FINDING OF NO SIGNIFICANT IMPACT & DECISION RECORD
FOR
Yates Petroleum Corporation
Verde POD
ENVIRONMENTAL ASSESSMENT –WY-070-08-177

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize Yates Petroleum Corporation's Verde Coal Bed Natural Gas (CBNG) POD comprised of the following 11 Applications for Permit to Drill (APDs):

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	VERDE PORCUPINE CS	1	NENE	1	42N	73W	WYW139648
2	VERDE PORCUPINE CS	2	SWNE	1	42N	73W	WYW139648
3	VERDE GREEN CS	1	NENE	2	42N	73W	WYW135591
4	VERDE GREEN CS	2	NENW	2	42N	73W	WYW135591
5	VERDE GREEN CS FED COM	3	SWNW	2	42N	73W	WYW135591
6	VERDE GREEN CS	4	SWNE	2	42N	73W	WYW135591
7	VERDE QUILL CS FED COM	4	SWNE	25	43N	73W	WYW129519
8	VERDE GREEN CS FED COM	6	SWSE	26	43N	73W	WYW135591
9	VERDE BUNN CS FED COM	22	NESE	26	43N	73W	WYW103274
10	VERDE CS FED COM	1	NESW	34	43N	73W	WYW139960
11	VERDE CS FED COM	2	SWNW	35	43N	73W	WYW139960

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

	IMPOUNDMENT Name / Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	CUSTER	NESW	2	42	73	0.75	1	FEE
2	CHEROKEE	NWNW	2	42	73	1.5	1	FEE
3	WRANGLER	SWSE	2	42	73	11.3	4	FEE
4	DAKOTA	NWSW	35	43	73	0.86	1	WYW 152835
5	COWBOY	SWNW	1	42	73	11.7	6	WYW 135592
6	GROVES 14-23-4373	SWSW	23	43	73	1.17	2	WYW 5331
7	GROVES 33-26-4373	NWSE	26	43	73	8.1	4	WYW 103274
8	QUICK DRAW	SWNW	6	42	72	4	2	WYW 139640

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

RATIONALE: The decision to authorize Alternative C, as described in the attached Environmental Assessment (EA), is based on the following:

1. The Operator, in their POD, has committed to:
    - Comply with all applicable Federal, State and Local laws and regulations.

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

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

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

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

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

Field Manager:_____ Date: _____

BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
Yates Petroleum Corporation
Verde
PLAN OF DEVELOPMENT
WY-070-08-177

INTRODUCTION

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

1. PURPOSE AND NEED

The purpose for the proposal is to produce coal bed natural gas (CBNG) on five 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: Yates Petroleum Corporation's (YPC) Verde Plan of Development (POD) for 11coal bed natural gas well APD`s and associated infrastructure.

Proposed Well Information: There are 11 wells proposed within this POD; the wells are vertical bores proposed on an 80 acre spacing pattern with 1 well per location. Each well will produce from two coal seams. Proposed well house dimensions are 6 ft wide x 6 ft length x 6 ft height. Well house color is Covert Green (18-0617 TPX), selected to blend with the surrounding vegetation. Proposed wells are located as follows:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	VERDE PORCUPINE CS	1	NENE	1	42N	73W	WYW139648
2	VERDE PORCUPINE CS	2	SWNE	1	42N	73W	WYW139648
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9	VERDE BUNN CS FED COM	22	NESE	26	43N	73W	WYW103274
10	VERDE CS FED COM	1	NESW	34	43N	73W	WYW139960
11	VERDE CS FED COM	2	SWNW	35	43N	73W	WYW139960

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

	IMPOUNDMENT Name / Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
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4	DAKOTA	NWSW	35	43	73	0.86	1	WYW 152835
5	COWBOY	SWNW	1	42	73	11.7	6	WYW 135592
6	GROVES 14-23-4373	SWSW	23	43	73	1.17	2	WYW 5331
7	GROVES 33-26-4373	NWSE	26	43	73	8.1	4	WYW 103274
8	QUICK DRAW	SWNW	6	42	72	4	2	WYW 139640
9	RENO RESERVOIR	SWSE	25	43	73	96		

County: Campbell

Applicant: Yates Petroleum Corporation

Surface Owners: Richard W. Leavitt Trust, Bernice Groves

Project Description:
The proposed action involves the following:

- Drilling of 11 total federal CBNG wells in the Anderson and Canyon coal seams. The total depth of wells within the project area ranges from 990 to 1,340 feet. CBNG will be produced by co-mingling production (a single well per location capable of producing from multiple coal seams).

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

- Well metering shall be accomplished by telemetry and well visitation. Metering would entail 4 to 8 visits per month to each well.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: 9 proposed discharge points and 9 existing stock water reservoirs, which will require rehabilitation to meet WSEO standards for CBNG storage, within the Antelope Creek watershed. The operator has stated that their WYPDES permit will allow direct discharge to Antelope Creek and the Cheyenne River watershed. Therefore, the impoundments are not essential to their water management strategy.

- An unimproved and improved road network.

- An above ground power line network to be constructed by Powder River Energy Corporation. The proposed route has been reviewed by the contractor. 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. If the power line network is not completed before the wells are in production, then temporary diesel generators shall be placed at the 5 proposed power drops.

- A storage tank of 1,000 gallon capacity shall be located with each diesel generator. Generators are projected to be in operation for 6 months. Fuel deliveries are anticipated to be 1 times per week. Noise level is expected to be 85 decibels at 10 feet distance.

- 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 in the POD and individual APDs. Also see the subject POD and/or APDs for maps showing the proposed well locations and associated facilities described above. More information on CBNG well drilling, production and standard practices is also available in the PRB FEIS, Volume 1, pages 2-9 through 2-40 (January 2003).

Implementation of committed mitigation measures contained in the MSUP, Drilling Program and WMP, in addition to the Standard COA contained in the PRB FEIS Record of Decision Appendix A, are incorporated and analyzed in this alternative.

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

1. Comply with all applicable Federal, State and Local laws and regulations.
2. Obtain the necessary permits for the drilling, completion and production of these wells including water rights appropriations, the installation of water management facilities, water discharge permits, and relevant air quality permits.
3. Offer water well agreements to the owners of record for permitted water wells within ½ mile of a federal CBNG producing well in the POD
4. Provide water analysis from a designated reference well in each coal zone.

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

2.3. Alternative C – Environmentally Preferred

Alternative C represents a modification of Alternative B based on the operator and BLM working cooperatively to reduce environmental impacts. The description of Alternative C is the same as

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

2.3.1. Changes/Discussions as a result of the on-sites

Well Name & Number	Aliquot	Section	T/R	Notes
Quill CS Federal Com. #4	SWNE	25	43/73	Well location sited within 1/4 mile of raptor nest. Flat to low rising topography did not allow for an alternative location within the drilling window as well as for a location outside the line-of-sight. Location of the access road was discussed with the operator. An alternative shorter route from the county road was sited, but the landowner preferred the proposed route from the north to prevent uncontrolled access to the property from the county road.
Bunn CS Federal Com. #22	NESE	26	43/73	The reserve pit will require a liner due to the location's proximity to an adjacent drainage (approx. 200ft N). The pit will serve as the northern boundary of drilling layout/location. Infrastructure and equipment will be placed to the south, facing the county road.
Green CS Federal Com. #6	SWSE	26	43/73	The proposed surface upgrade (SU3) and the access road were dropped. The access road will be co-located with the proposed utility corridor coming from the west.
Verde CS Federal Com. #1	NESW	34	43/73	The proposed utility corridor was rerouted to prevent unnecessary surface disturbance, and habitat fragmentation, as well as potential impacts to scenic, hydrological and biological resources. Existing disturbances and other opportunities for co-locating the proposed corridor were recommended. The operator will now place the corridor along the existing crown & ditch road (SESW Sec. 34) of Cosner Road to access the well location. Although this route adds a longer distance to the utility corridor, it eliminates new surface disturbance and reduces fragmentation in the project area.

Well Name & Number	Aliquot	Section	T/R	Notes
Porcupine CS Federal #1	NENE	1	42/73	The well location was moved upslope approx. 163 yards S/SE, out of the sagebrush and closer to the main access road. The Spring Creek sage-grouse lek is within 0.5 miles south. The new location is slightly sloped, facing north and surrounded by scattered sagebrush.

Wildlife

1. In order to minimize additional human visitation in proximity of an active nest, Yates agreed to restrict travel along the road in S02 T42N R73W from the section line on the west to the 2GREE well on the east.

Water Management

1. Outfall 004 to 14-23 Dam—the overflow pipe should be carried to the pothole about 25-50 feet from the staked end of pipe location. This will reduce the need for a large rock chute.

2. Outfall 006 to Quick Draw Dam—the overflow pipe should daylight into the bottom of the pool. If iron precipitation is important, the "splash trough" will need to be moved farther up the hill.

3. Outfall 003 and 005—both have long draws down which water will flow before reaching reservoir pools. These draws, with perennial discharge and cows, will turn into "bogs" which have potential for trapping livestock and wildlife. Yates needs to outline alternative discharge methods (wetting and drying) or consider fencing the draws (landowner decision) in order to prevent livestock/wildlife entrapment.

2.3.2. Programmatic mitigation measures identified in the PRB FEIS ROD

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

2.3.2.1. Groundwater

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

2.3.2.2. Surface Water

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

any blockage or restriction of the existing channel. Material removed will be stockpiled for use in reclamation of the crossings.

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

4. The operator will supply 2 copies of the complete approved SW-4, SW-3, or SW-CBNG permits to BLM as they are issued by WSEO for impoundments.

5. The operator will supply 2 copies of the complete approved WYPDES permit or permits, and any attachments, to the BLM as they are issued by the 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. Wetland/Riparian

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

2. 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.

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

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

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

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

2.3.2.5. Wildlife

1. For any surface-disturbing activities proposed in sagebrush shrublands, the Companies will conduct clearance surveys for sage grouse breeding activity during the sage grouse's breeding season before initiating the activities. The surveys must encompass all sagebrush shrublands within 0.5 mile of the proposed activities.

2. 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.

3. 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.

4. 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.

2.3.2.6. Threatened, Endangered, or Sensitive Species

2.3.2.6.1. Bald Eagle

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

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

2.3.2.6.2. Black-footed Ferret

1. If any black-footed ferrets are located, the USFWS will be consulted. Absolutely no disturbance will be allowed within prairie dog colonies inhabited by black-footed ferrets.

2. Additional mitigation measure may be necessary if the site-specific project is determined by a BLM biologist to have adverse effects to black-footed ferrets or their habitat. In the event that a mountain plover is located during construction or operation, the USFWS' Wyoming Field Office (307-772-2374) and the USFWS' Law Enforcement Office (307-261-6365) will be notified within 24 hours.

2.3.2.7. Air Quality

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

2.3.3. Site specific mitigation measures

General

1. All changes made at the pre-approval onsite will be followed. They have all been incorporated into the operator's plan of development (POD). Please refer to Table 2.3.1 "Changes as a result of the onsite" on pages 6 & 7 of EA#WY-070-EA08-177, and the Post-Onsite Deficiency Letter dated 07/28/2008.

2. Yates field representatives and contractors will have a copy of the approved POD map and conditions of approval (COAs) at all times while conducting activities within the Verde Federal POD project area.

3. Please contact Julian Serafin – Natural Resource Specialist, @ (307) 684-1043, Bureau of Land Management, Buffalo, if there are any questions concerning surface use COAs.

Surface Use

1. All permanent above-ground structures (e.g., production equipment, well house, 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 Verde Federal POD is Covert Green, 18-0617 TPX.

2. Interim Reclamation of disturbed areas will adhere to the following guidance (as per the Wyoming Policy on Reclamation (IM WY-90-231):
   A. The reclaimed area shall be stable and exhibit none of the following characteristics:
      i. Large rills or gullies.
      ii. Perceptible soil movement or head cutting in drainages.
      iii. 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:
      i. Successful onsite establishment of species included in the planting mixture or other desirable species.
      ii. 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.

3. All topsoil removed during construction activities will be respread for interim reclamation success.

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

Species	**% in Mix**	**Lbs PLS***
Western Wheatgrass (Pascopyrum smithii)/or ***Thickspike Wheatgrass*** (Elymus lanceolatus ssp. lanceolatus)	35	4.2
Bluebunch Wheatgrass (Pseudoroegneria spicata ssp. Spicata)	15	2.1
Green needlegrass (Nassella viridula)	25	3.0
Rocky Mountain beeplant (Cleome serrulata) /or ***American vetch*** (Vicia americana)	10	1.4
White or purple prairie clover (Dalea candidum, purpureum)	5	0.3
Scarlet Globemallow (Sphaeralcea coccinea) / or ***Blue flax*** (Linum lewisii)	5	0.4
Prairie coneflower (Ratibida columnifera)	5	0.8
Totals	**100%**	**12.2 lbs/acre**

*Pure Live Seed *Northern Plains adapted species
*Slopes too steep for machinery may be hand broadcast and raked with twice the specified amount of seed. Complete fall seeding after September 15 and prior to prolonged ground frost. To be effective, complete spring seeding after the frost has left the ground and prior to May 15.

5. Disturbance for pipelines and utility corridors adjacent to access roads will be contained within the disturbance allowed for road construction (Refer to CBNG Project Surface Use Data Summary Form, received September 5th, 2008.)

