FINDING OF NO SIGNIFICANT IMPACT & DECISION RECORD
FOR
Pinnacle Gas Resources
Cabin Creek. Phase II POD
ENVIRONMENTAL ASSESSMENT –WY-070-**07-162**

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize Pinnacle Gas Resources's Cabin Creek. Phase II POD Coal Bed Natural Gas (CBNG) POD comprised of the 63 Applications for Permit to Drill (APDs) with 5 APDs to be pending approval following the 30 day public posting period as indicated in the following table:

***Note:** These APD's will be held pending the 30 day public posting period ending September 28, 2007.
**** Note:** This APD will be held pending the 30 day public posting period ending October 11, 2007.

	Well Name	Well #	Qtr/Qtr	Sec.	TWP	RNG	Lease #
1	Cabin Creek II CB	17CC-30	NENW	30	57N	76W	WYW141873
2	Cabin Creek II CB	17WP-30	NENW	30	57N	76W	WYW141873
3	Cabin Creek II CB	18CC-30	NWNW	30	57N	76W	WYW151717
4	Cabin Creek II CB	18WP-30	NWNW	30	57N	76W	WYW151717
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6	Cabin Creek II CB	21WP-30	SWNW	30	57N	76W	WYW151717
7	Cabin Creek II CB	25CC-30	NWSW	30	57N	76W	WYW151717
8	Cabin Creek II CB	25WP-30	NWSW	30	57N	76W	WYW151717
9	Cabin Creek II CB	*13CC-12	SWSW	12	57N	77W	WYW144218
10	Cabin Creek II CB	*13WP-12	SWSW	12	57N	77W	WYW144218
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25	Cabin Creek II CB	05CC-14	SWNW	14	57N	77W	WYW149974
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68	Cabin Creek II CB	01WP-35	NENE	35	57N	77W	WYW149974

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.
8. Based on current information, we determined that no significant impacts in the spread of WNV would occur from the implementation of this project.

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
Pinnacle Gas Resources
Cabin Creek. Phase II POD
PLAN OF DEVELOPMENT
WY-070-07-162

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 quantify reserves and produce coal bed natural gas (CBNG) on 7 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: Pinnacle Gas Resources's Cabin Creek. Phase II POD Plan of Development (POD) for 72 coal bed natural gas well APD`s and associated infrastructure.

Proposed Well Information: Pinnacle Gas Resources submitted APDs for 72 wells within this POD, the wells are vertical bores proposed on an 80 acre spacing pattern with 2 wells per location. Each well will produce from 2 coal seams. Proposed well house dimensions are 5 ft wide 5 ft length x 4 ft height. Well house color is Covert Green, selected to blend with the surrounding vegetation.

Water Management Plan: The preferred water discharge alternative of the Cabin Creek Phase II POD is treatment of all produced water via the continuous crosscurrent ion exchange process and discharge of the treated water directly into the Middle Powder River. This option will also allow for the future CBNG

discharges in the region to be treated and discharged at the same facility.

The proposed well locations are listed as follows:

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72	Cabin Creek II CB	01WP-35	NENE	35	57N	77W	WYW149968

County: Sheridan

Applicant: Pinnacle Gas Resources

Surface Owners: BLM, Pee Gee Ranch, Ritchie, Cross, Rowley, Fence Cr. Ranch

Project Description:
The proposed action involves the following:

- Drilling of 72 total federal CBM wells in Cook/Canyon, Wall/Pawnee and coal zones to depths ranging from 507 to 1,281 feet. Multiple seams will be produced by both co-locating wells (multiple wells at a single location each targeting a single formation) and co-mingling production (a single well cable of producing from multiple coal seams) The Cook will be co-mingled with the Canyon, and the Wall will be co-mingled with the Pawnee. 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 and maintenance shall be accomplished by a combination of telemetry and weekly well visits.

- A Water Management Plan (WMP) that involves an existing EMITs water treatment facility and 1 treated water discharge point (outfall 012) analyzed under the Cabin Creek Phase I POD Environmental Assessment WY-070-07-057.

- An unimproved and improved road network.

- An above ground power line network will be planned by the KLJ Engineering and constructed by a subcontractor. The proposed route has been reviewed by the KLJ. If the proposed route is altered, then the new route will be proposed via sundry application and analyzed in a separate NEPA action. Power line construction has not been scheduled and will not be completed before the CBNG wells are producing. Temporary diesel generators shall be placed at the 5 power drops.

A storage tank of 1,000 gallon capacity shall be located with each diesel generator. At this time there is no schedule for the installation of the overhead power lines and it is unknown how long generators are projected to be in operation. Fuel deliveries are anticipated to be 2 times per week. Noise level is expected to be 84 decibels at 4 feet distance but is not expected to exceed 49 decibels at any surrounding sage-grouse or sharp-tail grouse display grounds or 10dBA above background.

- A buried gas, water and power line network.

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(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.

Well locations are adjusted during the onsite to reduce effects on the landscape. When well locations are re-staked within an adjacent quarter/quarter, a new APD and plat were required. This occurred during the Cabin Creek Phase II POD onsite and those APD(s) (05WP-14) affected are noted in the table 2.3.1 below.

During the onsite inspection, 4 twin well locations and/or the proposed access routes were found to lay over steep slopes in excess of 25% and highly erosive soil. The BLM recommended avoiding those locations where the potential for successful reclamation is marginal. The operator agreed with the BLM's recommendations and withdrew the 8 APD's (09CC-23, 09WP-23, 15CC-23, 15WP-23, 11CC-24, 11WP-24, 01CC-26 and 01WP-26) as noted in the well list below. Pinnacle proposed that the BLM consider 2 additional twin well locations that were not submitted with the original submittal. BLM agreed including them in the onsite inspection and recommended that the operator submit the 4 additional APD's (13CC-12, 13WP-12, 13CC-24 and 13WP-24) to be included in the Cabin Creek Phase II POD analysis. The final count includes 68 APD's which are included in the final well list on page 1 of this document.

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 Cabin Creek. Phase II POD POD are listed below under 2.3.1:

2.3.1. Changes as a result of the on-sites

Well #'s	Comments/changes
17CC/WP-30	The original location is a saddle with erosive soils on both sides to the location and requiring a pad. BLM recommended that the well be moved approximately 400' west to a location with better soils with reclamation potential. The operator agreed to the move and stated that the location would require only minimal rig leveling.

Well #'s	Comments/changes
18CC/WP-30	There is excessive fill proposed with the drainage crossing. BLM recommended the operator realigned the access to reduce the cut and fill.
21CC/WP-30	The access road includes 2 low water crossings that are included in the road designs. The operator requested that the downstream low water crossing be modified from the design and replaced by a spot upgrade. BLM agreed with the recommendation that proper crossing drainage and rock reinforcement be integrated into the design.
25CC/WP-30	The operator re-staked the wells 50' NW prior to the onsite to accommodate a larger work space area. The proposed access route was reduced from improved to primitive.
13CC/WP-12	These APD's were not included in Pinnacle's original submittal. Pinnacle requested BLM inspect this location as they like to resubmit it with Cabin Cr. 2. BLM agreed.
01CC/WP-13	The access was reduced to a proposed primitive with surfacing. A metal gate at the fence crossing was added to the plan.
03CC/WP-13	The wells were moved approx. 75' SW to avoid highly erosive and alkaline soils. The access was changed at landowner request to a proposed primitive with a spot upgrade with a low water crossing/culvert combo and was shifted approx. 200 feet east.
07CC/WP-13	The access was reduced to a proposed primitive access.
13CC/WP-13	Wells were moved SE approx. 300 feet off the hill top due to the lack of work space and eliminated a 2nd designed road segment. A pad is needed due to rough ground and. The access at the first designed segment re-routed to the south and through a small saddle to avoid a steep side slope cuts & fills.
01CC/WP-14	The well was moved approximately. 120' west to avoid a pad, and erosive soils at the toe of the hill side. Pinnacle reduced the access to proposed primitive.
05CC/WP-14	This is a poor location with the access and location encroaching into side lopes 25%+. The landowner does not favor the location and suggested a location to the west on the other side of the draw. A new location was agreed to approx. 850 feet NW with the access utilizing an old conventional well access and a template design including a low water crossing. The 5WP-14 was moved out of the SWNW to the NWNW
07CC/WP-14	The wells need to be moved approx. 200 feet west to provide adequate work space. The last 750 feet of the access road will be shifted 100 feet west as well to follow the topography. A stock tank was added at this location.
11CC/WP-14	The pits at this location need to be lined due to the proximity to the edge of the rim rock. The access route is an old existing conv. well road that has unraveled in places due to steep side and vertical slopes and erosion. BLM recommends that the road be re-designed following the original centerline, minimizing the road wide to 30 feet, adding pullouts at the tops of inclines and adding drainage control structures. Pinnacle agreed.
15CC/WP-14	The wells will be moved approx. 100' south away from the edge of the ridge providing adequate work space.

Well #'s	Comments/changes
01CC/WP-23	This location is at the edge of the rim. The access to the well will be from the west only and will not continue east on to the 13CC/WP-13 location as proposed. The utility corridor will follow the staked access route to the east. Pinnacle agreed to a 30' max. disturbance width, extra reclamation efforts and maintenance only by atv.
03CC/WP-23	Add a stock tank to this location. BLM recommended realignment of access road to follow existing contours more closely and avoid excessive cuts and fills. Move intersection of 3-23 and 11-23 approximately 600' northeast.
09CC/WP-23	This is a ridge top with steep slopes on both sides. The sandy soil type and shallow bed rock does not present suitable material to build the pad or access road. > 25% side and vertical slopes exist with highly erosive soil. The surrounding area does not present an alternate route to the location nor is there an alternate location to be found on the plateau. BLM recommended the operator withdraw the APD's. The operator agreed to withdraw the APD's.
11CC/WP-23	The wells will be moved approx. 100' north to avoid the edge where the hill drops off. BLM recommended realignment of road to follow existing contours more closely and avoid excessive cuts and fills. Move intersection of 3-23 and 11-23 approximately 600' northeast.
15CC/WP-23	This is a ridge top with steep slopes on both sides. The sandy soil type and shallow bed rock does not present suitable material to build the pad or access road. > 25% side and vertical slopes exist with highly erosive soil. The surrounding area does not present an alternate route to the location nor is there an alternate location to be found on the plateau. BLM recommends the operator withdraw the APD's. The operator agreed to withdraw the APD's.
03CC/WP-24	The wells were moved 75' SE away from the edge of a drainage. The low water crossing needs to be extended and add drainage control where the existing road is. This is the landowner selected this route.
05CC/WP-24	The access descends from a ridge top with steep slopes on both sides. The sandy soil type and shallow bed rock does not present suitable material to build the access road. > 25% side and vertical slopes exist with highly erosive soil. BLM recommends the operator pursue an alternate route to the well off an existing primitive road along the drainage below. The operator staked an alternate well location and designed the access along the recommended route as per the landowners instructions.
11CC/WP-24	The access route has steep vertical slopes (+35%) and large erosion features as well as bedrock. The sandy soil type and shallow bed rock does not present suitable material to build the pad or access road. > 25% side and vertical slopes exist with highly erosive soil. The surrounding area does not present an alternate route to the location nor is there an alternate location to be found on the plateau. BLM recommends the operator withdraw the APD's. The operator agreed to withdraw the APD's.
01CC/WP-25	The operator re-routed the access to follow an existing primitive road. The revised route requires 2 low water/culvert crossings that the operator requested a spot upgrade for.
09CC/WP-25	The access route was realigned to follow the natural contour; Pinnacle requested the status of the access be reduced to primitive. Pinnacle moved the wells NE approx. 200 feet prior to the onsite to provide a larger work space area and avoid erosive soil.

