Soils, Vegetation and Ecological Sites

4.3.1.1. Soils

Ten wells, the 11-27, 21-27, 22-27, 31-27, 32-27, 33-27, 34-27, 32-34, 41-34 and 42-34 in T51 R77, are proposed to be accessed through a route that crosses Turner Draw. This route does not meet BLM road standards due to impacts of steep 30-65% side slopes, erosive soils and potential mass wasting. In addition this Turner Draw access road comes into the POD from the north in sections 27 and 34 T51N R77W but it has no approved connection out to a main road. Actual drill sites locations are not the problem for five of these ten wells, (31-27, 32-27, 33-27, 34-27, and 41-34) the problem is the access getting to the sites in and out of Turner Draw, and crossing deeply incised drainages all along the route through sections 27 and 34. Three of these wells 11-27, 21-27, 22-27, have additional issues with raptors. Two, the 32-34 and 42-34, have issues topography and soils on the proposed pad locations. The 32-34-5177 well location has slopes >25%, erosive soils, high erosion hazard, and poor reclamation potential on the well location. Well location 42-34-5177 has the same soils issues; and it is surrounded by steep slopes in a drainage pathway with erosive soils. Even with the site specific reclamation plans that were proposed with the POD, these two wells are not expected to maintain stability. Expectations for reclamation are poor.

- Recommend denial of the access roads in section 27 through Turner Draw and through section 34. Three engineered road sections do not meet BLM road standards due to excessive amounts of disturbance, poor soils with little to no reclamation potential, and steep side slopes ranging from 30 to 65%.
    a. Turner Draw: Engineered section 22; AOI 0.84 acres disturbance, impacts 65% side slopes
    b. Section 34 T51 R77: Engineered section 20; AOI 2.51 acres disturbance, impacts 40% side slopes
    c. Section 27 and 34 T51 R77: Engineered section 8; AOI 5.36 acres disturbance, impacts 30% side slopes
- Recommend denial of ten wells due to lack of access 11-27, 21-27, 22-27, 31-27, 32-27, 33-27, 34-27, 32-34, 41-34 and 42-34.
- Recommend denial of two wells due to location of constructed pads 32-34 and 42-34 surrounded by steep slopes, in poor soils with sedimentation and erosion issues.
- Recommend denial of utility corridor S4, S5 and S9 T50 R77. It was not field reviewed. It was added to the map after the onsite.
- Recommend denial of pump jacks. Pump jacks were not considered during the onsite. Pump jacks were added after the onsite.

Applications of five wells (31-27, 32-27, 33-27, 34-27, and 41-34) may be submitted at a later date, if access is located and engineered to ensure stability, safety and reclamation.

4.3.1.1.1. Direct and Indirect Effects

Effects to soils would be reduced under Alternative C. Direct and indirect effects under Alternative C would be the same as Alternative B but fewer acres would be affected with two wells surrounded by steep slopes, in poor soils with sedimentation and erosion issues not approved.

4.3.1.1.2. Cumulative Effects

Cumulative effects under Alternative C would be reduced. Fewer acres of highly erosive soils, with slope hazards and in areas of poor reclamation potential would be impacted. Cumulative erosion and sedimentation would be reduced by not constructing the access road through Turner Draw...

4.3.1.1.3. Residual Effects

Residual effects under Alternative C would be greatly reduced by not constructing wells and infrastructure in areas with slopes greater than 25% that contain clayey soils, in poor reclamation potential with severe erosion hazard.

General effects of construction can be the lack of ecosystem function If an area is not reclaimed or if seeding fails, the plant community could be reduced to a “Go-back Land Plant Community” (Section 3.2 Plant Communities and Ecological Function).

4.3.2. Wildlife

As with Alternative B, all road and utility corridor disturbance was considered new if the disturbance was not along an existing improved route. Ranch two-track roads were not considered existing disturbance due to their difficulty to distinguish on the landscape and their limited levels of use. Figure 6 depicts new disturbance and existing disturbance associated with this analysis and an overview of Alternatives B & C.

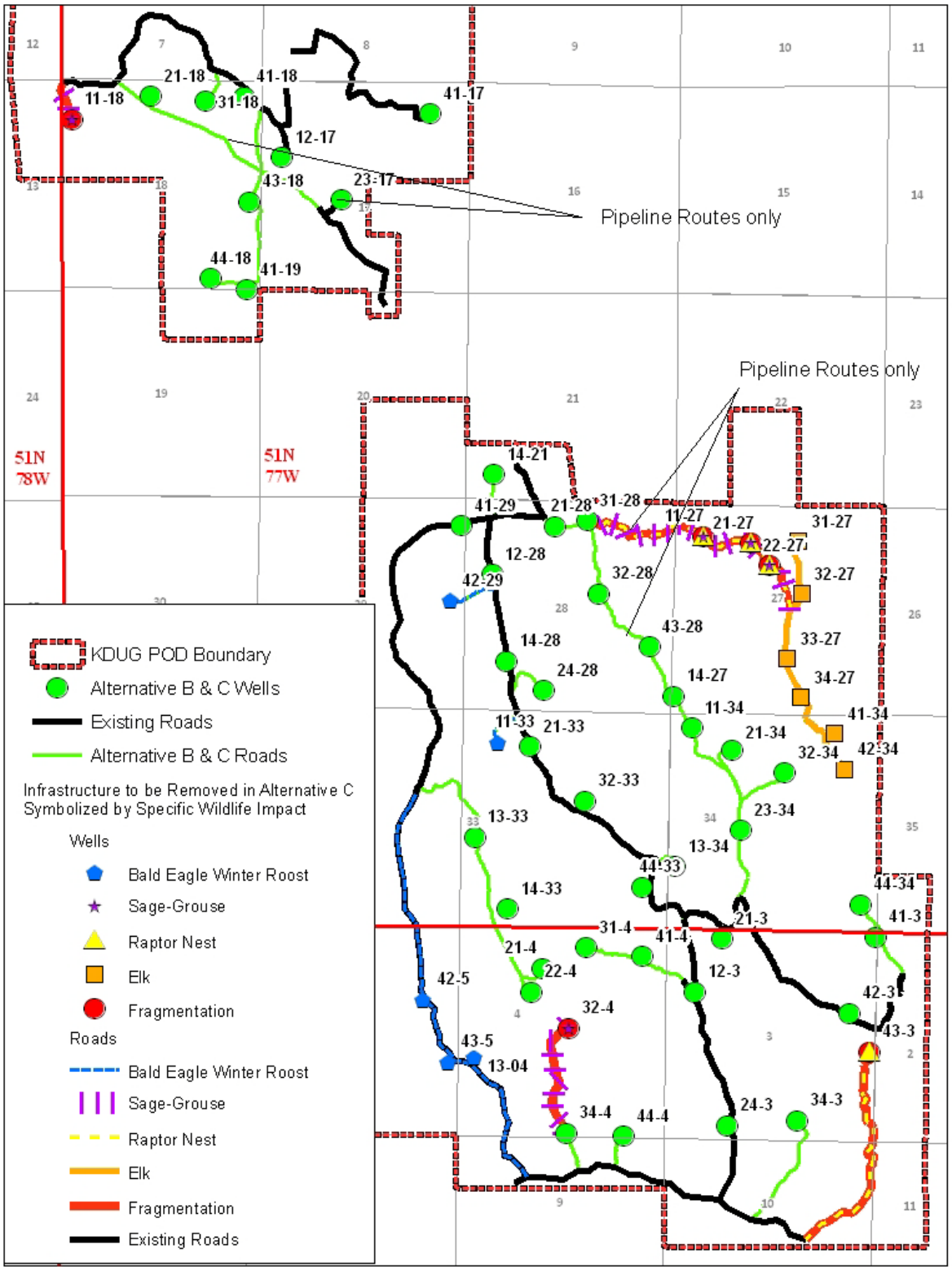


Figure 6 Comparison of Alternatives B & C depicted by wildlife impact

4.3.2.1. Habitat Types

4.3.2.1.1. Direct and Indirect Effects

Alternative C would result in less direct loss and fragmentation of all habitats, including sagebrush shrublands. Approximately 11.6 miles (4.4 miles less than Alternative B) of new linear disturbance would be introduced through sagebrush shrublands, 2.5 miles (0.2 miles less than Alternative B) of which would occur in WGFD Sagebrush/Mixed Grass Habitat crucial/enhancement area.

