FINDING OF NO SIGNIFICANT IMPACT & DECISION RECORD
For
North Finn, LLC
Big Bend III
ENVIRONMENTAL ASSESSMENT –WY-070-EA07-201

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize North Finn, LLC's Big Bend IIICoal Bed Natural Gas (CBNG) POD comprised of the following 19 Applications for Permit to Drill (APDs):

	Name	Well Number	Qtr	Sec.	TWP	RNG	Lease #
1	BIG BEND III FED	3-14	NENW	14	43N	78W	WYW128635
2	BIG BEND III FED	5-14	SWNW	14	43N	78W	WYW128635
3	BIG BEND III FED	11-14	NESW	14	43N	78W	WYW128635
4	BIG BEND III FED	13-14	SWSW	14	43N	78W	WYW128635
5	BIG BEND III FED	1-15	NENE	15	43N	78W	WYW128635
6	BIG BEND III FED	3-15	NENW	15	43N	78W	WYW128635
7	BIG BEND III FED	7-15	SWNE	15	43N	78W	WYW128635
8	BIG BEND III FED	9-15	NESE	15	43N	78W	WYW128635
9	BIG BEND III FED	15-15	SWSE	15	43N	78W	WYW128635
10	BIG BEND III FED	7-21	SWNE	21	43N	78W	WYW135231
11	BIG BEND III FED	11-21	NESW	21	43N	78W	WYW132277
12	BIG BEND III FED	15-21	SWSE	21	43N	78W	WYW132277
13	BIG BEND III FED	1-22	NENE	22	43N	78W	WYW134927
14	BIG BEND III FED	7-22	SWNE	22	43N	78W	WYW134927
15	BIG BEND III FED	5-15	SWNW	15	43N	78W	WYW128635
16	BIG BEND III FED	11-15	NESW	15	43N	78W	WYW128635
17	BIG BEND III FED	13-15	SWSW	15	43N	78W	WYW128635
18	BIG BEND III FED	1-21	NENE	21	43N	78W	WYW135231
19	BIG BEND III FED	5-22	SWNW	22	43N	78W	WYW134927

The following impoundments were also 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 Number
1	BLM 21-15	NENW	15	43	78	12.5	5	WYW128635
2	BLM 31-21 (PIT)	NWNE	21	43	78	33.1	5	WYW135231
3	MEIKE 42-22	SENE	22	43	78	4.51	3	WYW134927
4	MEIKE 22-14	SENW	14	43	78	19.9	9	WYW128635
5	MEIKE 24-14	SESW	14	43	78	4.4	3	WYW128635
6	BLM 42-21	SENE	21	43	78	1.7	1.5	WYW132277
7	LOHSE 33-21	NWSE	21	43	78	1.33	1.5	WYW132277

The following well is not approved due to highly erosive soils, steep slopes and erosional features associated with the access road.

1	BIG BEND III FED	3-22	NENW	22	43N	78W	WYW135231

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
North Finn, LLC
Big Bend III
PLAN OF DEVELOPMENT
WY-070-EA07-201

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/or impacts that are not covered within the PRB FEIS.

1. PURPOSE AND NEED

The purpose for the proposal is to define and produce coal bed natural gas (CBNG) on 4 valid federal oil and gas mineral leases issued to the applicant by the BLM. Analysis has determined that federal CBNG is being drained from the federal leases by surrounding fee or state mineral well development. The need exists because without approval of the Applications for Permit to Drill (APDs), federal lease royalties will be lost and the lessee will be deprived of the federal gas they have the rights to develop.

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: North Finn, LLC's Big Bend III Plan of Development (POD) for 21 coal bed natural gas well APD`s and associated infrastructure.

Proposed Well Information: There are 21 wells proposed within this POD, the wells are vertical bores proposed on an 80 acre spacing pattern with 1 well per location. Well and metering house color will be Covert Green, 18-0617 TPX; selected to blend with the surrounding vegetation.

Wells are located as follows:

	Name	Well Number	Qtr	Sec.	TWP	RNG	Lease #
1	BIG BEND III FED	3-14	NENW	14	43N	78W	WYW128635
2	BIG BEND III FED	5-14	SWNW	14	43N	78W	WYW128635
3	BIG BEND III FED	11-14	NESW	14	43N	78W	WYW128635
4	BIG BEND III FED	13-14	SWSW	14	43N	78W	WYW128635
5	BIG BEND III FED	1-15	NENE	15	43N	78W	WYW128635
6	BIG BEND III FED	3-15	NENW	15	43N	78W	WYW128635
7	BIG BEND III FED	7-15	SWNE	15	43N	78W	WYW128635
8	BIG BEND III FED	9-15	NESE	15	43N	78W	WYW128635
9	BIG BEND III FED	15-15	SWSE	15	43N	78W	WYW128635
10	BIG BEND III FED	7-21	SWNE	21	43N	78W	WYW135231
11	BIG BEND III FED	11-21	NESW	21	43N	78W	WYW132277
12	BIG BEND III FED	15-21	SWSE	21	43N	78W	WYW132277
13	BIG BEND III FED	1-22	NENE	22	43N	78W	WYW134927
14	BIG BEND III FED	7-22	SWNE	22	43N	78W	WYW134927
15	BIG BEND III FED	5-15	SWNW	15	43N	78W	WYW128635
16	BIG BEND III FED	11-15	NESW	15	43N	78W	WYW128635
17	BIG BEND III FED	13-15	SWSW	15	43N	78W	WYW128635
18	BIG BEND III FED	1-21	NENE	21	43N	78W	WYW135231
19	BIG BEND III FED	3-22	NENW	22	43N	78W	WYW135231
20	BIG BEND III FED	5-22	SWNW	22	43N	78W	WYW134927
21	BIG BEND III FED	9-21*	NESE	21	43N	78W	WYW132277

*Previously approved:
The 9-21 well was approved in a previous POD. The associated infrastructure connected with this well is being analyzed with the Big Bend III POD.

	IMPOUNDMENT Name / Number	Qtr/Qtr	SEC	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease Number
1	BLM 21-15	NENW	15	43	78	12.5	5	WYW128635
2	BLM 31-21 (PIT)	NWNE	21	43	78	33.1	5	WYW135231
3	MEIKE 42-22	SENE	22	43	78	4.51	3	WYW134927
4	MEIKE 22-14	SENW	14	43	78	19.9	9	WYW128635
5	MEIKE 24-14	SESW	14	43	78	4.4	3	WYW128635
6	BLM 42-21	SENE	21	43	78	1.7	1.5	WYW132277
7	LOHSE 33-21	NWSE	21	43	78	1.33	1.5	WYW132277

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

County: Johnson

Applicant: North Finn, LLC

Surface Owners: Chris and Peggy LeDoux, Michael and Connie Lohse, Meike Ranch, Inc., BLM

Project Description:
The proposed action involves the following:

- Drilling of 21 federal CBNG wells to depths of approximately 1,320 feet.

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

- Well metering and maintenance shall be accomplished by a combination of telemetry and well visitation. Metering will entail approximately 1 visit per 6 months to each well. Well maintenance will be as needed with the operator's personnel in the field daily.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: 7 discharge points to 7 stock water impoundments and 1 discharge point to an infiltration channel upstream of one of the stock water impoundments within the Upper Powder River watershed.

- An unimproved and improved road network.

- An above ground power line network to be constructed by a contractor. The proposed route has not 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 proposed power drops.

- A buried gas, water and power line network, and 0 central gathering/metering facilities.

For a detailed description of design features, construction practices and water management strategies associated with the proposed action, refer to the Master Surface Use Plan (MSUP), Drilling Plan and WMP in the POD and individual APDs. Also see the subject POD 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 Big Bend III POD are listed below under 2.3.1:

2.3.1. Changes as a result of the on-sites

1	Big Bend III	3-22	43N	78W	22	NENW	The access road to this well is within highly erosive soils with steep slopes and erosional features that have very poor reclamation potential. Alternate location for road was considered, but not accepted due to the fragile soils and poor reclamation potential of the area.
2	Big Bend III	11-15	43N	78W	15	NESW	Moved proposed two track access road to the north to avoid rough ridge material just before well site. Use existing two track from north as access.
3	Big Bend III	5-15	43N	78W	15	SWNW	Use existing two track from north as access.
4	Big Bend III	3-15	43N	78W	15	NENW	Use existing two track from north as access.
5	Big Bend III	3-14	43N	78W	14	NENW	Modified pipeline route from the 3-14 to the 5-14 well, keep two track access road within pipeline corridor.
6	Big Bend III	1-15	43N	78W	15	NENE	Use access road from the 3-14 well. Access will not come off Streeter Rd.
7	Big Bend III	5-14	43N	78W	14	SWNW	Modified pipeline route (see 3-14).
8	Big Bend III	13-14	43N	78W	14	SWSW	Show proposed pipeline route and access road between 13-14 and the 3-23.
9	Big Bend III	1-21	43N	78W	21	NENE	Moved access road to south and east along side hill and then curve northerly to well site.
10	Big Bend III	7-21	43N	78W	21	SWNE	Provide route for pipelines, access off highway.

11	Big Bend III	11-21	43N	78W	21	NESW	Provide spot upgrade, channel crossing diagram for access road off existing two track road.

- Pipeline from the 7-21 well to BLM 31-21 pit was removed by the operator due to steep slopes and highly erosive soils. Pipeline will instead bore under Highway 192 in two places, one by Streeter Rd., to connect the south half of project area with northern portion, the other pipeline bore is south of the 7-21 well.

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

1. In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ has developed a guidance document, "Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments" (June 14, 2004) which can be accessed on their website. This guidance document became effective August 1, 2004. For WYPDES permits received by DEQ after the August 1st effective date, the BLM will require that operators comply with the latest DEQ standards and monitoring guidance.

2.3.2.2. Surface Water

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

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

4. The operator will be required to provide a reclamation bond for impoundments over federal minerals in the amount specified by a qualified Professional Engineer for the impoundments to be used for the management of CBNG water. The bond amount will be submitted within 90 days after POD approval and will be approved by the BLM prior to commencing impoundment construction.

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

6. The operator will supply a copy of the complete approved WYPDES permits to BLM as they are issued by WDEQ.

2.3.2.3. Soils

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

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

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

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

4. Containment impoundments will be fenced to exclude wildlife and livestock. If they are not fenced, they will be designed and constructed to prevent entrapment and drowning.

5. The Companies will limit the construction of aboveground power lines near streams, water bodies, and wetlands to minimize the potential for waterfowl colliding with power lines.

6. All stock tanks shall include a ramp to enable trapped small birds and mammals to escape. See Idaho BLM Technical Bulletin 89-4 entitled Wildlife Watering and Escape Ramps on Livestock Water

Developments: Suggestions and Recommendations.

2.3.2.6. Threatened, Endangered, or Sensitive Species

2.3.2.6.1. Bald Eagle

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

2. A disturbance-free buffer zone of 0.5 mile (i.e., no surface occupancy) will be established year-round for all bald eagle nest sites. A seasonal minimal disturbance buffer zone of one mile will be established for all bald eagle nest sites (February 15 – August 15). These buffer zones and timing may be adjusted based on site-specific information through coordination with, and written approval from, the USFWS.

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

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

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.

2.3.2.6.3. Mountain Plover

1. Project-related features that encourage or enhance the hunting efficiency of predators of mountain plover will not be constructed within ½ mile of occupied mountain plover nesting habitat.

2. Construction of ancillary facilities (for example, compressor stations, and processing plants) will not be located within ½ mile of known nesting areas. The threats of vehicle collision to adult plovers and their broods will be minimized, especially within breeding aggregation areas.

3. Work schedules and shift changes will be set to avoid the periods from 30 minutes before to 30 minutes after sunrise and sunset during June and July, when mountain plovers and other wildlife are most active.

4. Creation of hunting perches or nest sites for avian predators within 0.5 mile of identified nesting areas will be avoided by burying power lines, using the lowest possible structures for fences and other structures and by incorporating perch-inhibiting devices into their design.