Well #'s	Comments/changes
03CC/WP-25	An alternate access route to the well was staked prior to the onsite avoiding 2 culvert crossings requiring large cut & fills (>30% slopes). The operator requested a 20' X 120' rig slot at this location, BLM agreed. The BLM recommended that the wells be moved approx. 400' east to avoid erosive soil and a large hillside in the upslope with potential to move water onto the location.
07CC/WP-25	The access route to the well was revised prior to the onsite. The new route does not require design as submitted but will be an improved access. The operator requested a 20' X 120' rig slot at this location, BLM agreed with diagram required. BLM requires the excavation for the slot must avoid the toe of slope of the background hill. The operator agreed.
15CC/WP-25	The operator staked an alternate access route that reduces the road status to a primitive road with a low water crossing that will require design and most be staked prior to the pre-construction. The north side of the crossing only provides 45' of working width requiring that the utilities be placed in the roadway. The operator agreed.
01CC/WP-26	This is a ridge top with steep slopes on both sides. The sandy soil type and shallow bed rock does not present suitable material to build the pad or access road. > 25% side and vertical slopes exist with highly erosive soil. The surrounding area does not present an alternate route to the location nor is there an alternate location to be found on the plateau. BLM recommends the operator withdraw the APD's. The operator agreed to withdraw the APD's.
03CC/WP-26	The access was realigned to shift the centerline upslope and away from 4 erosion features along this route. The road construction will include culverts with broken backs to the bottoms of the 4 headcuts reinforced with rock along this route as well as soil stabilization measures. Minimize access width to avoid placing fill in the erosion features and excessive cut & fill. Place utilities in the road way. The operator agreed.
05CC/WP-26	The landowner requested the access be reduced to primitive road and was realigned to accommodate that. The beginning of the access shifted 200' east. The main utility corridor route into the area is proposed to follow the existing access road. Due to the large size of the steel pipeline, Pinnacle has requested that the corridor be allowed with fewer corners and run cross country in the SWSW of section 26. This is acceptable but requires additional cultural survey and the true route needs to be included on the maps.
07CC/WP-26	Slopes exceed 25% from STA A83+00 to A90+00. Cuts and fills extend onto the steep slopes in several locations. The operator adjusted the alignment and profile to avoid these areas. BLM recommended that the wells be moved approximately 200' South to avoid alkaline soils. Pinnacle agreed.
09CC/WP-26	The access was realigned to avoid steep vertical slope @ the beginning of the designed segment and erosion features along the designed segment. The operator agreed to reduce the beginning of the access road from improved to primitive.
15CC/WP-26	The access was realigned to and the operator agreed to reduce it from improved to primitive.
01CC/WP-35	The operator requested to reduce the proposed road status from improved to primitive with a low water crossing - spot upgrade. BLM agreed.

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 COAs and will be in addition to stipulations applied at the time of lease issuance and any standard COA.

2.3.2.1. Groundwater

1. 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) Minimize channel disturbance as much as possible by limiting pipeline and road crossings.
   b) Avoid running pipelines and access roads within floodplains or parallel to a stream channel.
   c) 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.
   d) 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.

4. The operator will supply a copy of the complete approved Chapter 3 permit to construct associated with EMIT treatment facilities to BLM as they are issued by WDEQ.

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. Vegetation

1. Temporarily fence reseeded areas, if not already fenced, for at least two complete growing seasons to insure reclamation success on problematic sites (e.g. close to livestock watering source, erosive soils etc.).

2.3.2.5. 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.

2.3.2.6. Wildlife

1. The Companies will locate facilities so that noise from the facilities at any nearby sage grouse or sharp-tailed grouse display grounds does not exceed 49 decibels (10 dBA above background noise) at the display ground.

2. The Companies will construct power lines to minimize the potential for raptor collisions with the lines. Potential modifications include burying the lines, avoiding areas of high avian use (for example, wetlands, prairie dog towns, and grouse leks), and increasing the visibility of the individual conductors.

3. The Companies will locate aboveground power lines, where practical, at least 0.5 mile from any sage grouse breeding or nesting grounds to prevent raptor predation and sage grouse collision with the conductors. Power poles within 0.5 mile of any sage grouse breeding ground will be raptor-proofed to prevent raptors from perching on the poles.

2.3.2.7. Threatened, Endangered, or Sensitive Species

2.3.2.7.1. Bald Eagle

1. Surveys for active bald eagle nests and winter roost sites will be conducted within suitable habitat by a BLM approved biologist. Surface disturbing activities will not be permitted within one mile of suitable habitat prior to survey completion.

2. A disturbance-free buffer zone of 0.5 mile (i.e., no surface occupancy) will be established year-round for all bald eagle nest sites. A seasonal minimal disturbance buffer zone of one mile will be established for all bald eagle nest sites (February 1 – August 15).

3. A disturbance-free buffer zone of 0.5 mile (i.e., no surface occupancy) will be established year-round for all bald eagle winter roost sites. A seasonal minimal disturbance buffer zone of 1 mile will be established for all bald eagle winter roost sites (November 1 – April 1). These buffer zones and timing may be adjusted based on site-specific information through coordination with, and written approval from, the USFWS.

4. Within ½ mile of bald eagle winter roost sites additional measures such as remote monitoring and restricting maintenance visitation to between 9:00 and 3:00 may be necessary to prevent disturbance (November 1 – April 1).

5. 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.

2.3.2.8. 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.

2.3.2.9. Noise

1. Noise mufflers will be installed on the exhaust of compressor engines to reduce the exhaust noise.

2. Where noise impacts to existing sensitive receptors are an issue, noise levels will be required to be no greater than 55 decibels measured at a distance of one-quarter mile from the appropriate booster (field) compressor. When background noise exceeds 55dBA, noise levels will be no greater than 5dBA above background. This may require the installation of electrical compressor motors at these locations.

2.3.2.10. Air Quality

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

2.3.3. Site specific mitigation measures

Surface Use:

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

2. All Pinnacle Gas Resources representatives and contractors will have a copy of the approved POD map and conditions of approval with them at all times while conducting activities within the Cabin Creek Phase II POD project area.

3. No surface disturbance will be authorized on federal lands prior to the approval of a Pesticide Use Plan (PUP) form WY-04-9222-1 submitted by the operator to the Buffalo Field Office.

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

   Reclamation Standards:

   A. 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.

   B. 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. 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.

D. 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.

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

6. 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

7. Top soil will be segregated for all excavation including the entire disturbance area for constructed pads and excavated areas for rig leveling, reserve pits, constructed roads, spot upgrades, reservoir upgrades, outfalls and utility trenches. This requirement will not apply to trenches installed with wheel trenchers.

8. 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 Cabin Creek Phase II POD is Covert Green.

9. If produced water is to be applied to road surfaces as dust abatement, the operator needs an approved Wyoming Oil & Gas Commission Facility Information for Road Application of Waste and Waste Water (Form 20) along with the proposed action describing locations, application rates, etc. Form 20 is available at http://wogcc.state.wy.us.

10. The approval of this project does not grant authority to use off lease federal lands. No surface disturbing activity, or use of off-lease federal lands, is allowed on affected leases until right-of-way grants become effective on the date in which the right-of-way grant is signed by the authorized officer of the BLM. Approval of ROW's is required prior to POD development at the following locations:

    - NW section 30, T57N/R76W
    - SW section 30, T57N/R76W
    - NW section 31, T57N/R76W

11. All rig slots approved with the POD will be reclaimed back to approximate original contour following well completion. This includes the following locations: 03CC/WP-14-57-77, 03CC/WP-25-57-77 and 07CC/WP-25-57-77.

12. All roads, well pads, rig slots, culverts, spot upgrades and locations where engineered construction will occur will be completely slope staked for the pre-construction meeting.

13. The utility corridor disturbance located between the 01CC/WP-23-57-77 and 13CC/WP-13-57-77 wells shall not exceed a width of 30 feet.

14. Disturbance for pipelines and utility corridors adjacent to access roads will be contained within the disturbance allowed for road construction.

15. Improved roads with utility corridor working width will not exceed 50 feet with clearing and blading not to exceed 35 feet unless specific design is included in the plan and profile section of the master surface use plan.

16. Primitive roads (2-tracks) with utility corridor working width will not exceed 30 feet with clearing and blading not to exceed 20 feet. Construction of primitive roads access/utility corridor within the POD will minimize impact to sagebrush by minimizing road width, mowing and wheel trenching

17. Pipeline installation and/or corridors without road access working width will not exceed 50 feet with clearing and blading not to exceed 35 feet.

18. Utility corridors will be expediently reclaimed following construction and maintained in a professional and workmanship manner avoiding tire rutting, settling and erosion.

19. A minimum 20 foot undisturbed vegetative buffer will be maintained for erosion features along all access roads unless addressed with proper mitigation in the detailed road designs.

20. Mowing at the well site where a constructed pad is not approved as designed will be minimized to a radius of 75 feet or less from the well stake.

21. The operator will maintain well drilling, completion and associated construction operations within a 150 foot by 150 foot work area for those locations where a constructed pad is not approved as designed.

22. All stock water tanks installed on BLM surface will be installed with a rock apron of 4 inch aggregate surrounding the tank and extending a minimum of 8 feet out from the tank.

23. All existing stock tanks shall be retrofitted with a ramp to enable trapped small birds and mammals to escape. See Idaho BLM Technical Bulletin 89-4 entitled Wildlife Watering and Escape Ramps on Livestock Water Developments: Suggestions and Recommendations.

24. Reserve pits containing frozen fluids will not be closed. See "Operations/Maintenance", COA #10 of the Conditions of Approval document for further clarification.

25. Top soil will be segregated for all excavation including the entire disturbance area for constructed pads and excavated areas for rig slots, reserve pits, constructed roads, spot upgrades, reservoir upgrades, outfalls and utility trenches. Segregation will not be required for trenches installed with wheel trenchers.

