FINDING OF NO SIGNIFICANT IMPACT & DECISION RECORD
FOR
Pennaco Energy, Inc.
Peterson 29 Ext
ENVIRONMENTAL ASSESSMENT –WY-070-**08-144**

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize Pennaco Energy, Inc.'s Peterson 29 Ext Coal Bed Natural Gas (CBNG) POD comprised of the following 13 Applications for Permit to Drill (APDs):

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	Chase Farms	1-22MZCR	NENE	22	58N	82W	WYW145649
2	Chase Farms	3-22MZCR	NENW	22	58N	82W	WYW145649
3	Chase Farms	5-22MZCR	SWNW	22	58N	82W	WYW145649
4	Chase Farms	7-22MZCR	SWNE	22	58N	82W	WYW145649
5	Chase Farms	11-23MZCR	NESW	23	58N	82W	WYW145650
6	Chase Farms	13-23MZCR	SWSW	23	58N	82W	WYW145650
7	Chase Farms	15-23MZCR	SWSE	23	58N	82W	WYW145650
8	Chase Farms	3-23MZCR	NENW	23	58N	82W	WYW145650
9	Chase Farms	5-23MZCR	SWNW	23	58N	82W	WYW145650
10	Chase Farms	3-26MZCR	NENW	26	58N	82W	WYW143068
11	Chase Farms	5-26MZCR	SWNW	26	58N	82W	WYW143068
12	Chase Farms	1-27MZCR	NENE	27	58N	82W	WYW145649
13	Chase Farms	3-27MZCR	NENW	27	58N	82W	WYW145649

The following impoundments were inspected and approved for use in association with the water management strategy for the POD.

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	R7-27N-58-82	SWNE	27	58	82	14.8	3	FEE
2	R11-22-58-82—w/COAs	NESW	22	58	82	13.5	3	FEE

This approval is subject to adherence with all of the operating plans 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 Environmental Impact Statement and Resource Management Plan Amendment (PRB FEIS) approved April 30, 2003.

RATIONALE: The decision to authorize Alternative C, as described in the attached Environmental Assessment (EA), 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 Landowner(s).
3. Alternative C will not result in any undue or unnecessary environmental degradation.
4. It is in the public interest to approve these wells, as the leases are being drained of federal gas, resulting in a loss of revenue for the government.
5. Mitigation measures applied by the BLM will alleviate or minimize environmental impacts.
6. Alternative C is the environmentally-preferred Alternative.
7. The proposed action is in conformance with the PRB FEIS and the Approved Resource Management Plan for the Public Lands Administered by the Bureau of Land Management (BLM), Buffalo Field Office, April 2001.

FINDING OF NO SIGNIFICANT IMPACT: Based on the analysis of the potential environmental impacts, I have determined that NO significant impacts are expected from the implementation of Alternative C and, therefore, an environmental impact statement is not required.

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: _____

BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
Pennaco Energy, Inc.
Peterson 29 Ext
PLAN OF DEVELOPMENT
WY-070-08-144

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 Buffalo Field Office. This project EA addresses site-specific resources and impacts that were not covered within the PRB FEIS.

1. PURPOSE AND NEED

The purpose for the proposal is to produce coal bed natural gas (CBNG) on 3 federal oil and gas mineral leases issued to the applicant by the BLM.

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

The proposed action is in conformance with the terms and the conditions of the Approved Resource Management Plan for the Public Lands Administered by the Bureau of Land Management, Buffalo Field Office (BFO), April 2001 and the PRB FEIS, as required by 43 CFR 1610.5

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

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 Proposed Action

Proposed Action Title/Type: Pennaco Energy, Inc. 's Peterson 29 Ext Plan of Development (POD) for 13 coal bed natural gas well APD`s and associated infrastructure.

Proposed Well Information: There are 13 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 Smith, Dietz 1, Dietz 2, Dietz 3, Monarch and Carney coal seams. Proposed well head dimensions are 10 ft wide x 8 ft length. Well house color ix Beetle 19-0312 TPX, selected to blend with the surrounding vegetation.

Wells are located as follows:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	Chase Farms	1-22MZCR	NENE	22	58N	82W	WYW145649
2	Chase Farms	3-22MZCR	NENW	22	58N	82W	WYW145649
3	Chase Farms	5-22MZCR	SWNW	22	58N	82W	WYW145649
4	Chase Farms	7-22MZCR	SWNE	22	58N	82W	WYW145649
5	Chase Farms	11-23MZCR	NESW	23	58N	82W	WYW145650
6	Chase Farms	13-23MZCR	SWSW	23	58N	82W	WYW145650
7	Chase Farms	15-23MZCR	SWSE	23	58N	82W	WYW145650
8	Chase Farms	3-23MZCR	NENW	23	58N	82W	WYW145650
9	Chase Farms	5-23MZCR	SWNW	23	58N	82W	WYW145650
10	Chase Farms	3-26MZCR	NENW	26	58N	82W	WYW143068
11	Chase Farms	5-26MZCR	SWNW	26	58N	82W	WYW143068
12	Chase Farms	1-27MZCR	NENE	27	58N	82W	WYW145649
13	Chase Farms	3-27MZCR	NENW	27	58N	82W	WYW145649

Water Management Proposal: The following impoundments were proposed for use in association with the water management strategy for the POD.

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	R7-27N-58-82	SWNE	27	58	82	14.8	3	FEE
2	R11-22-58-82—w/COAs	NESW	22	58	82	13.5	3	FEE

County: Sheridan

Applicant: Pennaco Energy, Inc.

Surface Owners: Chase Farms dba NX Bar Ranch c/o Brian McCarthy, Bert Dow

Project Description:
The proposed action involves the following:

- Drilling of 13 total federal CBM wells in Smith/Carney, Dietz 1, 2, & 3 and Monarch coal zones to depths ranging from 1261 to 1500 feet. Multiple seams will be produced by co-mingling production (a single well per location cable of producing from multiple coal seams).

- 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.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: 2 discharge points and 2 stock water reservoirs within the Upper Tongue River watershed and use of existing and proposed subsurface drip irrigation systems (SDI) along the terraces above Badger

Creek on private surface.

- An unimproved and improved road network.

- An above ground power line network is already in existence that will be utilized by the operator. If a new proposed route is proposed, then the new route will be handled via sundry application and analyzed in a separate NEPA action. The proposed power to the CBNG wells will be achieved through a buried power line network that is generally corridor in a common trench with the gas and water pipelines.

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 and/or APDs 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 COA contained in the PRB FEIS Record of Decision Appendix A, are incorporated and analyzed in this alternative.

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 ½ mile of a federal CBNG producing well in the POD
4. Provide water analysis from a designated reference well in each coal zone.

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

2.3. Alternative C – Environmentally Preferred

Alternative C represents a modification of Alternative B based on the operator and BLM working cooperatively to reduce environmental impacts. The description of Alternative C is the same as Alternative B with the addition of the project modifications identified by BLM and the operator following the initial project proposal (Alternative B). At the on-sites, all areas of proposed surface disturbance were inspected to insure that the project would meet BLM multiple use objectives to conserve natural resources while allowing for the extraction of Federal minerals. In some cases, access roads were re-routed, and well locations, pipelines, discharge points and other water management control structures were moved, modified, mitigated or dropped from further consideration to alleviate environmental impacts. Alternatives to the different aspects of the proposed action are always considered and applied as pre-approval changes, site specific mitigation and/or Conditions of Approval (COAs), if they will alleviate environmental effects of the operator's proposal. The specific changes identified for the Peterson 29 Ext POD are listed below under 2.3.1:

2.3.1. Changes as a result of the on-sites

Surface Use

	Well Name	Well #	Qtr/Qtr	Sec	TWP	RNG	Comments
1	Chase Farms Fed	3-27-58-82 MZ/CR	NENW	27	58N	82W	The well was moved across drainage to a flat location to the East. This eliminated the need for a constructed pad and engineered road.
2	Chase Farms Fed	3-22-58-82 MZ/CR	NENW	22	58N	82W	Moved the well ± 400 ft to east to take location off of a ridgeline; new location in a grassy area; Access road will require a template design and entire road will be graveled.
3	Chase Farms Fed	1-27-58-82 MZ/CR	NENE	27	58N	82W	Moved location down into clearing at about 150ft to the north; No constructed pad will be required. Moved access road to follow bench then across drainage.
4	Chase Farms Fed	11-23-58-82 MZ/CR	NESW	23	58N	82W	Moved location from top of ridge to below ridge on a grassy flat east.
5	Chase Farms Fed	15-23-58-82 MZ/CR	SWSE	23	58N	82W	Moved 45ft to East to more level terrain.
6	Chase Farms Fed	5-22-58-82 MZ/CR	SWNW	22	58N	82W	Access road moved to follow fence line that Chase Farms built. The last portion of the road will require a template design.
7	Chase Farms Fed	3-23-58-82 MZ/CR	NENW	23	58N	82W	The access road will require and engineered design. This road will be permanent per landowner request
8	Chase Farms Fed	5-23-58-82 MZ/CR	SWNW	23	58N	82W	The access road will require and engineered design. This road will be permanent per landowner request.
9	Reservoir	R11-22-58-82— w/COAs	NESW	22	58N	82W	The reservoir will be drained and a bentonite/earth seal will be properly installed. If the reservoir continues to seep, discharge of water produced from the federal actions will cease and the operator will provide irrefutable proof that this has been accomplished.

2.3.2. Programmatic mitigation measures identified in the PRB FEIS ROD

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

2.3.2.1. Groundwater

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ has developed and revised a guidance document, "Compliance Monitoring and siting Requirements for Unlined Impoundments Containing Coalbed Methane Produced Water" (September, 2006) which can be accessed on their website. For all WYPDES permits the BLM will require that operators comply with the latest DEQ standards and monitoring guidance.

2.3.2.2. Surface Water

1. Channel Crossings:
   a) 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.

b) Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.

2. Low water crossings will be constructed at original streambed elevation in a manner that will prevent any blockage or restriction of the existing channel. Material removed will be stockpiled for use in reclamation of the crossings.

3. Concerns regarding the quality of the discharged CBNG water on downstream irrigation use may require operators to increase the amount of storage of CBNG water during the irrigation months and allow more surface discharge during the non-irrigation months.

2.3.2.3. Soils

1. The Companies, on a case by case basis depending upon water and soil characteristics, will test sediments deposited in impoundments before reclaiming the impoundments. Tests will include the standard suite of cations, ions, and nutrients that will be monitored in surface water testing and any trace metals found in the CBNG discharges at concentrations exceeding detectable limits.

2.3.2.4. Wetland/Riparian

1. 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.

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

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

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

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

2.3.2.5. Wildlife

2.3.2.6. Threatened, Endangered, or Sensitive Species

2.3.2.6.1. Bald Eagle

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

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

2.3.2.7. Visual Resources

1. The Companies will mount lights at compressor stations and other facilities on a pole or building and direct them downward to illuminate key areas within the facility while minimizing the amount of light projected outside the facility.

2.3.2.8. 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 from the BLM authorized officer.

2.3.3. Site specific mitigation measures

General

1. All changes made at the onsite will be followed. They have all been incorporated into the operator's POD.

2. Please contact Mary Maddux, Natural Resource Specialist, @ (307) 684-1164, Bureau of Land Management, Buffalo, if there are any questions concerning these COAs.

Surface Use

1. 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 Petersen 29 Ext.POD is Beetle, 19-0312 TPX.

2. Provide 4" of aggregate where grades exceed 8%.

3. 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:

Grade	Drainage Spacing
2-4%	310 ft
5-8%	260 ft
9-12%	200 ft
12-16%	150 ft

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

Species - *Cultivar*	**Full Seeding (lbs/ac PLS)**	**% in Mix**	**Lbs PLS**
Western Wheatgrass - *Rosana*	12	20	2.4
Bluebunch wheatgrass – *Secar or P-7*	14	30	4.2
Idaho fescue - *Joseph*	8	30	2.4
American vetch **OR** Cicer Milkvetch - *Lutana*	14	10	1.4
Winterfat – *Open Range*	16	5	.80
Lewis - *Appar*, Blue, or Scarlet flax	8	5	.40
Totals		**100%**	**11.6 lbs/acre**

This is a recommended seed mix based on the native plant species listed in the NRCS Ecological Site descriptions, U.W. College of Ag. and seed market availability.

5. The following roads are not permitted for use until revised road designs have been received and approved by the BLM.
    a. Chase Farms Fed 5-22-58-82 MZ/CR
    b. Chase Farms Fed 1-22-58-82 MZ/CR

6. The pipeline route for Chase Farms Fed 5-23 well location has not been finalized with the landowner, once route is finalized, Pennaco will be required to submit a sundry for approval along with a revised map.

7. The access road to Chase Farms Fed 3-22 will be graveled the entire length.

8. 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.

Lease	**Well #**	**Aliquot**	**Sec**	**T**	**R**
WYW145650	3-23	NENW	23	58N	82W
WYW145650	5-23	SWNW	23	58N	82W

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

   Reclamation Standards:
   C. 3 The reclaimed area shall be stable and exhibit none of the following characteristics:
   a. Large rills or gullies.
   b. Perceptible soil movement or head cutting in drainages.
   c. Slope instability on, or adjacent to, the reclaimed area in question.
   C.4. The soil surface must be stable and have adequate surface roughness to reduce runoff and capture rainfall and snow melt. Additional short-term measures, such as the application of mulch, shall be used to reduce surface soil movement.
   C.5. Vegetation canopy cover (on unforested sites), production and species diversity (including shrubs) shall approximate the surrounding undisturbed area. The vegetation shall stabilize the site and support the planned post disturbance land use, provide for natural plant community succession and development, and be capable of renewing itself. This shall be demonstrated by:
   a. Successful onsite establishment of species included in the planting mixture or other desirable species.
   b. Evidence of vegetation reproduction, either spreading by rhizomatous species or seed production.
   C.6. The reclaimed landscape shall have characteristics that approximate the visual quality of the adjacent area with regard to location, scale, shape, color and orientation of major landscape features and meet the needs of the planned post disturbance land use.