6. The operator will maintain all existing improved roads in the Verde Federal POD in accordance with guidelines contained in the BLM/FS Gold Book, 4th Edition "Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development," and/or the Road Standards in the BLM Manual 9113.

7. Adequate drainage control must be in place at all stages of construction and culverts installed as soon as feasible.

8. Final grading and surfacing shall occur immediately after utility installation is complete. All rills, gullies, and other surface defects shall be ripped to the full depth of erosion across the entire width of the roadway prior to final grading and surfacing.

9. Reserve pits will be lined at the Bunn CS Federal Com. #22.

10. Utility corridors will be expediently reclaimed following construction and maintained to avoid tire rutting, settling and erosion.

Wildlife

Ute Ladies'-tresses Orchid

The following will alleviate impacts to Ute Ladies'-tresses Orchid:

1. A habitat suitability survey will be conducted at the Cowboy Reservoir and downstream from the reservoir as far as saturated soils remain at the surface to evaluate the potential for these areas to support Ute Ladies'-tresses orchid.
    a. In areas around and downstream of Cowboy Reservoir identified to be suitable habitat, a protocol survey will be required prior to those areas receiving discharged water. The survey shall be conducted to the according to Powder River Basin Interagency Working Group's (PRBIWG) accepted protocol. If individual plants are found, then BLM reserves the right to re-evaluate the water management plan to mitigate potential impacts to the plant.

2. In their 2007 wildlife survey report submitted to BLM for the Verde project, Jones & Stokes reported that Porcupine Creek hosted several intermittent pools of water and flowing water in NENW S25 T43N R73W during October of 2007. The vegetation and soils that characterized these areas were not described. In order to adequately evaluate impacts of the Verde project on ULT habitat, BLM requests that Yates provide an additional report specifically identifying those areas that contained standing or flowing water along Porcupine Creek that will receive discharged water, along with photographs, and a description of the vegetation, hydrology, and soils characteristic of these areas, prior to discharging water into the Reno Reservoir.

Raptors

The following conditions will alleviate impacts to raptors:

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

Legal	Infrastructure
S25 T43N R73W	1 well (4QUIL-COM). All corridors. All two-track roads. Water discharge point. Overhead power drop.
S02 T42N R73W	3 wells (2GREE, 4GREE, 3GREE). All corridors, except segment from NE corner to 1GREE in NENE. All two-track roads, except segment from NE corner to 1GREE in NENE. Water discharge point and tire tank. Power drop in SWNW. 2 reservoirs (Cherokee, Custer).

2. Surveys to document nest occupancy shall be conducted by a biologist following BLM protocol, between April 15 and June 30. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities. Surveys outside this window may not depict nesting activity. If a survey identifies active raptor nests, a 0.5 mile timing buffer will be implemented. The timing buffer restricts surface disturbing activities within 0.5 mile of occupied raptor nests from February 1 to July 31.

3. Nest occupancy and productivity checks shall be completed for nests within a 0.5 mile of any surface disturbing activities (e.g., well drilling or pipeline installation) across the entire POD for as long as the POD is under construction. Once construction of the POD has ceased, nest occupancy and productivity checks shall continue for the first five years on all nests that are within a 0.5 mile of locations where any surface-disturbing activities took place. Productivity checks shall be completed only on those nests that were verified to be occupied during the initial occupancy check of that year. 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. In 2009, this applies to the nest(s) listed and is subject to change each year after that, pending surveys.

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

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

Sage-Grouse

The following conditions will alleviate impacts to sage-grouse:

1. No surface disturbing activities are permitted within two miles of the Porcupine Creek, Spring Creek, and 160-Acre leks between March 1 and June 15, prior to completion of a 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:

Legal	Wells and Infrastructure
S25 T43N R73W	1 well (4QUIL-COM). All infrastructure.
S23 T43N R73W	All infrastructure.
S26 T43N R73W	2 wells (6GREE, 22BUNN-COM). All infrastructure.
S35 T43N R73W	All infrastructure.

Legal	Wells and Infrastructure
S36 T43N R73W	Waterline in SWSW.
S06 T42N R72W	All infrastructure in NWNW.
S01 T42N R73W	2 wells (1PORC, 2PORC). All infrastructure.
S02 T42N R73W	3 wells (1GREE, 2GREE, 5GREE). Corridors in NENE, SENW, NENW. Two-track roads in NENE, SWNE, SENW. Water discharge point in SENW. 2 reservoirs (Custer, Wrangler) in S.

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

3. Well metering, maintenance and other site visits within 2.0 miles of documented sage grouse lek sites should be minimized as much as possible during the breeding season (March 1– June 15).

Mountain Plover

The following conditions will alleviate impacts to mountain plovers:

1. A mountain plover nesting survey is required in suitable habitat prior to commencement of surface disturbing activities within 0.25 mi of the historic prairie dog colony located in S S25 T43N R73W and in S02 T42N R73W.

2. Mountain plover nesting surveys shall be conducted by a biologist following the most current USFWS Mountain Plover Survey Guidelines (the survey period is May 1-June 15). All survey results must be submitted in writing to the BFO and approved prior to initiation of surface disturbing activities.

3. No surface disturbing activities are permitted in the suitable habitat area listed above, from March 15-July 31, unless a mountain plover nesting survey has been conducted during the current breeding season. This timing limitation will be in effect unless surveys determine no plovers are present. This timing limitation will affect the following:

Legal	Wells and Infrastructure
S25 T43N R73W	1 well (4QUIL-COM). Corridor in SWNE and SENW. Two track road in SWNE and SENW. Water discharge point in SENW. Power drop in SWNE.
S02 T42N R73W	4 wells (1GREE, 2GREE, 3GREE, 4GREE). Pipelines and road corridors between 4GREE and 1GREE, 4GREE and 2GREE, and 4GREE and 3GREE.

4. If occupied mountain plover habitat is identified, then a seasonal disturbance-free buffer of 0.25 mile shall be maintained between March 15 and July 31. If no mountain plover observations are identified, then surface disturbing activities may be permitted within suitable habitat until the following breeding season (March 15).

5. No dogs will be permitted at work sites to reduce the potential for harassment of mountain plovers.

Swift Fox

The following conditions will alleviate impacts to swift fox:

1. A swift fox survey will be required in the historic prairie dog colony located in SE S02 and NE S11 T42N R73W between April 15 and June 15. This condition will be implemented on an annual basis for the duration of surface disturbing activities within 0.25 miles of this prairie dog colony. All survey results must be submitted in writing to the BFO.

    a. If a swift fox den is identified, then a seasonal disturbance-free buffer of 0.25 mile shall be maintained between March 1 and August 31. If no swift fox dens are identified, then surface disturbing activities may be permitted within suitable habitat until the following breeding season (March 1).

Burrowing Owls
The following conditions will alleviate impacts to burrowing owls:

1. No surface disturbing activity shall occur within 0.25 miles of all identified prairie dog colonies from April 15 to August 31, annually, prior to a burrowing owl nest occupancy survey for the current breeding season.

    a. If a burrowing owl nest is identified, a 0.25 mile disturbance-free buffer will be applied. This condition will be implemented on an annual basis for the duration of surface disturbing activities within 0.25 mile of the prairie dog town. This timing limitation will be in effect unless surveys determine the nest(s) to be inactive. This timing limitation will affect the following:

Legal	Infrastructure
S S02 T42N R73W	Wrangler Reservoir

Water Management
1. The operator will add Reno Reservoir to its tabulation of reservoirs to be used in their water management plan prior to discharging water produced as a result of this action to it.

2.4. Alternatives considered but not analyzed in detail

The landowner evaluated a number of alternative water management strategies. They were direct discharge of raw produced water into tributaries of Spring and Porcupine creeks, treatment and discharge into tributaries of Spring and Porcupine creeks, reinjection, irrigation (Land Application Disposal), and containment in infiltration/evaporation reservoirs. For a complete discussion of each of these alternatives and why they were accepted or rejected, please see pages 8-10 of the water management plan.

2.5. Summary of Alternatives

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

Table 2.5 Summary of the Alternatives
Existing energy development in the general project area includes Federal, Fee, and State CBNG and conventional oil and gas wells and associated infrastructure. The Verde project area involves well locations and infrastructure found within POD boundary, approximately 3,036 acres.

Other federal CBNG PODs in the general vicinity include Tuit (EA# WY-070-04-098) & Tuit Draw (EA# WY-070-04-026), Uprising (EA# WY-070-04-305), SW Reno Flats (EA# WY-070-07-196) Stoddard (EA# WY-070-07-010), and Leavitt (EA# WY-070-08-170).

Facility	Alternative A (No Action) Existing Number or Miles	Alternative B (Original Proposal) Proposed Number or Miles	Alternative C (Environmental Alt.) Revised Number or Miles
Total CBNG Wells	10	11	11
Fee	9		
Fed	0		
State	1		
Total Locations		11	11
Nonconstructed Pads		11	11
Slotted Pads		0	0
Constructed Pads		0	0
Conventional Wells	0	0	0
Gather/Metering Facilities	1	0	0
Compressors	1	0	0
Impoundments			
On-channel	9	9	8
Off-channel	0	0	0
Water Discharge Points	2	7	7
Improved Roads	5.5	1.1	1.0
No Corridor		0.3	0.2
With Corridor		0.8	0.8
2-Track Roads	3.0	7.6	7.7
No Corridor		3.2	3.1
With Corridor		4.4	4.6
Buried Utilities	5.0	4.3	4.0
No Corridor		0.3	0.3
With Corridor		4.0	3.7
Overhead Powerlines	2.47	1.41	1.41
Communication Sites	0	0	0
Staging/Storage Areas	0	0	0
Acres of Disturbance	89.78	89.43	83.66

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on 12/04/2007. Field inspections of the proposed Verde CBNG project were conducted on 7/17/2008 by:

NAME	TITLE	AGENCY
Ben Adams	Hydrologist	Bureau of Land Management
Clint Crago	Archeologist	Bureau of Land Management
Courtney Frost	Wildlife Biologist (Lead)	Bureau of Land Management

NAME	TITLE	AGENCY
Jennifer Morton	Wildlife Biologist	Bureau of Land Management
Julian Serafin	Natural Resource Specialist	Bureau of Land Management
Jeb Tachick	Federal Regulatory Specialist	Yates Petroleum Corporation
Jim Nies	Drilling Superintendent	Yates Petroleum Corporation
Vicki Kissack	Environmental Regulatory Agent	Yates Petroleum Corporation

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		Courtney Frost
Floodplains			X	Ben Adams
Wilderness Values			X	Julian Serafin
ACECs			X	Julian Serafin
Water Resources	X			Ben Adams
Air Quality	X			Julian Serafin
Cultural or Historical Values			X	Clint Crago
Prime or Unique Farmlands			X	Julian Serafin
Wild & Scenic Rivers			X	Julian Serafin
Wetland/Riparian	X			Ben Adams
Native American Religious Concerns			X	Clint Crago
Hazardous Wastes or Solids		X		Julian Serafin
Invasive, Nonnative Species	X			Julian Serafin
Environmental Justice			X	Julian Serafin

3.1. Topographic Characteristics of Project Area

The Verde POD is located approximately 7.7 miles southwest of Wright, Campbell County, Wyoming within Sections 23, 25, 26, and 34-36 T43N R73W; and, Sections 1, 2, and 6 T42N R73W. Elevations within the project area range from approximately 5,000 to 5,250 feet above sea level. The topography varies from relatively flat creek bottoms to rolling hills and moderately eroded draws. The project area is located within tributaries of Porcupine Creek and Spring Creek in the Antelope Creek drainage. Antelope Creek is a tributary to the Cheyenne River. Porcupine Creek flows from north to south through the eastern boundary of the Verde POD, and Spring Creek flows from west to east along the southwestern edge of the project area. The climate is semi-arid, averaging 12 to 14 inches of precipitation annually, more than 60% of which occurs between April and September. Conventional oil and gas production, as well as CBNG development exists around and within the proposed Verde Federal project; this, in conjunction with livestock grazing, are the major land uses within the general area.

3.2. Vegetation & Soils

The general vegetation community within the project area consists of a mixed sagebrush/grassland mosaic. Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) intermixed with various native bunch grasses dominates the project area. The greatest concentrations of sagebrush occurred among the gentler upland slopes with patches of silver sagebrush (*Artemisia cana*) and rubber rabbitbrush (*Chrysothamnus nauseous*) occurring infrequently throughout the area.

Soils have developed in alluvium and residuum derived from the Wasatch Formation. Lithology consists of light to dark yellow and tan siltstones and sandstones with minor coal seams resulting in a wide variety of surface and subsurface textures of silt loam and fine sandy loam. Soil depths vary from deep on lesser slopes to shallow and very shallow on steeper slopes. Soils are generally productive, though varies with texture, slope and other characteristics such as topographic location, slope and elevation.

Soils within the project area were identified from the *South Campbell County Survey Area, Wyoming (WY605).* 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.

The dominant map units 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. The map unit symbols within this project area were filtered and map units representing 3.0% or greater in extent within the pod boundary are displayed.