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

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

2.3.2.7. Visual Resources

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

2.3.2.8. Noise

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

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

2.3.2.9. Air Quality

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

2.3.3. Site specific mitigation measures

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

2. All permanent above-ground structures (e.g., production equipment, tanks, etc.) not subject to safety requirements will be painted to blend with the natural color of the landscape. The paint used will be a color which simulates "Standard Environmental Colors." The color selected for the Big Bend III POD is Covert Green, 18-0617 TPX.

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

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

B. Clayey Sites Seed Mix:

Species-Cultivar	**LBS PLS/ACRE**
Western Wheatgrass	5.0
Green Needlegrass	4.0
Bluebunch Wheatgrass	3.0
American Vetch	1.5
Purple Prairie Clover	0.5
Lewis Flax	0.5

Fourwing Saltbush	0.5
Total	**15.0**

Note: use the appropriate seed mix for roads and pipelines that cross onto different sites (i.e. Sandy, Clayey and Loamy).

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

5. 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.

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

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

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

8. Disturbance areas mentioned below have fragile soils and erosive conditions that shall be stabilized in a manner which eliminates erosion until a self-perpetuating non-weed native plant community has stabilized the site. Stabilization efforts shall be finished within 30 days (or sooner) of the completion of construction activities.

   Road / Pipeline segments associated with well(s): **1-21, 13-15**

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

   Reclamation Standards:

   C. 3. The reclaimed area shall be stable and exhibit none of the following characteristics:
   a. Large rills or gullies.
   b. Perceptible soil movement or head cutting in drainages.
   c. Slope instability on, or adjacent to, the reclaimed area in question.

   C.4. The soil surface must be stable and have adequate surface roughness to reduce runoff and capture rainfall and snow melt. Additional short-term measures, such as the application of mulch, shall be used to reduce surface soil movement.

   C.5. Vegetation canopy cover (on unforested sites), production and species diversity (including shrubs) shall approximate the surrounding undisturbed area. The vegetation shall stabilize the site and support the planned post disturbance land use, provide for natural plant community succession and development, and be capable of renewing itself. This shall be demonstrated by:
   a. Successful onsite establishment of species included in the planting mixture or other desirable species.

b. Evidence of vegetation reproduction, either spreading by rhizomatous species or seed production.

C.6. The reclaimed landscape shall have characteristics that approximate the visual quality of the adjacent area with regard to location, scale, shape, color and orientation of major landscape features and meet the needs of the planned post disturbance land use. No pesticide spraying will be authorized on federal lands prior to the approval of a Pesticide Use Plan submitted by the operator to the Buffalo Field Office.

10. No pesticide spraying will be authorized on federal lands prior to the approval of a Pesticide Use Plan submitted by the operator to the Buffalo Field Office.

11. All roads, pads, impoundments and locations where engineered construction will occur will be completely slope staked for the pre-construction meeting.

12. Primitive roads (2-tracks) with a utility corridor and the pipeline installation without road access will not exceed a disturbance width of 15 feet.

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

14. Mowing at the well site where a constructed pad is not approved as designed will be minimized to a 30 foot radius of the well stake.

Paleontology

15. Due to the finding of a fragment of hyracotherium in the draw east of well #7-15, a construction monitor will be required for the segment of pipeline and/or road in the N1/2SWNE and SWNWNE of Section 15, T43N, R78W. The find is consistent with a large vertebrate locality immediately to the south which is not in the Area of Effect.

16. The access road to wells #3-15, 5-15 and 11-15 passes through a significant paleontological locality (#UC 84125). Monitoring is required for the road construction in the NESESW, NWSWSE and SWNWSE of Section 10.

Water Management

17. The BLM 21-15 dam re-construction will require construction oversight because of the erosive nature of the soils and the challenging topography in the immediate vicinity. This will allow significant structural issues to be addressed during the building phase rather than after the fact.

18. A pre-construction onsite will be conducted for the BLM 31-21 Pit. BLM will be notified well in advance (at least 2 weeks) of the construction so personnel have time to schedule this visit. Full construction staking will have been completed prior to this onsite visit.

19. The shallow groundwater boring logs for the BLM 31-21 Pit will be provided to the BLM prior to beginning construction.

20. Cottonwood sprigs will be planted around the proposed high water line of the BLM 21-15 reservoir to replace those lost by inundation and/or construction. A ratio of 100 sprigs to 1 cottonwood tree lost is reasonable in order to ensure establishment of trees in arid areas.

21. Please contact Amy Shepperson, Natural Resource Specialist, @ (307) 684-1119, Bureau of Land Management, Buffalo, if there are any questions concerning these surface use COAs.

Wildlife

22. No surface disturbing activities are permitted in suitable mountain plover habitat (i.e. prairie dog colonies) from March 15-July 31 annually; unless a mountain plover survey has been conducted during the current breeding season. This condition will be implemented on an annual basis for the duration of surface disturbing activities. This timing limitation will affect the following proposed wells and their associated infrastructure:

Township/Range	***Section***	***Affected Wells and Infrastructure***
T43N, R78W	14	Well 3-14, 5-14, 11-14 and their associated infrastructure; reservoirs Meike 22-14 and 24-14 and their associated infrastructure.
T43N, R78W	15	Well 1-15, 9-15, 15-15 and their associated infrastructure; the pipeline from Streeter Road to well 7-15.
T43N, R78W	21	Well 11-21 & 15-21 and their associated infrastructure; Lohse 33-21 reservoir and associated infrastructure.
T43N, R78W	22	Well 7-22 & 1-22 and their associated infrastructure; Meike 42-22 reservoir and its associated infrastructure; pipeline from the 5-22 well to the 11-22 well.
T43N, R78W	23	Proposed access road/pipeline from the 13-14 federal well to the 3-23 fee well.

The surveys will be conducted in suitable habitat (i.e. prairie dog colonies, roads, pipelines, reservoirs under construction and any short grass prairie area) throughout the entire project area.

a. Mountain plover nesting surveys shall be conducted by a biologist following the most current U.S. Fish and Wildlife Service 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.
b. If a mountain plover is identified, then a seasonal disturbance-free buffer of ¼ mile shall be maintained between March 15 and July 31. If no mountain plovers are identified, then surface disturbing activities may be permitted within suitable habitat until the following breeding season (March 15).

23. No surface disturbing activities are permitted in suitable burrowing owl habitat (i.e. prairie dog colonies) from April 15 to August 31, annually, unless a burrowing owl survey has been conducted during the current breeding season. Survey period is April 15 to June 15. This condition will be implemented on an annual basis for the duration of surface disturbing activities. **This timing limitation will affect all prairie dog colonies within project area**. The surveys will be conducted in active and inactive prairie dog colonies throughout the entire project area. This timing limitation will affect the following proposed wells and their associated infrastructure:

Township/Range	***Section***	***Affected Wells and Infrastructure***
T43N, R78W	14	Well 3-14, 5-14, 11-14 and their associated infrastructure; reservoirs Meike 22-14 and 24-14 and their associated infrastructure.
T43N, R78W	15	Well 1-15, 9-15, 15-15 and their associated infrastructure; the pipeline from Streeter Road to well 7-15.
T43N, R78W	21	Well 11-21 & 15-21 and their associated infrastructure; Lohse 33-21 reservoir and associated infrastructure.
T43N, R78W	22	Well 7-22 & 1-22 and their associated infrastructure; Meike 42-22 reservoir and its associated infrastructure; pipeline from the 5-22 well to the 11-22 well.

Township/Range	*Section*	*Affected Wells and Infrastructure*
T43N, R78W	23	Proposed access road/pipeline from the 13-14 federal well to the 3-23 fee well.

a. If a burrowing owl is identified, then a seasonal disturbance-free buffer of ¼ mile shall be maintained between April 15 and August 31. If no burrowing owls are identified, then surface disturbing activities may be permitted within suitable habitat until the following breeding season.

24. No surface disturbing activities are permitted in suitable swift fox habitat (i.e. prairie dog colonies) from March 1 to August 31, annually, unless a survey for swift foxes has been conducted during the current breeding season. Survey period is April 15 to June 15. This condition will be implemented on an annual basis for the duration of surface disturbing activities. **This timing limitation will affect all prairie dog colonies within the project area.** The surveys will be conducted in active and inactive prairie dog colonies throughout the entire project area. This timing limitation will affect the following proposed wells and their associated infrastructure:

Township/Range	*Section*	*Affected Wells and Infrastructure*
T43N, R78W	14	Well 3-14, 5-14, 11-14 and their associated infrastructure; reservoirs Meike 22-14 and 24-14 and their associated infrastructure.
T43N, R78W	15	Well 1-15, 9-15, 15-15 and their associated infrastructure; the pipeline from Streeter Road to well 7-15.
T43N, R78W	21	Well 11-21 & 15-21 and their associated infrastructure; Lohse 33-21 reservoir and associated infrastructure.
T43N, R78W	22	Well 7-22 & 1-22 and their associated infrastructure; Meike 42-22 reservoir and its associated infrastructure; pipeline from the 5-22 well to the 11-22 well.
T43N, R78W	23	Proposed access road/pipeline from the 13-14 federal well to the 3-23 fee well.

a. If a swift fox den is identified, then a seasonal disturbance-free buffer of ¼ 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).

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

Township/Range	*Section*	*Affected Wells and Infrastructure*
T43N, R78W	**15**	**Wells 13-15 and5-15 and their associated infrastructure.**

a. Surveys to document nest occupancy shall be conducted by a biologist following BLM protocol, between April 15 and June 30. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities. Surveys outside this window may not depict nesting activity. If a survey identifies active raptor nests, a ½ mile timing buffer will be implemented. The timing buffer restricts surface disturbing activities within ½ mile of occupied raptor nests from February 1 to July 31.

b. Nest productivity checks shall be completed for the first five years following project completion. The productivity checks shall be conducted no earlier than June 1 or later than June 30 and any evidence of nesting success or production shall be recorded. Survey results will be submitted to a Buffalo BLM biologist in writing no later than July 31 of each survey year. Nests to be checked are within a ½ mile or less of the proposed development. The nests are listed below:

BLM ID #	UTM N	UTM E	Legal
None	4838569	400739	NESE Sec 16,T43N, R78W
None	4838590	400744	NESE Sec 16,T43N, R78W
None	4836445	400346	SWSE Sec 21, T43N, R78W

26. No surface disturbing activities are permitted within 2 miles of the following sage-grouse leks: Rhodes, Rhodes 2, East Holler, Garrett between March 1 and June 15, prior to completion of a greater sage-grouse lek survey.
    a. If an active sage grouse lek is identified during the survey, the 2 mile timing restriction (March 1-June 15) will be applied and surface 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.
    b. Creation of raptor hunting perches will be avoided within 0.5 mile of documented sage grouse and sharp-tailed grouse lek sites. Perch inhibitors will be installed to deter avian predators from preying on sage grouse.

27. If a sharp-tailed grouse lek is identified during the survey, the 0.67 mile timing restriction (March 1 to June 15) will be applied and surface disturbing activities will not be permitted until after the nesting season. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the buffer until the following breeding season. The required survey will be conducted by a biologist following the most current WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.

2.4. Alternatives considered but not analyzed in detail

The operator considered and rejected the use of land application disposal (irrigation) as part of its water management strategy due to, among other reasons, the lack of suitable irrigable land that is not already under irrigation and lack of landowner interest. Subsurface injection into shallow aquifers is being considered per a landowner's request, but is not currently part of this plan of development. The operator has committed to provide a sundry to the BLM should it choose to add this option after POD approval.