26. Reserve pit will be lined at the following locations: 11CC/WP-14-57-77

27. Disturbance areas mentioned below have fragile soils and erosive conditions that shall be stabilized in a manner which eliminates erosion until a self-perpetuating non-weed native plant community has stabilized the site. Stabilization efforts shall be finished within 30 days of the completion of construction activities.
    - Well site(s): 05CC/WP-14-57-77, 05CC/WP-24-57-77, 03CC/WP-25-57-77, 07CC/WP-25-57-77, 03CC/WP-26-57-77 and 09CC/WP-26-57-77
    - Road / Pipeline segments associated with well(s): 05CC/WP-14-57-77, 11CC/WP-14-57-77, 03CC/WP-23-57-77, 11CC/WP-23-57-77, 13CC/WP-24-57-77, 01CC/WP-25-57-77, 03CC/WP-25-57-77, 07CC/WP-25-57-77, 15CC/WP-25-57-77, 03CC/WP-26-57-77 and 09CC/WP-26-57-77
    - Pipeline segment(s): 01CC/WP-23-57-77 to 13CC/WP-13-57-77

28. 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:

Seed Mix

Shallow Loamy Ecological Site Seed Mix, 15-19" Precipitation Zone		
Species	**% in Mix**	**Lbs PLS***
Western Wheatgrass - *Rosana*	20	2.4
Idaho fescue – *Joseph*	30	3.6
Bluebunch wheatgrass – *Secar or P-7*	30	3.6
Rocky Mountain beeplant (Cleome serrulata)	10	1.2
Lewis - *Appar*, Blue, or Scarlet flax	5	0.6
White – *Antelope* or Purple Prairie Clover - *Bismarck*	5	0.6
Total	**100%**	**12 lbs/acre**

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

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

Wildlife:

1. The contract biologist shall contact the BLM prior to initiating any wildlife surveys.

2. The following conditions will minimize impacts to nesting and roosting bald eagles:
   a. No surface disturbing activity shall occur within one mile of bald eagle habitat (Powder River in Sec. 30 and 31, T57N, R76W) annually from November 1 through April 1, prior to a winter roost survey or from February 1 through August 15, prior to a nesting survey. This affects the following wells and infrastructure:

Township/Range	Section	Wells and Infrastructure
5776	**30**	17-30CC, WP, 18-30CC, WP, 21-30CC, WP, 25-30CC, WP, road corridors and pipelines, over head powerlines
5777	**25**	1-25CC, WP, 7-25CC, WP, 9-25CC, WP, 15-25CC, WP road corridors and pipelines

   b. If a roost is identified and construction has not been completed, a year round disturbance-free buffer zone of 0.5 mile will be established for all bald eagle winter roost sites. A seasonal minimum disturbance buffer zone of 1-mile will be established for all bald eagle roost sites (November 1 - April 1). Additional measures such as remote monitoring and restricting maintenance visitation to between 9:00 AM and 3:00 PM may be necessary to prevent disturbance.
   c. If a nest is identified and construction has not been completed, a disturbance-free buffer zone of 0.5 mile (i.e., no surface occupancy) would be established year round for all bald eagle nests. A seasonal minimum disturbance-free buffer zone of 1-mile will be established for all bald eagle nest sites (February 1 - August 15).
   d. Additional mitigation measures may be necessary if the site-specific project is determined by a Bureau biologist to have an adverse affect to bald eagles or their habitat.

3. No surface disturbing activity shall occur within ½ mile of all identified raptor nests from February 1 through July 31, annually, prior to a raptor nest occupancy survey for the current breeding season. **This condition will be implemented on an annual basis for the duration of surface disturbing activities.** This timing limitation will affect the following proposed wells and their associated infrastructure:

Township/Range	*Section*	*Affected Wells and Infrastructure*
5777	14	7-14 CC,WP; 9-14 CC,WP; 11-14 CC,WP; 13-14 CC, WP; 15-14 CC, WP and all associated road corridors and pipelines
5777	23	1-23 CC, WP; 3-23 CC, WP; and all associated road corridors and pipelines
5777	26	5-26 CC, WP and all associated road corridors and pipelines
5777	35	Road access to the 1-35 CC, WP wells, proposed improved road, 3 phase powerline
5777	36	Proposed improved road, 3 phase powerline
5776	30	Proposed improved road, 3-phase powerline

   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 disturbance activities. Surveys outside this window may not depict nesting activity. If a survey identifies active raptor nests, a ½ mile timing buffer will be implemented. The timing buffer restricts surface disturbing activities within ½ 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. Nests to be checked are within a ½ mile or less of the proposed development.
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.

4. The following conditions will reduce impacts to sage grouse:
   a. No surface disturbing activities are permitted within 2 miles of the following lek: Remington; between March 1 and June 15, prior to completion of a greater sage-grouse lek survey. **This condition will be implemented on an annual basis for the duration of surface disturbing activities.** This timing limitation will affect the following wells and infrastructure:

Township/Range	***Section***	***Affected Wells and Infrastructure***
5777	12	13-12 CC,WP, road corridor and pipelines
5777	13	1-13 CC,WP, 3-13 CC,WP, 7-13 CC,WP, 9-13 CC,WP, 11-13 CC,WP, 13-13 CC,WP, 15-13 CC,WP road corridors and pipelines, over head powerlines
5777	14	1-14 CC,WP, 7-14 CC,WP, 9-14 CC,WP, 11-14 CC,WP, 15-14 CC,WP road corridors and pipelines, over head powerlines
5777	23	1-23 CC,WP, 3-23 CC,WP, 11-23 CC,WP, road corridors and pipelines
5777	24	3-24 CC,WP, 5-24 CC,WP, 13-24 CC,WP; road corridors and pipelines, over head powerlines
5777	25	1-25 CC,WP, 3-25 CC,WP, 7-25 CC,WP, 9-25 CC,WP, 15-25 CC,WP; road corridors and pipelines,
5776	30	17-30 CC,WP, 18-30 CC,WP, 21-30 CC,WP, 25-30 CC,WP, road corridors and pipelines, over head powerlines

   b. If an active sage grouse lek is identified during the survey, the 2 mile timing restriction (March 1-June 15) will be applied and surface disturbance 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 disturbance activities may be permitted within the 2 mile buffer until the following breeding season (March 1). 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.
   c. Creation of raptor hunting perches will be avoided within 0.5 mile of documented sage grouse and sharp-tailed grouse lek sites. Perch inhibitors will be installed to deter avian predators from preying on sage grouse.

5. Sharp-tailed grouse surveys are required during the life of the project. If a new sharp-tailed grouse lek is identified during the survey, the 0.67 mile timing restriction (March 1 to 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 buffer until the following breeding season. The required 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.

6. All pits associated with water treatment facilities containing more than 17,000 mg/L of sodium concentration will be netted to prevent access by migratory birds.

Archeological Monitoring:

1. All earth moving activity in the following areas will be monitored by an archeologist who meets or exceed the qualification standards recommended by the Secretary of the Interior. The Bureau has identified these areas as containing the potential for buried cultural deposits. The Bureau will require the submission of two copies of a monitoring report within 30 days of the completion of work.

2. All earth moving activities in alluvial deposits within site 48SH178, T57N R76W Section 30 and T57N R77W Section 25. Specifically, the trenching locations between the Powder River and the 9-25 and 25-30 wells.

2.4. Alternatives considered but not analyzed in detail

Alternatives considered but eliminated for use include:

- Evaporation and infiltration via on-channel and off-channel impoundments
- Re-injection to shallow, subsurface coal seams.

Impoundments were eliminated due to the lack of suitable area for construction. Re-injection testing by Pinnacle has had marginal success in the Powder River Basin, but in general target subsurface coals are too shallow for regulatory compliance with the UIC permit under WYDEQ.

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on October 12, 2006. Field inspections of the proposed Cabin Creek Phase II POD CBNG project were conducted on June 5, 6, 27 & 28 and August 9 of 2007 by the following:

- Representing BLM:
  - Jim Verplancke, NRS
  - Larry Gerard, Wildlife Biologist
  - Clinton Crago, Archeologist
  - Chris Perry, Civil Engineer
  - Arnie Irwin, Soil Scientist

- Representing Pinnacle Gas Resource, Inc.:
  - Brian Duerloo, Pinnacle Gas Resources, Project Manager
  - Larry Sare, Pinnacle Gas Resources
  - Jake Crissup, ALL Consulting
  - Jim Aksamit, Western Lands Service

- Landowners:
  - Cliff Ritchie
  - Clay Rowley
  - Mike Schauer, Fence Cr. Ranch

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			Larry Gerard
Floodplains		X		Jim Verplancke, Mike McKinley
Wilderness Values			X	Jim Verplancke
ACECs			X	Jim Verplancke
Water Resources	X			Jim Verplancke, Mike McKinley
Air Quality	X			Jim Verplancke
Cultural or Historical Values	X			Clint Crago
Prime or Unique Farmlands			X	Jim Verplancke
Wild & Scenic Rivers			X	Jim Verplancke
Wetland/Riparian		X		Jim Verplancke, Mike McKinley
Native American Religious Concerns			X	Clint Crago
Hazardous Wastes or Solids		X		Jim Verplancke
Invasive, Nonnative Species	X			Jim Verplancke
Environmental Justice		X		Jim Verplancke

3.1. Topographic Characteristics of Project Area

The Cabin Creek Phase II POD is within the Powder River Basin (PRB) which lies within the Missouri Plateau of the northern Great Plains ecological region (Kuchler, 1964; Bailey, 1976). The dominant physiographic character of the uplands is one of a gently rolling prairie occasionally punctuated by prominent, non-eroded buttes and ridges. The northeast portion of the project area is within the Big Remington Creek Watershed tributary of the Middle Powder River. The southeast portion of the project area is within the Cabin Creek Watershed tributary of the Lower Clear Creek. Tributaries of the Middle Powder River and Lower Clear Creek are immediately adjoined by steeply eroded "draws" and "breaks" (i.e., ridges and canyons) surrounding subordinate ephemeral or intermittent streams in the drainage bottoms for several miles distant from the main stem river. Typical of the Powder River Breaks, many slopes are steep ranging from 15% to more than 25%. Hillsides appear terraced, and hilltops are generally at uniform elevations. The valley within this area has relatively wide (i.e., 1-2 miles), flat floors with terraced floodplains. Elevations within the project area range from 3,600 to 4,120 feet above sea level.

The regional climate is mid-latitude, interior continental, with relatively long, cold winters and relatively short, warm-hot summers and distinct spring and fall shoulder seasons. The summer growing season

(frost free) typically ranges from 95-130 days (ave. = 120 days) between late May and mid-September, with considerable daily variation and occasional cool periods. On the plains, average daily temperatures typically range from 5-10 (low) and 30-35 (high) degrees Fahrenheit in mid-winter, and between 55-60 (low) and 80-85 (high) degrees Fahrenheit in mid-summer. The regional climate is considered semi-arid, and typically, total annual precipitation ranges from 10-14 inches, with most of that coming as rain between May and September. Snowfall varies from year-to-year, but it is common to have continuous snow cover for a period of 30 days or more in a "normal" winter. Annual prevailing winds are from the southwest, but local conditions vary. Arctic air masses with strong winds commonly occur during the winter months, and air masses from the Gulf of Mexico sometimes influence summer weather conditions.

3.2. Vegetation & Soils

3.2.1. Soils

Soils within the project area were identified from the *Sheridan County Survey Area, Wyoming (WY633).* The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards. Pertinent information for analysis was obtained from the published soil survey and the National Soils Information System (NASIS) database for the area.

Soils differ with topographic location, slope and elevation. Topsoil depths to be salvaged for reclamation range from 0 to 4 inches on ridges to 8+ inches in bottomland. Erosion potential varies from moderate to severe depending on the soil type, vegetative cover and slope. Reclamation potential of soils also varies throughout the project area.

Table 3.2 - Reclamation Potential

Reclamation Rating	Acres	Percent
Poor	2346	60%
Moderate	1499	38%
Fair	75	2%

The map units symbol (MUSYM) identified for the soils within this project area are listed in the table below along with the individual acreage and the percentage of the total area identified within the POD boundary.