Soil Map Unit Types

Map Unit	Map Unit Name	Acres	Percent
146	FORKWOOD-CUSHMAN LOAMS, O TO 6 PERCENT SLOPES	554.1	18%
227	ULM CLAY LOAM, 0 TO 6 PERCENT SLOPES	553.5	18%
211	SHINGLE-WORF LOAMS, 3 TO 30 PERCENT SLOPES	308.4	10%
217	THEEDLE-SHINGLE LOAMS, 3 TO 30 PERCENT SLOPES	230.3	8%
111	BIDMAN-PARMLEED LOAMS, 0 TO 6 PERCENT SLOPES	220.5	7%
157	HILAND-BOWBAC FINE SANDY LOAMS, 0 TO 6 PERCENT SLOPES	213.2	7%
158	HILAND-BOWBAC FINE SANDY LOAMS, 6 TO 15 PERCENT SLOPES	190.5	6%
147	FORKWOOD-CUSHMAN LOAMS, 6 TO 15 PERCENT SLOPES	96.8	3%
116	CAMBRIA-KISHONA-ZIGWEID LOAMS, 0 TO 6 PERCENT SLOPES	95.5	3%

For more detailed soil information, see the NRCS Soil Survey 605 – South Campbell County. Additional site specific soil information is included in the Ecological Site interpretations below.

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. The main soil limitations in the project area include: depth to bedrock, low organic matter content, soil droughtiness, and low water holding capacity.

3.2.1. Dominant Ecological Sites and Plant Communities by dominant soil series

Ecological Site Descriptions are used to provide site and vegetation information needed for resource identification, management and reclamation recommendations. To determine the appropriate Ecological Sites for the area contained within this proposed action, BLM specialists analyzed data from onsite field reconnaissance and Natural Resources Conservation Service published soil survey soils information.

The map unit symbols for the soils identified above and the associated ecological sites for the identified soil map unit symbols found within the POD boundary are listed in the table below.

Map Unit	Ecological Site
146	Loamy 10-14" Northern Plains
227	Clayey 10-14" Northern Plains
211	SHALLOW LOAMY (10-14 NP)
217	Loamy 10-14" Northern Plains
111	Loamy 10-14" Northern Plains
157	SANDY (10-14 NP)
158	SANDY (10-14 NP)
147	Loamy 10-14" Northern Plains
116	Loamy 10-14" Northern Plains

Dominant Ecological Sites and Plant Communities identified in this POD and its infrastructure are Loamy and Clayey sites with minor amounts of Sandy and Shallow Loamy locations.

Loamy Sites occur on gently undulating to rolling land on landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 10-14 inch precipitation zone. These soils are moderately deep to very deep (greater than 20" to bedrock), well drained soils that formed in alluvium and residuum derived from sandstone and shale. These soils have moderate permeability.

Shallow Loamy Sites occur on steep slopes and ridge tops, but may occur on all slopes, on landforms which include hill sides, ridges and escarpments in the 10-14 inch precipitation zone. Generally, the soils of this site are shallow (less than 20" to bedrock) well-drained soils formed in alluvium over residuum or residuum derived from sandstone and shale. These soils have moderate permeability and may occur on all slopes. The bedrock may be any kind which is virtually impenetrable to plant roots, except igneous. The main soil limitations include the depth to bedrock.

The present plant community in both the loamy and shallow loamy sites is *Mixed Sagebrush/Grass*. Wyoming big sagebrush is a significant component of the plant community. Perennial cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Dominant grasses include: bluebunch wheatgrass, rhizomatous wheatgrass, blue grama, needleandthread, and little bluestem. Other grasses occurring on the state include Cusick's and Sandberg bluegrass, and prairie junegrass.
Clayey Sites occur on nearly level to steep slopes on landforms which include hill sides, alluvial fans and stream terraces in the 10-14 inch precipitation zone. The soils of this site are moderately deep to very deep (greater than 20" to bedrock), well-drained soils that formed in alluvium or alluvium over residuum derived calcareous shale. These soils have slow permeability. The bedrock is clay shale which is virtually impenetrable to plant roots. The present plant community is a Mixed Sagebrush/Grass. Wyoming big sagebrush is a significant component of this Mixed Sagebrush/Grass plant community. Perennial cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Dominant grasses include rhizomatous wheatgrasses, green needlegrass, blue grama, and prairie junegrass. Forbs include Louisiana sagewort (cudweed), plains wallflower, hairy goldaster, and scarlet globemallow. Fringed sagewort and plains pricklypear and also occur.

Sandy Sites occur on nearly level to steep slopes on landforms which include alluvial fans, hillsides, plateaus, ridges, and stream terraces in the 10-14 inch precipitation zone. The soils of this site are moderately deep to very deep (greater than 20"to bedrock), well drained soils that formed in eolian deposits or residuum derived from unspecified sandstone. These soils have moderate, moderately rapid, or rapid permeability. The main soil limitations include low available water holding capacity, and high wind erosion potential. Cool-season mid-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. The dominant understory grasses include needleandthread, threadleaf sedge, prairie junegrass, and fringed sagewort.

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.

Summary of Ecological Sites

Ecological sites	Acres	Percent
Loamy 10-14" Northern Plains	1485.5	49%
Clayey 10-14" Northern Plains	586.4	19%
SANDY (10-14 NP)	547.1	18%
SHALLOW LOAMY (10-14 NP)	308.4	10%
SHALLOW SANDY (10-14 NP)	73.0	2%
SHALLOW CLAYEY (10-14 NP)	28.8	1%
CLAYEY OVERFLOW (10-14NP)	6.6	<1%
SALINE UPLAND (10-14NP)	<1	<1%

3.2.2. Wetlands/Riparian/Floodplains

The project lies near the headwaters of Spring and Porcupine Creeks. In many ways, it is an anomaly in this area, characterized by relatively gently sloping and undulating terrain with steep, gully lands both upstream and downstream. Because of this gently sloping terrain, water moves much more slowly through the area and substantial wetland areas have developed. These wetland areas are characterized by the presence of sedges, cattails, and hydric soils. There were no floodplains within the project area. Outwash plains occur where the gullies from the uplands emerge onto this broad relatively flat area and deposit their sediment loads.

3.2.3. Invasive Species

The Wyoming Energy Resource Information Clearinghouse (WERIC) web site (www.weric.info) identifies skeletonleaf bursage (*Ambrosia tonentosa* Nutt.), dalmation toadflax (*Linaria dalmatica*), and black henbane (*Hyoscyamus niger*), as known state-listed noxious weed populations in T41N R73W, T41N R72W, T42N R72W, and T42N 73W. The WERIC database was created cooperatively by the University of Wyoming, BLM and county Weed and Pest offices.

The following is a list of other species that are of specific concern to the Campbell County Weed & Pest for the Verde Federal POD project area:

- Canada thistle (*Cirsium arvense* L.)
- Russian knapweed (*Rhaponticum repens*)
- buffalobur (*Solanum rostratum* Dunal)
- Scotch thistle (*Onopordum acanthium*)
- spotted knapweed (*Centaurea stoebe*)

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 wildlife databases compiled and managed by BLM Buffalo Field Office (BFO), 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 Jones & Stokes Associates (Jones

& Stokes) in 2007 and 2008 (Jones & Stokes 2007, ICF Jones & Stokes 2008). All surveys were conducted according to the Powder River Basin Interagency Working Group's (PRBIWG) accepted protocol (available on the CBM Clearinghouse website at www.cbmclearinghouse.info). Jones & Stokes performed surveys for bald eagle roosts, raptor nests, greater sage-grouse, sharp-tailed grouse, black-tailed prairie dog colonies, mountain plovers, and Ute ladies'-tresses orchid habitat.

A BLM biologist conducted field visits on July 17, 2008. During this time, the biologist reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project modification recommendations where wildlife issues arose.

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

3.3.1. Big Game

Big game species expected to be within the Verde project area include pronghorn and mule deer. WGFD has determined that the project area contains yearlong range for both species. Yearlong use is when a population of animals makes general use of suitable documented habitat sites within the range on a year round basis. Animals may leave the area under severe conditions. Populations of pronghorn and mule deer within their respective hunt areas are above WGFD objectives. Big game range maps are available in the PRB FEIS (3-119 to 3-143) and from WGFD.

The Verde project area contains suitable habitat for pronghorn and mule deer. During the onsite, pronghorn individuals and sign were observed throughout the project area, and mule deer sign was noted across the project area.

3.3.2. Aquatics

The project area is located within tributaries of Porcupine Creek and Spring Creek in the Antelope Creek sub-watershed. Both drainages have been historically intermittent, but Porcupine Creek currently contains year-round flow as a result of CBNG discharge. Fish that have been identified to occur in the Cheyenne River drainage are listed in the PRB FEIS (3-156 to 3-159).

Amphibian and reptile species occur throughout the Basin, but baseline information is limited. Confluence Consulting, Inc., (2004) reported occurrence of the following species within the Clear Creek and Powder River watersheds (which are not in the Verde project area): Woodhouse's toad, Northern leopard frog, gopher snake, and garter snake. Because sampling at the upper two sites on Clear Creek occurred late in the season, when likelihood of observing these species is reduced, the timing of these surveys may have influenced the lack of reptiles and amphibians observed at these sites.

3.3.3. Migratory Birds

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

During the 2008 surveys, Jones & Stokes observed white-faced ibis and loggerhead shrike, both of which are listed by BLM Wyoming as Sensitive and discussed in further detail in Section 3.3.5.2 (Sensitive Species).

3.3.4. Raptors

Raptor species expected to occur within the Powder River Basin include northern harrier, Cooper's hawk, northern goshawk, red-tailed hawk, Swainson's hawk, ferruginous hawk, rough-legged hawk, American kestrel, merlin, prairie falcon, short-eared owl, long-eared owl, burrowing owl, great horned owl, golden eagle, and bald eagle. Most raptor species nest in a variety of habitats, including, but not limited to, native and non-native grasslands, agricultural lands, live and dead trees, cliff faces, rock outcrops, and tree cavities.

Four raptor nests were located by Jones & Stokes within 0.5 mile of the project area. Two nests were active in 2008. Nest 5458 was active with burrowing owls, and nest 5459 was active with Swainson's hawks. Nest 855 was active with red-tailed hawks for three years in a row (2003 – 2005), but recent surveys have shown no activity at this location. A discrepancy exists for the status of nest 4147 in 2007. Jones & Stokes reported that this nest was inactive in 2007, with no conclusive evidence of activity and no fresh sign under the nest during the spring surveys. Another consultant, however, reported that this nest was active with red-tailed hawks during that year.

Table 1. Documented raptor nests within the Verde POD Project Area in 2008

BLM ID	UTMs	Legal	Sub-strate[1]	Year	Con-dition	Status[2]	Species[3]
855	453467E 4836200N	S25 T43N R73W	CTL	2008	Fair	INAC	
				2007	Good	INAC	
				2005	Good	ACTI	RETA
				2004	Good	ACTI	RETA
				2003	Good	ACTI	RETA
4147	453767E 4835728N	S25 T43N R73W	WIL	2008	Fair	INAC	
				2007	Fair	INAC	
				2007	Excellent	ACTI	RETA
				2006	Good	ACTI	SWHA
5458	454470E 4835314N	S25 T43N R73W	ABB	2008	Unknown	ACTI	BUOW
5459	451817E 4832583N	S02 T42N R73W	CTL	2008	Good	ACTI	SWHA

Notes:
1 ABB = Abandoned Burrow; CTL = Cottonwood Live; WIL = Willow (live)
2 ACTI = Active; INAC = Inactive
3 BUOW = Burrowing owl; RETA = Red-tailed hawk; SWHA = Swainson's hawk

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 listed as Threatened or Endangered under the Endangered Species Act: the black-footed ferret and the Ute ladies'-tresses orchid.

3.3.5.1.1. Black-footed Ferret

The US Fish and Wildlife Service (USFWS) listed the black-footed ferret as Endangered on March 11, 1967. Active reintroduction efforts have reestablished populations in Mexico, Arizona, Colorado, Montana, South Dakota, Utah, and Wyoming. In 2004, WGFD identified seven prairie dog complexes (Arvada, Sheridan, Pleasantdale, Four Corners, Linch, Kaycee, and Thunder Basin National Grasslands) that are located partially or wholly within the BFO administrative area as potential black-footed ferret reintroduction sites (Grenier et al. 2004).

This nocturnal predator is closely associated with prairie dogs. The ferret depends almost entirely upon

prairie dogs for food and uses old prairie dog burrows for dens. Current science indicates that a black-footed ferret population requires at least 1,000 acres, separated by no more than 1.5 km, of black-tailed prairie dog colonies, for survival (USFWS 1989).