Cultural

1. Archaeological monitoring shall be performed during construction of well pad #13-23-58-82 and associated infrastructure (i.e., access road). This monitoring shall occur when vegetation removal and/or grading occurs. Any monitoring effort should not only examine the excavated areas, but should also examine any spoil piles for cultural material. All monitoring will be carried out by a qualified archaeologist with a valid BLM Cultural Resource Use Permit. If any cultural resources are found during monitoring, construction shall halt until a determination of "no historic properties affected" can be made or other mitigation is agreed upon (and completed as required), as per Standard COA (General)(A)(1). A report on monitoring activities will be submitted to BLM within 30 days of fieldwork.

Wildlife

Burrowing Owls

The following conditions will alleviate impacts to burrowing owls:

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

Raptors

The following conditions will alleviate impacts to raptors:

a) Surveys to document nest occupancy shall be conducted by a biologist following BLM protocol, between April 15 and June 30. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities. Surveys outside this window may not depict nesting activity. If a survey identifies active raptor nests, a 0.5

mile timing buffer will be implemented. The timing buffer restricts surface disturbing activities within 0.5 mile of occupied raptor nests from February 1 to July 31.

b) Nest productivity checks shall be completed for the first five years following project completion. The productivity checks shall be conducted no earlier than June 1 or later than June 30 and any evidence of nesting success or production shall be recorded. Survey results will be submitted to a Buffalo BLM biologist in writing no later than July 31 of each survey year. This applies to the following nest listed in Table 4.

c) 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.

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

Sage Grouse

The following conditions will minimize the impacts to sage-grouse:

a. A survey is required for sage-grouse between April 1 and May 7, annually, within the project area for the life of the project and results shall be submitted to a BLM biologist. The required sage grouse survey will be conducted by a biologist following the most current WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.

b. If an active lek is identified during the survey, the 2 mile timing restriction (March 1-June 15) will be applied and surface disturbing activities will not be permitted until after the nesting season. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the 2 mile buffer until the following breeding season (March 1).

c. Creation of raptor hunting perches will be avoided within 0.5-mile of documented sage-grouse lek sites. Perch inhibitors will be installed to deter avian predators from preying on sage-grouse.

d. Well metering, maintenance and other site visits within 0.5 miles of documented sage grouse lek sites shall be minimized as much as possible during the breeding season (March 1– June 15).

*Sharp-tailed Grouse*The following conditions will minimize impacts to sharp-tail-grouse:

a. A survey is required for sharp-tailed grouse between April 1 and May 7, annually, within the project area for the life of the project and results shall be submitted to a BLM biologist.

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

c. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the 0.5 mile buffer until the following breeding season (April 1).

d. Creation of raptor hunting perches will be avoided within 0.64 miles of documented sharp-tailed grouse lek sites. Perch inhibitors will be installed to deter avian predators from preying on grouse.

Water Management

1. The R11-22 dam seeps significantly along its left groin and along the left gully wall downstream of the dam. Pennaco has proposed a repair which includes draining the reservoir and installing a 2-3 foot thick compacted soil/bentonite liner. Approval for use of this reservoir as part of the

federal action is contingent upon the successful remediation of the structure and a post-remediation site visit by the BLM Civil Engineer and/or Hydrologist.

2. Only the existing portions of the SDI field may be used in conjunction with the Peterson 29 Ext POD for disposal of federal water. If new portions of the field are to be installed, then a sundry notice will be required for submittal and approved by the BLM prior to use of the new field portions.

3. CBNG water produced as a result of this federal action will not be discharged into the following reservoirs until proof of reclamation bonding has been provided to the BLM.

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	R7-27N-58-82	SWNE	27	58	82	14.8	3	FEE
2	R11-22-58-82—w/COAs	NESW	22	58	82	13.5	3	FEE

2.4. Alternatives considered but not analyzed in detail

The operator considered alternative water management strategies, including direct discharge, treatment, deep re-injection, irrigation and reservoir containment. For a complete discussion of the alternatives considered, see pages 9-13 of the water management plan submitted with this project proposal.

2.5. Summary of Alternatives

A summary of the infrastructure currently existing within the POD area (Alternative A), the infrastructure originally proposed by the operator (Alternative B), and the infrastructure within the BLM/operator modified proposal (Alternative C) are presented in Table 2.5.

Table 2.5 Summary of the Alternatives

Facility	Alternative A (No Action) Existing Number or Miles	Alternative B (Original Proposal) Proposed Number or Miles	Alternative C (Environmental Alt.) Revised Number or Miles
Total CBNG Wells	11	13	13
Total Locations	11	13	13
Nonconstructed Pads		2	5
Slotted Pads		0	0
Constructed Pads		11	8
Conventional Wells	0	0	0
Gather/Metering Facilities	1	0	0
Compressors	0	0	0
Impoundments			
On-channel	2	2	2
Off-channel			
Water Discharge Points	2	2	2

Facility	Alternative A (No Action) Existing Number or Miles	Alternative B (Original Proposal) Proposed Number or Miles	Alternative C (Environmental Alt.) Revised Number or Miles
Improved Roads	5.5 miles		
No Corridor	0	0	0
With Corridor	0	4.2 miles	4.8 miles
2-Track Roads			
No Corridor	0.9 miles	0.5 miles	0
With Corridor	0	0.9 miles	0.5 miles
Buried Utilities			
No Corridor	0	0	0.4 miles
With Corridor	0	0.2 miles	0.3 miles
Overhead Powerlines	2.1 miles	0	0
Communication Sites	0	0	0
Staging/Storage Areas	0	0	4 @ 50' X 100'
SDI disturbance (acres)	688	688	688
Acres of Disturbance	41	38.4	40.5

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on October 5, 2007. Field inspections of the proposed Peterson 29 Ext CBNG project were conducted on 4/15/2008 by:

DATE	NAME	TITLE	AGENCY
4/15/2008	Jeb Beacham	Advanced Regulatory Compliance Representative	Pennaco Energy, Inc subsidiary of Marathon Oil Co.
4/15/2008	Annette Mathis		Pennaco Energy, Inc subsidiary of Marathon Oil Co.
4/15/2008	Bill Pritchard		Pennaco Energy, Inc subsidiary of Marathon Oil Co.
4/15/2008	Eric Kessner	Surveyor	William H. Smith & Assoc.
4/15/2008	Harry Kessner	Surveyor	William H. Smith & Assoc.
4/15/2008	Wade Filkins	Hydrology Consultant	Western Water Consultants
4/15/2008	Brian MacCarty	Ranch Manager	Chase Farms NX Bar Ranch
4/15/2008	Scott Alexander	Ranch Manager	Chase Farms NX Bar Ranch
4/15/2008	Wendy Sutton	Archaeologist	BLM-Buffalo Field Office
4/15/2008	Ben Adams	Hydrologist	BLM-Buffalo Field Office
4/15/2008	Ted Hamersma	Civil Engineer Technician	BLM-Buffalo Field Office
4/15/2008	Don Brewer	Wildlife Biologist	BLM-Buffalo Field Office
4/15/2008	Mary Maddux	Natural Resource Specialist	BLM-Buffalo Field Office

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. Certain critical environmental components require analysis under BLM policy. These items are presented below in Table 3.1.

Table 3.1 - Critical elements requiring mandatory evaluation are presented below.

Mandatory Item	Potentially Impacted	No Impact	Not Present On Site	BLM Evaluator
Threatened and Endangered Species		X		Donald Brewer
Floodplains	X			Ben Adams
Wilderness Values			X	Mary Maddux
ACECs			X	Mary Maddux
Water Resources	X			Ben Adams
Air Quality		X		Mary Maddux
Cultural or Historical Values		X		Wendy Sutton
Prime or Unique Farmlands			X	Mary Maddux
Wild & Scenic Rivers			X	Mary Maddux
Wetland/Riparian	X			Ben Adams
Native American Religious Concerns		X		Wendy Sutton
Hazardous Wastes or Solids		X		Mary Maddux
Invasive, Nonnative Species	X			Mary Maddux
Environmental Justice			X	Mary Maddux

3.1. Topographic Characteristics of Project Area

The project area is located T58N R82W Sections 22, 23, 26 and 27 of Sheridan County, Wyoming. The North side of the project area is the Montana and Wyoming State line. The project area is located 15 miles Northeast of Sheridan, Wyoming. Elevation in area ranges from 3700 to 4400 feet above sea level.

The project topography varies from gentle grasslands to rugged, rough pinion and ponderosa pine covered side slopes. The drainages in a good portion of the project area are heavily incised and some areas actively eroding. This is particularly true in the Northeastern part of the project area. The soils of the area are a shallow loamy and due to the relative proximity to bedrock or parent material at < 20 inches, these areas have a limited reclamation potential, which will require soil stabilization measures to prevent accelerated erosion and soil loss. The majority of the project area has slopes that exceed 15%. The average annual precipitation for this area is approximately 11.98 inches, as derived from the Western Climate Center (2004). More than two-thirds of the annual precipitation normally occurs during the growing season, with April, May and June being the wettest months.

The area has already had some CBNG development in terms of fee wells. Most of the roads which will be used for access to the federal wells were constructed or improved to accommodate the current fee production. There are active coal mines to the north in Montana and many historical coal mining locations occur throughout the adjacent area.

The area is also used for grazing and farming both currently and in the past. The area that the Peterson 29

Ext. POD encompasses is currently being used as an elk game farm although as small number of cattle use the area. The area is also farmed in terms of food plots for the resident elk population.

3.2. Vegetation & Soils

Loamy Ecological Site Description:

Species typical of short grass prairie comprise the project area flora. Specific species observed throughout the project area include Greasewood, Cheatgrass, Wyoming Big Sagebrush, Fringed Sage, Western Wheatgrass, and Bluestem. Differences in dominant species within the project area vary with soil type, aspect and topography.

Using the Natural Resource Conservation Service, (NRCS, USDA), Technical Guides for the Major Land Resource Area 58B Northern Rolling High Plains, in the 10-14" Northern Plains precipitation zone, the landforms, the soils and the predominant ecological sites occurring within the proposed POD are found to be Loamy to Shallow Loamy. Loamy sites occur on gently undulating rolling land, hill sides, alluvial fans, ridges & stream terraces where as Shallow Loamy sites generally occurs on steep slopes and ridge tops.

The loamy soils on the well locations are deep to moderately deep (greater than 20" to bedrock), well drained & moderately permeable. Layers of the soil most influential to the plant community varies 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.

The remaining well locations, the soils are shallow (less than 20"to bedrock) well-drained soils formed in alluvium over residuum or residuum. These soils have moderate permeability and may occur on all slopes. The bedrock may be any kind which is virtually impenetrable to plant roots, except igneous. The surface soil will have one or more of the following textures: very fine sandy loam, loam, silt loam, sandy clay loam, silty clay loam, and clay loam. Thin ineffectual layers of other textures are disregarded. Layers of the soil most influential to the plant community vary from 3 to 6 inches thick.

Soils differ with topographic location, slope and elevation. Topsoil depths to be salvaged for reclamation range from 2 to 4 inches on ridges to 6+ inches in bottomland. Erosion potential varies from none to minor depending on the soil type, vegetative cover and slope. Reclamation potential of soils also varies throughout the project area. The main soil limitation for both types of ecological sites includes low organic matter content and soil droughtiness. The low annual precipitation should be considered when planning a seeding.

Mixed Sagebrush/Grass Plant Community

Historically, this 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 management. Wyoming 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 grasses, and miscellaneous forbs.

Dominant grasses include needleandthread, western wheatgrass, and green needlegrass. Grasses of secondary importance include blue grama, prairie junegrass, and Sandberg bluegrass. Forbs commonly found in this plant community include plains wallflower, hairy goldaster, slimflower scurfpea, and scarlet globemallow. Sagebrush canopy ranges from 20% to 30%. Fringed sagewort is commonly found. Plains pricklypear can also occur.

When compared to the Historic Climax Plant Community, sagebrush and blue grama have increased. Production of cool-season grasses, particularly green needlegrass, has been reduced. The sagebrush canopy protects the cool-season mid-grasses, but this protection makes them unavailable for grazing. Cheatgrass (downy brome) has invaded the site. The overstory of 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.

This plant community is resistant to change. A significant reduction of big sagebrush can only be accomplished through fire or brush management. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

Western Wheatgrass/Cheatgrass Plant Community
This plant community is created when the Mixed Sagebrush/Grass Plant Community or the Heavy Sagebrush Plant Community is subjected to fire or brush management not followed by prescribed grazing. Rhizomatous wheatgrasses and annuals will eventually dominate the site.

Compared to the HCPC, cheatgrass has invaded with western wheatgrass and thickspike wheatgrass maintaining at a similar or slightly higher level. Virtually all other cool-season mid-grasses are severely decreased. Blue grama is the same or slightly less than found in the HCPC. Plant diversity is low.

This plant community is relatively stable with the rhizomatous wheatgrasses being somewhat resistant to overgrazing and the cheatgrass effectively competing against the establishment of perennial cool-season grasses.

An increase in bare ground reduces water infiltration and increases soil erosion. The watershed is usually functioning. The biotic integrity is reduced by the lack of diversity in the plant community.

The soil series included in these areas are Absted-Slickspots Complex, Cushman-Worf Association, Parmleed-Bidman Association, Shingle-Rock Outcrop Complex, Shingle-Samday Clay Loams, Shingle-Taluce Complex, Shingle-Theedle-Kishona Association, Shingle-Theedle Complex, Theedle-Kishona Association, and the Zigweid-Kishona Association.

3.2.1. Wetlands/Riparian

The area within the project boundary contains some limited wetland areas. The R11-22 dam has substantial seeps in the draw downstream of the structure which the landowner's representative stated have been there for as long as they remember (prior to the dam's construction). These are saline seeps, and there is evidence that they may be present within and above the pool area as well. Vegetation in this draw is typical of that found in saline areas with an abundance of foxtail barley (Hordeum jubatum) and other highly salt-tolerant species.

The proposed and existing SDI areas are outside the POD boundary and lie primarily on the terrace above Badger Creek. Badger Creek itself is a very large watershed which, under natural conditions, would be ephemeral to intermittent. It has been intensively farmed in recent history, so the vegetation tends to be brome, timothy and other desirable irrigated pasture and hayland species. Individual cottonwood trees occur up and down Badger Creek, becoming denser and forming stands farther downstream, nearer its confluence with the Tongue River.