Project modifications in Alternative C designed specifically to reduce impacts on habitats include:

- Recommended denial of well 32-4 and 3,110 feet (0.6 mi) of access road/utility corridor
- Recommended denial of well 43-3 and 6,060 feet (1.1 mi) of access road/utility corridor
- Recommended denial of well 11-18 and 970 feet (0.2 mi) of access road/utility corridor
- Recommended denial of well 11-27, 21-27, and 22-27 and 6,800 feet (1.3 mi) of access road/utility corridor

By removing well 32-4 and the access road, a contiguous patch of sagebrush habitat approximately 500 acres in size would be retained on the landscape and within the project boundary, and the amount of edge would be reduced by 1.5 miles from Alternative B.

By removing well 43-3 and the access road, a contiguous patch of mixed sagebrush and grassland habitat approximately 800 acres in size would be retained on the landscape inside the project boundary, and the amount of edge would be reduced by about 2.3 miles from Alternative B. Well 34-3 and its access road would still fragment the patch on the west, to some extent.

By removing well 11-18 and the access road, approximately 970 linear feet (0.2 mi) of disturbance in a contiguous patch of sagebrush habitat would be eliminated.

By removing wells 11-27, 21-27, and 22-27, approximately 6,800 feet (1.3 mi) of linear disturbance would be eliminated. These wells are located in some of the most intact, dense sagebrush on moderate terrain in the project area.

Because of the reduced impacts to sagebrush and reduced travel on a road that parallels the Powder River, Alternative C would result in the least impacts to WGFD's Sagebrush/Mixed Grass Habitat crucial/enhancement areas and Powder and Tongue River Riparian crucial/enhancement areas, therefore increasing the agency's ability to achieve the goals set forth in its *Strategic Habitat Plan* as compared with Alternative B.

4.3.2.1.2. Cumulative Effects

Cumulative impacts associated with Alternative C are the same as those discussed for Alternative B.

4.3.2.1.3. Mitigation Measures

No mitigation measures are proposed with Alternative C.

4.3.2.1.4. Residual Effects

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

4.3.2.2. Threatened, Endangered, Proposed and Candidate Species

4.3.2.2.1. Threatened and Endangered Species

Potential project effects on Threatened and Endangered Species from Alternative C are the same as those analyzed under Alternative B. A summary is provided in Table

4.3.2.2.2. Proposed Species

4.3.2.2.2.1. Mountain Plover

Potential project effects on mountain plover from Alternative C are the same as those analyzed under Alternative B.

4.3.2.2.3. Candidate Species

4.3.2.2.3.1. Greater Sage-grouse

4.3.2.2.3.1.1. Direct and Indirect Effects

Project modifications designed to reduce impacts on sage-grouse in Alternative C include the design features described under Alternative B and those recommended to reduce fragmentation of sagebrush habitats described in Section 4.2.3.1:

- Recommended denial of well 32-4 and 3,110 feet (0.6 mi) of access road/utility corridor
- Recommended denial of well 11-18 and 970 feet (0.2 mi) of access road/utility corridor
- Recommended denial of wells 11-27, 21-27, and 22-27 and 6,800 feet (1.3 mi) of access road/utility corridor

Implementation of Alternative C would preserve the largest and most intact sagebrush stands that meet the habitat requirements of sage-grouse, increasing the likelihood that sage-grouse would use these areas for nesting and wintering. Because USFWS (2010) identified that fragmentation and direct loss of habitats from roads and infrastructure represents are causing declines in sage-grouse, Alternative C will reduce this impact and represent the least likelihood that sage-grouse in the vicinity of the project area will continue to persist.

Drilling and construction activities that take place in proximity of sage-grouse nesting habitats, however, would create noise and human activity that might cause displacement of sage-grouse, regardless of efforts to minimize fragmentation and leave these areas intact.

4.3.2.2.3.1.2. Cumulative Effects

A discussion of cumulative impacts on sage-grouse is provided under Alternative B.

With approval of the wells proposed in Alternative C, well density in the cumulative effects analysis area would increase to 5.3 wells per square mile. With the approval of Alternative C, all four leks would exceed the WGFD threshold category for extreme impacts.

4.3.2.2.3.1.3. Mitigation Measures

Same as Alternative B.

4.3.2.2.3.1.4. Residual Effects

Same as Alternative B.

4.3.2.3. Sensitive Species

Impacts to sensitive species are discussed in the PRB FEIS on pp. 4-258 through 4-265. Impacts to bald eagles and black-tailed prairie dogs are discussed in more detail in this section because impacts to these species were determined to be of concern under the issues identification process during internal scoping.

4.3.2.3.1. Bald Eagle

In a letter dated 4 June 2010, USFWS expressed concern with the placement of these proposed wells and infrastructure and concurred with these recommendations. Project modifications designed to reduce impacts on roosting bald eagles include:

- Recommended denial of wells 42-5, 43-5, 13-4, 42-29, and 11-33
- Recommended denial of proposed access to wells 13-33, 14-33, 21-4, and 22-4

4.3.2.3.1.1. Direct and Indirect Effects

If a pair of bald eagles was to build a nest in the suitable nesting habitat, breeding, foraging, and sheltering activities may be disrupted by human activities associated with construction of infrastructure and/or well maintenance. Implementation of Alternative C, denying four wells and infrastructure, and denying proposed access to an additional four wells would reduce impacts to bald eagles that use the roosts identified in S29, S32 T51N R77W and in S04, S05, and S08 T50N R77W by minimizing the amount of disturbance within 0.5 miles of these areas.

4.3.2.3.1.2. Cumulative Effects

Traffic and human activities would not be elevated above current conditions within 0.5 miles of these roosts.

4.3.2.3.1.3. Mitigation Measures

BFO would enact the USFWS recommendations, otherwise the same as Alternative B.

4.3.2.3.1.4. Residual Effects

Under Alternative C, disturbance to foraging and sheltering would be to a lesser degree then Alternative B. Construction activities within 1.0 miles of the roosting areas and potential nesting areas may still cause disturbance to such a degree that foraging and sheltering activities of bald eagles may be disrupted as discussed in Alternative B.

4.3.2.3.2. Black-tailed Prairie Dogs

4.3.2.3.2.1. Direct and Indirect Effects

Same as Alternative B.

4.3.2.3.2.2. Cumulative Effects

Same as Alternative B.

4.3.2.3.2.3. Mitigation Measures

No mitigation measures are proposed with Alternative C.

4.3.2.3.2.4. Residual Effects

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

4.3.2.4. Big Game

4.3.2.4.1. Direct and Indirect Effects

Alternative C would result in the least amount of loss and fragmentation of habitats for big game species.

Project modification designed to reduce impacts on elk include:

- Recommended denial of wells 31-27, 32-27, 33-27, 34-27, 41-34, and 42-34

While these mitigation measures were developed to specifically reduce impacts to elk, these measures would also benefit pronghorn, mule deer, and white-tailed deer that use habitats in the project area.

Alternative C would reduce fragmentation of big game habitats and retain larger and more frequent patches of habitats. Connectivity would be maintained between the northeast portion of the project area and habitats to the east. The viewshed model indicates that Alternative C would result in retention of a single patch of effective habitat 895 acres in size (593 more acres than Alternative B) in the northeast corner.