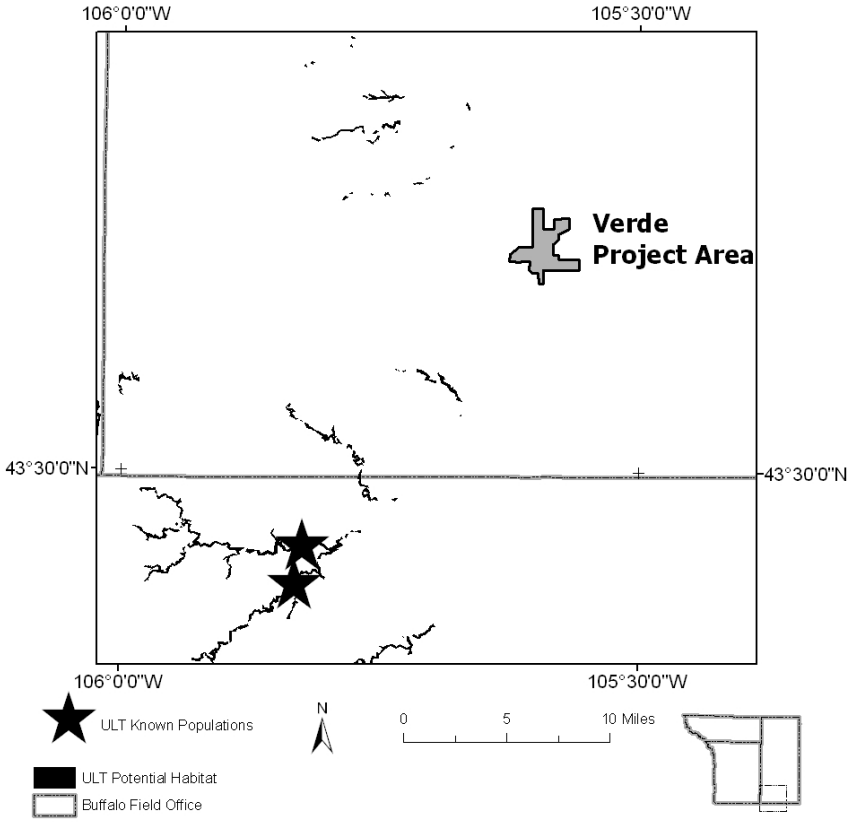
WGFD believes the combined effects of poisoning and Sylvatic plague on black-tailed prairie dogs have greatly reduced the likelihood of a black-footed ferret population persisting east of the Bighorn Mountains (Grenier 2003). USFWS has also concluded that black-tailed prairie dog colonies within Wyoming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

Black-footed ferret habitat is not present within the Verde project area. An active black-tailed prairie dog colony was located by Jones & Stokes about 0.3 miles outside the project area in SE S25 T43N R73W that is approximately nine acres in size. This colony is within a larger historical colony delineated by another consultant that is approximately 118 acres in size and directly adjacent to the project area, across Cosner Road. Another historical colony was identified by WGFD, approximately 12 acres in size, and located in SWSE S02 and N S11 T42N R73W. At least eight mapped prairie dog colonies occur within 1.5 km of each other, beginning with colonies that are no more than 1.5 km outside the project area. These colonies, some of which overlap, cover an area approximately 146 acres in size – which is not large enough to support a black-footed ferret population.

3.3.5.1.2. Ute Ladies'-Tresses Orchid

Ute ladies'-tresses orchid (ULT) is listed as Threatened under the Endangered Species Act. It is extremely rare and occurs in moist, sub-irrigated or seasonally flooded soils at elevations between 1,780 and 6,800 feet above sea level. Habitat includes wet meadows, abandoned stream channels, valley bottoms, gravel bars, and near lakes or perennial streams that become inundated during large precipitation events. In Wyoming, ULT blooms from early August to early September, with fruits produced in mid August to September (Fertig 2000).

Figure 1. Predicted Distribution of Ute Ladies'-tresses in the Vicinity of the Verde Project Area



Prior to 2005, only four orchid populations had been documented within Wyoming. Five additional sites were located in 2005 and one in 2006 (Heidel pers. Comm.). The new locations were in the same drainages as the original populations, with two on the same tributary and within a few miles of an originally known location. Drainages with documented ULT populations include Wind Creek and Antelope Creek in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County.

A WYNDD model predicted that undocumented populations may be present in the BFO administrative area, particularly within southern Campbell County, and also in Converse County. The model predicted that about 184 acres along Bates Creek, North Bates Creek, and Mexican Springs, approximately 6.7 miles to the southwest of the Verde project area (S34-36 T42N R74W, S1 T41N R74W, S6 and S7 T41N R73W), are likely to support ULT (Figure 1). Several other locations 5-10 miles to the northwest were also predicted by the model to support ULT.

Suitable ULT habitat is present within the Verde project area. Substantial wetland areas have developed in the around and downstream of the Cowboy Reservoir, located in SWNW S01 T42N R73W. Vegetation in these wetland areas is composed of sedges, cattails, and hydric soils. Marginal habitat may also be present in some areas along Porcupine Creek. In the fall of 2007, Porcupine Creek contained intermittent pools of water and had flowing water in NENW S25 T43N R73W as a result of CBNG discharge (Jones and Stokes 2007). Jones & Stokes did not perform pedestrian surveys to identify individual plants in the project area.

3.3.5.2. Sensitive Species

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. Sagebrush ecosystems commonly occur in the Powder River Basin and contain components required in the life cycle of several sensitive species. Species associated with this ecosystem are described below in general terms. Those species within the Powder River Basin that were once listed or candidates for listing under the Endangered Species Act of 1973 and remain BLM Wyoming Sensitive species are described in more detail later in this section.

In addition to the Sensitive species discussed further in this section, Jones & Stokes observed white-faced ibis and loggerhead shrike in the Verde project area. White-face ibis primarily inhabit marshes and wet meadows, feeding in large flocks on aquatic and moist-soil insects, crustaceans, and earthworms (Ryder et al. 1994). Declines in populations are attributed to habitat loss and degradation from alteration of wetland habitats and disturbance from livestock grazing (Ryder et al. 1994). Loggerhead shrike is described in Section

3.3.5.2.1. Prairie Dog Colony Obligates

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

Forty percent of the wildlife taxa found in South Dakota, including 134 vertebrate species, are associated with prairie dog colonies (Agnew 1983, Apa 1985, McCracken et al. 1985, Agnew 1986, Uresk and Sharps 1986, Deisch et al. 1989). Of those species regularly associated with prairie dog colonies, six are on the Wyoming BLM sensitive species list and are suspected or known to occur in the Verde POD: loggerhead shrike, long-billed curlew, ferruginous hawk, mountain plover, swift fox, and burrowing owl. The loggerhead shrike is a predatory songbird found in basin-prairie shrub and mountain-foothill shrub habitats. It preys upon other songbirds, insects, small mammals and reptiles. Declines are believed to be a result of environmental contaminants, habitat loss, and habitat degradation (Yosef 1996). Long-billed curlew is the largest North American shorebird It's diet includes many species of invertebrates and some vertebrates. The major threat to its persistence is habitat degradation (Dugger and Dugger 2002). Other factors include disturbance during breeding season, hunting, and pesticide use (Dugger and Dugger 2002). The affected environments for the remaining four sensitive species are evaluated later in this section.

3.3.5.2.2. Sagebrush Obligates

Sagebrush obligates are species that require sagebrush for some part of their life cycle. They cannot survive without sagebrush and its associated perennial grasses and forbs. Shrubland- and grassland-dependent birds are the fastest-declining group of species in North America (Knick et al. 2003).

Sagebrush obligates that may occur in the Verde project area and that are listed as Sensitive species by BLM Wyoming include sage thrasher, Brewer's sparrow, and greater sage-grouse. Sage thrasher and Brewer's sparrow require sagebrush for nesting, with nests typically located within or under the sagebrush canopy. Sage thrashers usually nest in tall dense clumps of sagebrush within areas having some bare ground for foraging. Brewer's sparrows are associated closely with sagebrush habitats having abundant scattered shrubs and short grass (Paige and Ritter 1999). Greater sage-grouse are discussed in more detail in Section 3.3.5.2.5.1.

3.3.5.2.3. Bald Eagle

The bald eagle was federally listed as Endangered on February 14, 1978, and was then removed from the Endangered species list on August 8, 2007. The bald eagle remains under the protection of the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. In order to avoid violation of these laws and uphold the BLM's commitment to avoid any future listing of this species, all conservation measures and terms and conditions identified in the Powder River Basin Oil and Gas Project Biological Opinion (ES-6-WY-07-F012) (USFWS 2007) shall continue to be complied with.

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

Bald eagle roosting habitat is not present in the Verde project area. The only trees present in the area include two small stands of mature boxelders and cottonwoods present near the ranching residences in NENW S02 T42N R72W and NWNW S25 T43N R73W. Suitability of these trees for roosting is minimal due to their limited size and frequent exposure to human activity.

3.3.5.2.4. Black-tailed Prairie Dog

The black-tailed prairie dog was added to the list of Candidate species for federal listing on February 4, 2000 but was then removed from the list on August 12, 2004. BLM Wyoming considers black-tailed prairie dogs a Sensitive species and continues to afford this species the protections described in the PRB FEIS.

The black-tailed prairie dog is a diurnal rodent inhabiting prairie and desert grasslands of the Great Plains. Due to human-caused factors, black-tailed prairie dog populations are now highly fragmented and isolated (Miller et al. 1994). Most colonies are small and subject to potential extirpation due to inbreeding, population fluctuations, and other problems that affect long term population viability, such as landowner poisoning and disease (Primack 1993, Meffe and Carroll 1994, Noss and Cooperrider 1994).

The black-tailed prairie dog is considered common in Wyoming, although its abundance fluctuates with activity levels of Sylvatic plague and the extent of control efforts by landowners. Comparisons with 1994 aerial imagery indicated that black-tailed prairie dog acreage remained stable from 1994 through 2001. However, aerial surveys conducted in 2003 to determine the status of known colonies indicated that approximately 47% of the prairie dog acreage was impacted by Sylvatic plague and/or control efforts (Grenier et al. 2004).

Black-tailed prairie dogs do not inhabit the Verde project area. No black-tailed prairie-dog colonies were observed by Jones & Stokes (2008). See Section 3.3.5.1.1 for a discussion of the closest reported active colony and locations of historically active colonies.

3.3.5.2.5. Grouse

3.3.5.2.5.1. Greater Sage-grouse

The greater sage-grouse (sage-grouse) is listed as a Sensitive species by BLM Wyoming. In recent years,

several petitions have been submitted to USFWS to list sage-grouse as Threatened or Endangered. On January 12th, 2005, USFWS issued a decision that the listing of 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. In 2007, the U.S. District Court remanded that decision, stating that USFWS's decision-making process was flawed and ordered USFWS to conduct a new Status Review (Winmill Decision Case No. CV-06-277-E-BLW, December 2007).

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).

Habitats within the Verde project area have the potential to support sage-grouse throughout the year. Numerous drainages within the area (Porcupine Creek, Spring Creek, and Green Draw) could provide adequate brood-rearing and late summer habitat. Large stands of moderately dense to dense sagebrush provide suitable nesting and wintering habitat for sage-grouse, with especially dense stands noted in E S22, E S27, N S34 T43N R73W. BLM records identified three active sage-grouse leks within four miles of the project area. The four-mile distance was recommended by the State wildlife agencies' ad hoc committee for consideration of oil and gas development effects to nesting habitat (WGFD 2008). The three lek sites are identified below (Table 2) with up to the most recent five years of peak male lek attendance. Where a year is not listed, no data were reported for that year.

Table 2. Sage-grouse Leks within 4 Miles of the Verde Project Area

Lek Name	Legal Location	Distance from Project Area (mi)	Year: Peak Males
Porcupine Creek	NWSE S23 T43N R73W	0.2	2008: 34 2006: 24 2005: 12
Spring Creek	SWSW S06 T42N R72W	0.4	2008: 10 2007: 12 2006: 16 2005: 18
160-Acre	NESE S15 T42N R73W	2.0	2008: 19 2007: 20 2006: 10

3.3.5.2.5.2. Sharp-tailed Grouse

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

The Verde project area has minimal potential for supporting sharp-tailed grouse throughout the year. The mosaic of grassland and sagebrush-grasslands throughout the project area could provide habitat from April through October. The limited cottonwoods in the area could provide some buds for winter forage, but other berry or bud-producing plants such as snowberry, rose, skunkbush sumac, and juniper are absent from the project area. No sharp-tailed grouse or sharp-tailed grouse sign were observed during surveys (Jones & Stokes 2007, 2008).

3.3.5.2.6. Mountain Plover

The mountain plover was proposed for listing as Threatened in 1999, but, in 2003, USFWS withdrew the proposal, stating that the population was larger than had been thought and was no longer declining.

Mountain plovers are a BLM Wyoming Sensitive species. Recent analysis of the USWFS Breeding Bird Survey data suggests that mountain plover populations have declined at an annual rate of 3.7% over the last 30 years which represents a cumulative decline of 63% during the last 25 years (Knopf and Rupert 1995).

Mountain plovers are typically associated with high, dry, short grass prairies (BLM 2003). Nesting habitat is often associated with heavily grazed areas such as prairie dog colonies and livestock pastures.

Suitable mountain plover habitat is present about 0.25 mile outside of the project area in a prairie dog colony located in SE S25 T43N R73W, and a mountain plover was observed within 0.25 mile of the project area in NESE S25 in spring 2004. Grasses in the prairie dog colony were very short and sparse, containing up to 50% bare ground, during surveys in 2007 (Jones & Stokes 2007). The area is relatively level. Additional habitat exists in S02 and NW S01 T42N R73W, where relatively level grasslands with short grass (< 6 inches) and moderate amounts of bare soil (40%) are present. Only a few short (~6 inches) sagebrush plants occur in that area, and moderate grazing of these areas was evident during 2007 surveys (Jones & Stokes 2007).