3.2.2. Invasive Species

The following state-listed noxious weeds and/or weed species of concern infestations were discovered by a search of inventory databases on the Wyoming Energy Resource Information Clearinghouse (WERIC) web site (www.weric.info):

- Leafy Spurge

The WERIC database was created cooperatively by the University of Wyoming, BLM and county Weed and Pest offices. Additionally, BLM did not observe the following WERIC identified infestations and/or documented additional weed species during subsequent field investigations:

- Leafy Spurge

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

Land cover within the project area consists of approximately 45% grassland and 40% sagebrush, the rest being made up of woodland, greasewood and cultivated soil. Grass height at peak growing season is moderate (6-12 inches) with taller, denser grass cover occurring among sagebrush-grassland habitats and along portions of Badger Creek. Bare ground and low-sparse vegetation occur in prairie dog towns and steep hillsides. The majority of sagebrush stands are sparse but moderately dense stands exist on the slopes above Badger Creek and along ridges throughout the northern and eastern portions of the project area. Sagebrush height ranges from 12-36 inches. Trees existing in the project area are juniper and ponderosa, with box elder and cottonwoods existing in drainages. Current land uses within the project area include CBNG development, livestock grazing, elk ranching, crop and hay production.

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

A habitat assessment and wildlife inventory surveys were performed by Thunderbird-Jones & Stokes. Thunderbird-Jones & Stokes (Jones & Stokes, ICF Jones and Stokes) performed surveys for bald eagles, mountain plover, sharp-tailed grouse, greater sage-grouse, raptor nests, and prairie dog colonies according to Powder River Basin Interagency Working Group (PRBIWG) accepted protocol in 2006, 2007 and 2008. A survey was conducted for Ute ladies'-tresses orchid in 2005 by BKS Environmental Associates, Inc. PRB IWG accepted protocol is available on the CBM Clearinghouse website (www.cbmclearinghouse.info).

A BLM biologist conducted a field visit on April 15, 2008. During this time, the biologist reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project modification recommendations where wildlife issues arose.

Wildlife species common to the habitat types present are identified in the PRB FEIS (pg. 3-114). Species that have been identified in the project area or that have been noted as being of special importance are described below.

3.3.1. Big Game

Big game species expected to be within the Peterson 29 Extension Project area include pronghorn antelope, mule deer, white-tailed deer, and elk. Elk sign was abundant throughout the POD. One mule deer antler shed was observed in NESW Section 23. Very little other deer or pronghorn sign was observed during the on-site inspection. The WGFD has determined that the project area contains yearlong range for pronghorn antelope and white-tailed deer and winter yearlong range for mule deer. Elk

within the project area are likely from the herd managed by the Padlock Ranch. The WGFD is not managing for an elk population in this area.

Winter-Yearlong use is when a population or a portion of a population of animals makes general use of the documented suitable habitat sites within this range on a year-round basis. During the winter months there is a significant influx of additional animals into the area from other seasonal ranges. Yearlong use is when a population of animals makes general use of suitable documented habitat sites within the range on a year round basis. Animals may leave the area under severe conditions.

Populations of pronghorn antelope, mule deer, and white-tailed deer within their respective hunt areas are above WGFD objectives. Elk are being raised by the landowner. Big game range maps are available in the PRB FEIS (3-119-143), the project file, and from the WGFD.

3.3.2. Aquatics

The project area is drained by Badger Creek, which is an ephemeral to intermittent tributary to the Tongue River. Within the project area, all tributaries to Badger Creek are ephemeral, flowing only in response to precipitation events and snow melt.

Fish that have been identified in the Upper Tongue River are listed in the PRB FEIS (3-156-159).

3.3.3. Migratory Birds

A wide variety of migratory birds may be found in the proposed project area at some point throughout the year. Migratory birds are those that migrate for the purpose of breeding and foraging at some point in the calendar year. Many species that are of high management concern use shrub-steppe and short grass prairie areas for their primary breeding habitats (Saab and Rich 1997). Migratory bird species of management concern that may occur in the project area are listed in the PRB FEIS (3-151).

3.3.4. Raptors

Raptors species expected to occur in suitable habitats within the Powder River Basin include northern harrier, golden eagle, red-tailed hawk, Swanson's hawk, ferruginous hawk, American kestrel, prairie falcon, short-eared owl, great horned owl, bald eagle, rough-legged hawk, Merlin, Cooper's hawk, northern goshawk, long-eared owl, and burrowing owl. Species observed by Thunderbird-Jones & Stokes and BLM biologists included; American Kestrel, Coopers hawk, red-tail hawk, Swanson's hawk, northern harrier, golden eagle, turkey vulture, burrowing owl, and great-horned owl. Most raptor species nest in a variety of habitats including but not limited to; native and non-native grasslands, agricultural lands, live and dead trees, cliff faces, rocky outcrops, and tree cavities.

Eight raptor nest sites were identified by Thunderbird-Jones & Stokes (2006) and BLM within 0.5 mile of the project area, of these, one nest were active in 2008.

Table 4. Documented raptor nests within the Peterson 29 Extension project area in 2008.

BLM ID#	SPECIES	UTM (NAD 83)	LEGAL LOCATION	SUBSTRATE	CONDITION	STATUS
4301	Unknown raptor	364703E 4983018N	NE SW Sec. 23 T58N, R82W	Juniper, dead	Gone	Gone
4302	American kestrel	366354E 4983044N	NE SW Sec. 24 T58N, R82W	Ponderosa, dead	Unknown	Inactive
4303	Golden eagle	365302E 4982097N	NW NE Sec. 26 T58N, R82W	Ponderosa	Gone	Gone
4304	Unknown raptor	363215E 4980453N	NE NW Sec. 34 T58N, R82W	Box elder, dead	Poor	Inactive

BLM ID#	SPECIES	UTM (NAD 83)	LEGAL LOCATION	SUBSTRATE	CONDITION	STATUS
4305	Great-horned owl/red-tailed hawk*	363362E 4979959N	SE NW Sec. 34 T58N, R82W	Box elder, live	Good	Active, Incubating
4306	Red-tailed hawk	363367E 4979929N	SE NW Sec. 34 T58N, R82W	Cottonwood, live	Gone	Gone

***= nesting species in 2008**

3.3.5. Threatened and Endangered and Sensitive Species

3.3.5.1. Threatened and Endangered Species

Within the BLM Buffalo Field Office there are two species that are Threatened or Endangered under the Endangered Species Act.

3.3.5.1.1. Black-footed ferret

The USFWS listed the black-footed ferret as Endangered on March 11, 1967. 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).

This nocturnal predator is closely associated with prairie dogs, depending almost entirely upon them for its food. The ferret also uses old prairie dog burrows for dens. Current science indicates that a black-footed ferret population requires at least 1000 acres of black-tailed prairie dog colonies for survival (USFWS 1989).

The WGFD believes the combined effects of poisoning and Sylvatic plague on black-tailed prairie dogs have greatly reduced the likelihood of a black-footed ferret population persisting east of the Big Horn Mountains (Grenier 2003). The U.S. Fish and Wildlife Service has also concluded that black-tailed prairie dog colonies within Wyoming are unlikely to be inhabited by black-footed ferrets (Kelly 2004).

Ten black-tailed prairie dog colonies were identified during site visits by Thunderbird-Jones & Stokes within the project area totaling 73.9 acres. Five of the colonies were reported as occupied and four were unoccupied. All of the colonies are within approximately two miles of each other. The location and status of the colonies are listed in Table 5. The project area is located approximately ten miles from the Sheridan complex, the nearest potential reintroduction area. Black-footed ferret habitat is not present within the Peterson 29 Extension project area.

Table 5. Locations and Acreages (2007) of ten black-tailed prairie dog colonies in the Peterson 29 Extension POD. All in T58N R82W.

LOCATION	ACRES	ACTIVE
NW SW SW 21	0.1	Yes
NE SW SW 21	0.2	No
SE SW SW 21	0.5	Yes
Eastern SW 21	12.6	Yes
South-central 22	51.0	Yes
NE NW 27	0.6	No
Central 27	5.4	Yes

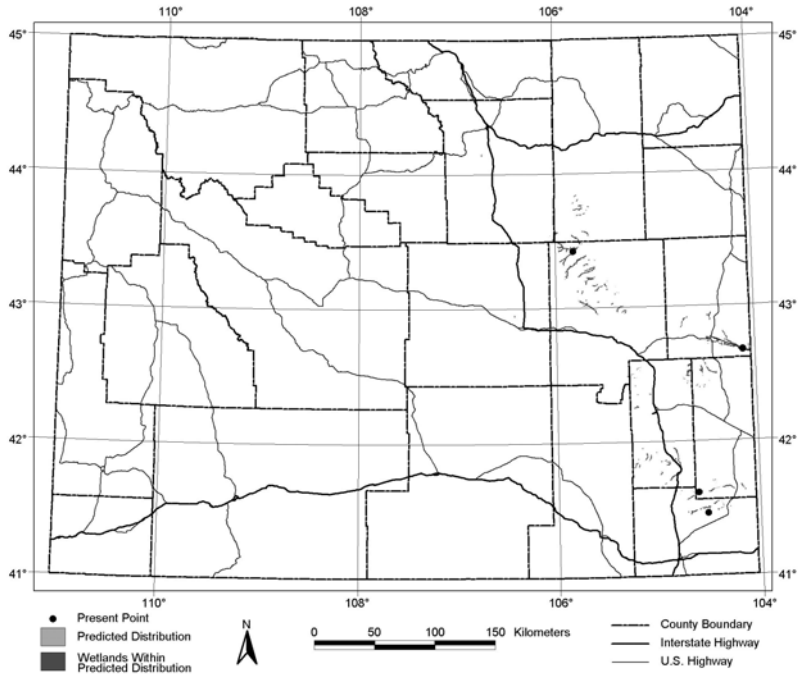
SW 27	2.7	No
NE SW SW 27	<0.1	No
SW SE SW 27	0.7	No

During the 2008 wildlife survey conducted for prairie dogs, only three of the above colonies totaling 26.6 acres remain active (ICF Jones & Stokes 2008).

3.3.5.1.2. Ute Ladies'-Tresses Orchid

This orchid is listed as Threatened under the Endangered Species Act. It is extremely rare and occurs in moist, sub-irrigated or seasonally flooded soils at elevations between 1,780 and 6,800 feet above sea level. Habitat includes wet meadows, abandoned stream channels, valley bottoms, gravel bars, and near lakes or perennial streams that become inundated during large precipitation events. Wyoming Natural Diversity Database model predicts undocumented populations may be present particularly within southern Campbell and northern Converse Counties.

Figure 1. Predicted Distribution of Ute ladies'-tresses in Wyoming



Prior to 2005, only four orchid populations had been documented within Wyoming. Five additional sites were located in 2005 and one in 2006 (Heidel pers. Comm.). The new locations were in the same drainages as the original populations, with two on the same tributary and within a few miles of an original location. Drainages with documented orchid populations include Antelope Creek in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County. In Wyoming, *Spiranthes diluvialis* blooms from early August to early September, with fruits produced in mid August to September (Fertig 2000).

Badger Creek and its tributaries are ephemeral. A survey for *S. diluvialis* was conducted by BKS Environmental Associates, Inc. (2005) in the project area. The survey failed to find orchids and concluded that the hydrology and soils were not favorable to support orchid populations. Suitable orchid habitat is not present within the Peterson 29 Extension.

3.3.5.2. Sensitive Species

The USDI Bureau of Land Management (BLM) Wyoming has prepared a list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate. Two habitat types, prairie dog colonies and sagebrush ecosystems, specifically, are the most common among habitat types within the Powder River Basin and contain habitat components required in the life cycle of several sensitive species. These are described below in general terms. Those species within the Powder River Basin that were once listed or candidates for listing under the Endangered Species Act of 1973 and remain BLM Wyoming sensitive species are described in more detail. The authority for this policy and guidance comes from the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and the Department Manual 235.1.1A.

3.3.5.2.1. Prairie dog colony obligates

Prairie dog colonies create habitat for many species of wildlife (King 1955, Reading et al. 1989). Agnew (1986) found that bird species diversity and rodent abundance were higher on prairie dog towns than on mixed grass prairie sites. Several studies (Agnew 1986, Clark 1982, Campbell and Clark 1981 and Reading et al. 1989) suggest that species richness increases with colony size and regional colony density. Prairie dog colonies attract many insectivorous and carnivorous birds and mammals because of the concentration of prey species (Clark 1982, Agnew 1986, Agnew 1988).

In South Dakota, forty percent of the wildlife taxa (134 vertebrate species) are associated with prairie dog colonies (Agnew 1983, Apa 1985, McCracken et al. 1985, Agnew 1986, Uresk and Sharps 1986, Deisch et al. 1989). Of those species regularly associated with prairie dog colonies, six are on the Wyoming BLM sensitive species list: swift fox (*Vulpes velox*), mountain plover (*Charadrius montanus*), ferruginous hawk (*Buteo regalis*), burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus*), and long-billed curlew (*Numenius americanus*). Burrowing owls were the only prairie dog obligate species reported by Thunderbird-Jones & Stokes to be present in the project area.

3.3.5.2.2. Sagebrush obligates

Sagebrush ecosystems support a variety of species. Sagebrush obligates are animals that cannot survive without sagebrush and its associated perennial grasses and forbs; in other words, species requiring sagebrush for some part of their life cycle. Sagebrush obligates within the Powder River Basin, listed as sensitive species by BLM Wyoming include greater sage-grouse, Brewer's sparrow, sage thrasher, and sage sparrow. Sage sparrows, Brewer's sparrows, and sage thrashers all require sagebrush for nesting, with nests typically located within or under the sagebrush canopy. Sage thrashers usually nest in tall dense clumps of sagebrush within areas having some bare ground for foraging. Sage sparrows prefer large continuous stands of sagebrush, and Brewer's sparrows are associated closely with sagebrush habitats having abundant scattered shrubs and short grass (Paige and Ritter 1999). Other sagebrush obligate species include sagebrush vole and pronghorn antelope. Species observed by Thunderbird-Jones & Stokes and during the onsite visit included Brewer's sparrow, and pronghorn.

3.3.5.2.3. Bald eagle

On February 14, 1978, the bald eagle was federally listed as Endangered. On August 8, 2007, the bald eagle was removed from the Endangered Species list. The bald eagle remains under the protection of the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. In order to avoid violation of these laws and uphold the BLM's commitment to avoid any future listing of this species, all conservation measures and terms and conditions identified in the Powder River Basin Oil and Gas Project Biological Opinion (WY07F0075) (USFWS 2007) shall continue to be complied with.