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on December 1, 2006. Field inspections of the proposed Big Bend III CBNG project were conducted on June 20, 2007 by:

North Finn, LLC:	SWCA:
Neil Neumiller	Brent Sobotka
	Georgia Knauss

BLM:
Amy Shepperson, NRS
Ben Adams, Hydrologist
Guymen Easdale, Wildlife Biologist
BJ Earle, Archeologist

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			Guymen Easdale
Floodplains	X			Ben Adams
Wilderness Values			X	Amy Shepperson
ACECs			X	Amy Shepperson
Water Resources	X			Ben Adams
Air Quality	X			Amy Shepperson
Cultural or Historical Values		X		BJ Earle
Prime or Unique Farmlands			X	Amy Shepperson
Wild & Scenic Rivers			X	Amy Shepperson
Wetland/Riparian	X			Ben Adams
Native American Religious Concerns		X		BJ Earle
Hazardous Wastes or Solids		X		Amy Shepperson
Invasive, Nonnative Species	X			Amy Shepperson
Environmental Justice			X	Amy Shepperson

3.1. Topographic Characteristics of Project Area

The Big Bend III POD is located in Johnson County, approximately 5 miles north of Linch, Wyoming in Township 43N, Range 78W sections 14, 15, 21, and 22. Much of the surrounding area is currently being developed for CBNG production. Livestock production and grazing is the dominant land use in the area. Elevation in the area ranges in elevation from 4,450 to 4,700 feet above sea level. The Big Bend III POD area falls within a 10-14" precipitation zone, with most of the precipitation falling during late winter and spring. The topography varies from rugged, steep ridges and cut draws to flat rolling terrain in the main (eastern) portion of the development area.

3.2. Vegetation & Soils

Soils within the project area were identified from the *South Johnson County Survey Area, Wyoming (WY619).* 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 landforms and the soils of this site have been identified as varying from a badlands/miscellaneous to clayey within the project area. There are a few small areas of sandy soils, mainly along ridgelines in the northeastern part of the project area. Topographic location, slope and elevation do not vary widely in this project area, and changes in soil types are fairly gradual. 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. Sites highly susceptible to erosion in this project area are found only in steep draws where no development is proposed. Reclamation potential of soils throughout the project area is primarily poor. The highly erosive soils, steep slopes and erosional features associated with the access road of the 3-22 well are typical features of the "badlands" soils classification. The access road proposed would follow a sharp pointed ridge descending to the well site. This action would include a great deal of cut along the top of the ridge. Reclamation potential of this ridgeline is very poor. Soil stability would be nearly impossible due to the lack of topsoil and organic matter that is needed for native plants to become established for erosion control.

Table 3.2 – Summary of Ecological Sites in Big Bend III Area

Map Unit Symbol	Map Unit Name	Map Unit Acres	Map Unit %
SDE	SAMSIL-SHALE OUTCROP COMPLEX, STEEP	949.2	57%
RED	RENOHILL-RAZOR ASSOCIATION, ROLLING	421.8	25%
BU	BRIGGSDALE-RENOHILL ASSOCIATION	177.2	11%
RAD	RAZOR-GAYNOR-SAMSIL COMPLEX, HILLY	43.1	3%
SNd	SHINGLE-KIM ASSOCIATION, VALLEYS	35.2	2%
KH	KIM-HAVERSON ASSOCIATION	15.7	1%
SCD	SAMSIL-GAYNOR-CADOMA COMPLEX, ROLLING	12.5	1%
STg	STONEHAM-ZIGWEID ASSOCIATION	0.6	0%

Badlands; *"Miscellaneous Areas":*
This site occurs on steep slopes and ridge tops, but may occur on all slopes which include landforms such as hillsides, ridges, and escarpments. Badlands have essentially no soil and support little or no vegetation. Steep or very steep, commonly non-stony, barren land dissected by many intermittent drainage channels. Badlands is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Clayey Sites:
This site occurs on nearly level to 30% slopes, on landforms which include hill sides, alluvial fans and stream terraces in the 10-14"precipitation zone.

The soils of this site are moderately deep 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 Historic Climax Plant Community (HCPC - defined as the plant community that was best adapted to the unique combination of factors associated with this ecological site) for this site would be a Rhizomatous Wheatgrasses, Green needlegrass Community. Potential vegetation is about 75% grasses or grass-like plants, 15% forbs, and 10% woody plants.

The present plant community is a Blue Grama Sod/Plains pricklypear plant community. It is dominated by a dense sod of blue grama and pricklypear cactus that covers the soil surface.

When the HCPC is replaced by warm season grass dominated communities grass production is reduced. The sod formed by these grasses is resistant to water infiltration. While the soil is protected by this sod, off-site areas are affected by excessive runoff which may cause gully erosion. This sod is resistant to change and may require practices such as range renovation to return to a cool season grass community.

Dominant grasses identified include: Sandberg's bluegrass, blue grama, threadleaf sedge, needle-and-thread, Indian ricegrass, western wheatgrass, bluebunch wheatgrass, and crested wheatgrass. Forbs identified include prickly pear cactus, various mustards, wooly plantain, wild onion, milkvetch, western stickweed, desert evening primrose, various asters, and scarlet globemallow. Other vegetative species identified at onsite: sagebrush, prickly pear cactus, saltbush, greasewood, rabbitbrush and fringed sage.

3.2.1. Wetlands/Riparian

Over the last several decades, stockwater impoundments have been constructed to help provide better distribution of grazing animals. Wetlands and riparian areas have developed around the reservoirs and along the watercourses because these dams held water for some period beyond the precipitation events. The wetlands in this project area are characterized by scattered stands of cottonwood trees, cattails, rushes and sedges. They provide valuable habitat for waterfowl, amphibians and other wetland species.

3.2.2. Invasive Species

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

- Scotch thistle
- Russian knapweed

The WERIC database was created cooperatively by the University of Wyoming, BLM and county Weed and Pest offices. Additionally, the operator or BLM confirmed the following WERIC identified infestations and/or documented additional weed species during subsequent field investigations:

- Scotch thistle
- Canadian thistle

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

3.3. Wildlife

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

A habitat assessment and wildlife inventory surveys were performed by Thunderbird-Jones & Stokes. Thunderbird-Jones & Stokes performed aerial surveys for bald eagles on December 22, 2004, January 21, 2005, February 10, and December 12, 2005; January 16, February 13, 2006; December 13, 2006, January 16, February 23, 2007. Thunderbird-Jones & Stokes performed aerial surveys for sage grouse on April 22, May 3, and 15, 2005; April 4, 24, 26, 2005; April 1, 11, 27, 2006; April 6, 15, 25, 2007. A habitat assessment, raptor surveys and prairie dog colony mapping was conducted by Thunderbird-Jones & Stokes on October 11, 12, 13, 2004; May 19, June 3, 16, 2005; May 12, 25 and June 8, 2006; May 11 and June 4, 14, 2007. Mountain plover surveys were conducted on May 19, June 3, 16, 2005; May 12, 25 and June 8, 2006; May 11, June 4, 14, 2007. A BLM biologist conducted a field visit on June 20, 2007. During this time, the biologist reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project adjustment recommendations where wildlife issues arose.

A BLM biologist conducted field visits on June 20, 2007. During this time, the biologist reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project adjustment recommendations where wildlife issues arose. A Biological Assessment was prepared by a BLM biologist. The Biological Assessment was submitted to the U.S. Fish and Wildlife Service (USFWS) for consultation.

Wildlife species common to the habitat types present are identified in the Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (PRB FEIS 3-114). Species that have been identified in the project area or that have been noted as being of special importance are described below.

3.3.1. Big Game

Big game species expected to be within the Big Bend 3 project area include mule deer and pronghorn antelope. The project area is part of the Pumpkin Butte mule deer herd unit. The 2006 estimated population of this herd was 9,900 with a population objective of 11,000 (Wyoming Game and Fish Department 2005). The project area is part of the Pumpkin Butte pronghorn antelope herd unit. The 2006 population estimate for this herd was 36,560 animals with a herd objective of 18,000 (WGFD 2005). The Wyoming Game and Fish Department has designated the entire project area as winter-yearlong range for mule deer; the southwest quarter of the project area is yearlong range and the rest of the project area is winter yearlong range for pronghorn antelope.

Winter-Yearlong use is when a population or a portion of a population of animals makes general use of the documented suitable habitat sites within this range on a year-round basis. During the winter months there is a significant influx of additional animals into the area from other seasonal ranges. **Yearlong** use is when a population of animals makes general use of suitable documented habitat sites within the range on a year round basis. Animals may leave the area under severe conditions. Big game range maps are available in the PRB FEIS (3-119-143), the project file, and from the WGFD.

3.3.2. Aquatics

The project area is drained by ephemeral tributaries of Carpenter Draw, House Creek and the Powder River. The operator has stated that no springs were found in the documentation or observed during the field evaluations. Fish that have been identified in the Upper Powder River watershed are listed in the PRB FEIS (3-156-159).

3.3.3. Migratory Birds

A wide variety of migratory birds may be found in the proposed project area at some point throughout the year. Migratory birds are those that migrate for the purpose of breeding and foraging at some point in the calendar year. Migratory bird species of management concern that may occur in the project area are listed in the PRB FEIS (3-151).

3.3.4. Raptors

Raptors species expected to occur in suitable habitats within the project area include northern harrier, golden eagle, red-tailed hawk, Swainson's hawk, ferruginous hawk, American kestrel, prairie falcon, short-eared owl, great horned owl, bald eagle, rough-legged hawk, Merlin and burrowing owls. 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 (PRB FEIS 3-145-148).

The project area is primarily sagebrush grassland habitat type; therefore nesting substrates (i.e. cliffs and trees) for many raptor species are limited. A few scattered cottonwood trees are found in the draws throughout the project area.

Ten raptor nest sites were identified by Thunderbird-Jones & Stokes within 0.5 miles of the project area. Four nests were active in 2007.

Documented raptor nests within the Big Bend 3 project area in 2007.

BLM ID#	SPECIES	UTM (NAD 83)	LEGAL LOCATION	SUBSTRATE	CONDITION	STATUS
None	GHOW	400587E 4839778N	SWSE Sec 9 T43N, R78W	Cottonwood live	Good	2007 Active 2006 Active
None	UNK	400739E 4838569N	NESE Sec 16 T43N, R78W	Cottonwood live	Fair	2007 Inactive 2006 Active
None	GHOW	400744E 4838590N	NESE 16 T43N, R78W	Cottonwood live	Good	2007 Active 2006 Inactive
None	UNK	404083E 4838120N	SESE Sec 14 T43N, R78W	Willow live	Poor	2007 Inactive 2006 Inactive
None	UNK	404081E 4838117N	SESE Sec14 T43N, R78W	Willow live	Poor	2007 Inactive 2006 Inactive
None	FEHA	404181E 4838015N	NENE Sec 23 T43N, R78W	Ground	Poor	2007 Inactive 2006 Inactive
None	RTHA	399620E 4835610N	NWSW Sec 28 T43N, R78W	Cottonwood live	Good	2007 Active 2006 Active
None	UNK	400742E 4838584N	NESE Sec 16 T43N, R78W	Cottonwood live	Good	2007 Inactive 2006 Inactive

3.3.5. Threatened and Endangered and Sensitive Species

3.3.5.1. Threatened and Endangered Species

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

3.3.5.1.1. Black-footed ferret

The USFWS listed the black-footed ferret as Endangered on March 11, 1967. Active reintroduction efforts have reestablished populations in Mexico, Arizona, Colorado, Montana, South Dakota, Utah, and Wyoming. In 1988, the WGFD identified four prairie dog complexes (Arvada, Recluse, Thunder Basin National Grasslands, and Midwest) partially or wholly within the BLM Buffalo Field Office administrative area as potential black-footed ferret reintroduction sites (Oakleaf 1988).

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

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

There are five active and densely populated prairie dog colonies within and adjacent to the Big Bend 3 project area. The eastern half of the project area is an active and densely populated colony (3,684 acres) and on the southeast border is another large active and densely populated colony (388 acres). Two small colonies also occur within the project area. An additional 26 active and densely populated prairie dog

colonies are within six miles of the project area. The total acreage of active prairie dog colonies within six miles of the project area equals 6,950 acres. The colonies range in size from 5 to 3,684 acres and the average distance between the colonies is 0.65 miles (1.05 kilometers). The project area is located within the Midwest potential reintroduction area. Black-footed ferret habitat is present within and around the Big Bend 3 project area.