3.3.5.2.7. Swift Fox

The swift fox was removed from the Federal list of candidate species in January 2001 due to the implementation of the Swift Fox Conservation Plan. It remains a BLM sensitive species, and, as such, recommendations for mitigation contained within the Swift Fox Conservation Plan will be applied to the project in order to uphold the direction set forth in BLM Manual 6840.

The swift fox is native to the grassland prairies of North America. The original range of the species was influenced primarily by the extent of the shortgrass prairie and midgrass prairie ecosystems. The swift fox range primarily follows the distribution of the black-tailed prairie dog. Swift fox populations have been reduced to about 40% of their former range.

Swift foxes tend to have their dens on or within 0.8 kilometers of prairie dog colonies (Hillman and Sharps 1978). The swift fox diet consists mostly of prairie dogs (49%) and insects (27%) (Uresk and Sharps 1986). Breeding occurs from December to February depending on latitude (Kilgore 1969, Hines 1980, Covell 1992). Gestation is approximately 51 days (Kahn et al. 1997). Pups are reared in dens with den sites possibly being changed several times during the pup-rearing period (Kahn et al. 1997). Under certain circumstances, litters from different fox pairs might share the same natal dens. At four or five months, the young foxes are almost fully grown and difficult to distinguish from adults (Kahn et al. 1997). Though little is known about pup-dispersal, it begins during September and October (Kahn et al. 1997).

Suitable swift fox habitat may exist in the project area. The project area is within three miles of portions of Thunder Basin National Grassland, which supports known populations of swift fox. The prairie dog colony located in S25 T43N R73W could provide habitat. Cosner Road separates this area from the project area, providing a physical barrier at which the landscape changes abruptly to upland habitat and which may limit swift fox expansion into the project area. The historic prairie dog colony located in SWSE S02 and N S11 T42N R73W could support swift fox, although Jones & Stokes reported that no evidence of historical or active colonies were documented in this area (Jones & Stokes 2007). Jones & Stokes did not survey for swift fox dens in their wildlife surveys for the Verde POD.

3.3.5.2.8. Western Burrowing Owl

The western burrowing owl is listed as a Sensitive species by the BLM throughout the west and by the US Forest Service. It has declined significantly throughout its North American range. Primary threats across its range are habitat loss and fragmentation, mostly due to intensive agricultural and urban development,

and habitat degradation, due to declines in populations of colonial burrowing mammals (Klute et al. 2003). Current population estimates for the United States are not well known, but trend data suggest significant declines (McDonald et al. 2004). The majority of the states within the owl's range have recognized that populations are declining. The last official population estimate placed them at less than 10,000 breeding pairs.

The burrowing owl is a small, long-legged owl found throughout open landscapes of North and South America. Burrowing owls can be found in grasslands, rangelands, agricultural areas, deserts, or any dry open area with low vegetation where abandoned burrows dug by mammals such as ground squirrels, prairie dogs, and badgers are available.

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

Suitable burrowing owl habitat exists within 0.5 mile of the project area. A burrowing owl nest was located in the active prairie dog colony in S25 T43N R73W, approximately 0.4 miles outside of the project area. Cosner Road separates this area from the project area, providing a physical barrier at which the landscape changes abruptly to upland habitat and which may limit burrowing owl expansion into the project area. The historic prairie dog colony located in SWSE S02 and N S11 T42N R73W may also provide habitat for burrowing owls, although Jones & Stokes reported that no evidence of historical or active colonies were documented in this area (Jones & Stokes 2007).

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

Year	Total WY Human Cases	Human Cases PRB	Veterinary Cases PRB	Bird Cases PRB
2001	0	0	0	0
2002	2	0	15	3
2003	392	85	46	25
2004	10	3	3	5
2005	12	4	6	3
2006	65	0	2	2
2007*	155	22	Unk	1

*Wyoming Department of Health Records September 12, 2007.

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

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

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

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

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

3.5. Water Resources

The project area is within the Antelope Creek watershed. It lies near the headwaters of Spring and Porcupine creeks.

3.5.1. Groundwater

Wyoming Department of Environmental Quality (WDEQ) water quality parameters for groundwater classifications (Chapter 8 – Quality Standards for Wyoming Groundwater) define the following limits for Total Dissolved Solids (TDS) and the classes of groundwater; 500 mg/l TDS for drinking water (Class I), 2000 mg/l for Agricultural Use (Class II)and 5000 mg/l for Livestock Use (Class III).

The PRB EIS Record of Decision includes a Monitoring, Mitigation and Reporting Plan (MMRP). The objective of the plan is to monitor those elements of the analysis where there was limited information available during the preparation of the EIS. The MMRP called for the use of adaptive management where changes could be made based on monitoring data collected during implementation. Specifically related to groundwater, the plan identified the following (PRB EIS ROD page E-4):

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

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

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

The on-going shallow groundwater impoundment monitoring at four other impoundment locations are

less intensive and consist of batteries of between 4 and 6 wells. Preliminary data from two of these other sites also are showing an increasing TDS level as water infiltrates while two other sites are not.
The WDEQ implemented requirements for monitoring shallow groundwater of Class III or better quality under unlined CBNG water impoundments effective August 1, 2004. The intent is to identify locations where the impoundment of water could potentially degrade any existing shallow groundwater aquifers. These investigations are conducted where discharged water will be detained in existing or proposed impoundments. If shallow groundwater is detected and the water quality is determined to fall within the Class III or better class of use (WDEQ Chapter 8 classifications for livestock use), operators are required to install batteries of 1 to 3 wells, develop a monitoring plan and monitor water levels and quality. The results of these investigations are being analyzed and interpreted as they are received by the WDEQ.

A search of the Wyoming State Engineer's Office (WSEO) Ground Water Rights Database for this area showed 14 registered stock and domestic water wells within a one mile radius of the Verde POD CBNG wells or reservoirs. Their depths range from 50 to 350 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 lies near the headwaters of Spring and Porcupine Creeks. These drainages join Antelope Creek, which is ultimately a tributary to the Cheyenne River.

In many ways, this area is an anomaly, characterized by relatively gently sloping and undulating terrain with steep gully lands both upstream and downstream. Because of this gently sloping terrain, water moves much more slowly through the area, leading to stream channels that are highly sinuous and water that moves relatively slowly. This slow movement of water contributes to a relatively high water table throughout most of the project area. The high water table contributes to reservoir levels and wetland development. All drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt) to intermittent (flowing only at certain times of the year when it receives water from alluvial groundwater, springs, or other surface source – PRB FEIS Chapter 9 Glossary). The entire area is characterized by irrigated and sub-irrigated meadows and haylands interspersed with the surrounding low hills and upland range.

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 Antelope Creek, the EC ranges from 1800 µmhos/cm at maximum monthly flow to 2354 µmhos/cm at low monthly flow and the SAR ranges from 2.82 at maximum monthly flow to 2.6 at low monthly flow. This data was collected at the USGS gage on Antelope Creek near Teckla, Wyoming.

For comparison purposes, the Upper Cheyenne River EC ranges from 2271µmhos/cm at maximum monthly flow to 4127 µmhos/cm at low monthly flow and the SAR ranges from 5.63 at maximum monthly flow to 8.66 at low monthly flow. These values were determined at the USGS station located on the Cheyenne River near Riverview, Wyoming (PRB FEIS page 3-49).

The operator did not state whether or not any natural springs were identified within the POD boundary.
For more information regarding surface water, please refer to the PRB FEIS Chapter 3 Affected Environment pages 3-36 through 3-56.

3.6. Cultural Resources

Class III inventories were conducted for the Verde project prior to on-the-ground project work (BFO project #'s 70080063, 70080063a). Pronghorn Archaeological Services conducted the 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 or near the Area of Potential Effect (APE).

Table 3.6 Cultural Resource Sites Identified within or near the Verde project area

Site Number	Site Type	Eligibility
48CA4868	Reno to Salt Creek Road	Not Eligible
48CA5505	Prehistoric Lithic Scatter	Not Eligible
48CA5514	Prehistoric Lithic Scatter and Campsite	Not Eligible
48CA6768	Historic Trash Scatter	Not Eligible
48CA6769	Historic Well and Cistern	Not Eligible
48CA6770	Prehistoric Campsite and Historic Artifact	Not Eligible

3.7. Air Quality

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

Existing air pollutant emission sources within the region include following:

- Exhaust emissions (primarily carbon monoxide [CO] and nitrogen oxides [NOx]) from existing natural gas fired compressor engines used in production of natural gas and CBNG; and, gasoline and diesel vehicle tailpipe emissions of combustion pollutants;
- Dust (particulate matter) generated by vehicle travel on unpaved roads, windblown dust from neighboring areas and road sanding during the winter months;
- Transport of air pollutants from emission sources located outside the region;
- Dust (particulate matter) from coal mines;
- NOx, particulate matter, and other emissions from diesel trains and,
- SO2 and NOx from power plants.

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

4. ENVIRONMENTAL CONSEQUENCES

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

4.1. Vegetation & Soils Direct and Indirect Effects

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the 11 proposed well locations, all can be drilled without a well pad being constructed. As such, surface disturbance associated with the drilling of the wells would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (estimated approximate size of 15ft wide x 55ft long x 15ft deep), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 11 wells would involve approximately 0.2 acre/well for a total estimated disturbance of 2.2 acres.

Approximately 1.0 mile of proposed road improvements would be constructed to provide access to various well locations. Approximately 7.7 miles of new and existing two-track primitive roads would be utilized to access project infrastructure. 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 4.0 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
Nonconstructed Pad	11	0.2/acre (100 x 100 feet)	2.2	Long Term
Gather/Metering Facilities	0	Site Specific	0.0	Long Term
Screw Compressors	0	Site Specific	0.0	Long Term
Impoundments				Long Term
On-channel	9	Site Specific	20.0	
Off-channel	0	Site Specific	0.0	
Water Discharge Points	7	Site Specific or 0.01 ac/WDP	1.0	
Channel Disturbance				
Headcut Mitigation*	0	Site Specific	0.0	
Channel Modification	0	Site Specific	0.0	

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Improved Roads	1.0	45' Width or Site Specific	5.33	Long Term
No Corridor	0.2		1.05	
With Corridor	0.8		4.28	
2-Track Roads	7.7		28	Long Term
No Corridor	3.1	12' Width	4.5	
With Corridor	4.6	45' Width or Site Specific	23.34	
Pipelines	4.0		22	Short Term
No Corridor	0.3	35' Width	1.27	
With Corridor	3.7	45' Width	20.18	
Overhead Powerlines	1.41	30' Width	5.13	Long Term

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

4.1.1. Soils

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 results in removal or relocation of organic matter and nutrients to depths where it would be unavailable for vegetative use. Soils which are more susceptible to wind and water erosion may be moved to the surface. Soil structure may be destroyed, which may impact infiltration rates. Less desirable inorganic compounds such as carbonates, salts or weathered materials may be relocated and have a negative impact on revegetation. This drastically disturbed site may change the ecological integrity of the site and the recommended seed mix.
- Soil compaction – the collapse of soil pores results in decreased infiltration and increased erosion potential. Factors affecting compaction include soil texture, moisture, organic matter, clay content and type, pressure exerted, and the number of passes by vehicle traffic or machinery. Compaction may be remediated by plowing or ripping.
- Loss of soil vegetation cover, organic matter and productivity. With expedient reclamation, productivity and stability should be regained in the shortest time frame.
- Soil erosion would also affect soil health and productivity. Erosion rates are site specific and are dependent on soil, climate, topography and cover.
- Soil productivity would be eliminated along improved roads and severely restricted along two track trails until successful final reclamation is achieved.
- Modification of hill slope hydrology.

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

Soil disturbances other than permanent facilities would be short term with expedient, successful interim reclamation and site stabilization. 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, wing ditches, culverts, rip-rap, etc) would ensure land productivity/stability is

regained and maximized. In addition, the operator will adhere to COAs which limit the surface disturbance allowable for construction and improvements.

The operator will follow the guidance provided in the Wyoming Policy on Reclamation (IM WY-90-231). The Wyoming Reclamation Policy applies to all surface disturbing activities. Authorizations for surface disturbing actions are based upon the assumptions that an area can and ultimately will be successfully reclaimed. BLM reclamation goals emphasize eventual ecosystem reconstruction, which means returning the land to a condition approximate to or better than that which existed before it was disturbed. Final reclamation measures are used to achieve this goal. BLM reclamation goals also include the short-term goal of quickly stabilizing disturbed areas to protect both disturbed and adjacent undisturbed areas from unnecessary degradation. Interim reclamation measures are used to achieve this short-term goal.

4.1.2. Vegetation

The construction associated with this project will directly disturb a total of 83.66 acres. To insure expedient reclamation that conforms to the Wyoming Reclamation Plan objectives, native seed mixes are recommended for use on the different ecological sites. Seed mixes for the Verde POD were determined based on soil map unit types, the dominant ecological sites found within the project area, and the mixing of soil horizons in disturbed areas. A loamy seed mix was created for the entire POD (see site specific COAs). These native species should adapt readily to each soil and ecological site in the POD area to ensure revegetation, with prompt and appropriate re-contouring and reclamation.

The construction of the access roads, pipelines and well locations will also disturb sagebrush. Wyoming big sagebrush has not been included in these mixes because direct seeding success has been marginal in the past. With expedient reclamation and re-spreading of the topsoil, sagebrush seed should be present in the seed base and should regenerate given proper environmental conditions.