Bald eagle nesting habitat is generally found in areas that support large mature trees. Eagles typically will build their nests in the crown of mature trees that are close to a reliable prey source. This species feeds

primarily on fish, waterfowl, and carrion. In more arid environments, such as the Powder River Basin, prairie dogs, ground squirrels, and lagomorphs (hares and rabbits) can make up the primary prey base. The diets of wintering bald eagles are often more varied. In addition to prairie dogs, ground squirrels, and lagomorphs, carcasses of domestic sheep and big game may provide a significant food source in some areas. Historically, sheep carcasses from large domestic sheep ranches provided a reliable winter food source within the Powder River Basin (Patterson and Anderson 1985). Today, few large sheep operations remain in the Powder River Basin. Wintering bald eagles may congregate in roosting areas generally made up of several large trees clumped together in stands of large ponderosa pine, along wooded riparian corridors, or in isolated groups. Bald eagles often share these roost sites with golden eagles as well.

Surveys conducted by Thunderbird-Jones & Stokes in 2005, 2006, 2007 and 2008 found no bald eagle nests or winter roosts within one mile of the project area. Furthermore, it was determined that no quality nesting or roosting habitat was present within the immediate project area or within one mile from proposed activities as trees are scarce.

3.3.5.2.4. Black-tailed prairie dog

The black-tailed prairie dog was added to the list of Candidate species for federal listing on February 4, 2000 (USFWS 2000). On August 12, 2004, the U.S. Fish and Wildlife Service removed the black-tailed prairie dog's Candidate status. BLM Wyoming considers prairie dogs as a sensitive species and continues to afford this species the protections described in the PRB FEIS. The black-tailed prairie dog is a diurnal rodent inhabiting prairie and desert grasslands of the Great Plains.

Due to human-caused factors, black-tailed prairie dog populations are now highly fragmented, and isolated (Miller 1994). Most colonies are small and subject to potential extirpation due to inbreeding, population fluctuations, and other problems, such as landowner poisoning and disease, which affect long term population viability (Primack 1993, Meffe and Carroll 1994, Noss and Cooperrider 1994).

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 Digital Ortho Quads indicated that black-tailed prairie dog acreage remained stable from 1994 through 2001. However, aerial surveys conducted in 2003 to determine the status of known colonies indicated that a significant portion (approximately 47%) of the prairie dog acreage was impacted by Sylvatic plague and/or control efforts (Grenier 2004).

Ten black-tailed prairie dog colonies, totaling approximately 73.9 acres were identified during site visits by Thunderbird-Jones & Stokes within the project area in 2007. Five of the colonies were reported as occupied and five were unoccupied. All of the colonies are within approximately two miles of each other. The 2008 wildlife survey reported that only three of these colonies totaling 26.6 acres remained active. The location and status of the colonies are listed in Table 5.

3.3.5.2.5. Burrowing owl

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

The western burrowing owl has declined significantly throughout its North American range. Current population estimates for the United States are not well known but trend data suggest significant declines (McDonald et al. 2004). The last official population estimate placed them at less than 10,000 breeding pairs. The majority of the states within the owl's range have recognized that western burrowing owl

populations are declining. It is listed as a sensitive species by the BLM throughout the west and by the USDAFS. Primary threats across the North American range of the burrowing owl are habitat loss and fragmentation primarily due to intensive agricultural and urban development, and habitat degradation due to declines in populations of colonial burrowing mammals (Klute et al. 2003).

Burrowing owl nesting habitat consists of open areas with mammal burrows. Individual burrowing owls have moderate to high site fidelity to breeding areas and even to particular nest burrows (Klute et al. 2003). Burrow and nest sites are reused at a higher rate if the bird has reproduced successfully during the previous year. Favored nest burrows are those in relatively sandy sites (possibly for ease of modification and drainage), areas with low vegetation around the burrows (to facilitate the owl's view and hunting success), holes at the bottom of vertical cuts with a slight downward slope from the entrance, and slightly elevated locations. In Wyoming, egg laying begins in mid-April. Incubation is assumed to begin at the mid-point of the laying period and lasts for 26 days (Olenick 1990). Young permanently leave the primary nest burrow around 44 days from hatch (Landry 1979). Juveniles will continue to hunt with and associate with parents until migration (early September through early November) (Haug 1985).

The BLM BFO databases and the survey information provided by Thunderbird-Jones & Stokes indicate burrowing owl nests at two locations within the project area or within 0.25 mile of the Peterson 29 Extension project area in 2008 (Table 6). One nest was gone, being destroyed by reservoir construction, and one was inactive in 2008.

Table 6. Documented burrowing owl nests within the Peterson 29 Ext. project area in 2008.

BLM ID#	SPECIES	UTM (NAD 83)	LEGAL LOCATION	SUBSTRATE	CONDITION	STATUS
5380	Burrowing owl	363212E 4981521N	NE SW Sec. 27 T58N, R82W	Prairie dog burrow	Unknown	Inactive
5381	Burrowing owl	362935E 44980998N	SW SW Sec. 27 T58N, R82W	Prairie dog burrow	Gone	Gone

3.3.5.2.6. Grouse

3.3.5.2.6.1. Greater sage-grouse

The Greater sage-grouse is listed as a sensitive species by BLM (Wyoming). In recent years, several petitions have been submitted to the USFWS to list greater sage-grouse as Threatened or Endangered. On January 12th, 2005, the USFWS issued a decision that the listing of the greater sage-grouse was "not warranted" following a Status Review. The decision document supporting this outcome noted the need to continue or expand all conservation efforts to conserve sage-grouse. A judge in Idaho ordered the USFWS to conduct a new Status Review as a result of a lawsuit and questions surrounding the 2005 review (Winmill Decision Case No. CV-06-277-E-BLW, December 2007).

Greater sage-grouse are found in prairie, sagebrush shrublands, other shrublands, wet meadows, and agricultural areas; they depend upon substantial sagebrush stands for nesting and winter survival (BLM 2003).

Suitable sage-grouse habitat is present within the project area. Limited areas of moderately dense sagebrush in northern portions of the area including Sections 21 and 22 and southwestern Section 34 could provide suitable nesting and wintering habitat. Moist draws along Badger Creek could provide brood rearing and late summer habitat. No sage-grouse or sage-grouse sign were observed on the project area during surveys or the on-site inspection BLM records identified one sage-grouse lek within 3 miles of the Peterson 29 Extension POD. The site is the PPL lek which is in SE SW Section 30, T58, R82W,

1.6 miles southwest of the project area. The lek was active in 2007. Surveys conducted by ICF Jones & Stokes in 2008 for grouse occurrence were negative.

Sharp-tailed grouse

Sharp-tailed grouse inhabit short and mixed-grass prairie, sagebrush shrublands, woodland edges, and river canyons. In Wyoming, this species is found where grasslands are intermixed with shrublands, especially wooded draws, shrubby riparian area, and wet meadows.

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The Peterson 29 Extension project area has the potential to support sharp-tailed grouse during most of the year. The mosaic of grasslands and sagebrush-grasslands could provide habitat from April through October. Cottonwoods and junipers could provide buds and berries, respectively, to sustain grouse through the winter. The only sharp-tailed grouse or sign observed were the remains of a sharp-tailed grouse found on a road by Thunderbird-Jones & Stokes surveyors in July 2007. Surveys conducted by ICF Jones & Stokes in 2008 for grouse occurrence were negative. The nearest known sharp-tailed grouse lek (Little Badger) is 1.9 miles southwest of the project boundary.

3.3.5.2.7. Mountain plover

The mountain plover was proposed for listing in 1999 (USFWS). In **2003**, the **USFWS** withdrew a proposal to list the Mountain Plover as a **Threatened species**, stating that the population was larger than had been thought and was no longer declining. Mountain plovers, which are a BLM sensitive species, are typically associated with high, dry, short grass prairies (BLM 2003). Mountain plover nesting habitat is often associated with heavily grazed areas such as prairie dog colonies and livestock pastures.

Very little suitable habitat for mountain plovers exists within the project area. Because of the steep terrain and density of vegetation, it is unlikely that mountain plovers would use the area.

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 3.4 Historical West Nile Virus Information

Year	Total WY	Human Cases	Veterinary Cases	Bird Cases

	Human Cases	PRB	PRB	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

*Wyoming Department of Health Records September 12, 2007.

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 Tongue River Watershed. The POD lies entirely within the Badger Creek watershed, and is physically less than 5 stream miles from its confluence with the Tongue River.

3.5.1. Groundwater

Wyoming Department of Environmental Quality (WDEQ) water quality parameters for groundwater classifications (Chapter 8 – Quality Standards for Wyoming Groundwater) define the following limits for Total Dissolved Solids (TDS) and the classes of groundwater; 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).

The PRB EIS Record of Decision 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 related to groundwater, the plan identified the following (PRB EIS ROD page E-4):

- The effects of infiltrating waters on the water quality of existing shallow groundwater aquifers are not well documented at this time
- Potential impacts will be highly variable depending upon local geologic and hydrologic conditions
- It may be necessary to conduct investigations at representative sites around the basin to quantify these impacts
- Provide site specific guidance on the placement and design of CBNG impoundments
- Shallow groundwater wells would be installed and monitored where necessary

As stated in the MMRP, an Interagency Working Group has been established to implement an adaptive management approach. BLM is working with the WDEQ and the Interagency Working Group regarding the monitoring information being collected and assessed to determine if changes in mitigation are warranted.

The BLM installed shallow groundwater monitoring wells at five impoundment locations throughout the PRB to assess ground-water quality changes due to infiltration of CBNG produced water. The most intensively monitored site had a battery of nineteen wells which were installed and monitored jointly by the BLM and USGS starting in August of 2003. Water quality data has been sampled from these wells on a regular basis. That impoundment site, which has since been reclaimed, lies atop approximately 30 feet of unconsolidated deposits (silts and sands) which overlie non-uniform bedrock on a side ephemeral tributary to Beaver Creek and is approximately one and one-half miles from the Powder River. Baseline investigations showed water in two sand zones, the first was at a depth of 55 feet and the second was at a depth of 110 feet. The two water bearing zones were separated by a fifty-foot thick shale layer. The water quality of the two water bearing zones fell in the WDEQ Class III and Class I classifications respectively. Preliminary results from this sampling indicated increasing levels of TDS and other inorganic constituents over a six month period resulting in changes from the initial WDEQ classifications.

The on-going shallow groundwater impoundment monitoring at four other impoundment locations are less intensive and consist of batteries of between 4 and 6 wells. Preliminary data from two of these other

sites also are showing an increasing TDS level as water infiltrates while two other sites are not.

The WDEQ implemented requirements for monitoring shallow groundwater of Class III or better quality under unlined CBNG water impoundments effective August 1, 2004. The intent is to identify locations where the impoundment of water could potentially degrade any existing shallow groundwater aquifers. These investigations are conducted where discharged water will be detained in existing or proposed impoundments. If shallow groundwater is detected and the water quality is determined to fall within the Class III or better class of use (WDEQ Chapter 8 classifications for livestock use), operators are required to install batteries of 1 to 3 wells, develop a monitoring plan and monitor water levels and quality. The results of these investigations have yet to be analyzed and interpreted. The WDEQ also permits the use of SDI (subsurface drip irrigation) systems under their UIC (Underground Injection Control) program.

A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 18 registered stock and domestic water wells within 1 mile of the POD with depths ranging from 60 to 950 feet. For additional information on water, please refer to the PRB FEIS (January 2003), Chapter 3, Affected Environment pages 3-1 through 3-36 (groundwater).

3.5.2. Surface Water

The project area is within the Badger Creek drainage which is a tributary to the Upper Tongue River. Badger Creek itself is 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). All other drainages in the project area are ephemeral, grading rapidly from steep gully systems to gentler swales as they approach their confluences with Badger Creek.

The PRB FEIS presents the historic mean Electrical Conductivity (EC, in µmhos/cm) and Sodium Adsorption Ratio (SAR) by watershed at selected United States Geological Survey (USGS) Gauging Stations in Table 3-11 (PRB FEIS page 3-49). These water quality parameters "…illustrate the variability in ambient EC and SAR in streams within the Project Area. The representative stream water quality is used in the impact analysis presented in Chapter 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM produced water of varying chemical composition to surface drainages within the Project Area" (PRB FEIS page 3-48). For the Upper Tongue River, the EC ranges from 318 µmhos/cm at Maximum monthly flow to 731 µmhos/cm at Low monthly flow and the SAR ranges from 0.36 at Maximum monthly flow to 0.86 at Low monthly flow. These values were determined at the USGS station located on the Tongue River near Decker, Wyoming (PRB FEIS page 3-49).

The operator has stated that no natural springs were found within the POD boundary. However, on the date of the onsite, it was clear that the draw downstream of the R11-22 dam, located in the NESW portion of section 22, T58N, R82W, has had flow from seeps for a long time prior to construction of the dam. This was confirmed by Brian MacCarty and Scott Alexander, NX Bar Ranch personnel. The amount of flow and quality from this wet area may have changed due to the construction of the R11-22 dam.

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

3.6. Cultural Resources

Class III cultural resource inventories were conducted for the Peterson 29 Ext project prior to on-the-ground project work (BFO #70080029). Foothills Archaeological Consultants conducted a Class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (48CFR190) for the project. Wendy Sutton, BLM Archaeologist,

reviewed the report for technical adequacy and compliance with Bureau of Land Management (BLM) Standards, and determined it to be adequate. No cultural resources have been recorded in or near the area of potential effect. One area within the POD was identified within the report and by the BLM archaeologist as having poor visibility during inventory and potential for buried deposits (13-23 well location). There are no eligible sites with the APE of the proposed project. Following the Wyoming State Protocol Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 7/21/2008 that no historic properties exist within the APE (DBU_WY_2008_1636).

3.7. Other Mineral Resources

There are no other mineral resources that will be adversely impacted by the proposal.

4. ENVIRONMENTAL CONSEQUENCES

The changes to the proposed action (Alternative B) resulted in development of Alternative C as the preferred alternative. The changes have reduced impacts to the environment which will result from this action. The environmental consequences of Alternative C are described below.