Implementation of the modifications to reduce impacts on elk in Alternative C would result in the loss of 1,050 acres of security habitat in elk yearlong range, based on a 0.5 mile buffer from roads. This would result in the loss of an additional 5% of security habitat in yearlong range, for a total loss of 25%, since the time WGFD made the recommendation to retain 50%. While the loss of security habitat is similar to Alternative B, it is necessary to consider the landscape perspective between these alternatives to evaluate the differences in impacts to elk. Alternative C would preserve connectivity between the northeast portion of the project area, which has shown to be of importance to the elk herd based on demonstrated use, and the rest of the seasonal ranges to the east. It would also preserve a direct connection to delineated crucial winter range to the east. Because 90% of the elk relocation data collected in the northeast portion of the project area occurred during the winter, this area may function as crucial winter range and might serve as an extension of that important habitat. Carrying capacity of the area for elk and other big game species would be increased as compared to Alternative B.

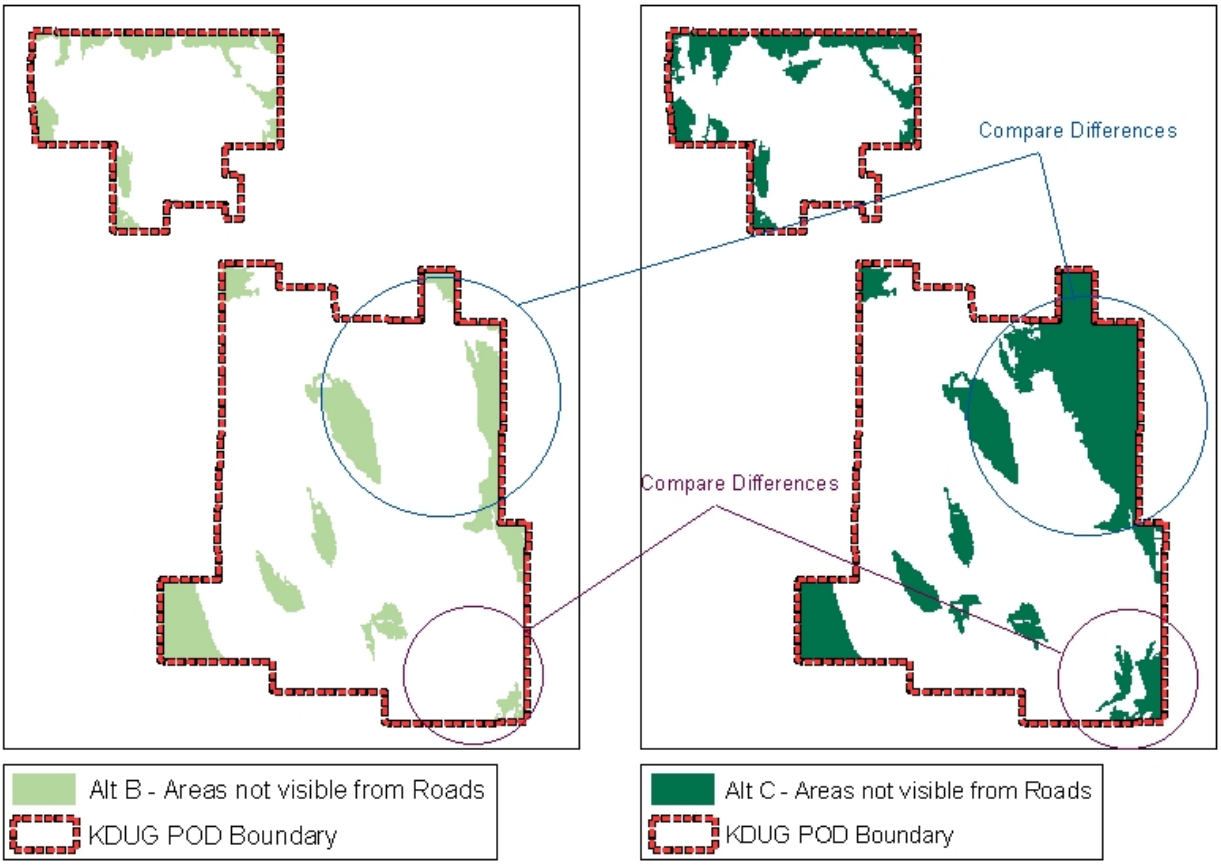


Figure 7 Comparison of effective habitat patches greater than 20 acres in size for Alternatives B and C. Twenty acres was selected as a threshold to show only those patches that were most likely to have habitat value for big game.

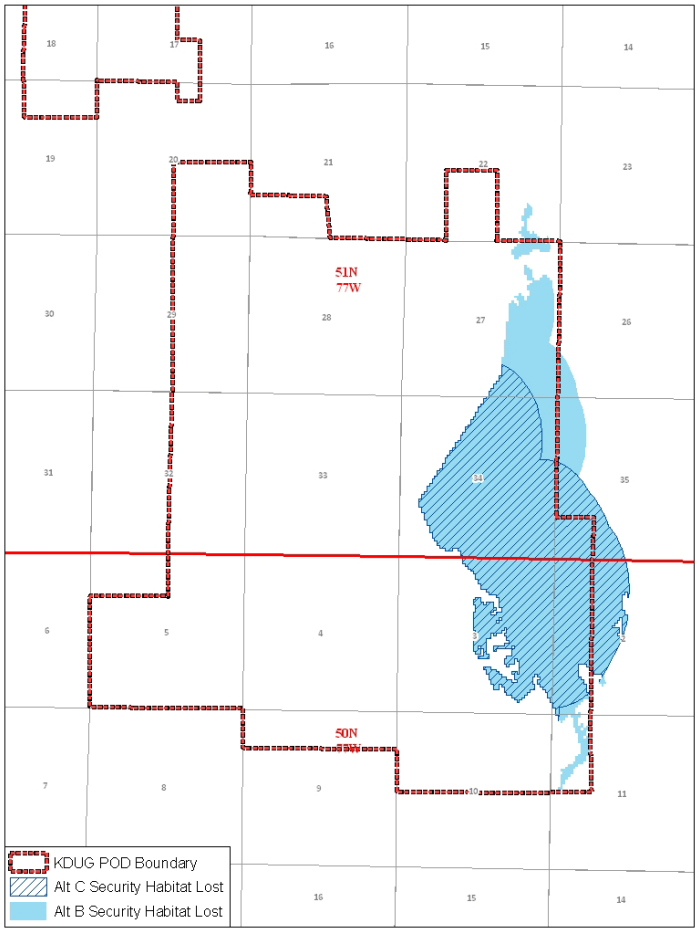


Figure 8 Comparison of elk security habitats lost with Alternatives B and C

4.3.2.4.2. Cumulative Effects

Same as Alternative B.

4.3.2.4.3. Mitigation Measures

No mitigation measures are proposed with Alternative C.

4.3.2.4.4. Residual Effects

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

4.3.2.5. Aquatics

4.3.2.5.1. Direct and Indirect Effects

Same as Alternative B.

4.3.2.5.2. Cumulative Effects

Same as Alternative B.

4.3.2.5.3. Mitigation Measures

No mitigation measures are proposed with Alternative C.

4.3.2.5.4. Residual Effects

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

4.3.2.6. Migratory Birds

4.3.2.6.1. Direct and Indirect Effects

While project modifications were not developed to specifically address impacts to migratory birds, those that were designed to reduce loss and fragmentation of habitats will also protect migratory bird habitat.

Alternative C would result in the least fragmentation and loss of habitats for migratory birds. Implementation of Alternative C would reduce the amount of habitat lost through avoidance by approximately 260 acres (from 870 acres to 610 acres). Implementation of Alternative C will also result in a reduction of direct habitat loss and fragmentation which will retain more habitats for native migratory bird species. Figure 9 depicts the difference in avoidance areas created with each alternative.