Table 3.3 – Soil Map Unit Types

MUSYM	Map Unit Name	Acres	%
113	BIDMAN-ARVADA COMPLEX, MOIST, 0 TO 3 PERCENT SLOPES	24.4	1%
114	BIDMAN-ULM, DRY, COMPLEX 0 TO 6 PERCENT SLOPES	1.2	<1%
118	CAMBRIA-FORKWOOD COMPLEX, MOIST, 0 TO 9 PERCENT SLOPES	94.0	2%
120	CEDAK-RECLUSE ASSOCIATION, 6 TO 9 PERCENT SLOPES	29.2	1%
136	DRAKNAB LOAMY FINE SAND, 0 TO 3 PERCENT SLOPES	0.9	<1%
146	GAYHART-BAHL ASSOCIATION, MOIST, 6 TO 15 PERCENT SLOPES	0.2	<1%
148	HARGREAVE-MOSKEE ASSOCIATION, 3 TO 9 PERCENT SLOPES	37.7	1%
158	HAVERDAD-DRAKNAB COMPLEX, 0 TO 3 PERCENT SLOPES	8.5	<1%
159	HAVERDAD-DRAKNAB COMPLEX, MOIST, 0 TO 3 PERCENT SLOPES	6.7	<1%
169	JONPOL-PLATMAK ASSOCIATION, 0 TO 9 PERCENT SLOPES	45.4	1%
171	KISHONA-CAMBRIA COMPLEX, 0 TO 3 PERCENT SLOPES	1.2	<1%
201	PARMLEED-BIDMAN ASSOCIATION, 3 TO 15 PERCENT	60.9	2%

MUSYM	Map Unit Name	Acres	%
	SLOPES		
254	SHINGLE, MOIST-BAUX-ROCK OUTCROP COMPLEX, 30 TO 60 PERCENT SLOPES	2.1	<1%
256	SHINGLE-HAVERDAD ASSOCIATION, MOIST, 0 TO 80 PERCENT SLOPES	16.9	<1%
257	SHINGLE-NIHILL COMPLEX, 3 TO 80 PERCENT SLOPES	13.0	<1%
261	SHINGLE, MOIST-ROCK OUTCROP COMPLEX, 30 TO 50 PERCENT SLOPES	1190.6	30%
266	SHINGLE-THEEDLE COMPLEX, 45 TO 75 PERCENT SLOPES	22.7	<1%
267	SHINGLE-THEEDLE LOAMS, MOIST, 45 TO 75 PERCENT SLOPES	233.5	6%
268	SHINGLE-THEEDLE-KISHONA ASSOCIATION, 6 TO 25 PERCENT SLOPES	790.0	20%
269	SHINGLE-THEEDLE-KISHONA ASSOCIATION, MOIST, 3 TO 30 PERCENT SLOPES	823.7	21%
279	TALUCE-TULLOCK-VONALEE ASSOCIATION, MOIST, 9 TO 30 PERCENT SLOPES	0.0	<1%
313	WYARNO CLAY LOAM, DRY, 3 TO 6 PERCENT SLOPES	3.9	<1%
319	ZIGWEID-KISHONA-CAMBRIA COMPLEX, MOIST, 3 TO 6 PERCENT SLOPES	38.6	1%
320	ZIGWEID-KISHONA-CAMBRIA LOAMS, MOIST, 6 TO 9 PERCENT SLOPES	463.2	12%
321	WATER	11.6	<1%

Note: Additional site specific soil information is included in the Ecological Site interpretations which follow in Section 3.4.2.

Ecological Site Descriptions are used to provide soils and vegetation information needed for resource identification, management and reclamation recommendations. To determine the appropriate Ecological Sites for the area contained within this proposed action, BLM specialists analyzed data from onsite field reconnaissance and Natural Resources Conservation Service published soil survey soils information. The map unit symbols identified for the soils and the associated ecological sites found within the POD boundary are listed in the table below.

Table 3.4 – Map Units and Ecological Sites

MUSYM	Ecological Site
113	LOAMY (15-19 NP)
114	Loamy 10-14" Northern Plains
118	LOAMY (15-19 NP)
120	LOAMY (15-19 NP)
136	LOWLAND (10-14 NP)
146	Clayey 10-14" Northern Plains
148	SANDY (15-19 NP)
158	LOWLAND (10-14 NP)
159	LOWLAND (15-19 NP)
169	LOAMY (15-19 NP)
171	Loamy 10-14" Northern Plains
201	Loamy 10-14" Northern Plains
254	VERY SHALLOW (15-19 NP)
256	SHALLOW LOAMY (15-19 NP)
257	SHALLOW LOAMY (10-14 NP)
261	SHALLOW LOAMY (15-19 NP)

MUSYM	Ecological Site
266	SHALLOW LOAMY (10-14 NP)
267	SHALLOW LOAMY (15-19 NP)
268	Loamy 10-14" Northern Plains
269	LOAMY (15-19 NP)
279	SANDY (15-19 NP)
313	Clayey 10-14" Northern Plains
319	LOAMY (15-19 NP)
320	LOAMY (15-19 NP)
321	Water

Dominant Ecological Sites and Plant Communities identified in this POD and its infrastructure, by dominant soil series are:

Loamy Sites:

This site occurs on gently undulating rolling land on landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 15-19 inch precipitation zone.

The soils of this site are moderately deep to deep (greater than 20" to bedrock), well drained soils that formed in alluvium and residuum derived from unspecified sandstone and shale. These soils have moderate permeability and may occur on all slopes.

The Historic Climax Plant Community (HCPC - defined as the plant community that was best adapted to the unique combination of factors associated with this ecological site) for this site would be a Rhizomatous Wheatgrasses, Needleandthread, Blue Grama Plant Community. The potential vegetation is about 75% grasses or grass-like plants, 15% forbs, and 10% woody plants. The site is dominated by cool season midgrasses.

The present plant community is a *Mixed Sagebrush/Grass*. Compared to the HCPC, sagebrush and blue grama have increased. Production of the cool season grasses have decreased. Cheatgrass has invaded the site.

Wyoming big sagebrush is a significant component of this Mixed Sagebrush/Grass plant community. Cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs.

Shallow Loamy Sites:

This site occurs on steep slopes and ridge tops, but may occur on all slopes on landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 15-19 inch precipitation zone.

The soils of this site are shallow (less than 20" to bedrock), well drained soils that formed in alluvium and residuum derived from shale and sandstone. These soils have moderate permeability and may occur on all slopes. The main soil limitations include depth to bedrock.

The HCPC for this site would be a Rhizomatous Wheatgrass, Bluebunch Wheatgrass, Idaho Fescue Plant Community. The potential vegetation is about 80% grasses or grass-like plants, 10% forbs, and 10% woody plants. The state is dominated by cool season mid-grasses.

The present plant community is a *Mixed Sagebrush/Grass*. Compared to the HCPC, sagebrush and blue grama have increased. Production of the cool season grasses and bluebunch wheatgrass have decreased.

Cheatgrass has invaded the site.

Wyoming big sagebrush is a significant component of this Mixed Sagebrush/Grass plant community. Cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs.

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

Table 3.5 – Summary of Ecological Sites

Ecological Site	Acres	Percent
LOAMY (15-19 NP)	1518.5	39%
SHALLOW LOAMY (15-19 NP)	1441.0	37%
Loamy 10-14" Northern Plains	853.3	22%
SANDY (15-19 NP)	37.7	1%
SHALLOW LOAMY (10-14 NP)	35.7	1%
Water	11.6	<1%
LOWLAND (10-14 NP)	9.3	<1%
LOWLAND (15-19 NP)	6.7	<1%
Clayey 10-14" Northern Plains	4.1	<1%
VERY SHALLOW (15-19 NP)	2.1	<1%

3.2.2. Wetlands/Riparian

No wetland areas were noted during the onsite.

Riparian areas noted within the project area include the banks of the Powder River as well as its tributaries. The tributaries found along the Powder River in the project area exhibit a defined flow path with riparian vegetation established along the channel where sediment deposition has occurred. The Powder River through the POD has mature cottonwood trees present along its banks in small groups or single trees. Cottonwood trees and riparian vegetation are prominent through the project area within the flood plains and oxbows along the Powder River.

3.2.3. Invasive Species

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

- Russian knapweed
- Salt cedar
- Leafy spurge

The WERIC database was created cooperatively by the University of Wyoming, BLM and county Weed and Pest offices. BLM confirmed the WERIC identified infestations during subsequent field investigations.

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

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 All Consulting (ALL) and Western Land Service (WLS). WLS performed aerial surveys for bald eagle winter roosts in January, February, and December 2006; and January 2007. ALL conducted ground surveys for mountain plover nesting activity; surveyed for greater sage-grouse on April 23, 30 and May 7, 2007; ground searched for raptor nests and prairie dog colonies during the spring of 2006, 2007. No formal surveys were conducted for Ute ladies'-tresses orchid. The only perennial water occurs along the Powder River outside of the POD area.

A BLM biologist conducted field visits on June 5, 6, 7, 2007. During this time, the biologist reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project adjustment recommendations where wildlife issues arose.

Wildlife species common to the habitat types present are identified in the Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (PRB FEIS 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 project area include pronghorn, mule deer, white-tailed deer, and occasionally elk. The WGFD has determined the entire project area to be Yearlong range for pronghorn and Winter/Yearlong for mule deer, and yearlong range for white-tailed deer. The antelope are part of the Clearmont herd unit estimated to be 8,351 in 2005. The population objective for the unit is 3,000. Mule deer are part of the Powder River herd unit estimated to be 54,495 in 2005. The herd objective is 52,000.

Yearlong use is when a substantial portion of a population makes general use of the habitat on a year-round basis. **Winter/Yearlong** use is when a population of animals makes general use of suitable habitat sites within a 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. 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 ephemeral tributaries of the Powder River. The Powder River Basin is one of the last free-flowing prairie stream ecosystems left in the United States; with existing flows, turbidity, and water quality within historic ranges. Due to this, the Powder River still supports an intact native fish community including several rare or declining species. These species have evolved life history strategies that allow them to survive in extreme conditions (Hubert, 1993). Native fish species include sauger, shovelnose sturgeon, goldeye, plains minnow, sand shiner, flathead chub, plains killifish, river carpsucker, sturgeon chub, western silvery minnow, channel catfish, fathead minnow, longnose dace, mountain sucker, shorthead redhorse, longnose sucker, stonecat, white sucker and others. Six of these are designated by the Wyoming Game and Fish Department as either Native Species Status (NSS) 1, 2, or 3 species. Species in these designations are considered to be species of concern, in need of more immediate management attention, and more likely to be petitioned for listing under the Endangered Species Act.

NSS1 species (sturgeon chub and western silvery minnow) are those that are physically isolated and/or

exist at extremely low densities throughout their range, and habitat conditions are declining or vulnerable. NSS2 species (goldeye, shovelnose sturgeon, and sauger) are physically isolated and/or exist at extremely low densities throughout their range, and habitat conditions appear to be stable. NSS3 species (plains minnow) are widely distributed throughout their native range and appear stable; however, habitats are declining or vulnerable. For these species, the Wyoming Game and Fish Department has been directed by the Wyoming Game and Fish Commission to recommend that no loss of habitat function occur. Some modification of the habitat may occur, provided that habitat function is maintained (i.e., the location, essential features, and species supported are unchanged).

The sturgeon chub was petitioned for listing under the Endangered Species Act in 2000. The Sturgeon Chub is a small minnow native to WY and is known to occur only in the Powder River and in one location on Crazy Woman Creek. The Sturgeon Chub requires large, free-flowing rivers characterized by swift flows, high variable flow regimes, braided channels, high turbidity and sand/gravel substrates. On April 18, 2001, the U.S. Fish and Wildlife Service determined that the listing was not warranted, due to the sturgeon chub population being more abundant and better distributed throughout their range than previously believed.

Amphibian and reptile species occur throughout the Basin, but there is little recorded baseline information available for them. Fish that have been identified in the Middle Powder River watershed 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. Migratory bird species of management concern that may occur in the project area are listed in the PRB FEIS (3-151). Species observed by ALL include Baird's sparrow.

3.3.4. Raptors

Seventeen new raptor nests were identified nests were located in the Cabin Creek 2 project area. In 2007, there were 10 active nests. Seven nests were inactive in 2007.

Table 3.3.4.1. Documented raptor nests within the Cabin Creek 2 project area in 2007 (UTM Zone 13, NAD83).