4.1. Vegetation & Soils Direct and Indirect Effects

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the 13 proposed well locations, 5 can be drilled without a well pad being constructed and 8 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the (5) wells without constructed pads would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (estimated approximate size of 15 x 15 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 5 wells would involve approximately 0.3 acre/well for 1.5 total acres. The other 8 wells requiring cut & fill pad construction would disturb on the average 0.7 acres/well pad for a total of 5.6 acres. The total estimated disturbance for all 13 wells would be 7.3 acres. In addition 4 staging areas will need to be utilized for this project. These areas are used to store materials such as pipe, culverts, wires etc that will be used in the project area. Staging areas are sometimes also used to fuse the pipe together in various lengths prior to installation into the trenches. The staging areas would encompass an area approximately 50 x 100 feet. The total estimated surface disturbance for the 4 staging areas would be 0.5 acres.

No new improved roads would be constructed to provide access to various well locations. Approximately 0.5 miles of new and existing two-track trails would be utilized to access well sites. The majority of proposed pipelines (gas and water) have been located in "disturbance corridors." Disturbance corridors involve the combining of 2 or more utility lines (water, gas, power) in a common trench, usually along access routes. Approximately 4.8 miles of disturbance corridor would be constructed along existing improved roads. This practice results in less surface disturbance and overall environmental impacts. Approximately 0.7 miles of pipeline would be constructed outside of corridors. Expedient reclamation of disturbed land with stockpiled topsoil, proper seedbed preparation techniques, and appropriate seed mixes, along with utilization of erosion control measures (e.g., waterbars, water wings, culverts, rip-rap, etc.) would ensure land productivity/stability is regained and maximized.

The access road to the Chase Farms 5-23-58-82MZ/CR and 3-23-58-82MZ/CR required an engineered design. The existing primitive road will not meet Pennaco's current and future needs as the road is a bench cut road with no drainage control structures in place. According to the surface owner the road has failed at least twice in the past 12 months. The surface owner also desires a new road to aid in accessing that portion of the ranch year round. Pennaco is potentially looking toward directional drilling in the future in order to access portions of the leasehold that currently have no viable means of road or pipeline

access. The new road would meet these future needs for the bigger equipment and increased traffic. Due to the soils having limited reclamation potential and the amount of surface disturbance that will be required, the new road would be a permanent road at the surface owner wishes and the old existing primitive road will be reclaimed. This would entail 0.5 miles of new road being built and 0.5 miles of existing road to be reclaimed. In addition the operator will be required as COA to have the access road and well pads 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.

Proposed stream crossings, including culverts and fords (low water crossings) are shown on the MSUP and the WMP maps (see the POD). These structures would be constructed in accordance with sound, engineering practices and BLM standards.

The PRB FEIS made predictions regarding the potential impact of produced water to the various soil types found throughout the Basin, in addition to physical disturbance effects. "Government soil experts state that SAR values of 13 or more cause potentially irreversible changes to soil structure, especially in clayey soil types, that reduce permeability for infiltration of rainfall and surface water flows, restrict root growth, limit permeability of gases and moisture, and make tillage difficult." (PRB FEIS page 4-144).

Table 4.1 summarizes the proposed surface disturbance.

Table 4.1 - SUMMARY OF DISTURBANCE

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Nonconstructed Pad	5	0.3/acre	1.5	Long Term
Constructed Pad	8	or Site Specific	5.8	
Gather/Metering Facilities	0	Site Specific	0	Long Term
Screw Compressors	0	Site Specific	0	Long Term
Monitor Wells	0	0.1/acre	0	Long Term
Impoundments				Long Term
On-channel	2	Site Specific	6.0	
Off-channel	0	Site Specific	0.0	
Water Discharge Points	2	Site Specific or 0.01 ac/WDP	0.5	
Channel Disturbance				
Headcut Mitigation*		Site Specific	0.0	
Channel Modification		Site Specific	0.0	
Improved Roads				Long Term
No Corridor	0	50' Width or Site Specific		
With Corridor	4.8		29.0	
2-Track Roads		12' Width or Site Specific		Long Term
No Corridor	0			
With Corridor	0.5	28' Width or Site	1.8	

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
		Specific		
Pipelines No Corridor With Corridor	 0.3	 25' Width or Site Specific	 1.0	Short Term
Buried Power Cable No Corridor	 0.4	15' Width or Site Specific	 0.8	Short Term
Overhead Powerlines	0	15' Width	0	Long Term
Additional Disturbance	4 staging areas	Site Specific	0.5	Short Term

The designation of the duration of disturbance is defined in the PRB FEIS (pg 4-1 and 4-151). "For this EIS, short-term effects are defined as occurring during the construction and drilling/completion phases. Long-term effects are caused by construction and operations that would remain longer".

4.1.1. Wetland/Riparian

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). "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 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).

If the R11-22 dam continues to seep, flows into this wet area will continue to increase until the dam fails. Re-surfacing water from the impoundments in this POD would potentially bring salt and other undesirable minerals to the surface, which would kill non-salt tolerant vegetation in the channels downstream.

4.1.2. Invasive Species

Based on the investigations performed during the POD planning process, the operator has committed to the control of noxious weeds and species of concern using the following measures in an Integrated Pest Management Plan (IPMP) included in the proposal:

1. Means to identify the presence of noxious weeds prior to any CBM related activity.
2. Control Methods, including frequency
3. Preventive practices
4. Education

Cheatgrass or downy brome (*Bromus tectorum*) and to a lesser extent, Japanese brome (*B. japonicus*) are known to exist in the affected environment. These two species are found in such high densities and numerous locations throughout NE Wyoming that a control program is not considered feasible at this time.

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. 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 salt cedar, Canada thistle and perennial pepperweed. However, mitigation as required by BLM applied COAs will reduce potential impacts from noxious weeds and invasive plants.

4.1.3. Cumulative Effects

The PRB FEIS stated that cumulative impacts to soils could occur due to sedimentation from water erosion that could change water quality and fluvial characteristics of streams and rivers in the sub-watersheds of the Project Area. SAR in water in the sub-watersheds could be altered by saline soils because disturbed soils with a conductivity of 16 mmhos/cm could release as much as 0.8 tons/acre/year of sodium (BLM 1999c). Soils in floodplains and streambeds may also be affected by produced water high in SAR and TDS. (PRB FEIS page 4-151).

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

- They are proportional to the actual amount of cumulatively produced water in the Tongue River drainage and the total amount that was predicted in the PRB FEIS, which is approximately 51% of that total (see section 4.4.2.1).
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
- The commitment by the operator to monitor the volume of water flowing into Badger Creek and to prevent significant volumes of water from flowing into the Upper Tongue River Watershed.
- The WMP for the Peterson 29 Ext proposes that produced water will not contribute significantly to flows downstream.

No additional mitigation measures are required.

4.2. Wildlife (Alternative C – Environmentally Preferred)

EFFECTS ANALYSIS

During the environmental analysis process, the BLM identified project modifications resulting in an environmentally preferred alternative (Alternative C). At the on-sites, all areas of proposed surface disturbance were inspected to ensure that potential impacts to natural resources would be reduced. In some cases, access roads were re-routed, and well locations, pipelines, discharge points and other water management control structures were moved, modified, mitigated or dropped from further consideration to alleviate or minimize environmental impacts.

4.2.1. Big Game Direct and Indirect Effects

Under the environmentally preferred alternative, Winter-Yearlong and Yearlong range for pronghorn antelope and mule deer would be directly disturbed with the construction of wells, reservoirs, pipelines and roads. Table 4.1 summarized the proposed activities; items identified as long term disturbance would be direct habitat loss. Short-term disturbances also result in direct habitat loss; however, they should provide some habitat value as these areas are reclaimed and native vegetation becomes established.

In addition to the direct habitat loss, big game would likely be displaced from the project area during drilling and construction. A study in central Wyoming reported that mineral drilling activities displaced mule deer by more than 0.5 miles (Hiatt and Baker 1981). The WGFD indicates a well density of eight wells per section creates a high level of impact for big game and that avoidance zones around mineral facilities overlap creating contiguous avoidance areas (WGFD 2004). A multi-year study on the Pinedale Anticline suggests not only do mule deer avoid mineral activities, but after three years of drilling activity the deer have not become accustomed to the disturbance (Madson 2005).

Big game animals are expected to return to the project area following construction; however, populations will likely be lower than prior to project implementation as the human activities associated with operation and maintenance continue to displace big game. Mule deer are more sensitive to operation and maintenance activities than pronghorn, and, as the Pinedale Anticline study suggests, mule deer do not readily habituate. A study in North Dakota stated "Although the population (mule deer) had over seven years to habituate to oil and gas activities, avoidance of roads and facilities was determined to be long term and chronic" (Lustig 2003). Deer have even been documented to avoid dirt roads that were used only by 4-wheel drive vehicles, trail bikes, and hikers (Jalkotzy et al. 1997).

Winter big game diets are sub-maintenance, meaning they lose weight and body condition as the winter progresses. Survival below the maintenance level requires behavior that emphasizes energy conservation. Canfield et al. (1999) pointed out that forced activity caused by human disturbance exacts an energetic disadvantage, while inactivity provides an energetic advantage for animals. Geist (1978) further defined effects of human disturbance in terms of increased metabolism, which could result in illness, decreased reproduction, and even death.

Reclamation activities that occur within big game habitats during the spring will likely displace does and fawns due to the human presence in the area. This may cause reduced survival rate of does and fawns that must expend increased energies to avoid such activities.

4.2.1.1. Big Game 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, page 4-211.

4.2.2. Aquatics Direct and Indirect Effects

Produced water is to be discharged to two existing outfalls and a subsurface drip irrigation SDI system. If a reservoir were to discharge, there is potential that the produced water could reach the Tongue River, and that downstream species could be affected.

4.2.2.1. Aquatics 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, page 4-247. No additional mitigation measures are required.

4.2.3. Migratory Birds Direct and Indirect Effects

Disturbance of the habitat types within the project area is likely to impact migratory birds. Native habitats are being lost directly with the construction of wells, roads, and pipelines. Prompt re-vegetation of short-term disturbance areas should reduce habitat loss impacts. Human activities will likely displace migratory birds farther than simply the physical habitat disturbance. Drilling and construction noise can be troublesome for songbirds by interfering with the males' ability to attract mates and defend territory, and the ability to recognize calls from conspecifics (BLM 2003).

Habitat fragmentation results in more than just a quantitative loss in the total area of habitat available; the remaining habitat area is also qualitatively altered (Temple and Wilcox 1986). Ingelfinger (2004) identified that the density of breeding Brewer's sparrows declined by 36% and breeding sage sparrows declined by 57% within 100 m of dirt roads within a natural gas field. Effects occurred along roads with light traffic volume (<12 vehicles per day). The increasing density of roads constructed in developing natural gas fields exacerbated the problem creating substantial areas of impact where indirect habitat losses (displacement) were much greater than the direct physical habitat losses.

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

Migratory bird species within the Powder River Basin nest in the spring and early summer and are vulnerable to the same affects as sage-grouse and raptor species. Though no timing restrictions are typically applied specifically to protect migratory bird breeding or nesting, where sage-grouse or raptor nesting timing limitations are applied, nesting migratory birds are also protected. Where these timing limitations are not applied and migratory bird species are nesting, migratory birds remain vulnerable. Additional direct and indirect effects to migratory birds are discussed in the PRB FEIS (4-231-235).

4.2.3.1. Migratory Birds 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, Page 4-235. No additional mitigation measures are required.

4.2.4. Raptors Direct and Indirect Effects

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

To reduce the risk of decreased productivity or nest failure, the BLM BFO requires a one-half mile radius timing limitation during the breeding season around active raptor nests and recommends all infrastructure requiring human visitation to be located greater than one-quarter mile from occupied raptor nests.

The two of the raptor nests within 0.5 mile of wells or infrastructure are gone. Well #s 3-23, 5-23, 11-23, and 13-23 are within 0.5 mile from raptor nest BLM # 4301 which was an unknown raptor nest in a dead juniper tree that has fallen down. The nest is now gone. Well #s 15-23 and 3-26 are within 0.5 mile of raptor nest BLM# 4303. This nest was in a dead ponderosa pine tree and was used by a golden eagle pair. It has been inactive the past three years. The tree supporting the nest fell this past year. The nest is permanently gone. These sites will not be impacted by CBM development.

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

4.2.4.1. Raptors 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, page 4-221. No additional mitigation measures are required.

4.2.5. Threatened and Endangered and Sensitive Species

Potential project effects on Threatened and Endangered Species were analyzed and a summary is provided in Table 4.2.5.1. Threatened and Endangered Species potentially affected by the proposed project area are further discussed following the table.

4.2.5.1. Threatened and Endangered Species

Table 4.2 Summary of Threatened and Endangered Species Habitat and Project Effects.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Endangered				
Black-footed ferret (*Mustela nigripes*)	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NP	NE	Suitable habitat of insufficient size.
Threatened				
Ute ladies'-tresses orchid (*Spiranthes diluvialis*)	Riparian areas with permanent water	NP	NE	No suitable habitat present.

Presence
K Known, documented observation within project area.
S Habitat suitable and species suspected, to occur within the project area.
NS Habitat suitable but species is not suspected to occur within the project area.
NP Habitat not present and species unlikely to occur within the project area.

Project Effects
LAA Likely to adversely affect
NE No Effect.
NLAA May Affect, not likely to adversely effect individuals or habitat.

4.2.5.1.1. Black-Footed Ferret Direct and Indirect Effects

Because the black-tailed prairie dog colonies within and adjacent to the project area is of insufficient size for supporting ferrets and is isolated from any prairie dog complexes, implementation of the proposed development will have "*no effect*" on the black-footed ferret.

4.2.5.1.2. Ute Ladies'-Tresses Orchid Direct and Indirect Effects

The Ute ladies'-tresses orchid is threatened by energy developments, noxious weeds, and water developments. Prolonged idle conditions in the absence of disturbance (flooding, grazing, and mowing) may be a threat just as repeated mowing and grazing during flowering may lead to decline (Hazlett 1996, 1997, Heidel 2007). Heavy equipment used in energy development construction could dig up plants. Invasive weeds transplanted by vehicle and foot traffic in habitat could out compete this fragile species. Restricting work from areas of Ute ladies'-tresses orchid habitat reduces these impacts.