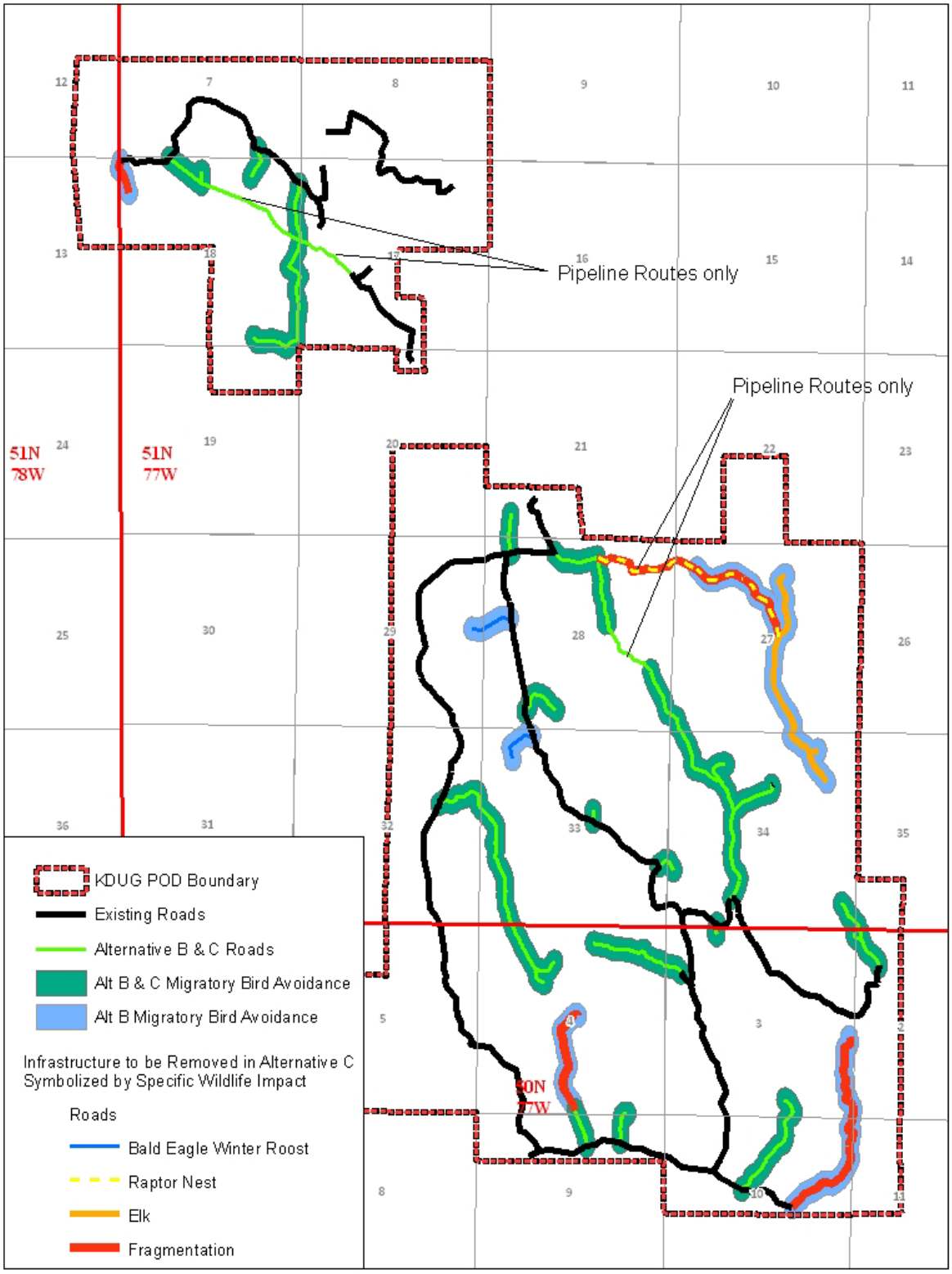


Figure 9 Comparison of impacts of alternatives on migratory birds. Areas in blue are areas that would be retained as migratory bird habitat with Alternative C.

4.3.2.6.2. Cumulative Effects

Same as Alternative B.

4.3.2.6.3. Mitigation Measures

No mitigation measures are proposed with Alternative C.

4.3.2.6.4. Residual Effects

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

4.3.2.7. Raptors

4.3.2.7.1. Direct and Indirect Effects

Project modification designed to reduce impacts on raptors include:

- Recommended denial of wells 11-27, 22-27, and 21-27
- Recommended denial of access road in S22 T51N R77W

Alternative C would result in the least amount of disturbance to nesting raptors and would retain the most foraging habitats and result in the highest amount of habitat effectiveness. Alternative C would mitigate impacts to nests 5119, 5194, and 4363 that would likely be abandoned under Alternative B due to operation and maintenance activities that are not restricted through timing limitations. The raptors that use these nests would likely continue to occupy the associated breeding territories, because human activities that have a high potential to disrupt breeding would be eliminated.

4.3.2.7.2. Cumulative Effects

Same as Alternative B.

4.3.2.7.3. Mitigation Measures

Same as Alternative B.

4.3.2.7.4. Residual Impacts

Same as Alternative B.

4.3.3. Comparison Summary of Effects By Cumulative effects

Table 4.6 provides a comparison of the cumulative effects associated with the alternatives.

Table 4.6 Cumulative Effects

Resource/Species	Alternative A	Alternative B	Alternative C
Wildlife			
Sagebrush Habitats	• No disturbance	• 16 miles new linear disturbance • Wells 32-4, 43-3 would fragment 2 intact habitat patches into 4 total patches averaging 325 acres in size with 12.7 miles edge	• 11.6 miles new linear disturbance (28% decrease from Alt B) • Removal of wells 32-4, 43-3 would maintain 2 intact habitat patches averaging 350 acres in size with 8.9 miles edge (8% increase in avg size and 30% decrease in edge from Alt B)
Riparian Habitats and WGFD Powder and Tongue River Riparian crucial/enhancement area	• No disturbance	• Increased traffic, erosion, risk of invasive weeds on 2.1 miles of road in corridor	• Less traffic, erosion, risk of invasive weeds
WGFD Sagebrush/Mixed Grass Habitat crucial/enhancement area	• No disturbance	• 2.7 miles new linear disturbance	• 2.5 miles new linear disturbance (7% decrease)
Black-footed ferret	• No disturbance	• 700’ linear disturbance through potential habitat	• Same as Alt B
Ute-ladies’-tresses	• No disturbance	• No disturbance	• No disturbance
Blowout Penstemon	• No disturbance	• No disturbance	• No disturbance
Greater sage-grouse	• No disturbance	• 16 miles new linear disturbance in habitat • Wells 23-4, 43-3 would fragment 2 intact habitat patches into 4 total patches averaging 325 acres in size with 12.7 miles edge	• 11.6 miles new linear disturbance (28% decrease from Alt B) • Removal of wells 23-4, 43-3 would maintain 2 intact habitat patches averaging 350 acres in size with 8.9 miles edge (8% increase in avg size and 30% decrease in edge from Alt B)
Mountain Plover	• No disturbance	• Some nesting habitat may be created • Increased human activities may cause displacement	• Same as Alt B

Resource/Species	Alternative A	Alternative B	Alternative C
Bald Eagles	• No disturbance	• Increased potential that roost will be abandoned	• Least potential that roost will be abandoned
Black-tailed Prairie Dogs	• No disturbance	• 700' of linear disturbance in colony	• Same as Alt B
Big game	• No disturbance	• Retention of six patches >20 acres in size and averaging 206 acres in size for refugia • No connection to less developed habitats to the east	• Retention of nine patches >20 acres in size and averaging 223 acres in size for refugia (50% increase in # patches and 8% increase in average size) • Connection maintained with less developed habitats to the east
Elk	• No disturbance	• Loss of 1,320 acres security habitat in YL • Functional winter range in northeast of project area eliminated • Connection of refugia patches to seasonal ranges to the east severed	• Loss of 1,050 acres security habitat in YL (20% decrease from Alt B) • Functional winter range in northeast of project area retained • Connection of refugia patch in northeast of project to seasonal ranges to the east retained
Migratory Birds	• No disturbance	• Greatest habitat impact • 870 acres avoided	• Least habitat impact • 610 acres avoided (30% decrease from Alt B)
Raptors	• No disturbance	• Abandonment of three nests	• Continued use of three nests