4.1.3. Wetland/Riparian/Floodplains

The operator has stated that their WYPDES permit will allow direct discharge into the tributaries of the Cheyenne River. However, they have stated in their water management plan that they intend to impound water as much as possible, allowing direct discharge of produced water when the impoundments are full or when landowners request water.

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Re-surfacing water from the impoundments will potentially allow for wetland-riparian species establishment. “Continuous high stream flows into wetlands and riparian areas would change the composition of species and dynamics of the food web. The shallow groundwater table [which is already fairly close to the surface within the project area] would rise closer to the surface with increased and continuous stream flows augmented by produced water discharges. Vegetation in riparian areas, such as cottonwood trees, that cannot tolerate year-round inundated root zones would die and would not be replaced. Other plant species in riparian areas and wetland edges that favor inundated root zones would flourish, thus changing the plant community composition and the associated animal species. A rise in the shallow groundwater table would also influence the hydrology of wetlands by reducing or eliminating the seasonal drying periods that affect recruitment of plant species and species composition of benthic and water column invertebrates. These changes to the aquatic food web base would affect the higher trophic levels of fish and waterfowl abundance and species richness for wetlands and riparian areas.” (PRB FEIS Page 4-175).

Individual cottonwood trees were observed scattered throughout the project area. However, no “gallery forests” exist until well down the main channels leading to the Cheyenne River.

4.1.4. Invasive Species

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

1. Control Methods: mowing, tillage, and herbicide applications.
2. Preventive Practices: use of sanitary procedures for field equipment between job locations, identification and delineation of new weed infestations, and use of certified weed-free seed for revegetation projects.
3. Education and awareness programs for field employees and contractors through county weed districts, and state and federal agencies.

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

The use of existing facilities along with the surface disturbance associated with construction of proposed access roads, pipelines, water management infrastructure, produced water discharge points and related facilities would present opportunities for weed invasion and spread. Produced CBNG water would likely continue to modify existing soil moisture and soil chemistry regimes in the areas of water release and storage. The activities related to the performance of the proposed project would create a favorable environment for the establishment and spread of noxious weeds/invasive plants such as salt cedar, Canada thistle and perennial pepperweed. However, mitigation as required by BLM applied COAs will reduce potential impacts from noxious weeds and invasive plants.

4.1.5. 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 Antelope Creek drainage and the total amount predicted in the PRB FEIS, which is approximately 25% of that total (see section 4.4.2.1).
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.

No additional mitigation measures are required.

4.2. Wildlife (Alternative C – Environmentally Preferred)

Table 4.1 summarizes the activities proposed with development of the Harris project area.

4.2.1. Big Game Direct and Indirect Effects

Yearlong range for pronghorn and mule deer will be directly disturbed with the construction of wells, reservoirs, pipelines and roads. Items identified as long-term disturbance will cause direct habitat loss.

Short-term disturbances will also result in direct habitat loss; however, these areas may provide some habitat value after they are reclaimed and native vegetation has been re-established.

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

Big game animals are expected to return to the project area following construction; however, populations will likely be reduced, as the human activities associated with operation and maintenance will continue to displace them. Mule deer are more sensitive to operation and maintenance activities than pronghorn, and, as the Pinedale Anticline study suggests, they do not readily habituate (Madson 2005). 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 used only by 4-wheel drive vehicles, trail bikes, and hikers (Jalkotzy et al. 1997). Reclamation and CBNG activities that occur within big game habitats during the spring will likely displace does and fawns due to the human presence in the area. This may cause reduced survival rate of does and fawns that must expend increased energies to avoid such activities.

Winter big game diets are sub-maintenance, meaning they lose weight and body condition as the winter progresses. Survival below the maintenance level requires behavior that emphasizes energy conservation. Canfield et al. (1999) pointed out that forced activity caused by human disturbance exacts an energetic disadvantage. 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. Big Game Cumulative Effects

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

4.2.2. Aquatics Direct and Indirect Effects

Produced water will be stored in nine existing on-channel reservoirs located within the Porcupine Creek and Spring Creek watersheds. The reservoirs may be allowed to discharge during dry conditions. If a reservoir were to discharge, it is unlikely that the produced water would reach a fish-bearing stream, thus affecting downstream species.

4.2.2.1. Aquatics Cumulative Effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-247. No additional mitigation measures are required.

4.2.3. Migratory Birds Direct and Indirect Effects

Disturbance of the habitat types within the project area is likely to impact migratory birds. Native habitats will be lost directly with the construction of wells, roads, and pipelines. Prompt re-vegetation of short-term disturbance areas should reduce habitat loss impacts.

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

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

Migratory bird species that utilize the disturbed areas for nesting may be disrupted by the human activity, and nests may be destroyed by equipment. 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).

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

4.2.3.1. Migratory Birds Cumulative Effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, Page 4-235. No additional mitigation measures are required.

4.2.4. Raptors Direct and Indirect Effects

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

To reduce the risk of decreased productivity or nest failure, the BLM BFO requires a 0.5 mile radius timing limitation during the breeding season around active raptor nests and recommends all infrastructure requiring human visitation to be located greater than 0.25 mile from occupied raptor nests.

Table 3. Proposed and Existing Infrastructure within 0.5 mile of Documented Raptor Nests within the Verde Project Area

BLM ID	Amount and Type of Infrastructure	
	< 0.25 Mile	0.25 - 0.5 Mile
855		• 1 well (4QUIL-COM) • 2 two-track roads • 1 pipeline corridor • 1 overhead power drop • 1 water discharge point
4147	• 1 well (4QUIL-COM) • 2 two-track roads • 1 pipeline corridor • 1 overhead power drop • 1 water discharge point	• 1 pipeline corridor
5458 (BUOW)		• 1 well (4QUIL-COM) • 2 two-track roads • 1 pipeline corridor • 1 overhead power drop
5456	• 1 well (2GREE) • 2 pipeline corridors • 1 power drop • 1 water discharge point and tire tank • 2 two-track roads • 1 low water crossing	• 2 additional wells (4GREE, 3GREE-COM) • 2 pipeline corridors • 3 two-track roads • 2 reservoirs • 1 low water crossing

A well and infrastructure are proposed within 0.25 mile of nest 4147. BLM and Yates discussed possible alternatives but were unable to determine a more suitable location. The location is adjacent to existing disturbance, including a road and powerline. The nest was active with Swainson's hawks in 2006, activity in 2007 was uncertain (see Section 3.3.4), and the nest was inactive in 2008. The increased activity surrounding this nest may lead to its abandonment in the future.

A well and infrastructure are proposed within 0.25 mile of nest 5456. The raptors that use this nest are accustomed to some amount of human disturbance, as the nest is located in a tree directly adjacent to an inhabited ranch house. In order to minimize additional human visitation in proximity of this nest, Yates agreed to restrict travel along the segment of the road in S02 T42N R73W from the section line on the west to the 2GREE well on the east. While human visitation is one factor that may cause nest abandonment, alteration and fragmentation of the surrounding landscape by the proposed CBNG development may cause enough disturbance to cause raptors to avoid this area and abandon this nest.

Nest 5458 is a burrowing owl nest and is therefore subject to a 0.25 timing limit stipulation. No surface-disturbing activities are proposed within 0.25 mile of the nest. Burrowing owls are relatively tolerant of lower levels of human activity (Bates 2006); however, artificially enhanced populations of predators (e.g., foxes and coyotes) can be problematic. Increased predators associated with the proposed development may impact burrowing owls using the area.

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

4.2.4.1. Raptors Cumulative Effects

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

4.2.5. Threatened and Endangered and Sensitive Species

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

4.2.5.1. Threatened and Endangered Species

Table 4. 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	Habitat not of sufficient area.
Threatened				
Ute ladies'-tresses orchid (*Spiranthes diluvialis*)	Riparian areas with permanent water	S	LAA	Habitat present. Surveys not conducted.

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

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

4.2.5.1.1. Black-Footed Ferret Direct and Indirect Effects

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

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

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

Suitable ULT habitat is present in the project area around and downstream of the Cowboy Reservoir. Reported marginal habitat is also present in Porcupine Creek, which is already receiving CBNG discharged water. Pedestrian surveys were not conducted in these areas to determine the presence of ULT.

Reservoir seepage may create suitable habitat if the historically ephemeral drainages become perennial. Because the project area contains suitable habitat within proximity of known ULT populations in the same sub-watershed, and because protocol surveys were not conducted, implementation of the Verde project is "likely to adversely affect" ULT.

Water management for the Verde project was proposed to include discharge to the Cowboy Reservoir (in addition to eight other reservoirs). A habitat assessment shall be conducted around and downstream of this reservoir prior to any surface disturbance, which includes addition of CBNG produced water. The surveys shall be conducted downstream as far as produced water is estimated to saturate soils at the surface. If suitable habitat is verified, a protocol survey will be required prior to those areas receiving produced water. Those portions of Porcupine Creek that Jones & Stokes reported as containing marginal ULT habitat shall be specifically identified in a report to BLM, in order for BLM to monitor the impacts resulting from implementation of the Verde project.

4.2.5.2. Sensitive Species Direct and Indirect Effects

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

4.2.5.2.1. Sagebrush Obligates

Construction and maintenance activities associated with development of the Verde project are likely to cause a decline in sagebrush obligate species. In Wyoming, existing oil and gas wells are located primarily in landscapes dominated by sagebrush, causing direct loss of this habitat. Associated road networks, pipelines, and powerline transmission corridors also influence vegetation dynamics by fragmenting habitats or by creating soil conditions facilitating the spread of invasive species (Braun 1998, Gelbard and Belnap 2003). Density of sagebrush-obligate birds within 100 m of roads constructed for natural gas development in Wyoming was 50% lower than at greater distances (Ingelfinger 2001).

Fragmentation of shrubsteppe habitat is a major disruption that has consequences for sagebrush-obligate species (Braun et al. 1976; Rotenberry & Wiens 1980a). In fragmented habitats, suitable habitat area remains only as remnants surrounded by unusable environments (Urban and Shugart 1984; Fahrig & Paloheimo 1988). Sagebrush-obligate species decline because areas of suitable habitat decrease (Temple & Cary 1988), because of lower reproduction, and/or because of higher mortality in remaining habitats (Robinson 1992; Porneluzi et al. 1993). Fragmentation of shrubsteppe has the further potential to affect the conservation of sagebrush-obligate species because of the permanence of disturbance (Knick and Rotenberry 1995). Several decades are required to reestablish ecologically functioning mature sagebrush communities. Due to this, sagebrush obligate species may not return for many years after reclamation activities are completed.

Table 5. 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	Habitat not present.
Spotted frog (*Ranus pretiosa*)	Mountain ponds, sloughs, and small streams	NP	NI	Habitat not present.
Birds				
Baird's sparrow (*Ammodramus bairdii*)	Grasslands, weedy fields	S	MIIH	Sagebrush and grassland cover will be affected.
Bald eagle (*Haliaeetus leucocephalus*)	Mature forest cover often within one mile of large water body.	S	MIIH	Foraging habitat will be affected.
Brewer's sparrow (*Spizella breweri*)	Basin-prairie shrub	S	MIIH	Sagebrush cover will be affected.
Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	K	MIIH	Habitat present.
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	S	MIIH	Human activity will increase.
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	S	MIIH	Grassland cover will be affected.
Mountain plover (*Charadrius montanus*)	Short-grass prairie with slopes < 5%	S	MIIH	Increased human activity will occur adjacent to habitat.
Northern goshawk (*Accipiter gentilis*)	Conifer and deciduous forests	NP	NI	No forest habitat present.
Peregrine falcon (*Falco peregrinus*)	Cliffs	NP	NI	No cliffs present.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	NS	MIIH	Sagebrush cover will be affected.
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	S	MIIH	Reservoirs may provide migratory habitat.
White-faced ibis (*Plegadis chihi*)	Marshes, wet meadows	K	MIIH	Reservoirs and drainages provide habitat.
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.	NP	NI	Prairie dog towns not within POD.
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	Habitat not present.
Swift fox (*Vulpes velox*)	Grasslands	NS	MIIH	Habitat not present.
Townsend's big-eared bat (*Corynorhinus townsendii*)	Caves and mines.	NP	NI	Habitat not present.
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.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
William's wafer parsnip (*Cymopterus williamsii*)	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides, 6000-8300 ft.	NP	NI	Habitat not present.

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

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

4.2.5.2.2. Bald Eagle Direct and Indirect Effects

Based on the raptor nesting surveys and lack of suitable habitat, it is unlikely bald eagles nest or roost within the Verde project area. The proposed project should not affect bald eagle nesting or winter roosting habitat but will likely impact foraging areas.