Reservoir seepage may create suitable habitat if historically ephemeral drainages become perennial, however no historic seed source is present within the project area. Implementation of the proposed coal bed natural gas project will have "*no effect*" on Ute ladies'- tresses orchid as suitable habitat is not present.

4.2.5.2. Sensitive Species Direct and Indirect Effects

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

4.2.5.2.1. Prairie dog colony obligates

Wells, roads, pipelines and other infrastructure associated with energy development constructed within prairie dog colonies will directly remove habitat for prairie dog colony obligate species. Activities that disturb these species could lead to temporary or even long-term or permanent abandonment. Direct loss of species may also occur from vehicle traffic. Continued loss of prairie dog habitat and active prairie dog towns will result in the decline of numerous sensitive species in the short grass prairie ecosystem.

4.2.5.2.2. Sagebrush obligates

Shrubland and grassland birds are declining faster than any other group of species in North America (Knick et al. 2003). In Wyoming, existing oil and gas wells are located primarily in landscapes dominated by sagebrush, causing direct loss of this habitat. Associated road networks, pipelines, and powerline transmission corridors also influence vegetation dynamics by fragmenting habitats or by creating soil conditions facilitating the spread of invasive species (Braun 1998, Gelbard and Belnap 2003). Density of sagebrush-obligate birds within 100 m of roads constructed for natural gas development in Wyoming was 50% lower than at greater distances (Ingelfinger 2001). Increased numbers of corvids and raptors associated with powerlines (Steenhof et al. 1993, Knight and Kawashima 1993, Vander Haegen et al. 2002) increases the potential predation impact on sage-grouse and other sagebrush-breeding birds (Knick et al. 2003)

Fragmentation of shrubsteppe habitat is a major disruption that has consequences for sagebrush-obligate species (Braun et al. 1976; Rotenberry & Wiens 1980a). In fragmented habitats, suitable habitat area remains only as a remnants surrounded by unusable environments (Urban and Shugart 1984; Fahrig & Paloheimo 1988). Populations of sagebrush-obligate species decline because areas of suitable habitat decrease (Temple & Cary 1988), because of lower reproduction, and/or because of higher mortality in remaining habitats (Robinson 1992; Porneluzi et al. 1993). Fragmentation of shrubsteppe has the further potential to affect the conservation of shrub-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 even after habitat reestablishment.

Table 4.3 Summary of Sensitive Species Habitat and Project Effects.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Amphibians				
Northern leopard frog (*Rana pipiens*)	Beaver ponds, permanent water in plains and foothills	S	MIIH	Additional water will affect existing waterways.
Spotted frog (*Ranus pretiosa*)	Ponds, sloughs, small streams	NP	NI	Prairie not mountain habitat.
Birds				
Baird's sparrow (*Ammodramus bairdii*)	Grasslands, weedy fields	S	MIIH	Sagebrush cover will be affected.
Bald eagle (*Haliaeetus leucocephalus*)	Mature forest cover often within one mile of large water body.	S	MIIH	Project includes overhead power.
Brewer's sparrow (*Spizella breweri*)	Basin-prairie shrub	K	MIIH	Sagebrush cover will be affected.
Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	K	MIIH	Prairie dog colony present. and nest documented.
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	NS	MIIH	Sagebrush cover will be affected.
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	K	WIPV	Sagebrush cover will be affected.
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	K	MIIH	Sagebrush cover will be affected.
Long-billed curlew (*Numenius americanus*)	Grasslands, plains, foothills, wet meadows	NP	NI	Habitat not present.
Mountain plover (*Charadrius montanus*)	Short-grass prairie with slopes < 5%	NP	NI	Habitat not present.
Northern goshawk (*Accipiter gentilis*)	Conifer and deciduous forests	NP	NI	No forest habitat present.
Peregrine falcon (*Falco peregrinus*)	cliffs	NP	NI	No nesting habitat present.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	S	MIIH	Reservoirs may provide migratory habitat.
White-faced ibis (*Plegadis chihi*)	Marshes, wet meadows	NP	NI	Permanently wet meadows not present.
Yellow-billed cuckoo (*Coccyzus americanus*)	Open woodlands, streamside willow and alder groves	NP	NI	Streamside habitats not present
Fish				
Yellowstone cutthroat trout (*Oncoryhynchus clarki bouvieri*)	Mountain streams and rivers in Tongue River drainage	S	MIIH	In Tongue River Drainage.
Mammals				
Black-tailed prairie dog (*Cynomys ludovicianus*)	Prairie habitats with deep, firm soils and slopes less than 10 degrees.	K	MIIH	Prairie dog towns will be affected.
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, caves and mines	NP	NI	Habitat not present.
Long-eared myotis (*Myotis evotis*)	Conifer and deciduous forest, caves and mines	NP	NI	Habitat not present.
Spotted bat (*Euderma maculatum*)	Cliffs over perennial water.	NP	NI	Cliffs & perennial water not present.
Swift fox (*Vulpes velox*)	Grasslands	NP	NI	Habitat not present.
Townsend's big-eared bat (*Corynorhinus townsendii*)	Caves and mines.	NP	NI	Habitat not present.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Plants				
Porter's sagebrush (*Artemisia porteri*)	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes 5300-6500 ft.	NP	NI	Habitat not present.
William's wafer parsnip (*Cymopterus williamsii*)	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides, 6000-8300 ft.	NP	NI	Habitat not present.

Presence
K Known, documented observation within project area.
S Habitat suitable and species suspected, to occur within the project area.
NS Habitat suitable but species is not suspected to occur within the project area.
NP Habitat not present and species unlikely to occur within the project area.

Project Effects
NI No Impact.
MIIH May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal listing or a loss of viability to the population or species.
WIPV Will Impact Individuals or Habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.
BI Beneficial Impact

4.2.5.2.1. Bald eagle Direct and Indirect Effects

Based on the raptor nesting and bald eagle winter roost surveys and lack of suitable habitat, it is unlikely bald eagles nest or roost within the Peterson 29 Extension project area. The proposed project should not affect bald eagle nesting or winter roosting.

There are two miles of existing overhead three-phase distribution lines within the project area. The wire spacing is in compliance with the Avian Power Line Interaction Committee's (2006) suggested practices, and with the Service's standards (USFWS 2002); however other features may not be in compliance. No additional overhead power is proposed for the Peterson 29 Extension Project. There are currently no improved roads within the project area. It is proposed that 4.25 miles of improved road will be constructed to provide access within the project.

The presence of overhead power lines may impact foraging bald eagles. Bald eagles forage opportunistically throughout the Powder River Basin particularly during the winter when migrant eagles join the small number of resident eagles. Power poles provide attractive perch sites in areas where mature trees and other natural perches are lacking. From May 2003, through December 28, 2006, Service Law Enforcement salvage records for northeast Wyoming identified that 156 raptors, including 1 bald eagle, 93 golden eagles, 1 unidentified eagle, 27 hawks, 30 owls and 4 unidentified raptors were electrocuted on power poles within the Powder River Basin Oil and Gas Project area (USFWS 2006a). Of the 156 raptors electrocuted 31 were at power poles that are considered new construction (post 1996 construction standards). Additionally, two golden eagles and a Cooper's hawk were killed in apparent mid span collisions with powerlines (USFWS 2006a). Power lines not constructed to APLIC suggestions pose an electrocution hazard for eagles and other raptors perching on them; the Service has developed additional specifications improving upon the APLIC suggestions.

Typically two-tracks and improved project roads pose minimal collision risk. In one year of monitoring road-side carcasses the BLM Buffalo Field Office reported 439 carcasses, 226 along Interstates (51%), 193 along paved highways (44%), 19 along gravel county roads (4%), and 1 along an improved CBNG road (<1%) (Bills 2004). No road-killed eagles were reported; eagles (bald and golden) were observed feeding on 16 of the reported road-side carcasses (<4%). The risk of big-game vehicle-related mortality along CBNG project roads is so insignificant or discountable that when combined with the lack of bald eagle mortalities associated with highway foraging leads to the conclusion that CBNG project roads do not affect bald eagles.

Produced water will be stored in two existing reservoirs which may attract eagles if reliable prey is present, most likely in the form of waterfowl. The effect of the reservoirs on eagles is unknown. The reservoirs could prove to be a benefit (e.g. increased food supply) or an adverse effect (e.g. contaminants, proximity of power lines and/or roads to water). Eagle use of reservoirs should be reported to determine the need for any future management.

4.2.5.2.2. Black-tailed prairie dog Direct and Indirect Effects

Based on observations during the on-site inspection, it appears that no prairie dog colonies will be affected by Peterson 29 Extension activities. Some sections of existing utility corridors transverse portions of two prairie dog colonies in Sections 22 and 27. These corridors will be used to service some of the proposed wells in the Peterson 29 Extension project area. Impacts to the overall colony will be minimal. BLM data and wildlife surveys for the Dow II POD (Jones&Stokes 2007) indicate the presence of prairie dog colonies in the Sections 1, 11 and 12 T57N, R82 where the subsurface drip irrigation system (SDI) is located on private surface. The increase in soil moisture and conversion of vegetation to "hay meadow" will likely displace the prairie dogs in this colony.

Individuals that survive the excavation process but whose burrows were destroyed will be displaced. As

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

Well houses and power poles may provide habitats for mammal and avian predators increasing prairie dog predation. Mineral related traffic on the adjacent roads may result in prairie dog road mortalities. During construction of these facilities, there is the possibility that prairie dogs within these colonies may be killed as a direct result of the earth moving equipment. Constant noise and movement of equipment and the destruction of burrows puts considerable stress on the animals and will cause an increase in prairie dog mortalities. During the construction of these facilities individuals are exposed more frequently to predators and have less protective cover.

4.2.5.2.3. Burrowing owl Direct and Indirect Effects

Well 3-27 was moved to a flatter site which will reduce the potential effect it would have on the burrowing owl nest (BLM# 5380) approximately .37 miles to the south. The nest, which is in a prairie dog burrow, produced four burrowing owl young in 2006. It was reported as gone in 2007 and 2008. The increase in human activity in the area could reduce the suitability the area for future burrowing owl activity, although burrowing owls are known to be somewhat tolerant of casual human activity. Because of the distance from proposed well construction and infrastructure to the prairie dog colony where the nest is located, the owls should not be greatly impacted. Since there will be minimal impacts to prairie dog towns, it is unlikely that any burrowing owls will be affected by Peterson 29 Extension activities.

The dramatic reduction of prairie habitat in the United States has been linked to reduction of burrowing owl populations (Klute et al. 2003). Use of roads and pipeline corridors may increase owl vulnerability to vehicle collision. Overhead power lines provide perch sites for larger raptors that could potentially result in increased burrowing owl predation. CBNG infrastructure such as roads, pipe line corridors, and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes.

The USDAFS Thunder Basin National Grasslands in Campbell County, WY, whom cooperated with the BLM in the creation of the 2003 PRB EIS, recommends a 0.25 mile timing restriction buffer zone for burrowing nest locations during their nesting season (April 15 to August 31). Instruction Memorandum No. 2006-197, directs the field offices to "use the least restrictive stipulations that effectively accomplish the resource objectives or uses." Alteration of the general raptor nest timing limitation (Feb 1 to July 31) to a more specific burrowing owl nesting season timing limitation will effectively reduce the vulnerability of owls to collision while shortening the timing restriction period to four and one half months (See Chapter 3 for breeding, nesting, and migration chronology) from six and one half months and from 0.5 mile to 0.25 mile.

4.2.5.2.4. Grouse

4.2.5.2.4.1. Greater sage-grouse Direct and Indirect Effects

BLM records identified one sage grouse lek within 4 miles of the Peterson 29 Extension POD. The site is the PPL lek which is in SE SW Section 30, T58, R82W, 1.6 miles southwest of the project area. The lek was active in 2007. Surveys conducted by ICF Jones & Stokes in 2008 for grouse occurrence were

negative. The proposed action will adversely impact nesting, brood rearing, late summer, winter habitat. Proposed project elements that are anticipated to negatively impact grouse are approximately: thirteen CBNG wells on thirteen locations, 4.78 miles of new roads, 0.41 miles of new pipelines and increased vehicle traffic on established roads. Using 0.6 miles as a distance for impacts (Holloran et al. 2007, Aldridge and Boyce 2007), effective sage-grouse habitat loss will be 1,993 acres from roads, and 4992 acres from thirteen well locations. These numbers are not additive since each well location has an associated road and power and in many cases wells are closer than 0.6 miles to each other. Therefore, the above numbers over-represent anticipated impacts within the project area if totaled, however since most well locations are within 0.6 miles of each other the entire project area (approximately 2,238 acres within the POD boundaries) can be considered affected.

Based on the best available science, which is summarized below, the proposed action will most likely contribute to the extirpation of the local grouse population and subsequent abandonment of the lek within the project area.

Greater sage-grouse Cumulative Effects

In addition to the direct impacts to sage-grouse habitat that will be created by the federal wells and associated infrastructure the project area does contain existing fee, state, and federal fluid mineral development. The sage-grouse cumulative impact assessment area for this project encompasses a four mile radius from the PPL sage-grouse lek. As of July 21, 2008, there are approximately 785 existing wells and associated infrastructure within four miles of the lek - an area of 50 square miles. The existing well density is approximately 15.7 wells/section. Due to this level of development there is a strong potential that the population breeding at this lek may become extirpated without the federal development.

There are 29 proposed wells (8 are the wells from this project) within four miles of the lek. With the addition of the 21 proposed wells that are not associated with this proposed action, the well density within four miles of the lek increases to 16.12 wells/section. With approval of alternative C (8 proposed well locations) the well density increases to 16.28 wells/section.

CBNG is a recent development, with the first well drilled in 1987 (Braun et al. 2002). In February 1998 there were 420 producing wells primarily restricted to eastern Campbell County (BFO 1999). By May 2003 there were 26,718 CBNG wells permitted within the BFO area (WGFD 2004). The PRB FEIS estimated 51,000 additional CBNG wells to be drilled over a ten year period beginning in 2003 (BFO 2003).