4.3.4. Economics and Recovery of CBNG Resources

4.3.4.1. Direct and Indirect Effects

BLM petroleum engineers calculated the Original Gas in Place (OGIP) within the KDU Gamma project area based on 80 acres spacing and a coal density of 1,742 ton/acre foot. Original Gas in Place in Million Cubic Feet of Gas is [acres*(ton of coal/acre ft.)*(thickness of coal in ft)*(gas content scf/ton of coal)]/1000000]. The gas content is determined by finding the depth of ground water for a nearby monitor well and calculated based to the depth of the coal to determine the gas content. Gas content is calculated [(Coal depth-ground water depth)* (.433*.71+(.496*well elevation)]. When added together, the OGIP for each coal seam is added together for that well to get the total gas in place.

A total of 20 wells are being recommended to be denied. The potential loss of gas is listed below:

CBM Gas lost without any surrounding wells drilled				
TWP	**RNG**	**Sec**	**Well Name**	**Unrecovered CBM MMCFG**
50N	77W	4	KUD Gamma 13-4	502.607
50N	77W	4	KUD Gamma 21-4	502.477

CBM Gas lost without any surrounding wells drilled				
TWP	**RNG**	**Sec**	**Well Name**	**Unrecovered CBM MMCFG**
50N	77W	4	KUD Gamma 22-4	502.494
50N	77W	4	KUD Gamma 32-4	502.475
50N	77W	5	KUD Gamma 42-5	469.208
50N	77W	5	KUD Gamma 43-5	467.178
51N	77W	27	KUD Gamma 11-27	832.492
51N	77W	27	KUD Gamma 21-27	832.482
51N	77W	27	KUD Gamma 22-27	832.411
51N	77W	27	KUD Gamma 31-27	832.511
51N	77W	27	KUD Gamma 32-27	832.433
51N	77W	27	KUD Gamma 33-27	832.339
51N	77W	27	KUD Gamma 34-27	832.349
51N	77W	29	KUD Gamma 42-29	890.541
51N	77W	33	KUD Gamma 11-33	890.527
51N	77W	33	KUD Gamma 13-33	890.51
51N	77W	33	KUD Gamma 14-33	890.438
51N	77W	34	KUD Gamma 32-34	1346.726
51N	77W	34	KUD Gamma 41-34	1346.81
51N	77W	34	KUD Gamma 42-34	1346.771

4.3.4.1.1. Cumulative Effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4.

Assuming the surrounding wells are drilled at or near 80 acres spacing, the potential of CBNG that will not be recovered as a result of selecting alternative C is listed below:

CBM Gas lost if surrounding 80 acres wells drilled				
TWP	**RNG**	**Sec**	**Well Name**	**Unrecovered CBM MMCFG**
50N	77W	4	KUD Gamma 13-4	55.287
50N	77W	4	KUD Gamma 21-4	55.272
50N	77W	4	KUD Gamma 22-4	55.274
50N	77W	4	KUD Gamma 32-4	55.272
50N	77W	5	KUD Gamma 42-5	51.613
50N	77W	5	KUD Gamma 43-5	51.390
51N	77W	27	KUD Gamma 11-27	91.574
51N	77W	27	KUD Gamma 21-27	91.573
51N	77W	27	KUD Gamma 22-27	91.565
51N	77W	27	KUD Gamma 31-27	91.576
51N	77W	27	KUD Gamma 32-27	91.568
51N	77W	27	KUD Gamma 33-27	91.557
51N	77W	27	KUD Gamma 34-27	91.558

CBM Gas lost if surrounding 80 acres wells drilled				
TWP	**RNG**	**Sec**	**Well Name**	**Unrecovered CBM MMCFG**
51N	77W	29	KUD Gamma 42-29	97.960
51N	77W	33	KUD Gamma 11-33	97.958
51N	77W	33	KUD Gamma 13-33	97.956
51N	77W	33	KUD Gamma 14-33	97.948
51N	77W	34	KUD Gamma 32-34	148.140
51N	77W	34	KUD Gamma 41-34	148.149
51N	77W	34	KUD Gamma 42-34	148.145

4.3.4.1.2. Mitigation Measures

No additional mitigation measures are considered.

4.3.4.1.3. Residual Effects

Economics dictates the rate of recovery of the CBNG resource. At this time, the market price of CBNG is depressed due primarily to low demand as storage facilities are at capacity and infrastructure to transport the product from Wyoming to other markets does not exist. Many existing CBNG wells within the PRB are currently shut in reducing the rate.

5. CONSULTATION & COORDINATION

Contact	Title	Organization	Present at Onsite
Mary Hopkins	SHPO	Wyoming State Historic Preservation Office	no
Brad Rogers	Wildlife Biologist	U.S. Fish & Wildlife Service	no
Bud Stewart	Energy Coordinator	WGFD	no

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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Appendix A. Affected Resources Worksheet

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Air quality	Yes	Yes	Yes	Analyzed Air Quality Section of EA
Cultural	Yes	Yes	No	Cultural Section of EA
Native American religious concerns	No	No	Yes	
Traditional Cultural Properties	No	No	Yes	
Mineral Potential				
Coal	No	No	Yes	
Fluid Minerals	Yes	Yes	No	Socio-economic Section of EA
Locatable Minerals	No	No	Yes	
Other leasables	No	No	Yes	
Salable minerals	No	No	Yes	
Paleontology				
PFYC 3	No	No	Yes	
PFYC 5	No	No	Yes	
Rangeland management				
Existing range improvements	No	No	Yes	
Proposed range improvements	No	No	Yes	
Recreation				
Developed site	No	No	Yes	
Walk-in-Area	No	No	Yes	
Social & Economic	Yes	Yes	No	Socio-economic Section of EA
Soils & Vegetation				
Erosion Hazard	Yes	Yes	No	Soils & Vegetation Section of EA
Poor Reclamation Potential	Yes	Yes	No	Soils & Vegetation Section of EA
Slope hazard	Yes	Yes	No	Soils & Vegetation Section of EA
Forest products	No	No	Yes	
Invasive Species	Yes	Yes	No	Soils & Vegetation Section of EA
Wetlands/Riparian	No	No	Yes	
Special Designations				
Proposed ACEC	No	No	Yes	
Wild & Scenic River	No	No	Yes	
Wilderness Characteristics/Citizen Proposed	No	No	Yes	
WSA	No	No	Yes	
Visual Resources				
Class II	No	No	Yes	
Class III	No	No	Yes	
Water				
Floodplains	No	No	Yes	
Ground water	Yes	Yes	Yes	

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Surface water	No	No	Yes	
Drinking water	No	No	Yes	
Wildland Urban Interface	No	No	Yes	
Wildlife				
ESA listed, proposed, or candidate species	Yes	Yes	No	Wildlife Section of EA
BLM sensitive species	Yes	Yes	No	Wildlife Section of EA
General wildlife	Yes	Yes	No	Wildlife Section of EA
West Nile virus potential	Yes	Yes	Yes	Wildlife Section of EA