BLM ID#	SPECIES	UTM	LEGAL LOCATION	SUBSTRATE	CONDITION	STATUS
4298	GOEA	4971932 416336	SWNW SEC 30 57/76	CLF	GOOD	ACT
617	UNK	4971039 417366	SESE SEC30 57/76	CTL	FAIR	INAC
4299	FEHA	4969052 413897	SWSW SEC 36 57/77	CTL	GOOD	ACT
4300	UNK	4971647 411234	SWNE SEC 27 57/77	CTL	POOR	INAC
4839	BUTEO	4969616 413966	NESW SEC 36 57/77	CTD	EXCEL	ACT
4840	BUTEO	4970029 412799	SWNE SEC 35 57/77	CTL	GOOD	INAC
4841	RTHA	4972606 411128	NESW SEC 22 57/77	CTL	GOOD	ACT
4842	UNK	4971194	NWSE SEC 27	CTL	FAIR	INAC

BLM ID#	SPECIES	UTM	LEGAL LOCATION	SUBSTRATE	CONDITION	STATUS
		411450	57/77			
4843	BUTEO	4971193 411516	NWSE SEC 27 57/77	CTL	GOOD	ACT
4844	UNK	4969488 412941	NWSE SEC 35 57/77	CTL	GOOD	ACT
4845	UNK	4969290 413899	SWSW SEC 36 57/77	CTD	POOR	INAC
4846	FEHA	4969231 414136	SESW SEC 36 57/77	CTL	GOOD	ACT
4847	COHA	4973931 412512	SESW SEC 14 57/77	POL	POOR	INAC
4848	RTHA	4973789 412293	SWSW SEC 14 57/77	POL	EXCEL	ACT
4849	RTHA	4974208 412674	NESW SEC 14 57/77	POL	GOOD	ACT
4850	RTHA	4974221 412625	NESW SEC 14 57/77	POL	POOR	INAC
4851*	PRFA	4972178 415121	SESE SEC 24 57/77	ROC	GOOD	ACT

*located on on-site by Gerard

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 1988, the WGFD identified four prairie dog complexes (Arvada, Recluse, Thunder Basin National Grasslands, and Midwest) partially or wholly within the BLM Buffalo Field Office administrative area as potential black-footed ferret reintroduction sites (Oakleaf 1988).

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).

Approximately 188 acres black-tailed prairie dog colonies were identified during site visits by ALL within the Cabin Creek 2 project area. Sufficient habitat is not present within the project area to support black-footed ferrets.

3.3.5.1.2. Ute's 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. Habitat includes wet meadows, abandoned stream channels, valley bottoms, gravel bars, and near lakes or perennial streams that become inundated during large precipitation events. The orchid is documented in four Wyoming locations, Converse County along a tributary of Antelope Creek, an irrigated field in Niobrara County, along Bear Creek in Goshen County, and Horse Creek in Laramie County.

Remington and Cabin Creek and its tributaries are ephemeral. There are no springs (ALL Consulting 2007) within the project area. Suitable orchid habitat is not present within the Cabin Creek 2 project area.

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. 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.

Prairie dogs colonies create a biological niche or habitat for many species of wildlife (King 1955, Reading 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 Reading1989) suggest that richness of associated species on black-tailed prairie dog colonies increases with colony size and regional colony density. Prairie dog colonies attract many insectivorous and carnivorous birds and mammals because of the concentration of numerous 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, Mac Cracken 1985, Agnew 1986, Uresk 1986, Deisch 1989). Of those species regularly associated with prairie dog colonies, six are on the Wyoming BLM sensitive species list. The species of concern are swift fox (*Vulpes velox*), mountain plover (*Charadrius montanus*), ferruginous hawk (*Buteo regalis*), burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus*), long-billed curlew (*Numenius americanus*).

3.3.5.2.1. 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 protection by 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) 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 can be more varied. In addition to prairie dogs, ground squirrels, and lagomorphs, domestic sheep and big game carcasses 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.

Bald eagles were observed near the project area during the 2006 and 2007 winters. BLM records indicate bald eagle winter roost locations along the Powder River east of the POD. The majority of trees capable of supporting roosting and nesting bald eagles are located approximately .5 miles and greater outside of the POD, in Sec 30 and 31 along the Powder River. Less suitable roost or nest trees occur along Cabin creek south of the Cabin Cr. 2 project area.

The project area has a year round prey base in the form of prairie dogs, and lagomorphs (hares and rabbits) and fish. Within the project area there are 188 acres of active prairie dog colonies.

3.3.5.2.2. Black-tailed prairie dog

On August 12, 2004, the U.S. Fish and Wildlife Service removed the black-tailed prairie dog's Candidate status. The Buffalo Field Office however will consider prairie dogs as a sensitive species and continue to afford this species the protections described in the FEIS.

Approximately 188 acres of black-tailed prairie dog colonies were identified during site visits by ALL within the project area. The majority of colonies occur along Big Remington Creek and one (colony 3) along Cabin Creek. The landowner is actively controlling the prairie dog population through poisoning. The majority of towns were unoccupied, with small remnant populations.

Name	Acres
Colony 1	31.79
Colony 2	41.89
Colony 3	32.72
Colony 4	27.64
Colony 5	33.75
Colony 6	21.03
Total	188.82

3.3.5.2.3. Greater sage-grouse

Sage-grouse listed as a sensitive species by BLM (Wyoming). In recent years, seven petitions have been submitted to the U.S. Fish and Wildlife Service (FWS) 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.

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).

Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), the primary shrub, occurs throughout the project area in a patchy mosaic of sparse (0-5% cover), low (5-10% cover), moderate (10-15% cover), and dense (15-25% cover) stands. On average, the sagebrush ranged in size from 15 to 20 inches tall. Suitable sage-grouse habitat is present throughout the project area. BLM records identified one sage grouse lek within 3.0 miles of the Cabin Cr. 2 project area.

Table 5. Documented sage-grouse leks within two miles of the project in 2007.

Lek ID	UTM NAD83	Legal Location	Status (Peak Males)	Distance From Project Area (Miles)
Remington	4973307N 415260E	NWSW Sec. 19 57/76	7	.5

3.3.5.2.4. Sharp-tailed grouse

Multiple surveys were conducted by ALL and no sharp-tailed grouse were documented using the area. The closest known sharp-tailed grouse lek is 11 miles northwest of the POD.

3.3.5.2.5. Mountain plover

Mountain plovers, which are a Buffalo Field Office sensitive species, are typically associated with high, dry, short grass prairies containing vegetation typically shorter than four inches tall, and slopes less than 5 degrees (BLM 2003). Mountain plovers are closely associated with heavily grazed areas such as prairie dog colonies and livestock pastures.

In September 2003, the U.S. Fish and Wildlife Service withdrew their proposal to list the mountain plover. However, the mountain plover remains an agency-designated sensitive species within both the Bureau of Land Management and the Forest Service. According to the U.S. Geological Survey, prairie dogs currently exist on less than one percent of their former range, and their numbers have declined by 98 percent (Turbak 2004). Mountain plover numbers have declined, possibly from millions to only about 10,000 birds today (Turbak 2004).

Suitable mountain plover habitat is limited to 6 prairie dog towns (188 acres), and a few level ridge tops with sparse grass cover (All 2007). Surveys conducted by ALL indicated the remainder of the project area to be unsuitable for mountain plover nesting due to steep terrain, vegetation greater than 30%, and presence of killdeer.

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	Human Cases PRB	Veterinary Cases PRB	Bird Cases PRB
2001	0	0	0	0
2002	2	0	15	3

Year	Total WY Human Cases	Human Cases PRB	Veterinary Cases PRB	Bird Cases PRB
2003	392	85	46	25
2004	10	3	3	5
2005	12	4	6	3
2006	65	0	2	2
2007	119	20	None reported	1

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 primarily within the Middle Powder River drainage system with a portion of the southwest corner of the POD within the Clear Creek drainage system. However, the 1 outfall where treated discharge water enters the Middle Powder River is in that watershed. No upland reaches of the watersheds will be impacted.

3.5.1. Groundwater

WDEQ water quality parameters for groundwater classifications (Chapter 8 – Quality Standards for Wyoming Groundwater) define the following limits for TDS: 500 mg/l TDS for Drinking Water (Class I), 2000 mg/l for Agricultural Use (Class II) and 5000 mg/l for Livestock Use (Class III).

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

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

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

The BLM has 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 has a battery of nineteen wells which have been installed and monitored jointly by the BLM and USGS since August, 2003. Water quality data has been sampled from these wells on a regular basis. That impoundment 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 indicate 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.

A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 12 registered stock water wells within ½ mile of a federal CBNG producing well in the POD with depths ranging from 27 to 600 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 primarily within the Middle Powder River watershed (where all discharge will occur), with a portion in the southwest part of the project within the Clear Creek watershed. Most of the drainages in the area, with the exception of Clear Creek and the Powder River, are ephemeral (flowing only in response to a precipitation event or snow melt) to intermittent (flowing only at certain times of the year when it receives water from alluvial groundwater, springs, or other surface source – PRB FEIS Chapter 9 Glossary). The channels are primarily well vegetated grassy swales, without defined bed and bank.

The PRB FEIS presents the historic mean Electrical Conductivity (EC, in µmhos/cm) and Sodium Adsorption Ratio (SAR) by watershed at selected United States Geological Survey (USGS) Gauging Stations in Table 3-11 (PRB FEIS page 3-49). These water quality parameters "illustrate the variability in ambient EC and SAR in streams within the Project Area. The representative stream water quality is used in the impact analysis presented in Chapter 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM produced water of varying chemical composition to surface drainages within the Project Area" (PRB FEIS page 3-48). For the Middle Powder River Watershed, the EC ranges from 1,421 at Maximum monthly flow to 2,154 at Low monthly flow and the SAR ranges from 3.92 at Maximum monthly flow to 4.62 at Low monthly flow. These values were determined at the USGS station located at Moorhead, MT(PRB FEIS page 3-49).

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

A current Class III inventory was conducted for the Cabin Creek Phase II project prior to on-the-ground project work (BFO project # 70070036). Foothills Archaeological Consulting conducted the current Class III inventory following the Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines (48FR190) for the proposed project. Clint Crago, BFO archaeologist, reviewed the report for technical adequacy and for compliance with BLM and Wyoming State Historic Preservation Office standards, and determined it to be adequate. The following resources are located within the Area of Potential Effect (APE).

Table 3.8 Cultural Resource Sites Identified within the Cabin Creek Phase II POD project area

Site Number	Site Type	National Register Eligibility
48SH167	Cabin	Not Eligible
48SH178	Prehistoric Occupation Site	Not Eligible
48SH665	Homestead	Not Eligible

4. ENVIRONMENTAL CONSEQUENCES

The changes to the proposed action which resulted in development of Alternative C as the preferred alternative, have reduced the impact 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

The majority of the proposed disturbance was planned within uplands areas containing loamy and shallow loamy ecological sites. Efforts have been made to avoid soil conditions with limited reclamation potential. However, in those areas where erosion concerns associated with proposed disturbance could not be avoided, mitigation and/or site specific COA's to address soil stabilization in a timely fashion have been applied. Portions of the project are planned within lowland ecological sites and measures have been taken to provide adequate buffers for riparian areas.

The predominance of shallow soils, steep slopes and climatic limitations throughout the POD as identified by the NRCS Soil Survey for Northern Sheridan County and the BLM onsite investigations warrant the need for additional reclamation related conditions of approval (COA's) and the use of best management practices (BMP's) to help assure that the reclamation requirements of the Wyoming Reclamation Policy will be met.