The Powder River Basin Oil and Gas Project FEIS (BLM 2003) concluded that "Activities associated with the proposed project would affect sage-grouse in several ways. These effects may include: (1) increased direct mortality (including legal hunting, poaching, and collision with power lines and vehicles); (2) the introduction of new perches for raptors and thus the potential change in rate of predation; (3) direct loss or degradation of habitats; (4) indirect disturbance resulting from human activity (including harassment, displacement, and noise); (5) habitat fragmentation (particularly through construction of roads); and (6) changes in population (pg. 4-257)." The FEIS goes on to state that "implementation of several mitigation measures would reduce the extent of each impact addressed by those measures. Despite these measures, 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)."

The Powder River Basin Oil and Gas Project Record of Decision (BLM 2003) included a Mitigation Monitoring and Reporting Plan (MMRP). The uncertainties as to where and at what level development

was to proceed as well as the uncertainties associated with the assumptions that were used to predict impacts suggests that one-time determination of impacts that is included in the EIS may not occur as projected. The MMRP helps to continually assess the effects of the project and the adequacy of the mitigation. Such a plan/process provides a mechanism to continuously modify management practices in order to allow development while continuing to protect the environment (E-1)." In other words, development pace and patterns may not occur as predicted, and so the BLM may use the adaptive management process provided for in the BFO RMP.

Impacts from CBNG development are likely to be significant and additive to the long-term impacts afflicting the sage-grouse population (WGFD 2004). Greater sage-grouse habitat is being directly lost with the addition of well sites, roads, pipelines, powerlines, reservoirs and other infrastructure in the Powder River Basin (WGFD 2005, WGFD 2004). Sage-grouse avoidance of CBNG infrastructure results in even greater indirect habitat loss. In southwestern Wyoming, yearling female greater sage-grouse avoid nesting in areas within 0.6 miles of producing well pads (Holloran et al. 2007), and in southern Alberta, brood-rearing females avoid areas within 0.6 miles of producing wells (Aldridge and Boyce 2007). Doherty et al. (2008) demonstrated that sage-grouse in the Powder River Basin avoided otherwise suitable wintering habitats once they have been developed for energy production, even after timing and lek buffer stipulations had been applied. The WGFD feels a well density of eight wells per section creates a high level of impact for sage-grouse and that sage-grouse avoidance zones around mineral facilities overlap creating contiguous avoidance areas (WGFD 2004). As interpreted by coordinated effort with state fish and wildlife agencies from Montana, Colorado, Utah, South Dakota, North Dakota and Wyoming, (State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development 2008), research indicates that oil or gas development exceeding approximately 1 well pad per square mile with the associated infrastructure, results in calculable impacts on breeding populations, as measured by the number of male sage-grouse attending leks (Holloran 2005, Walker et al. 2007)

Noise can affect sage-grouse by preventing vocalizations that influence reproduction and other behaviors (WGFD 2003). In a study of greater sage-grouse population response to natural gas field development in western Wyoming, Holloran (2005) concluded that increased noise intensity, associated with active drilling rigs within 5 km (3.1 miles) of leks, negatively influenced male lek attendance. In 2002, Braun et al. documented approximately 200 CBNG facilities within one mile of sage-grouse leks. Sage-grouse numbers were found to be consistently lower for these leks than for leks without this disturbance. Direct habitat losses from the facilities themselves, roads and traffic, and the associated noise were found to be the likely reason for this finding.

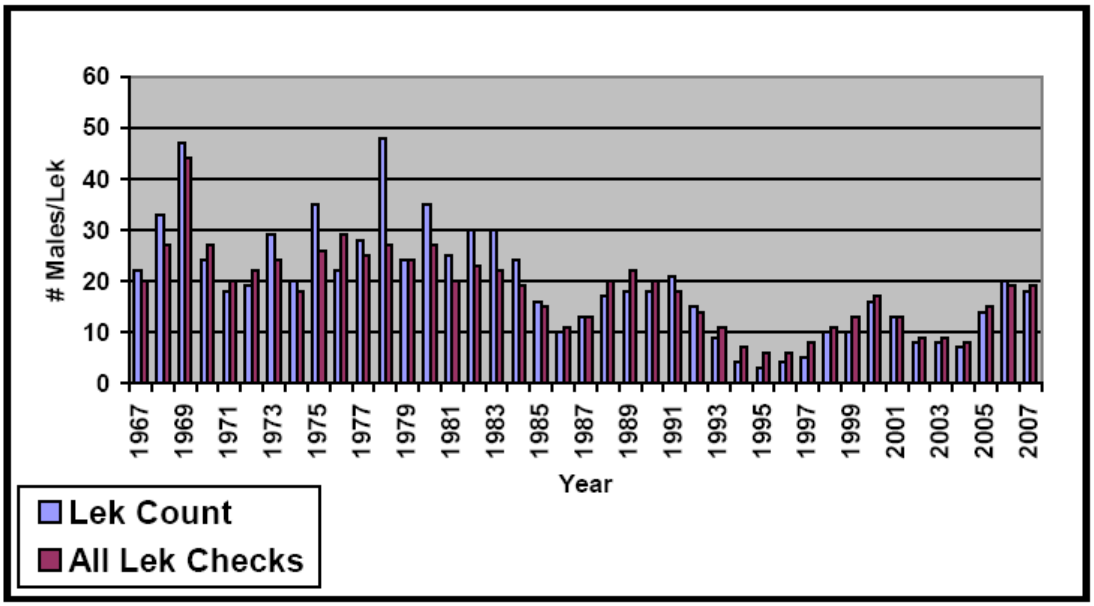
Vegetation communities within the Powder River Basin are naturally fragmented, as they represent a transition between the intermountain basin sagebrush communities to the west and the prairie communities to the east. The Powder River Basin is also near the eastern edge of greater sage-grouse range. A sagebrush cover assessment within Wyoming basins estimated sagebrush coverage within the Powder River Basin to be 35% with an average patch size less than 300 acres (Rowland et al. 2005). The Powder River Basin patch size has decreased by more than 63% in the past forty years, from 820 acre patches and an overall coverage of 41% in 1964 (Rowland et al. 2005). The existing development within the cumulative impacts assessment area has further fragmented the sage-grouse habitat. Disturbance created by this project will contribute to additional fragmentation.

Another concern with CBNG development is that reservoirs created for water disposal provide habitat for mosquitoes associated with West Nile virus (WGFD 2004). West Nile virus represents a significant new stressor, which in 2003 reduced late summer survival of sage-grouse an average of 25% within four populations including the Powder River Basin (Naugle et al. 2004). In northeastern Wyoming and southeastern Montana, West Nile virus-related mortality during the summer resulted in an average decline in annual female survival of 5% from 2003 to 2006 (Walker et al. 2007). Powder River Basin sage-

grouse losses during 2004 and 2005 were not as severe. Summer 2003 was warm and dry, more conducive to West Nile virus replication and transmission than the cooler summers of 2004 and 2005 (Cornish pers. comm.).

The sage-grouse population within northeast Wyoming is exhibiting a steady long term downward trend (Figure 1) (WGFD 2005). The figure illustrates a ten-year cycle of periodic highs and lows. Each subsequent population peak is lower than the previous peak. Long-term harvest trends are similar to that of lek attendance (WGFD 2005).

Figure 1. Male sage-grouse lek attendance within northeastern Wyoming, 1967-2007.



The BFO Resource Management Plan (BLM 2001) and the Powder River Basin Oil and Gas Project Record of Decision (BLM 2003) include a two-mile timing limitation within sage-grouse nesting habitat. The two-mile measure originated with the Western Association of Fish and Wildlife Agencies (WAFWA) (BLM 2004). BLM Wyoming adopted the two-mile recommendation in 1990 (BLM 1990). The two-mile recommendation was based on early research which indicated between 59 and 87 percent of sage-grouse nests were located within two miles of a lek (BLM 2004). These studies were conducted within prime, contiguous sage-grouse habitat such as Idaho's Snake River plain.

Additional studies, across more of the sage-grouse's range, indicate that many populations nest much farther than two miles from the breeding lek (BLM 2004). Holloran and Anderson (2005), in their Upper Green River Basin study area, reported only 45% of their sage-grouse hens nested within 3 km (1.86 mi) of the capture lek. Moynahan and Lindberg (2004) found only 36% of their grouse nesting within 3 km of the capture lek. Moynahan's study area was north-central Montana in an area of mixed-grass prairie and sagebrush steppe, with Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) being the dominant shrub species (Moynahan et al. 2007). Habitat conditions and sage-grouse biology within the Buffalo Field Office are more similar to Moynahan's north-central Montana study area than the Upper Green River area.

A two-mile timing limitation, given the long-term population decline and that less than 50% of sage-grouse are expected to nest within the limitation area, is insufficient to reverse the population decline. Moynahan and Lindberg (2004) like WAFWA (Connelly et al. 2000), recommend increasing the protective distance around sage-grouse leks. The BLM and University of Montana are currently

researching nest location and other sage-grouse questions and relationships between grouse and coalbed natural gas development. Thus far, this research suggests that impacts to leks from energy development are discernable out to a minimum of four miles, and that some leks within this radius have been extirpated as a direct result of energy development (State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development 2008). Even with a timing limitation on construction activities, sage-grouse may avoid nesting within CBNG fields because of the activities associated with operation and production. In a typical landscape in the Powder River Basin, energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87% to 5% percent (Walker et al. 2007).

Walker et al, 2007 indicates the size of a no-development buffer sufficient to protect leks would depend on the amount of suitable habitat around the lek and the population impact deemed acceptable. Also, rather than limiting mitigation to only timing restrictions, research suggests more effective mitigation strategies include, at a minimum, burying power lines (Connelly et al. 2000 b); minimizing road and well pad construction, vehicle traffic, and industrial noise (Lyon and Anderson 2003, Holloran 2005); and managing produced water to prevent the spread of mosquitoes with the potential to vector West Nile Virus in sage grouse habitat (Walker et al 2007).

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

4.2.5.2.4.2. Sharp-tailed grouse Direct and Indirect Effects

The Little Badger lek, which is in NW SW Section 30, T58, R82W, is 1.9 miles southwest of the Peterson 29 Ext. POD. Since the wells and infrastructure are to the north, the proposed project should not affect the lek. The construction of wells and infrastructure will disturb some of the vegetation that could provide food and cover for sharp-tailed grouse.

4.2.5.2.5. Mountain plover Direct and Indirect Effects

There is very little suitable mountain plover habitat present within the project area. The project should not impact mountain plovers.

Mineral development has mixed effects on mountain plovers. Disturbed ground, such as buried pipeline corridors and roads, may be attractive to plovers, while human activities within one-quarter mile may be disruptive. To reduce impacts to nesting mountain plovers, the BLM BFO requires a 0.25 mile timing limitation for potential nesting habitat prior to nest survey completion and a 0.25 mile timing limitation for all occupied nesting habitat for the entire nesting season.

Use of roads and pipe line corridors by mountain plovers may increase their vulnerability to vehicle collision. Limiting travel speed to 25mph provides drivers an opportunity to notice and avoid mountain plovers and allows mountain plovers sufficient time to escape from approaching vehicles. Even if a nesting plover flushes in time, the nest likely would still be destroyed. Overhead power lines provide perch sites for raptors that could result in increased mountain plover predation. CBNG infrastructure such as well houses, roads, pipeline corridors, and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes.

Mountain plovers have been forced to seek habitat with similar qualities that may be poor quality habitat when loss or alteration of their natural breeding habitat (predominately prairie dog colonies) occurs, such as heavily grazed land, burned fields, fallow agriculture lands, roads, oil and gas well pads and pipelines. These areas could become reproductive sinks. Adult mountain plovers may breed there, lay eggs and

hatch chicks; however, the young may not reach fledging age due to the poor quality of the habitat. Recent analysis of the USWFS Breeding Bird Survey (BBS) data suggests that mountain plover populations have declined at an annual rate of 3.7 % over the last 30 years which represents a cumulative decline of 63% during the last 25 years (Knopf and Rupert 1995). An analysis of direct and indirect impacts to mountain plover due to oil and gas development is included in the PRB FEIS (4-254-255).

4.2.5.2.6. Sensitive Species 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, page 4-271.

4.3. West Nile Virus 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.

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

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

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.

4.4. 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 Tongue River watershed and a 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 the proposed water management strategies. (See section 2.2—Alternative B Proposed Action, “Project Description” for a summary of the water management strategy.)

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 20.0 gpm per well or 260 gpm (0.6 cfs or 435 acre-feet per year) for this POD. The PRB FEIS projected the total amount of water that was anticipated to be produced from CBNG development per year (Table 2-8 Projected Amount of Water Produced from CBM Wells Under Alternatives 1, 2A and 2B pg 2-26). For the Upper Tongue River drainage, the projected

volume produced within the watershed area was 20,282 acre-feet in 2008 (maximum production was predicted to be 22,351 acre feet in 2006. As such, the volume of water resulting from the production of these wells is 2% of the total volume projected for 2008. This volume of produced water is also within the predicted parameters of the PRB FEIS.

4.4.1. Groundwater

The PRB FEIS predicts an infiltration rate of 39% to groundwater aquifers and coal zones in the Upper Tongue River drainage area (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 100 gpm will infiltrate at or near the discharge points and impoundments (160 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). However, there is potential for infiltration of produced water to influence the quality of the antecedent groundwater. The WDEQ requires that operators determine initial groundwater quality below impoundments to be used for CBNG produced water storage. If high quality water is detected (Class 3 or better) the operator is required to establish a groundwater monitoring program at those impoundments.

Shallow ground water monitoring is ongoing at numerous impoundment sites across the basin. Due to the limited data available from these sites, the still uncertain overall fate or extent of change that is occurring due to infiltration at those sites, and the extensive variability in site characteristics, both surface and subsurface, it is not reliable at this time to infer that findings from these monitoring wells should be directly applied to other impoundment locations across the basin.

The BLM has installed shallow groundwater monitoring wells at five impoundment locations in the PRB to assess ground-water quality changes due to infiltration of CBNG produced water. Water quality data has been sampled from these wells on a regular basis. Preliminary data from three sites show increasing TDS level as water infiltrates while two sites are not.