Prairie Dog Colonies within and adjacent to the Big Bend 3 (2006 and 2007)

Legal Location	SIZE (ACRES)	Distance From Project Area
Eastern ¼ Sec 10, most of Sec 11, most of Sec 12, eastern ¼ Sec 15, all of Sec 14, western ½ Sec 13,all Sec 23, northeast ¼ Sec 22. T43N, R78W	3,684	Within the eastern half of the project area.
Central Sec 22 and the eastern ½ Sec 27 T43N, R78W	388	On the southeast border of the project area
SESW Sec 21 T43N, R78W	7.7	Within the project area.
SWSE Sec 21 T43N, R78W	6.9	Within the project area.
NWSW Sec 10 T43N, R78W	5.0	0.3 miles north of project.
	4,091.6	

3.3.5.1.2. Ute's Ladies Tresses Orchid

This orchid is listed as Threatened under the Endangered Species Act. It is extremely rare and occurs in moist, sub-irrigated or seasonally flooded soils at elevations between 1,780 and 6,800 feet 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. Prior to 2005, only four orchid populations had been documented within Wyoming. Five additional sites were located in 2005 (Heidel pers. Comm.). The new locations were in the same drainages as the original populations, with two on the same tributary and within a few miles of an original location. Drainages with documented orchid populations include Antelope Creek in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County.

Prominent drainages within the project area include House Creek, Carpenter Draw, and an unnamed tributary of the Powder River. House Creek flows north through the eastern half of the project area, Carpenter Draw flows west from the southwestern margin, and the unnamed tributary flows from the northwestern portion of the project area. All of the drainages within the project area are ephemeral. All drainages were dry in 2005 and 2006 with the exception of two partially- filled reservoirs in NESE Section 21 and SESE Section 14. These reservoirs are surrounded by bare ground that abruptly transitions to upland vegetation. A reservoir in SWNW Section 15 contained water (~ 1 foot deep) in the spring but was dry by July. Numerous dry reservoirs with upland vegetation are located in drainages throughout the project area (Wilsey 2006).

3.3.5.2. Sensitive Species

The USDI Bureau of Land Management (BLM) Wyoming has prepared a list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate.

The authority for this policy and guidance comes from the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and the Department Manual 235.1.1A.

Prairie dogs colonies create a biological niche or habitat for many species of wildlife (King 1955, Reading 1989). Agnew (1986) found that bird species diversity and rodent abundance were higher on prairie dog towns than on mixed grass prairie sites. Several studies (Agnew 1986, Clark 1982, Campbell and Clark 1981 and Reading1989) suggest that richness of associated species on black-tailed prairie dog colonies increases with colony size and regional colony density. Prairie dog colonies attract many insectivorous and carnivorous birds and mammals because of the concentration of numerous prey species (Clark 1982, Agnew 1986, Agnew 1988).

In South Dakota, forty percent of the wildlife taxa (134 vertebrate species) are associated with prairie dog colonies (Agnew 1983, Apa 1985, Mac Cracken 1985, Agnew 1986, Uresk 1986, Deisch 1989). Of those species regularly associated with prairie dog colonies, six are on the Wyoming BLM sensitive species list. The species of concern are swift fox (*Vulpes velox*), mountain plover (*Charadrius montanus*), ferruginous hawk (*Buteo regalis*), burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus*), long-billed curlew (*Numenius americanus*).

3.3.5.2.1. Bald eagle

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

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

Trees are limited to the eastern and western extremes of the Big Bend 3 project area occurring primarily in the drainages. On the east side of the project area, small stands (1-3 trees) of mature cottonwood (*Populus spp*.) trees (25-45 feet tall) occur along House Creek , located in the eastern half and the SESW of Section 14, Township 43 North, Range 78 West. Along the western margin, small to moderate stands (2-15 trees) of mature cottonwoods are present along Carpenter Draw in Sections 20, 29, and 28, Township 43 North, Range 78 West. A stand of six mature cottonwood trees also occur in the NESE Section 16, eight young cottonwood trees in the SWNW Section 15, three young cottonwoods in the SENE Section 16, and a lone juniper (*Juniperus spp*.) in SWNW Section 24, Township 43 North, Range 78 West. Pine Ridge is located approximately 2.3 miles south of the project area which contains large stands of ponderosa pine trees. The trees are located in Sections 1, 2, 3, 4, 11, and 12, Township 42 North, Range 78 West. The Powder River is located 2.0 miles west of the project area and has dense

stands of cottonwood trees throughout that portion of the Powder River. The best roosting and nesting habitat occurs along the Power River to the west and Pine Ridge to the south. Since better quality roosting and nesting habitat is found along the Powder River and Pine Ridge, bald eagles are more likely to roost or nest in those locations.

The project area has a reliable year round prey base in the form prairie dogs, sheep, lagomorphs (hares and rabbits) and waterfowl. Within and adjacent to the project area there are 4,086.6 acres of active and densely populated prairie colonies. With 7 proposed reservoirs within the project area and 46 reservoirs within a 6 mile radius of the project area, there is the potential to have waterfowl in the project area year round. A large sheep and cattle ranch exists along the eastern border. On the western side of the project area is a cattle ranch. State Highway 192 runs along the southern border of the project area, thus creating a potential food source in the form of vehicle killed.carrion

3.3.5.2.2. Black-tailed prairie dog

On August 12, 2004, the U.S. Fish and Wildlife Service removed the black-tailed prairie dog's Candidate status. The Buffalo Field Office however will consider prairie dogs as a sensitive species and continue to afford this species the protections described in the FEIS. The black-tailed prairie dog is a diurnal rodent inhabiting prairie and desert grasslands of the Great Plains. Their decline is related to multiple factors including, habitat destruction, poisoning, and Sylvatic plague.

The black-tailed prairie dog is a burrowing rodent that feeds primarily on grasses. The black-tailed prairie dog is the only species of prairie dog that is found on the short and mid-grass plains east of the Rockies. Black-tailed prairie dogs avoid areas with tall grass, heavy sagebrush and other thick vegetative cover which interfere with detection of predators (Krueger 1986, Clark and Stromberg 19987).

Early historical records suggest black-tailed prairie dogs may have been the most abundant mammals in North America at the time of the first Euro-American explorations of the west. Merriam calculated that prairie dogs occupied some 700 million acres of the West in the late 1800's (Cully 1989). Since the turn of the century, it is estimated that prairie dog numbers have been reduced 98-99% of their former numbers across the West (Miller 1994).

Due to human-caused factors, black-tailed prairie dog populations are now highly fragmented, and isolated (Miller1994). Most colonies are small and subject to potential extirpation due to inbreeding, population fluctuations and other problems that affect long term population viability (Primack 1993, Meffe and Carroll 1994, Noss and Cooperrider 1994). An additional threat is posed by Sylvatic plague (Cully1989) which, combined with other human-caused mortality, may hasten the extirpation of the rodent from the Great Plains.

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. Mapping conducted by the Wyoming Game and Fish Department between 1982 and 1987 indicated a minimum of 131,000 acres of black-tailed prairie dog colonies with a maximum estimate of 204,000 acres. Comparisons with 1994 Digital Ortho Quads indicated that black-tailed prairie dog acreage remained stable from 1994 through 2001. However, aerial surveys conducted in 2003 to determine the status of all known colonies indicated that a significant portion (approximately 47%) of the prairie dog acreage was impacted by Sylvatic plague and/or control efforts (Grenier 2005).

There are five active and densely populated prairie dog colonies within and adjacent to the Big Bend 3 project area. One large and continuous colony (3,684 acres) covers the eastern half of the project area. The total acreage for the five colonies is 4,091.6 acres. An additional 26 active and densely populated black-tailed prairie dog colonies are within six miles of the project area. The total acreage of active and

densely populated prairie dog colonies within six miles of the project area equals 6,950 acres. The colonies range in size from 5 to 3,684 acres.

3.3.5.2.3. Burrowing owl

The western burrowing owl has declined significantly throughout its range in North America. Current population estimates for the United States are not well known but trend data suggest significant declines across their range. Last official estimated population placed them at less than 10,000 breeding pairs. In the 1990's the number of burrowing owl breeding pairs in Canada declined at a rate of over 20% per year (Skeel, Wellicome and Holroyd 2001). The burrowing owl is listed as Endangered in Canada and Threatened in Mexico. The majority of the mid-western and western states within the owl's range have recognized that western burrowing owls are in trouble: it is state listed as Endangered in Minnesota and Iowa, Threatened in Colorado, and as a state Species of Special Concern in Kansas, Nebraska, Oklahoma, South Dakota, North Dakota, Montana, Idaho, Utah, Washington, Oregon, and California. It is listed as a sensitive species by the Bureau of Land Management and by the U.S. Fish and Wildlife Service (Defenders of Wildlife).

The burrowing owl is a small, long-legged owl found throughout open landscapes of North and South America. Burrowing owls can be found in grasslands, rangelands, agricultural areas, deserts, or any dry open area with low vegetation where abandoned burrows dug by mammals such as ground squirrels (*Spermophilus spp*.), prairie dogs (*Cynomys spp.),* and badgers (*Taxidea taxus*) are available. Black-tailed prairie dog (*Cynomys ludoviscianus*) and Richardson's ground squirrel (*Spermophilus richardsonii*) colonies provide the primary and secondary habitat for burrowing owls (Klute 2003). Black-tailed prairie dogs provide burrows to nest in, a reliable prey base (insects, small mammals, birds, reptiles and amphibians), sound alarm calls when predators are near (may also prey on burrowing owls), and clear the vegetation for easier hunting (Butts 1973, Desmond 1991).

Burrowing owls are present in North America, and breed across the grassland regions of southeastern Alberta, Saskatchewan and Manitoba. They occur in all states west of the Mississippi Valley, breed south through the western and mid-western States. Burrowing owls are migratory. Most spend the winter in southern Mexico and Central America (Konig, Weick and Becking 1999).

There are five active and densely populated prairie dog colonies within and adjacent to the Big Bend 3 project area. One large and continuous colony (3,684 acres) covers the eastern half of the project area. The total acreage for the five colonies is 4,091.6 acres. Documented burrowing owl nest locations are listed below:

BLM ID#	SPECIES	UTM (NAD 83)	LEGAL LOCATION	SUBSTRATE	CONDITION	STATUS
None	BUOW	400346E 4836445N	SWSE Sec 21 T43N, R78W	Prairie dog burrow	Unknown	2007 Inactive 2006 Inactive
None	BUOW	403318E 4837097N	NESW Sec 23 T43N, R78W	Prairie dog burrow	Unknown	2007 Active

3.3.5.2.4. Grouse

3.3.5.2.4.1. Greater Sage-grouse

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

The project area is primarily comprised of approximately 63% grasslands, 34% sagebrush grasslands.

The eastern half of the project area is gently rolling grassland with a slope 0 to 6%, grass density ranges from 40 to 60% and grass height is between 4 and 8 inches tall. The eastern half of the project area is part of a large and continuous prairie dog colony (4,072 acres) (Easdale 2007). Sagebrush density is very sparse (0-3% cover) and averages between 4 and 12 inches tall. Good forb density and diversity occurs throughout the eastern half of the project area (Easdale 2007).

The western half of the project area is sagebrush grassland. Sagebrush cover is primarily low density (5-10% cover) and the height ranges from 6 to 18 inches. Grass cover is 10 to 25% and height ranges from 6 to 10 inches tall (Easdale 2007). The western half of the project area is made up of numerous deep and narrow draws, narrow ridges and small benches. In general, the slope is between 12 and 30% and the small benches are between 0 to 8%.

Sage-grouse lek(s) surrounding the Big Bend 3 project area.