Appendix B Threatened, Endangered, Proposed, and Candidate Species Worksheet

Common Name	Habitat	Habitat Present?	Individuals Present?	Direct Impacts Anticipated?	Impacts anticipated beyond the level analyzed within the PRB FEIS?
Endangered					
Black-footed ferret	Black-tailed prairie dog colonies or complexes > 1,000 acres.	Yes	No	Yes	4-251 & BA
Blowout penstemon	Sparsely vegetated, shifting sand dunes	No	n/a	n/a	Not in FEIS
Threatened					
Ute ladies'-tresses orchid	Riparian areas with permanent water	No	n/a	n/a	4-253 & BA
Proposed					
Mountain Plover	Short-grass prairie with slopes < 5%	Yes	No	Yes	No (pg 4-254, 4-255 & BA)
Candidate					
Greater sage-grouse	Basin-prairie shrub, mountain-foothill shrub	Yes	Yes	Yes	Yes

Sensitive Species worksheet

Common Name	Habitat	Habitat Present?	Individuals Present?	Direct Impacts Anticipated?	Impacts anticipated beyond the level analyzed within the PRB FEIS?
Amphibians					**4-258**
Northern leopard frog	Beaver ponds and cattail marshes from plains to montane zones.	No	n/a	n/a	n/a
Columbia spotted frog	Ponds, sloughs, small streams, and cattails in foothills and montane zones. Confined to headwaters of the S Tongue R drainage and tributaries.	No	n/a	n/a	n/a
Fish					**4-259 & 4-260**
Yellowstone cutthroat trout	Cold-water rivers, creeks, beaver ponds, and large lakes in the Upper Tongue sub-watershed	No	n/a	n/a	n/a
Birds					**4-260 to 4-264**
Baird's sparrow	Shortgrass prairie and basin-prairie shrubland habitats; plowed and stubble fields; grazed pastures; dry lakebeds; and other sparse, bare, dry ground.	Yes	None seen	Yes	No
Bald eagle	Mature forest cover often within one mile of large water body with reliable prey source nearby.	Yes	Yes	Yes	Yes. (4-251 to 4-253 & BA)
Brewer's sparrow	Sagebrush shrubland	Yes	None seen	Yes	No
Ferruginous hawk	Basin-prairie shrub, grasslands, rock outcrops	Yes	None seen	No	No
Loggerhead shrike	Basin-prairie shrub, mountain-foothill shrub	Yes	None seen	Yes	No
Long-billed curlew	Grasslands, plains, foothills, wet meadows	Yes	None seen	Yes	No
Northern goshawk	Conifer and deciduous forests	No	n/a	n/a	n/a
Peregrine falcon	Cliffs	No	n/a	n/a	n/a

Common Name	Habitat	Habitat Present?	Individuals Present?	Direct Impacts Anticipated?	Impacts anticipated beyond the level analyzed within the PRB FEIS?
Sage sparrow	Basin-prairie shrub, mountain-foothill shrub	Yes	None seen	Yes	No
Sage thrasher	Basin-prairie shrub, mountain-foothill shrub	Yes	None seen	Yes	No
Trumpeter swan	Lakes, ponds, rivers	Yes	None seen	Yes	No
Western Burrowing owl	Grasslands, basin-prairie shrub	Yes	None seen	Yes	No
White-faced ibis	Marshes, wet meadows	No	n/a	n/a	n/a
Yellow-billed cuckoo	Open woodlands, streamside willow and alder groves	Yes	None seen	Yes	No
Mammals					**4-264 &4-265**
Black-tailed prairie dog	Prairie habitats with deep, firm soils and slopes less than 10 degrees.	Yes	Yes	Yes	No. 4-255, 4-256
Fringed myotis	Conifer forests, woodland chaparral, caves and mines	Yes	None seen	Yes	No
Long-eared myotis	Conifer and deciduous forest, caves and mines	Yes	None seen	Yes	No
Spotted bat	Cliffs over perennial water.	No	n/a	n/a	n/a
Swift fox	Grasslands	No	n/a	n/a	n/a
Townsend's big-eared bat	Caves and mines.	Yes	None seen	Yes	n/a
Plants					**4-258**
Limber pine	Mountains, associated with high elevation conifer species	No	n/a	n/a	n/a
Porter's sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes 5300-6500 ft.	No	n/a	n/a	n/a
William's wafer parsnip	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides, 6000-8300 ft.	No	n/a	n/a	n/a

Attachment C

CONDITIONS OF APPROVAL FOR THE APPLICATION FOR PERMIT TO DRILL
Lance Oil & Gas Company, Inc (LOG)
Kinney Divide Unit Gamma (KDU Gamma)

Field Office: Buffalo Field Office
Address: 1425 Fort Street
Buffalo, WY 82834
Office Number: 307-684-1100

Well Sites:
The following 39 Applications for Permit to Drill (APDs) and associated infrastructure are authorized

	Lease	Well Name	Well #	TWP	RNG	Sec	QTR
1	WYW146307	KDU GAMMA	12-3	50N	77W	3	SWNW
2	WYW146307	KDU GAMMA	21-3	50N	77W	3	NENW
3	WYW146307	KDU GAMMA	24-3	50N	77W	3	SESW
4	WYW146307	KDU GAMMA	34-3	50N	77W	3	SWSE
5	WYW146307	KDU GAMMA	41-3	50N	77W	3	NENE
6	WYW146307	KDU GAMMA	42-3	50N	77W	3	SENE
7	WYW146307	KDU GAMMA	31-4	50N	77W	4	NWNE
8	WYW146307	KDU GAMMA	32-4	50N	77W	4	SWNE
9	WYW146307	KDU GAMMA	34-4	50N	77W	4	SWSE
10	WYW146307	KDU GAMMA	41-4	50N	77W	4	NENE
11	WYW146307	KDU GAMMA	44-4	50N	77W	4	SESE
12	WYW146313	KDU GAMMA	12-17	51N	77W	17	SWNW
13	WYW146313	KDU GAMMA	23-17	51N	77W	17	NESW
14	WYW146313	KDU GAMMA	41-17	51N	77W	17	NENE
15	WYW146313	KDU GAMMA	11-18	51N	77W	18	NWNW
16	WYW146313	KDU GAMMA	21-18	51N	77W	18	NENW
17	WYW146313	KDU GAMMA	31-18	51N	77W	18	NWNE
18	WYW146313	KDU GAMMA	41-18	51N	77W	18	NENE
19	WYW146313	KDU GAMMA	43-18	51N	77W	18	NESE
20	WYW146313	KDU GAMMA	44-18	51N	77W	18	SESE
21	WYW146313	KDU GAMMA	41-19	51N	77W	19	NENE
22	WYW146312	KDU GAMMA	14-21	51N	77W	21	SWSW
23	WYW146315	KDU GAMMA	14-27	51N	77W	27	SWSW
24	WYW146315	KDU GAMMA	12-28	51N	77W	28	SWNW
25	WYW146315	KDU GAMMA	14-28	51N	77W	28	SWSW

	Lease	Well Name	Well #	TWP	RNG	Sec	QTR
27	WYW146315	KDU GAMMA	24-28	51N	77W	28	SESW
28	WYW146315	KDU GAMMA	31-28	51N	77W	28	NENE
29	WYW146315	KDU GAMMA	32-28	51N	77W	28	SENE
30	WYW146315	KDU GAMMA	43-28	51N	77W	28	NESE
31	WYW146316	KDU GAMMA	41-29	51N	77W	29	NENE
32	WYW146315	KDU GAMMA	21-33	51N	77W	33	NENW
33	WYW146315	KDU GAMMA	32-33	51N	77W	33	SWNE
34	WYW146315	KDU GAMMA	44-33	51N	77W	33	SESE
35	WYW146315	KDU GAMMA	11-34	51N	77W	34	NWNW
36	WYW146315	KDU GAMMA	13-34	51N	77W	34	NWSW
37	WYW146315	KDU GAMMA	21-34	51N	77W	34	NENW
38	WYW146315	KDU GAMMA	23-34	51N	77W	34	NESW
39	WYW146315	KDU GAMMA	44-34	51N	77W	34	SESE