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

- Mixing of horizons occurs where construction on roads, pipelines or other activities take place. Mixing may result in removal or relocation of organic matter and nutrients to depths where it would be unavailable for vegetative use. Soils which are more susceptible to wind and water erosion may be moved to the surface. Soil structure may be destroyed, which may impact infiltration rates. Less desirable inorganic compounds such as carbonates, salts or weathered materials may be relocated and limit re-vegetation. This drastically disturbed site may change the ecological integrity of the site and the recommended seed mix.
- Loss of soil vegetation cover, biologic crusts, organic matter and productivity.
- Soil erosion would also affect soil health and productivity. Erosion rates are site specific and are dependant on soil, climate, topography and cover.
- Soil compaction is the collapse of soil pores resulting in decreased infiltration and increased erosion potential. Factors affecting compaction include soil texture, moisture, organic matter, clay content and soil type, pressure exerted, and the number of passes by vehicle traffic or machinery. Compaction may be remediated by plowing or ripping.
- Modification of hill slope hydrology.

These impacts, singly or in combination, increase the potential for valuable top soil loss due to increased water and wind erosion, invasive plant establishment, and increased sedimentation including salt loads to the watershed.

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. These 68 wells are proposed on 34 twin well locations. Of the 34 proposed twin well locations, 1 is on a reclaimed conventional well pads, 23 can be drilled without a well pad being constructed, and 10 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the 48 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 25 x 40 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 48 wells would involve approximately 0.34 acre/well location for 8.2 total acres. The other 20 wells requiring cut & fill pad construction would disturb approximately 0.68 acres/well pad for a total of 6.8 acres. The total estimated disturbance for all 68 wells would be 15 acres.

Approximately 11.6 miles of improved roads would be constructed to provide access to various well locations. Another 4.9 miles of existing primitive road will be improved. Approximately 5.7 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. This practice results in less surface disturbance and overall environmental impacts. Approximately 3.0 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, gabions etc.) would ensure land productivity/stability is regained and maximized.

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
Non-constructed Twin Well Pad Constructed Twin Well Pad	24 10	100' X 150' Site Specific	8.2 6.8	Long Term
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 On-channel Off-channel Water Discharge Points	 0 0 existing	 Site Specific Site Specific Site Specific or 0.01 ac/WDP	0.0 0.0 0.0 0.0	Long Term
Channel Disturbance Headcut Mitigation* Channel Modification	 0 0	 Site Specific Site Specific	 0.0 0.0	
Improved Roads No Corridor With Corridor Existing Primitive to be Improved With Corridor	 1.5 10.1 4.9	 50' Width or Site Specific 30' Width	 9.1 61.1 17.7	Long Term
2-Track Roads No Corridor With Corridor	 5.7	 50' Width	 34.7	Long Term
Pipelines No Corridor With Corridor	 3.0 0.2	 50' Width 40' Width	 18.4 0.9	Short Term
Buried Power Cable No Corridor	 0	12' Width or Site Specific		Short Term
Overhead Powerlines	2.6	30' Width	9.6	Long Term
Additional Disturbance	0	Site Specific	0	

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".

There are many areas which will be reclaimed by traditional methods. However, some areas will be challenging for reclamation due to soil properties and/or site characteristics. The proponent planned their project to some extent and the BLM made further recommendations on the onsite to avoid those areas having a low reclamation potential (highly erosive soils). The Bureau of Land Management has an obligation to protect these lands from unnecessary and undue disturbance. The proposed action will affect some areas of soils with a limited potential for successful reclamation. Disturbances within these areas require the programmatic/standard COA's be complimented with a site specific performance based reclamation related COA.

4.1.1. Wetland/Riparian

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

"Continuous high stream flows into wetlands and riparian areas would change the composition of species and dynamics of the food web. The shallow groundwater table would rise closer to the surface with increased and continuous stream flows augmented by produced water discharges. Vegetation in riparian areas, such as cottonwood trees, that cannot tolerate year-round inundated root zones would die and would not be replaced. Other plant species in riparian areas and wetland edges that favor inundated root zones would flourish, thus changing the plant community composition and the associated animal species. A rise in the shallow ground groundwater table would also influence the hydrology of wetlands by reducing or eliminating the seasonal drying periods that affect recruitment of plant species and species composition of benthic and water column invertebrates. These changes to the aquatic food web base would affect the higher trophic levels of fish and waterfowl abundance and species richness for wetlands and riparian areas." (PRB FEIS Page 4-175).

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. This includes but is not limited to the 3 state-listed noxious weeds that were identified; leafy spurge, Russian knapweed and salt cedar. Weed infestations were observed throughout the project area including both federal and privates surface. The operator has developed an Integrated Pest Management Plan in consultation with the Sheridan County Weed and Pest District. The operator has submitted a Pesticide Use Proposal (PUP) form WY-04-9222-1 to the BLM for the chemical treatment of noxious weeds. The following measures in an Integrated Pest Management Plan (IPMP) are included in the proposal:

1. A weed spraying program agreed upon by the BLM, Pinnacle and the private landowners will be administered on all disturbed area. The operator will control weeds annually.
    - Apply 1 quart of Tordon 22k (picloram) per acre (spot-spraying)
    - 1 quart of 2-4D (dicambia) per acre (spot-spraying)
    - 1 quart of wetting agent per 100 gallons of mixture for spring control of annual weeds

2. Precautionary measures, such as washing vehicles' under carriages, may also be implemented to minimize seed transportation and dispersal.
3. Pinnacle will educate field personnel and other contractors in identification and awareness of noxious weeds.

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.

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 drainage, which is approximately 40.8% of the total predicted in the PRB FEIS.
- 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 the Middle Powder Watershed.
- The WMP for the Cabin Creek Phase II POD proposes that produced water will not contribute significantly to flows downstream.

No additional mitigation measures are required.

4.2. Wildlife

4.2.1. Big Game Direct and Indirect Effects

Under the environmentally preferred alternative, winter yearlong range for mule deer and yearlong range for antelope and white-tailed 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 feels 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 accepted 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. In order to survive 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.

4.2.1.1. Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-211.

4.2.2. Aquatics Direct and Indirect Effects

Produced water will be treated through a EMITs facility near the Powder River, than discharged to the River. The Wyoming Game and Fish Department was consulted about impacts to fisheries as a result of the discharge.

The Wyoming Department of Environmental Quality (DEQ) regulates effluent discharge through the National Pollution Discharge Elimination System in compliance with the Federal Water Pollution Control Act and the Wyoming Environmental Quality Act. The Wyoming DEQ has established effluent limits for the protection of game and non-game, aquatic life other than fish, wildlife, and other water uses.

Altering water temperatures, flow timing and magnitude, turbidity and chemical composition of the Powder River could harm native fish species which inhabit the Powder River. Alterations could also allow for non native species to become established. Any water development that alters discharge patterns, reduces turbidity, changes water quality, modifies sediment transport, or blocks migratory routes for fish is likely to result in changes in the fish community. Additionally, altering of tributaries may have adverse effects to aquatic species. Tributaries provide spawning and nursery habitat for riverine fishes and support unique fish assemblages. Seasonal movements of riverine fishes into tributaries may be essential to the continued maintenance of several species found in the Powder River (Hubert, 1993).

Change in Water Quality

Fish and amphibian species have evolved and adapted to existing conditions. Changes in water quality may have detrimental impacts on the native aquatic fauna. Major information gaps for these species

include feeding habits, reproduction, specific habitat preference (pools, riffles, runs, backwaters, side channels, or a combination), and seasonal habitat use.

Wyoming Game and Fish Department initiated a detailed fish and amphibian survey of the main-stem Powder River in 2004 to determine baseline species composition and distribution in the Basin. In accordance with the PRB FEIS, a monitoring plan was establish by the Interagency work group. The plan calls for baseline data collection over a three year period which is intended to provide information relative to the effects upon the aquatic biota of CBNG water.

Changes in the conductivity and sodium absorption ratio may occur as increased flows move sediment from channel bottoms and potentially increase erosion of floodplains. Confluence Consulting reported high salinities and electrical conductivities, possibly due to CBNG water, for the Spotted Horse drainage in their recently released report on the Powder River. This report indicated that CBNG discharges could affect native species in the drainage. The water quality projected to be discharged to the Powder River from this project is 2000 µmhos/cm between March to November. During August and September Pinnacle expects to discharge water with an SAR of 5 to 6.5, and an EC of 2500 µmhos/cm.

Change in Water Quantity

Native fauna in the Powder River drainage have evolved and adapted to a very dynamic hydrograph with high sediment loads. Changes in this flow regime (i.e., perennial flows) may seriously impact native fauna by altering their use of historical habitats for spawning, rearing, and reproduction. Alterations that impact channel morphology is an issue, and will have impacts to the aquatic biota due to changes in sediment loads, loss of habitat, and possible disruption of migration movements due to barriers created by culverts and/or head cuts. This is a monitoring and adaptive management issue for CBNG development.

It is difficult to assess, due to limited information, what effects this discharge may have upon the aquatic biota in the Powder River system. The increase in flow resulting from the discharge of project CBNG treated water would be more noticeable during the late summer months or winter months when the mean monthly flow is smaller than during the remainder of the year. An addition of approximately (12.93 MGD per day) of project treated water to an average flow of 30 cfs into the Powder River is unlikely to affect its hydraulic regime or alter surface water quality. The flow attributable to project produced water is very small relative to storm flows. Peak flow estimates for the river range from 3,560 cfs for a two year storm event to 18,065 cfs for a 100-year storm event. Channel erosion, and/or channel sedimentation would be very unlikely to occur. Addition of the treated produced water would facilitate beneficial uses such as livestock and wildlife supply and irrigation supply during the late summer and winter months when the naturally occurring flow is diminished.

Wyoming Game and Fish (G&F) submitted comments to WDEQ on Pinnacle's application for NPDES. The G&F approved of the outfall locations and water quality and quantity estimates in the water management plan (ALL 2007). The WDEQ mandates additional information collected by Pinnacle to provide a better understanding of the dynamics of the aquatic system.

4.2.2.1. Cumulative effects

WDEQ is aware of the concerns about the effects of water quality and flows relative to discharge of treated water directly into the Powder River. They are taking a conservative approach to permitting until more information can be obtained and their watershed based permitting approach is implemented. Long term water quality and flow monitoring, that would be required in the NPDES permit, would ensure that effluent limitations are met. Under permitted conditions, it is not anticipated that existing downstream water uses would be affected.

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 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).

Density of breeding Brewer's sparrows declined by 36% within 100 m of dirt roads within a natural gas field. Effects occurred along roads with light traffic volume (<12 vehicles per day). Findings suggest that indirect habitat losses from energy development may be substantially larger than direct habitat losses (Ingelfinger 2004).

Density of breeding sage sparrows was reduced by 57% within a 100-m buffer of dirt roads regardless of traffic volume. The density of roads constructed in natural gas fields exacerbated the problem and the area of impact was substantial (Ingelfinger 2004).

Overhead power lines may affect migratory birds in several ways. Power poles provide raptors with perch sites and may increase predation on migratory birds. Power lines placed in flight corridors may result in collision mortalities. Some species may avoid suitable habitat near power lines in an effort to avoid predation. Additional direct and indirect effects to migratory birds are discussed in the PRB FEIS (4-231-235).

4.2.3.1. Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, 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 over heating or chilling of eggs or chicks. The 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. Additional direct and indirect impacts to raptors, from oil and gas development, are analyzed in the PRB FEIS (4-216-221).

Table 4.2. Infrastructure within close proximity to documented raptor nests within the Cabin Creek 2 project area (Timing limitations will apply to this infrastructure).