There are 2.47 miles of existing three-phase powerlines and 1.17 miles of existing single-phase powerlines to be upgraded to three-phase powerlines within the project area. The wire spacing is likely in compliance with the Avian Power Line Interaction Committee's (1996) suggested practices and with the Service's standards (USFWS 2002); however other features may not be in compliance. Yates is proposing an additional 1.41 miles of overhead three-phase distribution lines. The presence of overhead power lines may impact foraging bald eagles. Bald eagles forage opportunistically throughout the Powder River Basin particularly during the winter when migrant eagles join the small number of resident eagles. Power poles provide attractive perch sites in areas where mature trees and other natural perches are lacking. From May 2003, through December 28, 2006, Service Law Enforcement salvage records for northeast Wyoming identified that 156 raptors, including 1 bald eagle, 93 golden eagles, 1 unidentified eagle, 27 hawks, 30 owls, and 4 unidentified raptors were electrocuted on power poles within the Powder River Basin Oil and Gas Project area (USFWS 2006a). Of the 156 raptors electrocuted, 31 were at power poles that are considered new construction (post 1996 construction standards). Additionally, two golden eagles and a Cooper's hawk were killed in apparent mid-span collisions with powerlines (USFWS 2006a). Powerlines not constructed to APLIC suggestions pose an electrocution hazard for eagles and other raptors perching on them. USFWS has developed additional specifications improving upon the APLIC suggestions. Constructing power lines to the APLIC suggestions and USFWS standards minimizes but does not eliminate electrocution risk.

There are currently 4.0 miles of improved roads within the project area with 0.19 miles proposed, and 4.59 miles of two-track roads with 3.09 miles proposed. Typically, two-tracks and improved project roads pose minimal collision risk. In one year of monitoring road-side carcasses, BFO reported 439 carcasses, 226 along Interstates (51%), 193 along paved highways (44%), 19 along gravel county roads (4%), and 1 along an improved CBNG road (<1%) (Bills 2004). No road-killed eagles were reported. Bald and golden eagles were observed feeding on 16 of the reported road-side carcasses (<4%). The risk of big-game vehicle-related mortality along CBNG project roads is so insignificant or discountable that when combined with the lack of bald eagle mortalities associated with highway foraging, it is unlikely that CBNG project roads will affect bald eagles.

Produced water will be stored in nine existing reservoirs, which may attract eagles if reliable prey is present, most likely in the form of waterfowl. The effect of the reservoirs on eagles is unknown. The reservoirs could prove to benefit bald eagles by increasing their food supply or adversely affect them, from an increase in potential contaminants or by increasing collisions because of proximity to roads. Eagle use of reservoirs should be reported to determine the need for any future management.

4.2.5.2.3. Black-tailed Prairie Dog Direct and Indirect Effects

Black-tailed prairie dogs do not occur within the project area. The project should not impact black-tailed prairie dogs.

4.2.5.2.4. Grouse

4.2.5.2.4.1. Greater Sage-grouse Direct and Indirect Effects

According to WGFD sage-grouse lek database, three sage-grouse leks are located within four miles of the Verde project area boundary. The proposed action will adversely impact breeding, nesting, brood rearing, and late summer. Proposed project elements that are anticipated to negatively impact grouse include: 11 CBNG wells on 11 locations, 3.3 miles of new roads, 9.27 miles of new pipelines, and increased vehicle traffic on established roads. Using 0.6 miles as an avoidance buffer (Holloran et al. 2007, Aldridge and

Boyce 2007), effective sage-grouse habitat loss will be 14.33 square miles from roads and pipelines and 12.43 square miles from well locations. These numbers are not additive since the buffered area overlaps between these infrastructure types.

Based on the best available science, which is summarized below, the proposed action will most likely contribute to the extirpation of the local grouse population and reduction of attendance at the three leks within four miles of the project area.

Several changes were made at the onsite to minimize effects to sage-grouse habitat. The access road to the 6-GREEN well was moved out of a sagebrush stand and along the proposed pipeline corridor to minimize disturbance to and fragmentation of sage-grouse habitat. The proposed pipeline corridor to 1-VERDE was relocated so that, rather than introducing disturbance to an intact sagebrush stand, it instead travels along an existing crown and ditch county road to reduce fragmentation of and disturbance to sage-grouse habitat. The 1-PORCUPINE well was moved outside of a sagebrush stand and closer to the access road to reduce disturbance to and fragmentation of sage-grouse habitat.

BLM requested that Yates move the 22-BUNN well as close to the county road as possible, but Yates was unable to move the well closer to the road due to the presence of a high pressure gas line between the well location and the road. The well was staked a safe distance from the gas line.

4.2.5.2.4.2. Greater Sage-grouse Cumulative Effects

In addition to the direct impacts to sage-grouse habitat that will be created by the federal wells and infrastructure associated with the Verde project, the surrounding area contains existing fee, state, and federal fluid mineral development. The sage-grouse cumulative impact assessment area for this project encompasses a four mile radius from the three sage-grouse leks that intersect the project area. As of September 9, 2008, there were approximately 352 existing wells and associated infrastructure within four miles of the three leks - an area of 99.1 square miles. The existing well density is approximately 3.4 wells per square mile. Due to this level of development there is the potential that the populations breeding at these leks may become reduced without development of the Verde POD.

There are 148 proposed wells (11from this project) within four miles of the three leks. With the addition of the 137 proposed wells that are not associated with this proposed action, the well density within four miles of the leks increases to 4.9 wells per square mile. With approval of Alternative C (11 proposed well locations) the well density would increase to 5.0 wells per square mile.

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 administrative area (WGFD 2004). The PRB FEIS estimated 51,000 additional CBNG wells to be drilled over a ten year period beginning in 2003 (BLM 2003).

The PRB FEIS (BLM 2003) concluded that "Activities associated with the proposed project would affect sage-grouse in several ways. These effects may include: (1) increased direct mortality (including legal hunting, poaching, and collision with power lines and vehicles); (2) the introduction of new perches for raptors and thus the potential change in rate of predation; (3) direct loss or degradation of habitats; (4) indirect disturbance resulting from human activity (including harassment, displacement, and noise); (5) habitat fragmentation (particularly through construction of roads); and (6) changes in population (pg. 4-257)." The FEIS goes on to state that "implementation of several mitigation measures would reduce the extent of each impact addressed by those measures. Despite these measures, the synergistic effect of several impacts would likely result in a downward trend for the sage-grouse population, and may contribute to the array of cumulative effects that may lead to its federal listing. Local populations may be

extirpated in areas of concentrated development, but viability across the Project Area (Powder River Basin) or the entire range of the species is not likely to be compromised (pg. 4-270)."

The Powder River Basin Oil and Gas Project Record of Decision (PRB ROD) (BLM 2003) included a Mitigation Monitoring and Reporting Plan (MMRP). The uncertainties as to where and at what level development was to proceed as well as the uncertainties associated with the assumptions that were used to predict impacts suggests that one-time determination of impacts that is included in the EIS may not occur as projected. The MMRP helps to continually assess the effects of the project and the adequacy of the mitigation. Such a plan/process provides a mechanism to continuously modify management practices in order to allow development while continuing to protect the environment (E-1)." In other words, development pace and patterns may not occur as predicted, and so the BLM may use the adaptive management process provided for in the BFO Resource Management Plan (RMP) (BLM 2001).

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

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

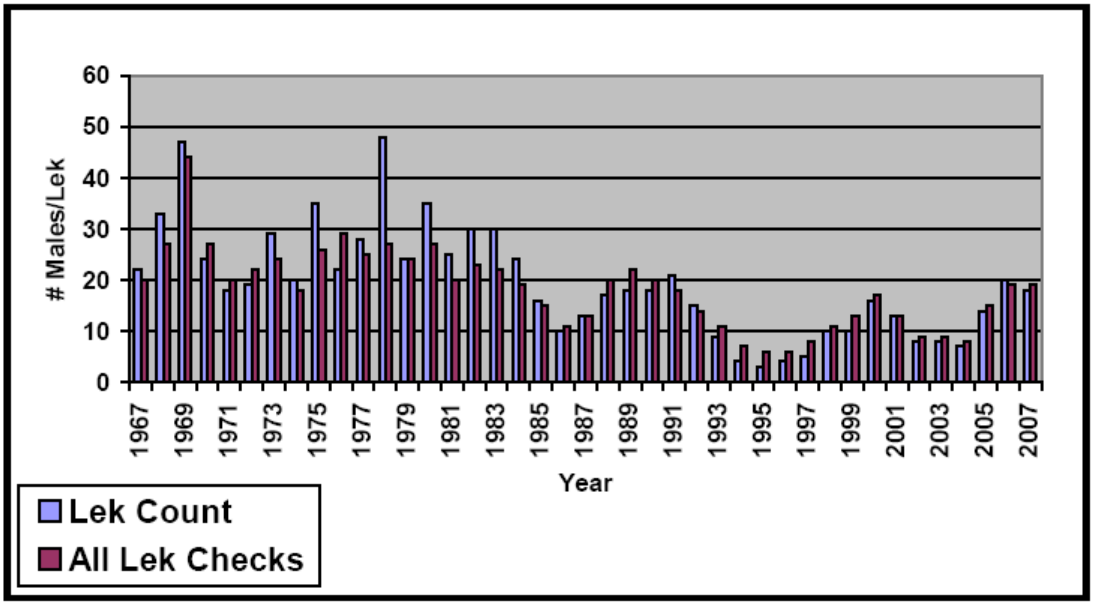
Vegetation communities within the Powder River Basin are naturally fragmented, as they represent a transition between the intermountain basin sagebrush communities to the west and the prairie communities to the east. The Powder River Basin is also near the eastern edge of the sage-grouse range. A sagebrush cover assessment within Wyoming basins estimated sagebrush coverage within the Powder River Basin to be 35% with an average patch size of less than 300 acres (Rowland et al. 2005). This is a decrease of more than 63% over the last 40 years, from 41% coverage with an average patch size of 820 acres (Rowland et al. 2005). The existing development within the cumulative impacts assessment area has further fragmented sage-grouse habitat. Disturbance created by this project will contribute to additional fragmentation.

Another concern with CBNG development is that reservoirs created for water disposal provide habitat for

mosquitoes associated with West Nile virus (WGFD 2004). West Nile virus represents a significant new stressor, which in 2003 reduced late summer survival of sage-grouse an average of 25% within four populations including the Powder River Basin (Naugle et al. 2004). In northeastern Wyoming and southeastern Montana, West Nile virus-related mortality during the summer resulted in an average decline in annual female survival of 5% from 2003 to 2006 (Walker et al. 2007). Powder River Basin sage-grouse losses during 2004 and 2005 were not as severe. Summer 2003 was warm and dry, more conducive to West Nile virus replication and transmission than the cooler summers of 2004 and 2005 (Cornish pers. comm.).

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

Figure 2. Male sage-grouse lek attendance within northeastern Wyoming, 1967-2007.



The BFO RMP and the PRB ROD include a two-mile timing limitation within sage-grouse nesting habitat. The two-mile measure originated with the Western Association of Fish and Wildlife Agencies (WAFWA) (BLM 2004). BLM Wyoming adopted the two-mile recommendation in 1990 (BLM 1990). The two-mile recommendation was based on early research which indicated between 59% and 87% of sage-grouse nests were located within two miles of a lek (BLM 2004). These studies were conducted within prime, contiguous sage-grouse habitat, such as Idaho's Snake River plain, which is not characteristic of the Powder River Basin.

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

A two-mile timing limitation, given the long-term population decline and that less than 50% of sage-grouse are expected to nest within the limitation area, is insufficient to reverse the population decline. Moynahan and Lindberg (2004) and WAFWA (Connelly et al. 2000), recommend increasing the protective distance around sage-grouse leks. The BLM and University of Montana are currently researching the relationship between grouse ecology and coalbed natural gas development. Thus far, this research suggests that impacts to leks from energy development are discernable out to a minimum of four miles, and that some leks within this radius have been extirpated as a direct result of energy development (State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development 2008). Even with a timing limitation on construction activities, sage-grouse may avoid nesting within CBNG fields because of the activities associated with operation and production. In a typical landscape in the Powder River Basin, energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87% to 5% percent (Walker et al. 2007).

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

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

4.2.5.2.5. Sharp-tailed grouse Direct and Indirect Effects

Effects to sharp-tailed grouse are similar to those expected for sage-grouse.

4.2.5.2.6. Mountain Plover Direct and Indirect Effects

Suitable mountain plover habitat is present within 0.25 mile of the project area. The project may impact mountain plovers.

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

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

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

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

4.2.5.2.7. Swift Fox Direct and Indirect Effects

Suitable swift fox habitat may exist within the project area. The project may impact swift foxes or their habitat. WGFD reported a prairie dog colony in NWNE S11 T42N R73W. Jones & Stokes reported that no evidence of this colony exists in this area (Jones & Stokes 2007). Because of these conflicting reports, in order for BLM to fufill its obligation under Manual 6840.22A, which requires BLM to obtain and use the best available information deemed necessary to evaluate the status of special status species, BLM will consider this area as potentially suitable habitat and require surveys for swift fox prior to any surface-disturbing activities within 0.25 mile of the prairie colony as mapped by WGFD.

The construction of well pads, roads, pipelines and reservoirs causes direct habitat loss (i.e. loss of prairie dogs and prairie dog burrows). During construction of these facilities, there is the possibility that swift foxes may be killed as a direct result of the earth moving equipment. Constant noise and movement of equipment and the destruction of burrows puts considerable stress on the animals and is likely to cause an increase in swift fox mortalities. During the construction of these facilities individuals are exposed more frequently to predators and have less protective cover. Mineral related traffic on the adjacent roads may result in swift fox road mortalities.