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

Facility Name	NEPA Document	QtrQtr	Sec	T	R	Lease	WDP	QtrQtr	Sec	T	R
Kinney Draw EMIT Water Treatment	Kinney Divide-Highland Unit Adds 1 WY-070-EA06-317	NENE	20	51	77	Fee	018	NWSE	20	51	77
Faddis-Kennedy EMIT Water Treatment	Kinney Divide-Highland Unit Adds 1 WY-070-EA06-317	SESW	31	51	77	Fee	016	NESW	32	51	77

Rights of Way:
The following rights-of-way are authorized with the approval of this POD:

Rights-of-way	Aliquot/Lot	Sec	TWP	RNG	Use/Type	Surface Disturbance (Acres)
WYW-170025	NWSW; 8	4, 5	50N	77W	Engineered road and buried power line	1.860
WYW-170008	NWSW; 8	4, 5	50N	77W	Gas pipeline	1.628
WYW-169471	S2NE, SWNW, N2SW; Lots 5,6 SESW; SWNE, E2NW, N2SE	3, 28, 33	51N	77W	Template access road	14.373

Rights-of-way	Aliquot/Lot	Sec	TWP	RNG	Use/Type	Surface Disturbance (Acres)
WYW-169442 #3	SESE	7	51N	77W	Primitive road, water pipeline and buried power line	0.619
WYW-169443 #2	SESE	7	51N	77W	Gas pipeline	0.488

Denials:
The following 20 Applications for Permit to Drill (APDs) and associated infrastructure are denied.

Well Name	Well #	Environmental Issue
KDU Fed	43-03-5077	Access and utility corridor impacts raptors, nest is within 1/4 mile. EA Section 4.3.2
KDU Fed	13-04-5077	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	21-04-5077	Access route impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	22-04-5077	Access route impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	42-05-5077	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	43-05-5077	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	11-27-5177	Well location and access/utility corridor impacts raptors, nest is within 1/4 mile. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1 and Section 4.3.2
KDU Fed	21-27-5177	Well location and access/utility corridor are within 1/4 mile raptor nest. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1 and Section 4.3.2
KDU Fed	22-27-5177	Well location and access/utility corridor impacts raptors, nest is within 1/4 mile. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1 and Section 4.3.2
KDU Fed	31-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	32-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	33-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	34-27-5177	The proposed access into Turner Draw does not meet BLM standards through steep slopes, deeply incised drainages, and highly erosive soils. EA Section 4.3.1
KDU Fed	42-29-5177	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2

Well Name	Well #	Environmental Issue
KDU Fed	11-33-5177	Well location and access/utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	13-33-5177	Access and utility corridor impacts bald eagles, roost is within 1/2 mile. EA Section 4.3.2
KDU Fed	14-33-5177	Access and utility corridor impacts bald eagles, roost is within 1/2 mile.
KDU Fed	32-34-5177	Slopes >25%, erosive soils, erosion hazard, poor reclamation potential on well location and access route. EA Section 4.3.1
KDU Fed	41-34-5177	The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1
KDU Fed	42-34-5177	Well location in a drainage pathway with erosive soils, erosion hazard, poor reclamation potential, in addition The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. EA Section 4.3.1
Access road into the POD from the north in sections 27 and 34 T51N R77W has no approved connection out to a main road. The proposed access into Turner Draw through steep slopes, deeply incised drainages, and highly erosive soils does not meet BLM standards. The access/utility corridor impacts raptor, nest within 1/4 mile. EA Section 4.3.1		
Utility corridor S4, S5 and S9 T50 R77 is denied. It was not field reviewed. It was added to the map after the onsite. EA Section 4.3.1		
Pump jacks are denied. Pump jacks were not considered during the onsite. EA Section 4.3.1		

SITE SPECIFIC

Site-Specific Conditions of Approval

In addition to the operator committed measures, the BLM is including the following site-specific COAs to alleviate environmental impacts:

Surface Use

1. Submit new POD maps with only approved wells and infrastructure, prior to the pre-construct.

2. Pull staking for all denied wells and infrastructure.

3. Post sign “No oil and gas traffic” on existing 2-track road in the SWSE of Section 7 T51N R77W. Entrance to the 21-18-5177 well is from the south. Put a “do not use” symbol on the map

4. For all wells spudded after November 1, the reserve pit fluids must be removed immediately following completion activities to avoid potential conflicts with raptor timing limitations and the standard COA that reserve pits be closed within 90 days, unless an exception is granted by the BLM Authorized Officer.

5. Improved roads with utility corridor working width will not exceed 50 feet with a clearing and blading not to exceed 40 feet in width unless a specific design is included in the plan and profile section of the master surface use plan.

6. Primitive roads with utility corridor working width will not exceed 40 feet with a clearing and blading not to exceed 30 feet in width.

7. Pipeline installation and/or corridors without road access working width will not exceed 35 feet with clearing and blading not to exceed 20 feet.

8. All pit spoil must be placed back in the pit once dry. The pit area should usually be mounded slightly to allow for settling and positive surface drainage.

9. 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 KDU Gamma POD is Covert Green.

10. In areas where there are steep slopes and/or fragile soils, improved roads used in conjunction with accessing federal wells must be fully built (including all water control structures such as wingditches, culverts, relief ditches, low water crossings, surfacing, etc.) and functional to BLM standards as outlined in the BLM Manual 9113 prior to drilling of the well. Specifically for this POD approved engineered roads must be fully built prior to accessing the well for drilling. The remaining roads in this POD, not constructed prior to drilling, will be fully built within 30 days of completion of the well they are used to access.

11. Steep Grade signs will be installed to inform travelers of the potential hazard on two of the constructed roads:
    a. Engineered Road #6: road grade is greater than 12% for 700 linear feet.
    b. Engineered Road #10: road grade is greater than 12% for 900 linear feet.

    Per BLM Manual 9113 .28-Signs and Markers- Signs and markers placed on or adjacent to the roadway to regulate, inform, or guide vehicle occupants must conform to the requirements of BLM Manual 9131 and the Federal Highway Administrations Manual of Uniform Traffic Control Devices.

12. The following well locations and access road/corridor in the project area have been identified to have limited reclamation potential that will require disturbed areas to be stabilized (stabilization efforts may include mulching, matting, soil amendments, etc.) in a manner which eliminates accelerated erosion until a self-perpetuating native plant community has stabilized the site in accordance with the Wyoming Reclamation Policy. Stabilization efforts shall be finished within 30 days of the initiation of construction activities:

Township/Range	Section	Wells and Infrastructure
T51N R77W	28	21-28 and 31-28 just access road, 43-28 well location
	33	32-33 well location
	34	11-34 just access road, 21-34 and 23-34 both well and access road
T50N R77W	3	21-3 and 41-3 just access road, 42-3 both well and access road
	4	31-4 and 44-4 both well and access road, 44-4 well location

13. The operator will seed on the contour to a depth of no more than 0.5 inch. To maintain quality and purity, 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:

Loamy Ecological Site Seed Mix 10-14" Precipitation Zone

Species	% in Mix	Lbs PLS*
Western Wheatgrass (Pascopyrum smithii)/ ***Thickspike Wheatgrass*** (Elymus lanceolatus ssp. lanceolatus)	30	4.8
Bluebunch Wheatgrass (Pseudoroegneria spicata ssp. Spicata)	10	1.2
Green needlegrass (Nassella viridula)	25	3.0
Slender Wheatgrass (Elymus trachycaulus ssp. trachycaulus)	20	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
Totals	**100%**	**12 lbs/acre**

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

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)	30	4.8
Slender Wheatgrass (Elymus trachycaulus ssp. trachycaulus)	20	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
Totals	**100%**	**12 lbs/acre**

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

Wildlife

Bald Eagles

The following conditions will alleviate impacts to bald eagles:

Township/Range	Section	Wells and Infrastructure
T51N R77W	7	All infrastructure
	8	All infrastructure
	17	41-17, 23-17, 12-17 and all infrastructure.
	18	41-18, 31-18, 43-18 and infrastructure in NE and road to north of 43-18.
	19	41-19
	21	14-21 and all infrastructure.
	28	31-28, 21-28, 12-28, 14-28, 24-28. Only infrastructure from well 32-28 to the south is excluded.
	29	41-29
	33	21-33, 32-33 Only infrastructure to the east of 32-33 is excluded.
T50N R77W	4	31-4, 32-4, 34-4, 44-4. Only 41-4 and infrastructure to the east is excluded.