Lek Name	UTM NAD83	Legal Location	Activity History	Distance From Project Area
Rhodes	402404E 4834279N	T43N, R78W SENE Sec34	2007 active 14 males 2006 active 14 males 2005 active 15 males 2004 active 5 males	1.5 miles
Rhodes 2	403660E 4834010N	T43N, R78W NESE Sec 35	2007 active 29 males 2006 active 13 males	2.2 miles
East Holler	403866E 4842300N	T43N, R78W SWNE Sec2	2007 active 4 males 2006 active 10 males	1.6 miles
Garrett	401668E 4844609N	T44N, R78W SESW Sec 27	2007 Unknown 2006 active 47 males 2005 active 25 males	3.0 miles

3.3.5.2.4.2. Sharp-tailed grouse

The Plains sharp-tailed grouse habitat is native grasslands composed of wheatgrasses, needlegrasses, grama grasses, and blue stem with some shrubby areas to serve as roosting cover and winter habitat. Plains sharp-tailed grouse are expected to occur throughout northeastern Wyoming. Suitable habitat for the Plains sharp-tailed grouse exists throughout the project area. During the surveys for sage and sharp-tailed grouse no sharp-tailed grouse were observed within the project area.

3.3.5.2.5. Mountain plover

The mountain plover originated on the plains, nesting solely on arid, level terrain (0-5% slope) with short vegetation and plenty of bare ground-the kind of habitat typically found in prairie dog colonies. According to Dinsmore (1995-2000) more food exists on prairie dog colonies than on adjacent grasslands. Prairie dogs produce lots of feces, which attracts the insects plovers like to eat. Consequently, prairie dog colonies long ago became prime nesting grounds for mountain plovers. According to the U.S. Geological Survey, prairie dogs currently exist on less than one percent of their former range, and their numbers have declined by 98 percent (Turbak 2004). Mountain plover numbers have declined-possibly from millions-to only about 10,000 birds today (Turbak 2004).

Once a common breeder in the short-grass prairie habitat of the Great Plains, the species is now absent from most of the eastern edge of its former range in South Dakota, Nebraska, Kansas, and Oklahoma. Numbers have also dropped considerably in the heart of its range in Montana, Wyoming, Colorado and New Mexico.

In September 2003, the U.S. Fish and Wildlife Service withdrew their proposal to list the mountain plover. However, the mountain plover remains an agency-designated Sensitive Species within both the Bureau of Land Management and the Forest Service.

The project area is primarily comprised of approximately 63% grasslands, 34% sagebrush grasslands. The eastern half of the project area is gently rolling grassland with slopes 0 to 6%, grass density ranges from 40 to 60% and grass height is between 4 and 8 inches tall. The eastern half of the project area is part of a large and continuous prairie dog colony (4,072 acres) (Easdale 2007). Sagebrush density is very sparse (0-3% cover) and averages between 4 and 12 inches tall. Good forb density and diversity occurs throughout the eastern half of the project area (Easdale 2007).

The western half of the project area is sagebrush grassland. Sagebrush cover is primarily low density (5-10% cover) and the height ranges from 6 to 18 inches. Grass cover is 10% to 25% and height ranges from 6 to 10 inches tall (Easdale 2007). The western half of the project area is rough topography, it is made up of numerous deep and narrow draws, narrow ridges and small benches, the slope is between 0 and over 25% (areas of 0 to 8% occur on the small benches).

Based on topography, poor grazing practices and the abundance of active and densely populated prairie dog colonies the eastern half of the project area provides good mountain plover habitat. There are five active densely populated prairie dog colonies within and adjacent to the Big Bend 3 project area.

Mountain plover observations within and adjacent to the Big Bend 3 project area (2007-first of three surveys).

Legal Location	UTMS	Number of Adult Mountain Plovers	Distance From Project Area
SWSE Sec14 T43N, R78W	403467E 4838104N	1 adult	Within the project area.
SWSE Sec 14 T43N, R78W	403631E 4838381N	1 adult	0.1 miles from the project area.
SESW Sec 23 T43N, R78W	403288E 4836837N	2 adult	0.5 miles from the project area.
SESW Sec 23 T43N, R78W	402972E 4836568N	2 adults	0.48 miles from the project area.
SESW Sec 23 T43N, R78W	403567E 4837389N	2 adults	0.6 miles from the project area.
SENE Sec15 T43N, R78W	402348E 4839069N	2 adults	Within the project area.

Mountain plover observations within and adjacent to the Big Bend 3 project area (2006).

Legal Location	UTMS	Number of Adult Mountain Plovers	Distance From Project Area
SWNE Sec 23 T43N, R78W	403676E 4837382N	2 adults	0.7 miles from the project area.
NWSE Sec 14 T43N, R78W	403599E 4838506N	2 adults	0.1 mile from project area
SWNE Sec 23 T43N, R78W	403810E 4837460N	1 adult	0.54 miles from the project area.
SWNE Sec 23 T43N, R78W	403497E 4837661N	1 adult	0.5 miles from the project area.

Legal Location	UTMS	Number of Adult Mountain Plovers	Distance From Project Area
SESE Sec 10 T43N, R78W	402465E 4839923N	2 adults	0.17 miles from the project area.
SESE Sec 10 T43N, R78W	402535E 4840056N	1 adult	0.2 miles from the project area.
SESE Sec 10 T43N,R78W	402499E 4840032N	2 adults, 3 eggs	0.20 miles from the project area.
SWSW Sec 11 T43N, R78W	403044E 4839643N	1 adult	0.21 miles from the project area.
SWNE Sec 14 T43N, R78W	403651E 4839142N	2 adults	0.12 miles from the project area.
SWNE Sec 23 T43N, R78W	403422E 4837455N	2 adults	0.48 miles from the project area.
SWSE Sec 14 T43N, R78W	403810E 4838239N	1 adult, 2 chicks	0.22 miles from the project area.
SWSW Sec 11 T43N, R78W	402933E 4839683N	1 adult	Within the project area.
SESE Sec 15 T43N, R78W	402260E 4838264N	1 adult, 3 eggs	Within the project area.
NENE Sec 22 T43N, R78W	402277E 4837976N	1 adult	Within the project area.
SWNW Sec 14 T43N, R78W	402736E 4838852N	1 adult	Within the project area.
SWSE Sec 14 T43N, R78W	403655E 4838228N	1 adult, 2chicks	0.13 miles from the project area.

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

3.3.5.2.6. Swift fox

The swift fox was removed from the Federal list of candidate species in January 2001. Swift fox populations have been reduced to about 40 percent of their former range. The swift fox was extirpated in Canada, but the animal has recently been reintroduced into Saskatchewan.

The swift fox is native to the grassland prairies of the Great Plains of North America. The original range of the species was influenced primarily by the extent of the shortgrass prairie and midgrass prairie ecosystem. Historic swift fox range is reported to have included 624,000 square miles of the grassland prairie in central North America (Scott-Brown 1987), extending north-south from central Alberta to central Texas and east-west between western Iowa and Minnesota to central Colorado (Hall 1981, Hall and Kelson 1959, Samuel and Nelson 1982, Scott-Brown 1987). The swift fox range primarily follows the distribution of the black-tailed prairie dog.

Swift foxes breed from December to February depending on latitude (Kilgore 1969, Hines 1980, Covell 1992). Gestation is approximately 51 days.

Swift foxes were found to have their dens within 0.8 kilometers of prairie dog colonies (Hillman and Sharps 1978). The major portion of the swift fox diet is prairie dogs, 49% and insects, 27% (Uresk and

Sharps 1986). The eastern half of the project area is good swift fox habitat. On June 4, 2007, a swift fox pup was heard in the NWNE Section 1, Township 43 North, Range 78 West by Thunderbird-Jones & Stokes while conducting wildlife surveys within the region. According to the BLM data base and a wildlife report submitted to the BLM by Wildlife Resources, five swift fox dens are 1.8 to 2.5 miles east of the Big Bend 3 project area. Three of the dens were active in 2007. Each active den location had between four and six foxes. The den locations are listed below:

Swift fox den locations

Legal Location	UTMS	Status	Distance From Project Area
SESW Sec 19 T43N, R77W	406480E 4835498N	2007 active 4 foxes	2.5 miles
SWSE Sec 19, T43N, R77W	406670E 4836733N	2007 inactive 2006 active	2.1 miles
NWNE Sec 30 T43N, R77W	406658E 4836131N	2007 active 2 adults & 6 pups	2.3 miles
SESW Sec 30 T43N, R77W	406637E 48368921N	2007 active 5 foxes	2.3 miles
NWNW Sec 30 T43N, R77W	405900E 4836450N	2007 inactive 2006 active	1.8 miles

3.4. West Nile Virus

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

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

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

Table 3.4 Historical West Nile Virus Information

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

*Wyoming Department of Health Records September 12, 2007.

Human cases of WNv in Wyoming occur primarily in the late summer or early fall. There is some

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

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

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

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

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

3.5. Water Resources

The project area is within the Upper Powder River drainage system. It straddles the divides between House Creek, Carpenter Draw and the Powder River. House Creek joins the Powder River approximately 18 miles downstream of the POD boundary. Carpenter Draw joins the Powder River approximately 3 miles downstream of the POD boundary.

3.5.1. Groundwater

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

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

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

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

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

The on-going shallow groundwater impoundment monitoring at four other impoundment locations are less intensive and consist of batteries of between 4 and 6 wells. Preliminary data from two of these other sites also are showing an increasing TDS level as water infiltrates while two other sites are not.

A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 5 registered stock and domestic water wells within ½ mile of a federal CBNG producing well in the POD with depths ranging from 500 to 800 feet. For additional information on water, please refer to the PRB FEIS (January 2003), Chapter 3, Affected Environment pages 3-1 through 3-36 (groundwater).

3.5.2. Surface Water

The project area straddles the divides between House Creek, Carpenter Draw and the Powder River. House Creek joins the Upper Powder River approximately 18 miles downstream of the POD boundary and Carpenter Draw enters approximately 3 miles downstream. All of the drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt) to intermittent (flowing only at certain times of the year when it receives water from alluvial groundwater, springs, or other surface source – PRB FEIS Chapter 9 Glossary). The channels on the House Creek side are primarily well

vegetated grassy swales, without defined bed and bank. The channels on the Carpenter Draw and Powder River sides are characteristic of arid, ephemeral systems along the breaks of the Powder River. They are steep, dry gully systems, fanning out into the main channels and eventually onto the Powder River flood plain.

Numerous dams were built in this area in years past to retard precipitation runoff and provide better grazing distribution for livestock. Six of these lie within the project area.

The PRB FEIS presents the historic mean Electrical Conductivity (EC, in µmhos/cm) and Sodium Adsorption Ratio (SAR) by watershed at selected United States Geological Survey (USGS) Gauging Stations in Table 3-11 (PRB FEIS page 3-49). These water quality parameters "illustrate the variability in ambient EC and SAR in streams within the Project Area. The representative stream water quality is used in the impact analysis presented in Chapter 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM produced water of varying chemical composition to surface drainages within the Project Area" (PRB FEIS page 3-48). For the Upper Powder River, the EC ranges from 1797 µmhos/cm at Maximum monthly flow to 3400 µmhos/cm at Low monthly flow and the SAR ranges from 4.76 at Maximum monthly flow to 7.86 at Low monthly flow. These values were determined at the USGS station located on the Powder River at Arvada (PRB FEIS page 3-49). As a comparison and to show the quality of water entering the Powder River system at a point closer to the POD, the gauge on Salt Creek near Sussex has an EC that varies from 5204 µmhos/cm at maximum monthly flow to 5668 µmhos/cm at low monthly flow and an SAR which varies from 18.9 at high monthly flow to 23.6 at low monthly flows. During the 7Q10 flow, the EC is 6741 µmhos/cm and the SAR is 25.1.

The operator has stated that no natural springs were found in or near the project area.