The BLM BFO has very little data on swift fox occurrence within the PRB associated with oil and gas PODs. The TBNG in Campbell County, WY, who cooperated with the BLM in the creation of the 2003 PRB EIS, has applied a standard condition to oil and gas activities in association with swift fox dens. Therefore, in order to adequately protect the species, the BLM BFO incorporated the following condition from the TBNG Land Resource Management Plan into this project: “To reduce disturbances to swift fox during the breeding and whelping seasons, prohibit the following activities within 0.25 miles of their dens from March 1 to August 31: Construction (e.g. roads, water impoundments, oil and gas facilities), reclamation, gravel mining operations, drilling of water wells, and oil and gas drilling.” This timing restriction, based on the best available science, will reduce direct impacts to swift foxes within the project area.

4.2.5.2.8. Western Burrowing Owl Direct and Indirect Effects

Suitable burrowing owl habitat exists within 0.5 mile of the project area. The project may impact burrowing owls or their habitat. WGFD reported a prairie dog colony in NWNE S11 T42N R73W. Jones & Stokes reported that no evidence of this colony exists in this area (Jones & Stokes 2007). Because of these conflicting reports, in order for BLM to fulfill its obligation under Manual 6840.22A, which requires BLM to obtain and use the best available information deemed necessary to evaluate the status of special status species, BLM will consider this area as potentially suitable habitat and require surveys for burrowing owl nests prior to any surface-disturbing activities within 0.25 mile of the prairie colony as mapped by WGFD.

Use of roads and pipeline corridors may increase owl vulnerability to vehicle collision. Overhead power lines provide perch sites for larger raptors that could potentially result in increased burrowing owl predation. CBNG infrastructure such as roads, pipe line corridors, and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes.

The USFS Thunder Basin National Grasslands (TBNG) in Campbell County, WY, who cooperated with

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

4.2.5.3. Sensitive Species Cumulative Effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-271.

4.3. West Nile Virus Direct and Indirect Effects

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

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

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

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

4.4. Water Resources

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

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 50 gpm per well or 550 gpm (1.2 cfs or 885 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 Antelope Creek drainage, the projected volume produced within the watershed was 12,613 acre-feet in 2008 (maximum production was predicted to have occurred in 2004 with 17,685 acre-feet). As such, the volume of water resulting from the production of these wells is 7% of the total volume projected for 2008. This volume of produced water is within the predicted parameters of the PRB FEIS.

4.4.1. Groundwater

The PRB FEIS predicts an infiltration rate of 28% to groundwater aquifers and coal zones in the Antelope Creek watershed (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 154 gpm will infiltrate at or near the discharge points and impoundments (250 acre feet per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, "…the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater." (PRB FEIS pg 4-54). Therefore, the chemical nature and volume of the discharged water may not degrade the antecedent groundwater

The WDEQ requires that operators determine initial groundwater quality below impoundments to be used for CBNG produced water storage. If high quality water is detected (Class 3 or better) the operator is required to establish a groundwater monitoring program at those impoundments.

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ developed a guidance document, "Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments" (June 14, 2004). This guidance document became effective August 1, 2004, and was revised as the "Compliance Monitoring and Siting Requirements for Unlined Coalbed Methane Produced Water Impoundments" which was approved in June, 2006.

The Wyoming DEQ established an Impoundment Task Force which drafted an "Impoundment Monitoring Plan" to investigate the potential for existing impoundments to have impacted shallow groundwater. Drilling at selected existing impoundments began in the spring of 2006.

As of April of 2008, approximately 1,774 impoundment sites had been investigated through over 1,988 borings. Of these impoundments, 259 met the criteria to require "compliance monitoring" if constructed and used for CBNG water containment. Only 109 impoundments requiring monitoring are presently being used. As of the first quarter of 2008, only 16 of those monitored impoundments caused a change in the "Class of Use" of the underlying aquifer water.

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.

The PRB FEIS predicts that one of the environmental consequences of coal bed natural gas production is possible impacts to the groundwater. "The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers." (PRB FEIS page 4-1). In the process of dewatering the coal zone to increase natural gas recovery rates, this project may have some effect on the static water level of water wells in the area. The permitted water wells in the area produce from zones ranging in depth from 50 to 350 feet. The targeted coal zones range from 990 to 1340 feet below ground surface. As mitigation, the operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence of the proposed wells.

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

Adherence to the drilling plan, the setting of casing at appropriate depths, following safe remedial procedures in the event of casing failure, and utilizing proper cementing procedures will protect any potential fresh water aquifers above the target coal zone. This will ensure that ground water will not be adversely impacted by well drilling and completion operations.

In order to determine the actual water quality of the producing formations in this POD and to verify the water analysis submitted for the pre-approval evaluation, the operator has committed to designate a reference well to each coal zone within the POD boundary. It will be equipped so that produced water can be sampled at the wellhead. A sample will be collected from the wellhead and submitted for analysis, using WDEQ's list of analytes, within 60 days of initial water production. The results of this analysis will be sent to the BLM's Buffalo, Wyoming, Field Office.

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 and the levels found in the POD's representative water sample. The pollutant limits for TDS, SAR and EC detailed in the WDEQ's WYPDES permit is not shown because the permit was not available at the time of preparation of this EA.

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 –		10	2000
Least Restrictive Proposed Limit		10	2500
Antelope Creek near Teckla, WY Historic Data Average at Maximum Flow Historic Data Average at Minimum Flow		 2.82 2.6	 1800 2354
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8) Drinking Water (Class I)	 500		

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** μmhos/cm
Agricultural Use (Class II)	2,000	8	
Livestock Use (Class III)	5,000		
Predicted Produced Water Quality			
Co-mingled Anderson and Canyon	492	8.6	798

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 492 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 Anderson/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 50.0 gallons per minute (gpm) is projected to be produced from each these 11 wells, for a total of 550 gpm for the POD. See Table 4.5.

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

There are 7 discharge points proposed for this project. They have been appropriately sited and utilize appropriate water erosion dissipation designs. Existing and proposed water management facilities were evaluated for compliance with best management practices during the onsite.

To manage the produced water, 9 on-channel impoundments (136 acre-feet of storage) would be improved within the project area. These impoundments will disturb approximately 20.0 acres including the dam structures. Monitoring may be required based on WYDEQ findings relative to "Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments" (June 14, 2004). These impoundments will meet the requirements of the WSEO, WDEQ and the needs of the operator and the landowner. All water management facilities were evaluated for compliance with best management practices during the onsite.

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Consequently, the volume of water produced from these wells may result in the addition of 0.2 cfs below the lowest reservoir (after infiltration and evapotranspiration losses). The operator has committed to monitor the condition of channels and address any problems resulting from discharge. Discharge from the impoundments will potentially allow for streambed enhancement through wetland-riparian species establishment. Sedimentation will occur in the impoundments, but would be controlled through a concerted monitoring and maintenance program. The discharges into the reservoirs are located upstream of the dams' high water lines. Wetlands that develop in these draws will also help reduce sedimentation in the reservoirs. The landowners have stated in writing that they plan on retaining these impoundments after the end of the CBNG mining in the area and that they will hold the federal government blameless for any damages that may result because of CBNG product water discharges into the reservoirs and down their channels.

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 would occur in 2004 with a total contribution to the mainstem of Antelope Creek of 13 cfs (PRB FEIS pages 4-81 – 4-83). The predicted maximum discharge rate from these 11 wells is anticipated to be 550 gpm or 1.2 cfs either to or through impoundments. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and full containment, the produced water re-

surfacing in Spring or Porcupine creeks from this action (0.2 cfs) may add a maximum 0.2 cfs to Antelope Creek flows, or 1.5% of the predicted total CBNG produced water contribution. This incremental flow rate is statistically below the measurement capabilities for flows in Antelope Creek without using specialized equipment and/or techniques (refer to Statistical Methods in Water Resources U.S. Geological Survey, Techniques of Water-Resources Investigations Book 4, Chapter A3 2002, D.R. Helsel and R.M. Hirsch authors). For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

The operator did not provide an analysis of the potential development in the watershed above the project area. However, based on an area of 45 square miles for Spring and Porcupine creeks, and an assumed density of 8 wells per square mile producing 50 gpm each, removing the proposed 11 wells, the potential exists for the development of 349 wells, which could produce a maximum flow rate of 17,450 gpm or 39 cfs of water. The BLM believes that this is not expected to occur because:

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

The potential maximum flow rate of produced water within the watershed upstream of the project area, 39 cfs, is less than the estimated runoff from the 2-year storm event for Porcupine and Spring Creeks.

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

The operator has applied for a Wyoming Pollutant Discharge Elimination System (WYPDES) permit for the discharge of water produced from this project from the WDEQ. However, the permit was not available for review at the time of preparation of this analysis.

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. It will be equipped so that produced water can be sampled at the wellhead. A sample will be collected from the wellhead and submitted for analysis, using WDEQ's list of analytes, within 60 days of initial water production. The results of this analysis will be sent to the BLM's Buffalo, Wyoming, Field Office.

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 Verde POD prepared by WWC Engineering for Yates Petroleum Company.

4.4.2.1. Surface Water Cumulative Effects

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

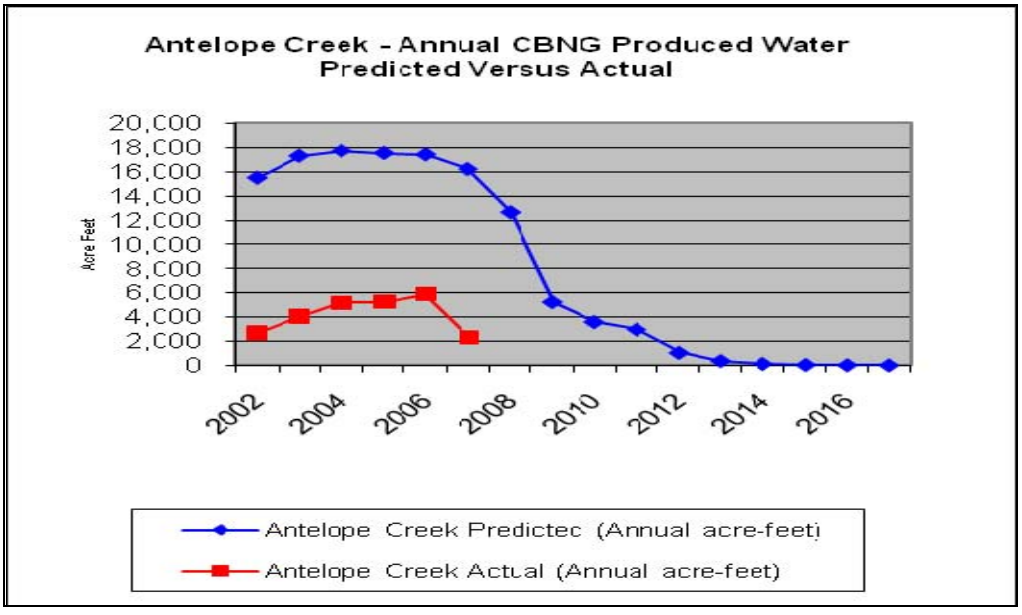
As of December 2007, all producing CBNG wells in the Antelope Creek watershed have discharged a cumulative volume of 25,321 acre-ft of water compared to the predicted 101,484 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.1 and Table 4.6 following. This volume is 25 % of the total predicted produced water analyzed in the PRB FEIS for the

Antelope Creek watershed.

Table 4.6 Actual vs predicted water production in the Antelope Creek watershed 2007 *Data Update 3-08-08*

Year	Antelope Creek Predicted (Annual acre-feet)	Antelope Creek Predicted (Cumulative acre-feet from 2002)	Antelope Creek Actual (Annual acre-feet)		Antelope Creek Actual (Cumulative acre-feet from 2002)	
			Actual Ac-ft	% of Predicted	Cum Ac-ft	% of Predicted
2002	15,460	15,460	2,668	17.3	2,668	17.3
2003	17,271	32,731	4,042	23.4	6,710	20.5
2004	17,685	50,416	5,181	29.3	11,891	23.6
2005	17,503	67,919	5,234	29.9	17,125	25.2
2006	17,385	85,304	5,869	33.8	22,994	27.0
2007	16,180	101,484	2,327	14.4	25,321	25.0
2008	12,613	114,097				
2009	5,226	119,323				
2010	3,574	122,897				
2011	2,956	125,853				
2012	1,041	126,894				
2013	363	127,257				
2014	124	127,381				
2015	40	127,421				
2016	13	127,434				
2017	3	127,437				
Total	**127,437**		**25,321**			

Figure 4.1 Actual vs predicted water production in the Antelope Creek watershed



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

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

1. They are proportional to the actual amount of cumulatively produced water in the Antelope Creek drainage and the total amount that was predicted in the PRB FEIS, which is approximately 25% of that total (see section 4.4.2.1).
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
3. The commitment by the operator to monitor the volume of water discharged.

No additional mitigation measures are required.

Refer to the PRB FEIS, Volume 2, page 4-81 – 4-83 and table 4-4 for cumulative effects relative to the Antelope Creek watershed and page 4-117 for cumulative effects common to all sub-watersheds.

4.5. Cultural Resources

No historic properties exist in the area of potential effect. On 9/30/08, the Bureau will electronically notify the Wyoming State Historic Preservation Office (SHPO), following section VI(A)(1) of the Wyoming State Protocol, of a finding of no effect to historic properties for the proposed project.

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

4.6. Air Quality

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

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Mary Hopkins	WY SHPO	Wyoming State Historic Preservation Office	No
Brad Rogers	Wildlife Biologist	US Fish & Wildlife Service	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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