BLM ID#	UTM (NAD 83)	SPECIES	STATUS	WELL / PIT NUMBER	DISTANCE
4298	4971932N 416336E	GOEA	ACT	17-30 WP, 17-30CC	.5 MI
4840	4970029N	BUTEO	INAC	1-35CC, 1-35WP	.3MI.

BLM ID#	UTM (NAD 83)	SPECIES	STATUS	WELL / PIT NUMBER	DISTANCE
	412799E				
4843	4971193N 411516E	BUTEO	ACT	5-26CC, 5-26WP	.4MI
4847	4973931N 412512E	COHA	INAC	13-14CC, 13-14WP, 15-14CC, 15-14WP, 1-23CC, 1-23WP	.2MI, .2MI. .4MI.
4848	4973789N 412293E	RTHA	ACT	3-23CC, 3-23WP	.2MI
4849	4974208N 412674E	RTHA	ACT	11-14WP, 11-14CC, 7-14WP. 7-14CC	.2MI .3MI
4850	4974221N 412625E	RTHA	INAC	11-14WP, 11-14CC, 7-14WP. 7-14CC	.2MI .3MI

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.

A pair of red-tailed hawks were observed calling near the 11-14 well location. The well was moved 100 yards to the west out of line of sight of a potential nest. Subsequent nest surveys by another consultant (WLS) located additional raptor nests within .5 miles of proposed well locations. The previous consultant (ALL) did not discover or record these nest locations until WLC informed them. A prairie falcon nest was documented by Gerard on the on-site. This nest was out of line of sight from development activities.

4.2.4.1. Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-221. No additional mitigation measures are required.

4.2.5. Threatened and Endangered and Sensitive Species

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

4.2.5.2. Table 4.3 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	Prairie dog colonies present (188 acres), but insufficient size for BFF.
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.

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

4.2.5.2.1. Black-footed ferret

Because the black-tailed prairie dog colonies within and adjacent to the Cabin creek 2 project area are of insufficient size for supporting ferrets and are isolated from any prairie dog complexes, implementation of the proposed development should have ***no effect*** on the black-footed ferret.

4.2.5.2.2. Ute's Ladies Tresses Orchid

Produced water will be treated and discharged to the Powder River. Suitable habitat is not present within the project area. No historic seed source is present within or upstream of the project area. Implementation of the proposed coal bed natural gas project should have "***no effect***" on the Ute ladies'- tresses orchid as suitable habitat is not present.

4.2.5.3. Sensitive Species Direct and Indirect Effects

Continued loss of prairie dog habitat and active prairie dog towns will result in population declines of multiple sensitive species in the short grass prairie ecosystem.

Table 4.4 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 effect 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.	K	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	S	MIIH	Prairie dog colony present.
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	K	MIIH	Active nest present.
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	K	MIIH	Sagebrush cover will be affected.
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	NP	NI	No 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	NP	NI	Outside species range.
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

4.2.5.3.1. Bald eagle

Although there are no documented nest sites or communal roosts within the Cabin Creek 2 project area, suitable habitat is present and bald eagle use has been documented in the project vicinity. Bald eagle populations are recovering; new nests and roosts are being established every year. Three new nests have been documented within or near the Buffalo Field Office administrative area in 2006 (Rogers pers. Comm., Byer pers comm.). Two of these nests are located in a stand of just a few cottonwood trees and are not associated with a fish-bearing water body. Timing limitations for nesting and winter roosting will be applied to the Cabin Creek 2 project as suitable habitat is present, bald eagle use has been documented, and eagles may initiate a new nest or roost site within the project area.

A proposed powerline is within .1 mile of the Powder River and will increase the risk of electrocution and collision for bald eagles. The powerline bisects Big Remington Creek which contains the majority of prairie dog colonies, a potential prey species for bald eagles.

There are no existing overhead three-phase distribution lines within the project area. Pinnacle is proposing an additional 2.63 miles of overhead three-phase distribution lines. There are currently 4.8 miles of improved roads within the project area, with 11.6 miles proposed.

The presence of overhead power lines may adversely affect 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. Constructing power lines to the APLIC suggestions and Service standards minimizes but does not eliminate electrocution risk.

Roads present a collision hazard, primarily from bald eagles scavenging on carcasses resulting from other road related wildlife mortalities. Collision risk increases with automobile travel speed. 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%).

Produced water will be treated and discharged to the Powder River which 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). Continual discharge to the Powder River could keep the river open when otherwise it might ice over. Eagle use of the Powder River should be reported to determine the need for any future management.

4.2.5.3.2. Black-tailed prairie dog

Approximately .75 mile of new roads and .25 mile of existing roads are planned within prairie dog towns. One well is planned within an unoccupied prairie dog town. There would be .25 miles of proposed over head powerline within a prairie dog town. The prairie dog towns are on private surface where the landowner is actively poisoning.

The well house and nearby power poles may provide habitats for mammal and avian predators increasing prairie dog predation. Mineral related traffic on the adjacent road may result in prairie dog road mortalities.

4.2.5.3.3. Greater sage-grouse

One sage grouse lek was recorded by ALL during surveys in the Cabin Creek 2 project area. The lek is adjacent (within 110 yards) to an improved main access road to the POD and near a fee CBNG well. Sage grouse are likely to be impacted from vehicle collisions from increased traffic. A proposed powerline is .5 miles from the lek. Power to individual well locations will be buried from a power drop. An estimated 16 acres of sage grouse habitat would be disturbed by wells, roads and pipeline corridors.

Greater sage-grouse habitat is being directly lost with the addition of well sites, roads, pipelines, power lines, and other infrastructure (Theiele 2005, Oedekoven 2004). Sage grouse avoidance of CBNG infrastructure results in even greater indirect habitat loss. The Wyoming Game and Fish Department (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).

The presence of overhead power lines and roads within the project area may impact sage grouse. Overhead power lines create hunting perches for raptors, thus increasing the potential for predation on sage grouse. Increased predation from overhead power near leks may cause a decrease in lek attendance and possibly lek abandonment. Overhead power lines are also a collision hazard for sage grouse flying through the area. Increased roads and mineral related traffic can affect grouse activity and reduce survival (Braun et al. 2002). Activity along roads may cause nearby leks to become inactive over time (WGFD 2003).

Noise can affect sage grouse by preventing vocalizations that influence reproduction and other behaviors (WGFD 2003). Sage grouse attendance on leks within one mile of compressors is lower than for sites farther from compressors locations (Braun et al. 2002).

The Buffalo Field Office (BFO) Resources 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), which includes the WGFD, 1977 sage-grouse guidelines (Bennett 2004). Under pressure for standardization BLM Wyoming adopted the two-mile recommendation in 1990, and instructed the field offices to incorporate the measure into their land use plans (Bennett 2004, Murkin 1990).

The two-mile recommendation was based on research which indicated between 59 and 87 percent of sage-grouse nests were located within two-miles of a lek (Bennett 2004). These studies were conducted within prime, contiguous sage-grouse habitat such as Idaho's Snake River plain.

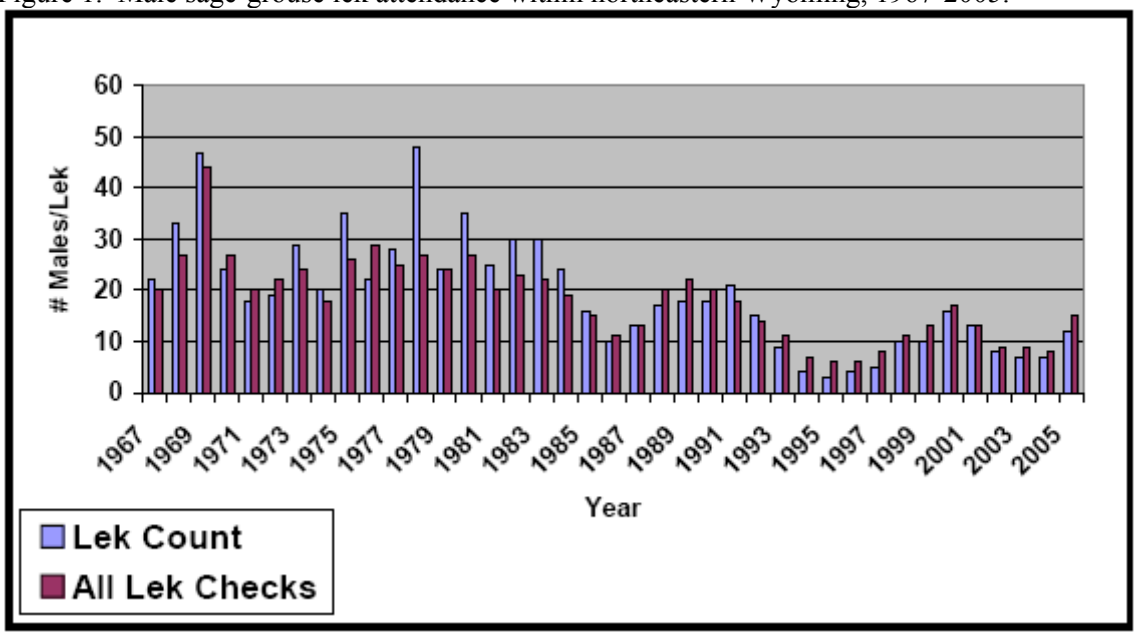
Additional studies, across more of the sage-grouse's range, indicate that many populations nest much farther than two miles from the lek of breeding (Bennett 2004). Holloran and Anderson (2005), in their Upper Green River Basin study area, reported only 45% of their sage grouse hens nested within 3 km (1.86 mi) of the capture lek. Moynahan and Lindberg (2004) found 36% of their grouse nesting within 3 km of the capture leks. 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. In press).

Percentage of sage-grouse nesting within a certain distance from their breeding lek is unavailable for the Powder River Basin. The Buffalo and Miles City field offices through the University of Montana with assistance from other partners including the U.S. Department of Energy and industry are currently researching nest location and other sage-grouse questions and relationships between grouse and coalbed natural gas development. Habitat conditions and sage grouse biology within the Buffalo Field Office is probably most similar to Moynahan's north-central Montana study area.

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. Without contiguous habitat available to nesting grouse it is likely a smaller percentage of grouse nest within two-miles of a lek within the PRB than grouse within those areas studied in the development of the 1977 WAFWA recommendations and even the Holloran and Moynahan study areas. Holloran and Moynahan both studied grouse in areas of contiguous sagebrush habitats without large scale fragmentation and habitat conversion (Moynahan et al In press, Holloran and Anderson 2005). A recent sagebrush cover assessment within Wyoming basins estimated sagebrush coverage within Hollaran and Anderson's Upper Green River Basin study area to be 58% with an average patch size greater than 1200 acres; meanwhile Powder River Basin sagebrush coverage was estimated to be 35% with an average patch size less than 300 acres (Rowland et al. 2005). The Powder River Basin patch size decreased by more than 63% in forty years, from 820 acre patches and an overall coverage of 41% in 1964 (Rowland et al. 2005). Recognizing that many populations live within fragmented habitats and nest much farther than two miles from the lek of breeding WAFWA revised their sage grouse management guidelines (Connelly et. al. 2000) and now recommends the protection of suitable habitats within 5 km (3.1 mi) of leks where habitats are not distributed uniformly such as the Powder River Basin.

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

Figure 1. Male sage-grouse lek attendance within northeastern Wyoming, 1967-2005.



Sage-grouse populations within the PRB are declining independent of coalbed natural gas development. 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 (Oedekoven 2004). The Powder River Basin Oil and Gas Project Final Environmental Impact Statement estimated 51,000 additional CBNG wells to be drilled over a ten year period beginning in 2003 (BFO 2003). Impacts from CBNG development are likely to be significant and additive to the long-term impacts afflicting the sage-grouse population (Oedekoven 2004). In other terms, CBNG development is expected to accelerate the downward sage-grouse population trend.