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 and Paleontological Resources

Class III cultural resource inventories were conducted for the Big Bend III project prior to on-the-ground project work (BFO project #70070058, SWCA: Clint Lindsay, Rob Schweitzer, PI., *A Class III Cultural Resources Inventory of the North Finn Big Bend III POD, Johnson County, Wyoming*). A total of 1672 acres were inventoried to Class III level, and 11 sites and 13 Isolated Resources were identified. Of the cultural sites, only one National Register non-eligible site, 48 JO 1371, might be affected; a road and utility corridor will pass close to the small locality. Site 48 JO 3665, a segment of the 1910 Variant Black and Yellow Trail, has been developed as Streeter Road, and is maintained as a crowned-and-ditched county road. The Black & Yellow segues into the paved State Highway 192 within the POD boundary. The entire section is unevaluated for National Register eligibility, but the local segment is non-contributing due to periodic maintenance and change of design. In the NENE of Section 21 and the NWNW of Section 22, remnants of the pre-pavement road will be used to place POD infrastructure, but this segment is crowned-and-ditched, and post-dates the Black & Yellow trail.

Table 3.6 Cultural Resources Inventory Results

Site Number	Site Type	Eligibility
48 JO 941	Campsite	Unevaluated
48 JO 943	Lithic	Not eligible
48 JO 1343	Campsite	Not eligible

Site Number	Site Type	Eligibility
48 JO 1369	Lithic	Not eligible
48 JO 1370	Campsite	Not eligible
48 JO 1371	Campsite	Not eligible
48 JO 3665	Historic road	Unevaluated
48 JO 3716	Campsite	Eligible
48 JO 3717	Campsite	Not eligible
48 JO 3718	Campsite	Not eligible
48 JO 3719	Historic homestead, lithic	Not eligible
NA	13 Isolated Resource localities	Not eligible

The project area is mapped as Tertiary Wasatch, with a Paleontological sensitivity rating of 5, a high ranking. Paleontological research has been conducted in the region by University of Colorado, and a number of significant vertebrate localities have been identified. The area is particularly valuable for the Paleocene-Eocene boundary research which is being carried out in the area, and the numerous mammal localities which are being researched. Many of the localities contain micro-mammals, which require careful analysis of anthill exposures, but *Hyracotherium*, a small horse, turtles and crocodiles, are also reported in this formation.

No resources of interest to Native American cultural groups or Traditional Cultural Properties are known to occur in the project area.

4. ENVIRONMENTAL CONSEQUENCES

The changes to the proposed action POD, which resulted in development of Alternative C as the preferred alternative, have reduced the potential impact to the environment which will result from this action. The environmental consequences of Alternative C are described below.

4.1. Vegetation & Soils Direct and Indirect Effects

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the 19 well locations, none are on existing or reclaimed conventional well pads; all proposed wells can be drilled without a well pad being constructed. 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 32 x 20 feet) and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these wells would involve approximately 0.1 acre/well for 1.9 total acres.

Approximately 0.8 miles of improved roads would be constructed to provide access to various well locations. Approximately 6.5 miles of new and existing two-track trails would be utilized to access well sites. The majority of proposed pipelines (gas and water) have been located in "disturbance corridors." Disturbance corridors involve the combining of 2 or more utility lines (water, gas, power) in a common trench, usually along access routes. This practice results in less surface disturbance and overall environmental impacts. Approximately 1.0 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.

The 3-22 well is within an area of highly erosive soils, steep slopes and erosional features associated with the access road. The access road proposed to follow a sharp pointed ridge descending to the well site. This action would include a great deal of cut along the top of the ridge. Reclamation potential of this ridgeline is very poor. The soils associated with the ridge area are classified as "Badlands". An alternate location was considered along base of ridgeline, but was too close to a highly active headcut to be safely constructed, maintained and reclaimed.

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

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

Table 4.1 summarizes the proposed surface disturbance.

Table 4.1 - SUMMARY OF DISTURBANCE

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Non-constructed Pad Constructed Pad	19	0.1/acre	1.9	Long Term
Gather/Metering Facilities	0	Site Specific	0	Long Term
Screw Compressors	0	Site Specific	0	Long Term
Impoundments				Long Term
On-channel	6	Site Specific	23	
Off-channel	1	Site Specific	5	
Water Discharge Points	8	Site Specific or 0.01 ac/WDP	0.1	
Channel Disturbance				
Headcut Mitigation*	0	Site Specific	0	
Channel Modification	0	Site Specific	0	
Improved Roads			2.33	Long Term
No Corridor	0		0	
With Corridor	0.8	24' Width	2.33	
2-Track Roads			9.55	Long Term
No Corridor	0.5	12' Width	0.73	
With Corridor	5.2	14' Width	8.82	
Pipelines				Short Term
No Corridor	1.0	10' Width	1.21	

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
With Corridor				
Buried Power Cable No Corridor	0	12' Width or Site Specific	0	Short Term
Overhead Powerlines	0.0	30' Width	0	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. Wetland/Riparian

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

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

4.1.2. Invasive Species

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

1. Control methods and cooperation with the Johnson County Weed and Pest and a certified commercial applicator.
2. Education of field personnel to identify and understand the impacts of noxious and invasive species.

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

The use of existing facilities along with the surface disturbance associated with construction of proposed access roads, pipelines, water management infrastructure, produced water discharge points and related

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

The operator submitted an integrated pest management plan developed in coordination with the Johnson County Weed and Pest District. The goal of the plan is to minimize impacts on the current plant community and to avoid promoting the encroachment of these invasive species throughout the project area. In addition, North Finn, LLC will submit a Pesticide Use Proposal (PUP) form WY-04-9222-1 to the BLM for the chemical treatment of noxious weeds. A COA has been applied to this approval that no surface disturbance will be authorized on federal lands prior to the approval of a Pesticide Use Plan submitted by the operator to the Buffalo Field Office.

4.1.3. Cumulative Effects

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

Portions of this project will inundate a number of established cottonwood trees, especially around the BLM 21-15 reservoir. In other parts of the project, the additional water may enhance wetland and riparian species survival or establishment by mitigating the effects of drought.

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 Upper Powder River drainage and the total amount that was predicted in the PRB FEIS, which is approximately 17% of that total (see section 4.4.2.1).
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
- The commitment by the operator to monitor the volume of water flowing into House Creek, Carpenter Draw and the Powder River, and to construct additional downstream reservoirs, if necessary, to prevent significant volumes of water from flowing into the Upper Powder River.
- The WMP for the Big Bend III proposes that produced water will not contribute significantly to flows downstream.

No additional mitigation measures are required.

4.2. Wildlife

4.2.1. Big Game Direct and Indirect Effects

Under the environmentally preferred alternative, winter yearlong for mule deer and winter yearlong and yearlong range for pronghorn antelope would be directly disturbed with the construction of wells, reservoirs, pipelines and roads. Table 4.1 summarized the proposed activities; items identified as long term disturbance would be direct habitat loss. Short-term disturbances also result in direct habitat loss;

however, they should provide some habitat value as these areas are reclaimed and native vegetation becomes established.

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

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

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

4.2.1.1. Cumulative effects

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

4.2.2. Aquatics Direct and Indirect Effects

Produced water is to be fully contained within six existing on-channel and one proposed off-channel impoundments. The Wyoming Department of Environmental Quality (DEQ) regulates effluent discharge through the National Pollution Discharge Elimination System in compliance with the Federal Water Pollution Control Act and the Wyoming Environmental Quality Act. The Wyoming DEQ has established effluent limits for the protection of game and non-game, aquatic life other than fish, wildlife, and other water uses.

4.2.2.1. Cumulative effects

The operator has committed, in its water management strategy, to fully contain all water produced as a result of this development upstream of its most downstream dams. It is highly unlikely that subsurface seepage from these reservoirs would reach the Powder River.

4.2.3. Migratory Birds Direct and Indirect Effects

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

territory, and the ability to recognize calls from conspecifics (BLM 2003).

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

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

Overhead power lines may affect migratory birds in several ways. Power poles provide raptors with perch sites and may increase predation on migratory birds. Power lines placed in flight corridors may result in collision mortalities. Some species may avoid suitable habitat near power lines in an effort to avoid predation.

Existing and newly constructed reservoirs may have either a positive or negative affect on waterfowl. The reservoirs may provide forage and nesting habitat for migrating waterfowl and shore birds. Direct effects (toxicity) to waterfowl could occur. Concentrations of salts and metals, particularly barium and selenium, may increase in the containment reservoirs receiving coalbed natural gas produced water discharges, as water evaporates overtime.

With 7 proposed reservoirs within the project area and 46 existing reservoirs within 6 miles of the project area, the potential for mosquito breeding areas will increase. The creation of more reservoirs within the sagebrush and prairie communities may increase exposure to the West Nile virus. Mortality rates are likely to increase and reproductive success is likely to decrease in susceptible bird species. Additional direct and indirect effects to migratory birds are discussed in the PRB FEIS (4-226-235).

4.2.3.1. Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, Page 4-235.

4.2.4. Raptors Direct and Indirect Effects

Human activities in close proximity to active raptor nests may interfere with nest productivity. Romin and Muck (1999) indicate that activities within 0.5 miles of a nest are prone to cause adverse impacts to nesting raptors. If mineral activities occur during nesting, they could be sufficient to cause adult birds to remain away from the nest and their chicks for the duration of the activities. This absence can lead to over heating or chilling of eggs or chicks. The prolonged disturbance can also lead to the abandonment of the nest by the adults. Both actions can result in egg or chick mortality. In addition, routine human activities near these nests can draw increased predator activity to the area and increase nest predation. Additional direct and indirect impacts to raptors, from oil and gas development, are analyzed in the PRB FEIS (4-216-221).

Wells within close proximity to documented raptor nests within the Big Bend III project area (Timing limitations will apply to these wells).

BLM ID#	UTM (NAD 83)	SPECIES	STATUS	WELL / PIT NUMBER	DISTANCE
None	400587E 4839778N	GHOW	Active	Reservoir BLM 21-15	0.6 miles
None	400739E	UNK	Inactive	Well 5-15	0.4 miles

BLM ID#	UTM (NAD 83)	SPECIES	STATUS	WELL / PIT NUMBER	DISTANCE
	4838569N			Well 13-15	0.39 miles
None	400744E 4838590N	GHOW	Active	Well 5-15 Well 13-15	0.4 miles 0.37 miles
None	404083E 4838120N	UNK	Inactive		All infrastructure is 0.5 miles or more away
None	404081E 4838117N	UNK	Inactive		All infrastructure is 0.5 miles or more away
None	404181E 4838015N	FEHA	Inactive		All infrastructure is 0.5 miles or more away
None	399620E 4835610N	RTHA	Active		0.5 miles from the project area
None	400742E 4838584N	UNK	Inactive		0.5 miles from the project area

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

4.2.4.1. Cumulative effects

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

4.2.5. Threatened and Endangered and Sensitive Species

Within the BLM Buffalo Field Office there are two species that are Threatened or Endangered under the Endangered Species Act. Potential project effects on Threatened and Endangered Species were analyzed in a Biological Assessment and a summary is provided in Table 4.3. Threatened and Endangered Species potentially affected by the proposed project area are further discussed following the table.

4.2.5.1. Threatened and Endangered and Sensitive Species

Table 4.3 Summary of Threatened and Endangered Species Habitat and Project Effects.

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

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

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

4.2.5.1.1. Black-footed ferret

Black-tailed prairie dog colonies within the Big Bend 3 project area are of sufficient size to support a black-footed ferret population. The project area is located within the Midwest potential reintroduction area.

There are 10 proposed wells, associated infrastructure, and 3 reservoirs within active prairie dog colonies. The wells and reservoirs are listed below:

Township/Range	Section	Affected Wells and Infrastructure
T43N, R78W	14	Wells 3-14, 5-14, 11-14 and 13-14 and their associated infrastructure; Meike 22-14 and 24-14 reservoirs.
T43N, R78W	15	Wells 1-15, 9-15 and 15-15 and their associated infrastructure.
T43N, R78W	21	Well 15-21
T43N, R78W	22	Wells 7-22, 1-22 and their associated infrastructure; Meike 42-22 reservoir and access road.