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ has developed a guidance document, "Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments" (June 14, 2004) which can be accessed on their website. This guidance document became effective August 1, 2004. The BLM will require that operators comply with the requirements outlined in the DEQ compliance monitoring guidance document (June 14, 2004) prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

Approximately 1774 new impoundment sites have been investigated with over 1988 borings as of April, 2008. Of those impoundments, 259 met the criteria to provide compliance monitoring data if constructed and used for CBNG water containment. Only 109 monitored impoundments are currently in use. As of the 1st quarter 2008, only 16 monitored impoundments exceed groundwater class of use limits (Fischer, 2008). The BLM requires that operators comply with the DEQ compliance monitoring guidance document prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

The PRB FEIS predicts that one of the environmental consequences of coal bed natural gas production is possible impacts to the groundwater. "The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers." (PRB FEIS page 4-1). In the process of dewatering the coal zone to increase natural gas recovery rates, this project may have some effect on the static water level of water wells in the area. The permitted water wells in the area produce from water bearing zones

ranging in depth from 60 to 950 feet below the ground surface. The targeted coal zones range from 200 to 2200 feet below ground surface. As mitigation, the operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence of the proposed wells.

Recovery of the coal bed aquifer was predicted in the PRB FEIS to "…resaturate and repressurize the areas that were partially depressurized during operations. The amount of groundwater 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).

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.

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

4.4.1.1. Groundwater 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.

4.4.2. Surface Water

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 pollutant limits for TDS, SAR and EC detailed in the WDEQ's WYPDES permit, and the levels found in the POD's representative water sample.

Table 4.5 Comparison of Regulated Water Quality Parameters to Predicted Water Quality

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** μmhos/cm
Most Restrictive Proposed Limit –		0.5	500
Least Restrictive Proposed Limit		10	2500
Tongue River at MT state line nr Decker, WY Historic Data Average at Maximum Flow		0.36	318

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** μmhos/cm
Historic Data Average at Minimum Flow		0.86	731
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8) Drinking Water (Class I) Agricultural Use (Class II) Livestock Use (Class III)	 500 2,000 5,000	 8	
WDEQ Water Quality Requirement for WYPDES Permit # WY0054453 At discharge point	 5000	 NS**	 7500
Combined sample from Smith, Dietz 1-3, Monarch and Carney	1580	58	2460

**Not Specified

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 1580.0 mg/l TDS which is within the WDEQ criteria for agricultural use (2000 mg/l TDS). Irrigation is included in this proposal as subsurface drip (SDI). Surface application of this water would require amendments or treatment to reduce the impacts from the high SAR (58), which could be detrimental to soil structure.

The quality for the water produced from the targeted coal zones from these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of 20.0 gallons per minute (gpm) is projected is to be produced from each of these 13 wells, for a total of 260 gpm for the POD. See Table 4.5.

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

There are 2 discharge points proposed for this project. They have been 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. A condition of approval has been applied to the R11-22 dam with respect to the seepage observed during the onsite.

To manage the produced water from fee development in the area, 2 impoundments (29 AF) were constructed. These impoundments have disturbed approximately 6.0 acres including the dam structures. These water impoundments are on-channel. Monitoring may be required based upon WYDEQ findings relative to "Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments" (June 14, 2004). All water management facilities were evaluated for compliance with best management practices during the onsite.

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Consequently, the volume of water produced from these wells may result in the addition of less than 0.1 cfs below the lowest reservoir (after infiltration and evapotranspiration losses and assuming all produced water is sent to the two impoundments). The operator has committed to monitor the condition of channels and address any problems resulting from discharge. Sedimentation will occur in the impoundments, but would be controlled through a concerted monitoring and maintenance program. Phased reclamation plans for the impoundments will be submitted and approved on a site-specific, case-by-case basis as the impoundments are no longer needed for disposal of CBNG water, as required by BLM applied COAs.

Alternative (2A), the approved alternative in the Record of Decision for the PRB FEIS, states that the peak production of water discharged to the surface will occur in 2006 at a total contribution to the mainstem of the Upper Tongue River of 5 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 13 wells is anticipated to be a total of 260 gpm or 0.6 cfs to impoundments and SDI. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and assuming full containment, the produced water re-surfacing in the Tongue River from this action (less than 0.1 cfs) may add a maximum 0.07 cfs to the Upper Tongue River flows, or 1% of the predicted total CBNG produced water contribution. This incremental volume is statistically below the measurement capabilities for the volume of flow in the Tongue River (refer to Statistical Methods in Water Resources U.S. Geological Survey, Techniques of Water-Resources Investigations Book 4, Chapter A3 2002, D.R. Helsel and R.M. Hirsch authors). For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

In the WMP portion of the POD, the operator did not provide an analysis of the potential development in the watershed above the project area. However, based on the area of the Badger Creek watershed above the POD (139 sq mi) and an assumed density of 1 well per location every 80 acres, the potential exists for the development of 1,112 wells which could produce a maximum flow rate of 22,240 gpm (50 cfs) of water. The BLM agrees with the operator that this is not expected to occur because:

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

The potential maximum flow rate of produced water within the watershed upstream of the project area, 50 cfs, is less than the peak runoff estimated from the 2-year storm event for Badger Creek drainage (WMP page 7).

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

The operator has obtained a Wyoming Pollutant Discharge Elimination System (WYPDES) permit for the discharge of water produced from this project from the WDEQ. They have also obtained an injection permit for their SDI operations.

Permit effluent limits were set at (WY0054453 part I page 2):

pH	6.5 to 9
TDS	5000 mg/l max
Specific Conductance	7500 mg/l max
Dissolved iron	1000 µg/l max
Total Recoverable Arsenic	150 µg/l max
Chlorides	230 mg/l

Subsurface Drip Irrigation

According to Wyoming State Water Law (W.S. 41-3-101) the water extracted in the production of CBNG is the waters of the state; BLM policy 1982 directs the BLM's cooperation and full compliance with State water laws. Subsurface Drip Irrigation (SDI) is permitted and regulated by Wyoming Department of Environmental Quality (WDEQ) through the Underground Injection control (UIC) program, requiring a WDEQ 5C5 UIC permit. The BLM is responsible for analyzing the proposed action with available data provided in the WMP for the POD and disclose potential impacts of the proposed action. Responsibility,

liability, monitoring, mitigation measures and reclamation should be addressed in the surface use agreement (SUA).

SDI systems are designed to utilize cations present in the soils to mitigate the impact of the quality of CBNG water on soils. The irrigation quality of the CBNG "produced water" and the variability of soils and the range in characteristics (RIC) of their physical and chemical properties within the project area, have the potential to cause long term soil impacts.

Literature review of soils and soil primary soil characterization lab data collected by the NRCS indicates a wide variability of the soils and their properties within the Powder River Basin. Variability or RIC of soil features and properties of the identified soils include:

- soil depth
- available water holding capacity
- saturated hydraulic conductivity
- amount, depth to base and the mineralogy of clays present
- highly variable chemical properties found in alluvial and colluvial soils within the Powder River Basin.

CBNG "produced water" has a moderate to high salinity hazard and often has a very high sodium hazard based on standards used for irrigation suitability. The sodium hazard of CBNG "produced water" may affect the soil resource. Sodic irrigation water causes dispersion of clays and clogging of soil pores thereby impairing soil hydraulic conductivity, affecting water availability and reducing soil aeration, all of which are important to long term soil health and productivity. Elevated sodium concentrations can harm some plants due to direct toxicity as they are taken up by the root cells. Sodium can also indirectly affect crop growth by causing calcium, potassium, and magnesium deficiencies.

With time, salts from CBNG water can accumulate in the root zone in concentrations that will affect plant growth and water utilization. Semi arid and arid climates create the potential for upward movement of salts into the root zone. Proper plant selection for deep rooted salt tolerance is important. Germination of these plant species may require special management practices to prevent negative impacts to soils.

With yearlong water disposal at volumes above the desirable leaching fraction, there is a potential for impacted water to affect shallow aquifers. The characteristics of the water impacting shallow ground water maybe very difficult to predict and model, from our previous experience there is a potential for migration of low quality water to impact the subsurface environment.

Sites should be closely monitored to assure long term soil health and productivity is maintained. Specific soil chemical and physical property action levels should be established to ensure that the soil is not measurably impacted and that remedial actions can be implemented before soil damage occurs. These thresholds should be based on soil type, vegetation, water quality, soil and/or water amendments used, potential land use, beneficial use goals and landowner requests. Monitoring of the SDI site should include an evaluation of soil chemical and physical properties, runoff and erosion, water quantity and quality, and vegetative performance.

The long term impacts and mitigation success are unknown at this time. Impacts are subjective and not well defined and long term effects will depend on the success of applied soil amendments and intense monitoring, management and immediate site mitigation. Reclamation or mitigation practices maybe difficult to achieve and are expensive and are the responsibility of the operator, contractor and landowner, addressed in the Surface Use Agreement (SUA).

Bene Terra and the operator have approximately 688 acres of land in SDI for "disposal" of water produced from fee development. They have proposed that water produced from this federal action in excess of the storage in the two reservoirs will be "disposed of" through this SDI system, which has been permitted by the WYDEQ. According to personnel at Bene Terra, Inc, the owners and managers of the SDI, they expect that the fields in the Badger Creek will accept approximately 65 BWPD/Acre, or 1300 gallons per minute. This will adequately address the operator's expected production from the federal portion of this development.

The WYPDES permit also addresses existing downstream concerns, such as irrigation use, in the COA for the permit. The designated point of compliance identified for this permit is the end of the discharge pipe into the on-channel headwaters reservoirs. The SDI water is not allowed to enter the flow of Badger Creek.

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.

The development of coal bed natural gas and the production and discharge of water in the area surrounding the existing natural spring may affect the flow rate or water quality of the spring.

In-channel downstream impacts are addressed in the WMP for the Peterson 29 Extension POD prepared by WWC Engineering for Pennaco Energy, Inc, a subsidiary of Marathon Oil Company.

4.4.2.1. Surface Water Cumulative Effects

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

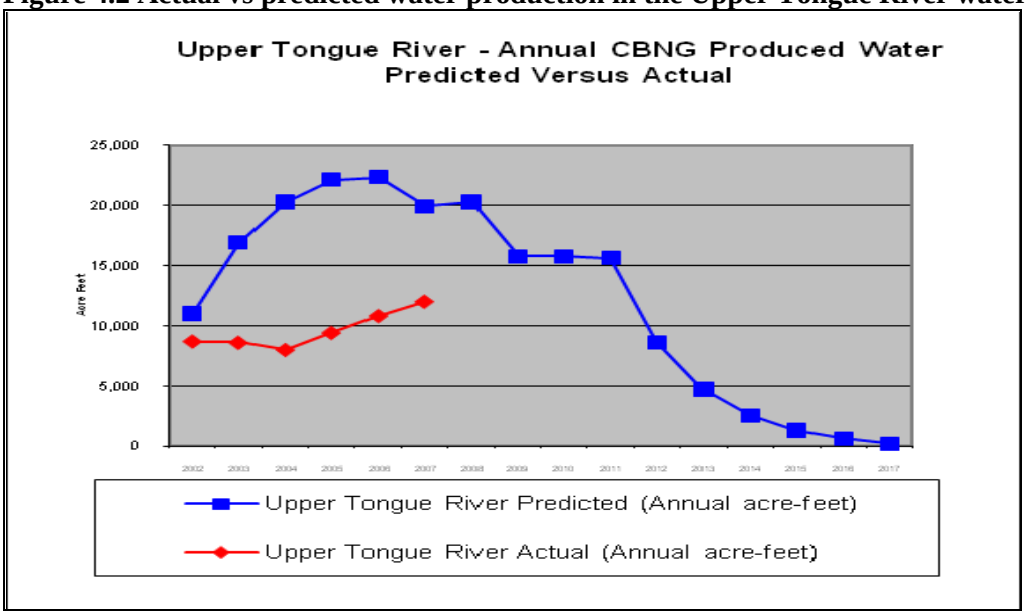
As of December 2007 all producing CBNG wells in the Upper Tongue River watershed have discharged a cumulative volume of 57,396 acre-ft of water compared to the predicted 112,670 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.1 and Table 4.6 following. This volume is 51% of the total predicted produced water analyzed in the PRB FEIS for the Upper Tongue River watershed.

Table 4.6 Actual vs predicted water production in the Upper Tongue River watershed *2007 Data Update 3-08-08*

Year	Upper Tongue River Predicted (Annual acre-feet)	Upper Tongue River Predicted (Cum acre-feet from 2002)	Upper Tongue River Actual (Annual acre-feet)		Upper Tongue River Actual (Cumulative acre-feet beginning 2002)	
			Ac-ft	% of Predicted	Ac-ft	% of Predicted
2002	11,019	11,019	8,675	78.7	8,675	78.7
2003	16,950	27,969	8,574	50.6	17,248	61.7

2004	**20,272**	**48,241**	**7,971**	**39.3**	**25,220**	**52.3**
2005	**22,133**	**70,374**	**9,397**	**42.5**	**34,617**	**49.2**
2006	**22,351**	**92,725**	**10,795**	**48.3**	**45,412**	**49.0**
2007	**19,945**	**112,670**	**11,984**	**60.1**	**57,396**	**50.9**
2008	**20,282**	**132,952**				
2009	**15,782**	**148,734**				
2010	**15,782**	**164,516**				
2011	**15,654**	**180,170**				
2012	**8,646**	**188,816**				
2013	**4,721**	**193,537**				
2014	**2,522**	**196,059**				
2015	**1,290**	**197,349**				
2016	**601**	**197,950**				
2017	**214**	**198,164**				
Total	**198,164**		**57,396**			

Figure 4.2 Actual vs predicted water production in the Upper Tongue 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 CBM 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). Litigation between Wyoming and Montana which was entered into after issuing the PRB FEIS ROD will now determine the water quality and quantity parameters which will be applied to CBNG produced water disposal into waters flowing from Wyoming into Montana.

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

1. They are proportional to the actual amount of cumulatively produced water in the Upper Tongue River drainage and the total amount that was predicted in the PRB FEIS, which is approximately 51% of that total (see section 4.4.2.1).
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.

No additional mitigation measures are required.

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

4.5. Cultural Resources

One location, 13-23-58-82 and associated infrastructure (i.e., access road), has been identified as requiring archaeological monitoring during construction. This area was identified within the report (70080029) and by the BLM archaeologist as having poor visibility during inventory and potential for buried deposits.

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).

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Mary Hopkins	Acting State Historic Peservation Officer	Wyoming State Historic Preservation Office	No
Michael Saffell	General Manager	BeneTerra LLC	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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