A two-mile timing limitation given the long-term population decline and that less than 50% of grouse are expected to nest within the limitation area is likely insufficient to reverse the population decline. Moynahan and Lindberg (2004) like WAFWA (Connely et al. 2000) recommend increasing the protective distance around sage grouse leks. 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. As stated earlier, a well density of eight wells per section creates sage-grouse avoidance zones which overlap creating contiguous avoidance areas (WGFD 2004).

An integrated approach including habitat restoration, grazing management, temporal and spatial mineral limitations etc. is necessary to reverse the population decline. The Wyoming Game and Fish Department (WGFD) has initiated such a program within the Buffalo Field Office area (Jellison 2005). The WGFD program is modeled after a successful program on the Deseret Ranch in southwestern Wyoming and northeastern Utah. The Deseret Ranch has demonstrated a six-fold increase in their sage-grouse population while surrounding areas exhibited decreasing populations (Danvir 2002).

4.2.5.3.4. Mountain plover

Mineral development may have mixed effects on mountain plovers. Disturbed ground such as buried pipe line corridors and roads may be attractive to plovers while human activities within one-quarter mile may be disruptive. Use of roads and pipe line corridors by mountain plovers may increase their vulnerability to vehicle collision. The existing overhead power lines adjacent to the project area provide perch sites for

raptors potentially resulting in increased mountain plover predation. CBNG infrastructure such as the well houses may provide shelter and den sites for ground predators such as skunks and foxes. 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).

The project area contains 188 acres of prairie dogs with minimal populations. The majority of towns had extensive vegetative growth in 2007. The landowner is actively controlling prairie dog numbers. Suitable mountain plover habitat is not present within the project area. The project should not affect mountain plovers.

4.2.5.4. 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

BLM has consulted with applicable state agencies, County Weed and Pest and the State Health Department, regarding the disease. 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 Middle Powder River watershed and commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Qualified hydrologists, in consultation with the BLM, developed the water management plan. Adherence with the plan, in addition to BLM applied mitigation (in the form of COAs), would reduce project area and downstream impacts from proposed water management strategies of treatment and discharge to the Middle Powder River.

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 1360.0 gpm (3.03 cfs or 2,193 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 drainage, the projected volume produced

within the watershed area was 12,044 acre-feet in 2006 (maximum production is estimated in 2005 at 12,328 acre-feet). As such, the volume of water resulting from the production of these wells is 18.2% of the total volume projected for 2006. 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 37% to groundwater aquifers and coal zones in the drainage area (PRB FEIS pg 4-5). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, "the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater." (PRB FEIS pg 4-54). Therefore, the chemical nature and the volume of the discharged water may not degrade the groundwater quality.

The PRB FEIS predicts that one of the environmental consequences of coal bed natural gas production is possible impacts to the groundwater. "The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers." (PRB FEIS page 4-1). In the process of dewatering the coal zone to increase natural gas recovery rates, this project may have some effect on the static water level of wells in the area. The permitted water wells produce from depths which range from 27 to 600 feet compared to 459 feet to 982 feet to the Cook/Canyon and 759 feet to 1,272 feet to the Wall/Pawnee. 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 (½ mile of a federal CBNG producing well) of the proposed wells.

Recovery of the coal bed aquifer was predicted in the PRB FEIS to "…resaturate and repressurize the areas that were partially depressurized during operations. The amount of groundwater 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 analysis submitted for the pre-approval evaluation, the operator has committed to designate a reference well within the POD. The reference well will be sampled at the well head for analysis within sixty days of initial production and a copy of the water analysis will be submitted to the BLM Authorizing Officer.

Shallow ground water monitoring is ongoing at 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 variable 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.

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, and is currently being revised as the "Compliance Monitoring and Siting Requirements for Unlined Coalbed Methane Produced Water Impoundments" which should be approved by June, 2006. Approximately 800 new impoundments have been investigated to date with 102 impoundments in 52 permits that have gone into compliance monitoring. The Wyoming DEQ has established an Impoundment Task Force which is in the process of drafting an "Impoundment Monitoring Plan" to investigate the potential for existing impoundments to have impacted shallow groundwater. Drilling at selected existing impoundments should begin in the spring of 2006. For WYPDES permits received by DEQ after the August 1st effective date, the BLM will require that operators comply with the requirements outlined in the current approved DEQ compliance monitoring guidance document prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

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 –		2	1,000
Least Restrictive Proposed Limit		10	3,200
Primary Watershed at Moorhead, MT Gauging station Historic Data Average at Maximum Flow Historic Data Average at Minimum Flow		 3.92 4.62	 1,421 2,154
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 # WYW0051934 At discharge point At Irrigation Compliance point			 2,500

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** µmhos/cm
Predicted Produced Water Quality			
Co-mingled Canyon/Cook Coal Zones	1,160	44.8	1,910
Co-mingled Wall/Pawnee Coal Zones	1,500	57.4	2,370

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 1,160.0 to 1,500 mg/l TDS which is within the WDEQ criteria for agricultural use (2000 mg/l TDS). However direct land application is not included in this proposal. If at any future time the operator entertains the possibility of irrigation or land application with the water produced from these wells, the proposal must be submitted as a sundry notice for separate environmental analysis and approval by the BLM.

The quality for the water produced from the Cook/Canyon target coal zone 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 these 34 wells, for a total of 680.0 and 1360.0 gpm for the POD. See Table 4.5.

The quality for the water produced from the Wall/Pawnee target coal zone 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 gpm is projected is to be produced from these 34 wells, for a total of 680.0 and 1360.0 gpm for the POD. See Table 4.5.

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

To manage the produced water no impoundments will be constructed within the project area. All water management facilities were evaluated for compliance with best management practices during the onsite.

Alternative (2A), the approved alternative in the Record of Decision for the PRB FEIS, states that the peak production of water discharged to the surface will occur in 2006 at a total contribution to the mainstem of the of 86 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 68 wells is anticipated to be a total of 1360.0 gpm. For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

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

Permit effluent limits were set at (WYPDES WYW0051934, Appendix F):

pH	6.5 to 9.0
TDS	5000 mg/l max
Specific Conductance	2500 mg/l max
Sulfates	3000 mg/l max
Dissolved iron	250 µg/l max
Dissolved manganese	630 µg/l max
Dissolved Sodium (March through October)	270 mg/l
Dissolved Sodium (November through February)	350 mg/l
Total Recoverable Barium	1800 µg/l max
Total Recoverable Arsenic	8.4 µg/l max
Total Recoverable Radium	1 pCi/l
Chlorides	150 mg/l

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 are UPR12 (SENW, Sec. 29, T57N, R76W) and DPR12 (NENW, Sec. 29, T57N, R76W).

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

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

In-channel downstream impacts are addressed in the WMP for the Cabin Creek Phase II POD prepared by ALL Consulting for Pinnacle Gas Resources, Inc..

4.4.2.1. Surface Water Cumulative Effects

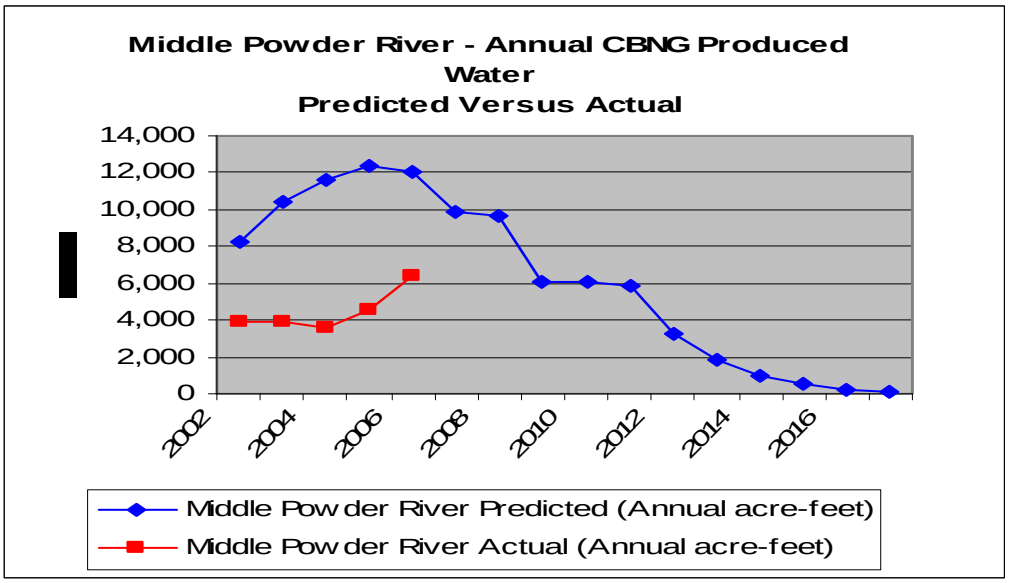
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of March 2007, all producing CBNG wells in the Middle Powder watershed have discharged a cumulative volume of 22,292 acre-ft of water compared to the predicted 54,690 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 40.8% of the total predicted produced water analyzed in the PRB FEIS for the watershed.

Table 4.6 Actual vs predicted water production in the watershed ***2006 Data Update 3-16-07***

Year	Predicted (Annual acre-feet)	Predicted (Cumulative acre-feet from 2002)	Actual (Annual acre-feet)		Actual (Cumulative acre-feet from 2002)	
			Actual Ac-ft	% of Predicted	Cum Ac-ft	% of Predicted
2002	8,257	8,257	3,929	47.6	3,929	47.6
2003	10,421	18,678	3,860	37.0	7,789	41.7
2004	11,640	30,318	3,547	30.5	11,336	37.4
2005	12,328	42,646	4,588	37.2	15,924	37.3
2006	12,044	54,690	6,368	52.9	22,292	40.8
2007	9,897	64,587				
2008	9,689	68,276				
2009	6,030	80,306				
2010	6,030	86,336				
2011	5,899	92,235				
2012	3,276	95,511				
2013	1,797	97,308				
2014	964	98,272				
2015	495	98,767				
2016	231	98,998				
2017	82	99,080				
Total	**99,080**		**22,292**			

Figure 4.1 Actual vs predicted water production in the 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)

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

1. They are proportional to the actual amount of cumulatively produced water in the drainage, which is approximately 40.8% of the total predicted in the PRB FEIS.
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
3. The commitment by the operator to monitor the volume of water discharged.

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 watershed and page 117 for cumulative effects common to all sub-watersheds.

4.5. Cultural Resources

Site 48SH665 will be impacted by the project; however it is considered not eligible to the NRHP. Eligible site 48SH178 will be impacted in a non-contributing portion of the site. The Bureau will require an archaeological monitoring condition for the construction activities in alluvial deposits within 48SH178, due to the high potential for buried cultural deposits. Specifically, the trenching locations between the Powder River and the 9-25 and 25-30 wells will require monitoring. On 9/13/07, the Bureau electronically notified the Wyoming State Historic Preservation Office (SHPO), following section VI(B)(2) of the Wyoming State Protocol, of a finding of No Adverse Effect to historic properties.

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
Brad Rogers	Wildlife Biologist	US Fish & Wildlife Service	Yes
Mike Schauer	Landowner	Fence Creek Ranch	Yes
Nancy Green	Ranch Manager	Pee Gee Ranch	Yea
Clay & Gayla Rowley	Landowner	NA	yes
Cliff Ritchie	Landowner	NA	yes
Michael & Betty Cross Mary Hopkins	Landowner Interim WY SHPO	NA Wyoming SHPO	no 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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