Approximately 35 acres of black-footed ferret habitat will be lost due to well pad, road/pipeline and reservoir construction. The construction of well pads, roads, pipelines and reservoirs causes direct prairie dog mortalities and an immediate loss of prairie dog burrows, thus causing direct habitat loss for the black-footed ferret.

Because suitable habitat is of sufficient size to support a black-footed ferret population and the project area is in and adjacent to the Midwest potential reintroduction area, but it is highly unlikely ferrets are present, implementation of the proposed development ***"may affect, but is not likely to adversely affect"*** the black-footed ferret. If ferrets become present, the proposed action will make portions of the project area unsuitable for inhabitance.

4.2.5.1.2. Ute's Ladies Tresses Orchid

All wells and infrastructure are located in dry upland vegetation and within ephemeral draws with no perennial water. Reservoir seepage may create suitable habitat if historically ephemeral drainages become perennial. Suitable habitat is not present; therefore the proposed development of the Big Bend 3 project will have ***"no effect"*** on the Ute Ladies'-tresses Orchid.

4.2.5.2. Sensitive Species Direct and Indirect Effects

Continued loss of prairie dog habitat and active prairie dog towns will result in the decline of numerous sensitive species in the short grass prairie ecosystem.

Table 4.4 Summary of Sensitive Species Habitat and Project Effects.

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

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

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

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

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

4.2.5.2.1. Bald eagles

Bald eagle nesting and winter roosting habitat is sparse throughout the project area.

With 4,091.6 acres of active and densely populated prairie dog colonies within and around the project area and with 7 proposed reservoirs within the project area, bald eagles are likely to be found foraging within the project area between October and April feeding on prairie dogs, waterfowl, and sheep carcasses.

There are approximately 3.59 miles of existing overhead three-phase distribution lines within and near the project boundaries. 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. At this time North Finn is not proposing any new overhead power lines within the Big Bend 3 project area.

The presence of overhead power lines and roads 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 August 14, 2007, Service Law Enforcement salvage records for northeast Wyoming identified that 180 raptors, including 1 bald eagle, 106 golden eagles, 1 unidentified eagle, 28 hawks, 44 owls and 8 unidentified raptors and 1 great-blue heron were electrocuted on power poles within the Powder River Basin Oil and Gas Project area (USFWS 2007). Of the 180 raptors electrocuted 58 were at power poles that are considered new construction (post 1996 construction standards). Additionally, two golden eagles and a Cooper's hawk were killed in apparent mid span collisions with powerlines (USFWS 2006a). Power lines not constructed to APLIC suggestions pose an electrocution hazard for eagles and other raptors perching on them; the Service has developed additional specifications improving upon the APLIC suggestions. Constructing power lines to the APLIC suggestions and Service standards minimizes but does not eliminate electrocution risk.

Roads present a collision hazard, primarily from bald eagles scavenging on carcasses resulting from other road related wildlife mortalities. Collision risk increases with automobile travel speed. Typically two-tracks and improved project roads pose minimal collision risk In one year of monitoring road-side carcasses the BLM Buffalo Field Office reported 439 carcasses, 226 along Interstates (51%), 193 along paved highways (44%), 19 along gravel county roads (4%), and 1 along an improved CBNG road (<1%) (Bills 2004). No road-killed eagles were reported; eagles (bald and golden) were observed feeding on 16 of the reported road-side carcasses (<4%).

A county road (Streeter Road) runs north and south through the middle of the project area. The road runs through a large and continuous prairie dog colony (4,091.6 acres). With the increase in gas development in the area, vehicle size and traffic volume will also increase. The posted speed limit for the county road is 45 mph. The road presents a collision hazard as bald eagles forage in the area, bald eagle mortalities are possible.

Produced water will be stored in 7 proposed reservoirs which may attract eagles if reliable prey is present, most likely in the form of waterfowl. The effect of the reservoirs on eagles is unknown. The reservoirs could prove to be a benefit (e.g. increased food supply) or an adverse effect (e.g. contaminants, proximity of power lines and/or roads to water). Eagle use of reservoirs should be reported to determine the need for any future management.

4.2.5.2.2. Black-tailed prairie dog

There are 10 proposed wells, associated infrastructure, and 3 reservoirs within active prairie dog colonies. The wells and reservoirs are listed below:

Township/Range	Section	Affected Wells and Infrastructure
T43N, R78W	14	Wells 3-14, 5-14, 11-14 and 13-14 and their associated infrastructure; Meike 22-14 and 24-14 reservoirs.
T43N, R78W	15	Wells 1-15, 9-15 and 15-15 and their associated infrastructure.
T43N, R78W	21	Well 15-21
T43N, R78W	22	Wells 7-22, 1-22 and their associated infrastructure; Meike 42-22 reservoir and access road.

Approximately 35 acres of active black-tailed prairie dog colony will be destroyed due to well pad, road/pipeline and reservoir construction. The construction of well pads, roads, pipelines and reservoirs causes direct prairie dog mortalities and an immediate loss of prairie dog burrows.

When construction begins on reservoirs, roads, pipelines, and pads the earth moving equipment can remove several feet of dirt at one time destroying prairie dog burrows and foraging habitat. During construction of these facilities, there is the possibility that many of the prairie dogs within these colonies may be killed as a direct result of the earth moving equipment. Constant noise and movement of equipment and the destruction of burrows puts considerable stress on the animals and will cause an increase in prairie dog mortalities. During the construction of these facilities individuals are exposed more frequently to predators and have less protective cover.

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

Three of the reservoirs occur in the middle of densely populated active prairie dog colonies. Mass immigration to surrounding colonies from those destroyed by the reservoirs would expose the prairie dogs to a higher rate of predation and an increase in stress resulting in higher mortality rate. Depending on when the construction occurs, the prairie dogs may be forced to disperse at the wrong time of the year when their body condition is below peak heath levels, thus creating more stress on the animals and resulting in a higher mortality rate. Another problem with displacement of the prairie dogs into the surrounding area is that the soil and vegetation may not be conducive to prairie dog survival.

Unlike roads and pipelines, the construction and operation of reservoirs will permanently remove habitat. By the time the reservoirs are no longer needed, the reservoirs may become hard pan, soil that has hardened due to mineral deposits and evaporation. Prairie dogs may be unable to burrow in this type of soil compaction.

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

4.2.5.2.3. Burrowing owl

The eastern half the Big Bend 3 project area is one large and continuous prairie dog colony. The major reasons for declining populations are degradation of habitat and the decline of prairie dog colonies across the western United States. Other factors include urban sprawl, conversion of prairie to farmland, road collisions and accidental deaths through pesticide programs aimed at insect and mammal pests (Korfanta 2005).

Infrastructure within close proximity to documented burrowing owl nests within the Big Bend III project area (Timing limitations will apply to this infrastructure).

BLM ID#	SPECIES	UTM (NAD 83)	STATUS	WELL / PIT NUMBER	DISTANCE
New	BUOW	400346E 4836445N	Inactive	Well 15-21	0.12 miles
New	BUOW	403318E 4837097N	Active		0.44 miles from the project area.

Approximately 35 acres of active black-tailed prairie dog colony will be destroyed due to well pad, road/pipeline and reservoir construction. The construction of well pads, roads, pipelines and reservoirs causes an immediate loss of prairie dog burrows (nesting habitat) and foraging habitat.

The burrowing owl nest located in SWSE Section 21, Township 43 North, Range 78 West, is 0.13 miles from the 15-21 well. The nest location was not known at the time of the onsite. Based on the topographic map the nest appears to be out of sight of the well. The well was not moved. The burrowing owl nest in NESW Section 23, Township 43 North, Range 78 West is 0.44 miles from all proposed infrastructure.

When construction begins on reservoirs, roads, pipelines and pads the earth moving equipment can remove several feet of dirt at one time destroying prairie dog burrows and foraging habitat. During construction of these facilities, there is the possibility that burrowing owls within these colonies may be killed as a direct result of the earth moving equipment. Constant noise and movement of equipment and the destruction of burrows puts considerable stress on the burrowing owls and will likely cause an increase in burrowing owl mortalities. During the construction of these facilities individuals are exposed more frequently to predators and have less protective cover.

The presence of overhead power lines and roads within the project area may adversely affect burrowing owls. Overhead power lines create hunting perches for lager raptors, thus increasing the potential for predation on burrowing owls. Overhead power lines are also a collision hazard for burrowing flying through the area. Mineral related traffic on the adjacent roads may result in burrowing owl collisions with vehicles.

Stopping all project related activities (i.e. road/pipeline, reservoir and well pad construction, vehicle traffic, well drilling, human presence, overhead powerline construction, etc.) within one quarter mile of an active burrowing owl nest during the breeding season (April through August) will help to reduce nest failure and would prevent road related mortalities. The burrowing owl is protected under the Migratory Bird Treaty Act. Road related mortalities are considered take under the under the Migratory Bird Treaty Act.

> *The Migratory Bird Treaty Act (MBTA)*
> *The MBTA (16 U.S.C. 703-712), prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted regulation. Implementing regulations define "take" under the MBTA as*

"pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect."

4.2.5.2.4. Grouse

4.2.5.2.4.1. Greater Sage-Grouse

There are four sage grouse leks within 3.0 miles of the Big Bend 3 project area, the leks are Rhodes, Rhodes 2, East Holler, and Garrett.

BLM 31-21 reservoir (off-channel pit) was moved approximately 500 feet north/northeast out of moderately dense sagebrush (10-15% cover) to a grassy clearing.

Greater sage-grouse habitat is being directly lost with the addition of well sites, roads, pipelines, power lines, reservoirs and other infrastructure (Theiele 2005, Oedekoven 2004). Sage grouse avoidance of CBNG infrastructure results in even greater indirect habitat loss. The Wyoming Game and Fish Department (WGFD) feels a well density of eight wells per section creates a high level of impact for sage grouse and that sage-grouse avoidance zones around mineral facilities overlap creating contiguous avoidance areas (WGFD 2004).

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

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

Another concern with CBNG is that reservoirs created for water disposal provide habitat for mosquitoes associated with West Nile virus (Oedekoven 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). Powder River Basin 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 Buffalo Field Office (BFO) Resources Management Plan (BLM 2001) and the Powder River Basin Oil and Gas Project Record of Decision (BLM 2003) include a two-mile timing limitation within sage-grouse nesting habitat. The two-mile measure originated with the Western Association of Fish and Wildlife Agencies (WAFWA), which includes the WGFD, 1977 sage-grouse guidelines (Bennett 2004). Under pressure for standardization BLM Wyoming adopted the two-mile recommendation in 1990, and instructed the field offices to incorporate the measure into their land use plans (Bennett 2004, Murkin 1990).

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

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

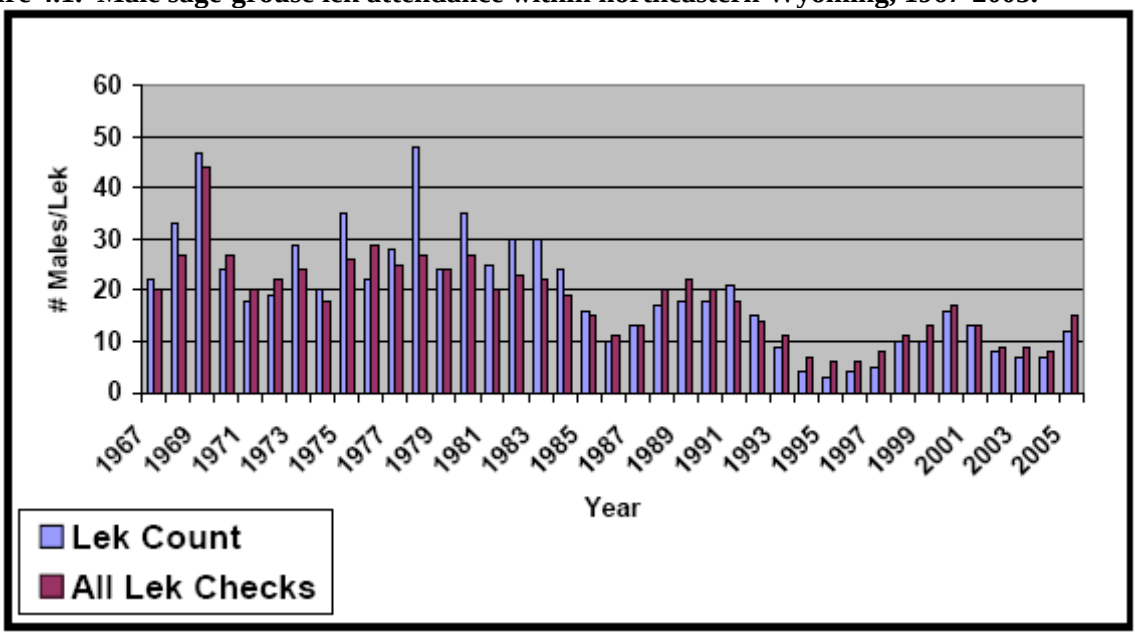
(1.86 mi) of the capture lek. Moynahan and Lindberg (2004) found 36% of their grouse nesting within 3 km of the capture leks. Moynahan's study area was north-central Montana in an area of mixed-grass prairie and sagebrush steppe, with Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) being the dominant shrub species (Moynahan et al. In press).