1. No project related actions shall occur within one mile of bald eagle habitat, annually, from 1 November through 1 April, prior to a winter roost survey, or from 1 February through 15 August, prior to a nesting survey. This timing limitation will be in effect unless surveys determine the habitat to be unoccupied. This affects the following wells and infrastructure:

    a. Surveys to document activity shall be conducted by a biologist following BLM protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.
    b. If a roost is identified and construction has not been completed, a year-round disturbance-free buffer zone of 0.5 mile will be established. A seasonal minimum disturbance buffer zone of 1 mile will be established for all bald eagle roost sites (1 November – 1 April).

    c. If a nest is identified and construction has not been completed, a year-round disturbance-free buffer zone of 0.5 mile would be established. A seasonal minimum disturbance buffer zone of 1 mile will be established for all bald eagle nest sites (1 February – 15 August).

2. Additional mitigation measures may be necessary if the site-specific project is determined by a Bureau biologist to have an adverse affect to bald eagles or their habitat.

Mountain Plover

The following conditions will alleviate impacts to mountain plovers:

1. No surface-disturbing activities shall occur within 0.25 mile of potential mountain plover nesting habitat, annually, from 15 March through 31 July, prior to a nesting survey. This timing limitation will be in effect unless surveys determine the habitat to be unoccupied. This affects the following wells and infrastructure:

Township/Range	Section	Wells and Infrastructure
T51N R77W	21	14-21 and all infrastructure
	29	41-29 and infrastructure in NW

    a. Mountain plover nesting surveys shall be conducted by a biologist following the most current USFWS Mountain Plover Survey Guidelines. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.

b. If a nest is identified, no surface-disturbing activities shall occur within 0.25 miles from 15 March through 31 July.
c. No dogs will be permitted at work sites to reduce the potential for harassment of mountain plovers.

Raptors

The following conditions will alleviate impacts to raptors:

1. No surface-disturbing activities shall occur within 0.5 mile of all identified raptor nests, from 1 February through 31 July, annually, prior to a nesting survey. This timing limitation will be in effect unless surveys determine the nest to be inactive. This affects the following wells and infrastructure:

Township/Range	Section	Wells and Infrastructure
T51N R77W	17	41-17 and infrastructure in NE
	27	14-27 and all infrastructure in N and SW.
	28	14-28
	32	Infrastructure on N-S road
	33	21-33, 32-33, 44-33, and all infrastructure except in NW.
	34	All infrastructure
T50N R77W	3	All infrastructure
	10	All infrastructure
	9	All infrastructure in NE

a. Surveys shall be conducted by a biologist following BLM protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.

b. 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.

Sage-Grouse

The following conditions will alleviate impacts to sage-grouse:

1. No surface-disturbing activities shall occur within sage-grouse habitat, from 1 March through 15 June, annually. This affects the following wells and all infrastructure associated with the listed wells:

Township/Range	Section	Wells
T51N R77W	17	12-17, 23-17, 41-17
	18	11-18, 21-18, 31-18, 44-18, 41-18, 43-18
	19	41-19
	21	14-21
	27	14-27
	28	12-28, 14-28, 21-28, 24-28, 31-28, 32-28, 43-28
	33	21-33, 44-33
	34	11-34, 13-34, 21-34, 23-34, 44-34
T50N R77W	3	12-03, 21-03, 24-03, 34-03, 41-03, 42-03
	4	31-04, 32-04, 34-04, 41-04, 44-04

Water Management

1. The Operator will not be permitted to use the Barber Creek Treatment Facility for the management of water produced in association with this project. In the water management plan, the operator proposed the use of one water discharge point that had been denied by the WDEQ and is no longer included in

the WYPDES Permit #WY0051276. No other discharge points associated with this facility were proposed to be used in the KDU Gamma water management plan.

Cultural

1. Monitoring by a qualified archaeologist will be required during construction of the #41-17 well pad and adjacent access road. Site 48 JO 4031 is eligible, has been tested, and proposed development is scheduled for non-contributing portions of the site.

2. The federal agency is required to take into consideration the effect of its undertakings on cultural properties, both on federal surface and private lands. This is handled through inventory and review of existing documentation. There still remains some potential for discoveries. If human remains are encountered, procedures require immediate notification of law enforcement agencies and the Bureau of Land Management's authorized personnel. If buried cultural resources or discoveries are located, construction is halted and the BLM consults with the State Historic Preservation Office (SHPO) on mitigation or avoidance.

Programmatic mitigation measures identified in the PRB FEIS ROD

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.

Wetland/Riparian

1. Any fences used in wetland areas should be placed well back from the wetlands to prevent waterfowl mortalities and should be constructed to standards that allow big game movements.

2. Crossings of wetland/riparian areas by linear features, such as pipelines, roads, and power lines will be avoided to the extent practicable. Where crossings cannot be avoided, impacts will be minimized through use of the following measures:
   - Site-specific mitigation plans will be developed during the APD, POD, or Sundry Notice approval process for all proposed disturbance to wetland/riparian areas.

   - Crossings will be constructed perpendicular to wetland/riparian areas where practical.

   - Power line corridors will avoid wetlands, to the extent possible, in order to reduce the chance of waterfowl hitting the lines. Where avoidance can't occur, the minimum number of poles necessary to cross the area will be used.

- Wetland areas will be disturbed only during dry conditions (that is, during late summer or fall), or when the ground is frozen during the winter.

- No waste material will be deposited below high water lines in riparian areas, flood plains, or in natural drainage ways.

- The lower edge of soil or other material stockpiles will be located outside the active floodplain.

- Drilling mud pits will be located outside of riparian areas, wetlands, and floodplains, where practical.

- Disturbed channels will be re-shaped to their approximate original configuration or stable geomorphological configuration and properly stabilized.

- Reclamation of disturbed wetland/riparian areas will begin immediately after project activities are complete.

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.

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.

Bald Eagle

1. In the event that a bald eagle (dead or injured) is located during construction or operation, the USFWS' Wyoming Field Office (307-772-2374) and the USFWS' Law Enforcement Office (307-261-6365) will be notified within 24 hours.

2. Special habitats for raptors, including wintering bald eagles, will be identified and considered during the review of the Sundry Notices.

Mountain Plover

1. Work schedules and shift changes will be set to avoid the periods from 30 minutes before to 30

   minutes after sunrise and sunset during June and July, when mountain plovers and other wildlife are most active.

2. When above ground markers are used on capped and abandoned wells they will be identified with markers no taller than four feet with perch inhibiting devices on the top to avoid creation of raptor hunting perches within 0.5 mile of nesting areas.

3. Reclamation of areas of previously suitable mountain plover habitat will include the seeding of vegetation to produce suitable habitat for mountain plover.

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.

2. Companies will contact the counties to pursue development of maintenance agreements to ensure county roads are adequately maintained for the projected increase in use.

Air Quality

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.

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 Name Here @ NRS 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:

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

   2.2. 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:

   2.1. 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.

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

   2.3. 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

8. 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.

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

10. 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

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

12. 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.

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

14. 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.

15. 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.

16. 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

17. 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.

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

19. 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.

20. 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.

21. 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.

22. 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.

23. 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.

24. 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.

25. 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

26. 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.

27. 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.

28. 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.

29. 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