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

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

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

Figure 4.1. Male sage-grouse lek attendance within northeastern Wyoming, 1967-2005.



Sage-grouse populations within the PRB are declining independent of coalbed natural gas development. CBNG is a recent development, with the first well drilled in 1987 (Braun et al. 2002). In February 1998 there were 420 producing wells primarily restricted to eastern Campbell County (BFO 1999). By May 2003 there were 26,718 CBNG wells permitted within the BFO area (Oedekoven 2004). The Powder River Basin Oil and Gas Project Final Environmental Impact Statement estimated 51,000 additional CBNG wells to be drilled over a ten year period beginning in 2003 (BFO 2003). Impacts from CBNG development are likely to be significant and additive to the long-term impacts afflicting the sage-grouse population (Oedekoven 2004). In other terms, CBNG development is expected to accelerate the downward sage-grouse population trend.

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

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

4.2.5.2.4.2. Sharp-tailed Grouse

The effects are similar to sage grouse, but may not be to the same extent.

4.2.5.2.5. Mountain plover

The eastern half of the project area is good mountain plover habitat. Mineral development may have

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. Use of roads and pipe line corridors by mountain plovers may increase their vulnerability to vehicle collision. Overhead power lines provide perch sites for raptors that could potentially result in increased mountain plover predation. CBNG infrastructure such as well houses may provide shelter and den sites for ground predators such as skunks and foxes.

With the loss or alteration of their natural breeding habitat (predominately prairie dog colonies), mountain plovers have been forced to seek habitat with similar qualities that may be poor quality habitat 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 and 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 US Fish and Wildlife Service (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 1995).

Stopping all development activities (i.e. road/pipeline, overhead powerline, reservoir construction, well drilling and all activities associated with bringing the wells into production, vehicle traffic and human presence) within one quarter mile of occupied mountain plover nesting habitat will reduce direct impacts such as vehicle/equipment related mortalities. The mountain plover is protected under the Migratory Bird Treaty Act. Road related mortalities are considered take under the under the Migratory Bird Treaty Act (see definition of "take" above in the burrowing owl section).

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

4.2.5.2.6. Swift fox

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 will likely result in swift fox road mortalities.

Swift fox breed between December and February and gestation is approximately 51 days, the young are born late February to late March. The young foxes begin to disperse between September and October. A timing limitation from March 1 to August 31 will improve the young foxes chance of survival.

Stopping all development activities (i.e. road/pipeline, overhead powerline, reservoir construction, well drilling and all activities associated with bringing the wells into production, vehicle traffic and human presence) within a quarter mile of active swift fox dens will reduce direct impacts to swift foxes.

4.2.5.3. Cumulative effects

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

4.3. West Nile Virus Direct and Indirect Effects

This project is likely to result in standing surface water which may potentially increase mosquito breeding

habitat. BLM has consulted with applicable state agencies, County Weed and Pest and the State Health Department, per above mitigation in the PRB ROD page 18, regarding the disease and the need to treat. BLM has also consulted with the researchers that are studying the dynamics of WNv species and its effects in Wyoming.

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

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

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

4.4. Water Resources

The operator has submitted a comprehensive WMP for this project. It is incorporated-by-reference into this EA pursuant to 40 CFR 1502.21. The WMP incorporates sound water management practices, monitoring of downstream impacts within the Upper Powder River watershed and a commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Qualified hydrologists 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 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 15.0 gpm per well or 315 gpm (0.7 cfs or 508 acre-feet per year) for this POD. The PRB FEIS projected the total amount of water that was anticipated to be produced from CBNG development per year (Table 2-8 Projected Amount of Water Produced from CBM Wells Under Alternatives 1, 2A and 2B pg 2-26). For the Upper Powder River drainage, the projected volume produced within the watershed area was 163,521 acre-feet in 2007 (maximum production was estimated to occur in 2006 at 171,423 acre-feet). As such, the volume of water resulting from the production of these wells is 0.03% of the total volume projected for 2007. 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 40% to groundwater aquifers and coal zones in the Upper Powder River drainage area (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 126 gpm will infiltrate at or near the discharge points and impoundments (203 acre feet per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, “the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater.” (PRB FEIS pg 4-54). Therefore, the chemical nature and the volume of the discharged water may not degrade the groundwater quality.

The PRB FEIS predicts that one of the environmental consequences of coal bed natural gas production is

possible impacts to the groundwater. "The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers." (PRB FEIS page 4-1). In the process of dewatering the coal zone to increase natural gas recovery rates, this project may have some effect on the static water level of wells in the area. The permitted water wells produce from depths which range from 500 to 800 feet below the surface compared to 988 feet to the Big George coal zone. As mitigation, the operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence (½ mile of a federal CBNG producing well) of the proposed wells.

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

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

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

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

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ developed a guidance document, "Compliance Monitoring and Siting Requirements for Unlined Coalbed Methane Produced Water Impoundments" which was approved September, 2006. The Wyoming DEQ's Impoundment Task Force has investigated approximately 800 impoundments over the last year. As a result, 102 impoundments in 52 WYPDES permits have required compliance monitoring. For WYPDES permits received by DEQ after the effective date, the BLM requires that operators comply with the current approved DEQ compliance monitoring guidance document prior to discharge of federally-produced water into newly constructed or upgraded impoundments

4.4.1.1. Groundwater Cumulative Effects:

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

Development of CBNG through 2018 (and coal mining through 2033) would remove 4 million acre-feet of groundwater from the coal zone aquifer (PRB FEIS page 4-65). This volume of water "…cumulatively represents 0.5 percent of the recoverable groundwater stored in the Wasatch – Tongue River sands and

coals (nearly 750 million acre-feet, from Table 3-5). All of the groundwater projected to be removed during reasonably foreseeable CBM 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's proposed numeric limits for the watershed for SAR, and EC, the average value measured at selected USGS gaging stations at high and low monthly flows, and Wyoming groundwater quality standards for TDS and SAR for Class I to Class III water. It also shows pollutant limits for TDS, SAR and EC detailed in the WDEQ's WYPDES permit, and the levels found in the POD's representative water sample. Historic data for the gage at Salt Creek near Sussex is also shown for comparison purposes and to show the water quality of a major tributary to the Powder River upstream of this POD's boundary.

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

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** μmhos/cm
Most Restrictive Proposed Limit –		2	1000
Least Restrictive Proposed Limit		10	3200
Powder River at Arvada, WY Gaging station Historic Data Average at Maximum Flow Historic Data Average at Minimum Flow		 4.76 7.83	 1797 3400
Salt Creek nr Sussex, WY Gaging Station Historic Data Average at Maximum Flow Historic Data Average at Minimum Flow Historic Data at 7Q10 Flow		 18.9 23.6 25.1	 5204 5668 6741
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8) Drinking Water (Class I) Agricultural Use (Class II) Livestock Use (Class III)	 500 2,000 5,000	 8	
WDEQ Water Quality Requirement for WY0055387 and WY0055760	Not Stated	Not Stated	7500
Predicted Produced Water Quality Big George coal zone	 2490	 17.1	 3980

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 2490.0 mg/l TDS which is not within the WDEQ criteria for agricultural use (2000 mg/l TDS). 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 Big George 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 15.0 gallons per minute (gpm) is projected to be produced from these 21 wells, for a total of 315 gpm for the POD. See Table 4.5.

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

There are 8 discharge points proposed for this project. Outfall number 005 will discharge into a well

vegetated channel, but will ultimately be contained by the Meike 24-14 dam and reservoir. All outfalls have been appropriately sited and utilize appropriate water energy dissipation designs. Existing and proposed water management facilities were evaluated for compliance with best management practices during the onsite.

To manage the produced water, 7 impoundments (78 acre-feet) would potentially be constructed within the project area. These impoundments will disturb approximately 26.0 acres including the dam structures. Of these water impoundments, 6 are on-channel reservoirs disturbing 22.0 acres, and 1 would be off-channel, disturbing 4.0 acres. The off-channel impoundment would result in evaporation and infiltration of CBNG water. Criteria identified in "Off-Channel, Unlined CBNG Produced Water Pit Siting Guidelines for the Powder River Basin, Wyoming" (WDEQ, 2002) was used to locate this impoundment. Monitoring will be required based upon WYDEQ findings relative to "Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments" (June 14, 2004). Existing impoundments will be upgraded to 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 0.1 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. Phased reclamation plans for the impoundments will be submitted and approved on a site-specific, case-by-case basis as they are no longer needed for disposal of CBNG water, as required by BLM applied COAs.

Alternative (2A), the approved alternative in the Record of Decision for the PRB FEIS, states that the peak production of water discharged to the surface would occur in 2006 at a total contribution to the mainstem of the Upper Powder River of 68 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 21 wells is anticipated to be a total of 315 gpm or 0.7 cfs to impoundments. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and full containment the produced water re-surfacing in the Powder River from this action (0.1 cfs) may add a maximum 0.08 cfs to the Upper Powder River flows, or 0.1% of the predicted total CBNG produced water contribution. This incremental volume is statistically below the measurement capabilities for the volume of flow of the Powder River (refer to Statistical Methods in Water Resources U.S. Geological Survey, Techniques of Water-Resources Investigations Book 4, Chapter A3 2002, D.R. Helsel and R.M. Hirsch authors). For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

The operator did not provide an analysis of the potential development in the watersheds above the project area. However, based on the area of the various small watersheds above the POD (approximately 5 sq mi) and an assumed density of one well per location every 80 acres, the potential exists for the development of 40 wells which could produce a maximum flow rate of 600 gpm (1.3 cfs) of water. The BLM agrees with the operator that this is not expected to occur because:

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

The potential maximum flow rate of produced water within the watershed upstream of the project area, 1.3 cfs, is less than the volume of runoff estimated from the 2-year storm event for these small watersheds.

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 is in the process of obtaining a Wyoming Pollutant Discharge Elimination System (WYPDES) permit for the discharge of water produced from this project from the WDEQ.

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

pH	6.5 to 9.0
Specific Conductance	7500 µS/cm max
Dissolved iron	1000 µg/l max
Total Recoverable Barium	1800 µg/l max
Total Recoverable Arsenic	8.4 µg/l max
Chlorides	150 mg/l
Dissolved Copper	5.9 µg/l max
Dissolved Zinc	76 µg/l max
Total Flow for WY0055760	0.27 MGD (0.42 cfs)
Total Flow for WY0055387	1.88 MGD (2.9 cfs)

The WYPDES permits address existing downstream concerns, such as irrigation use, in the COAs for the permits. The designated points of compliance identified for these permits are the end of the discharge pipes. Discharge will be allowed between reservoirs, but will be contained by the lowest reservoir in each tributary. No discharge is to reach the Powder River. (WYPDES # WY0055387 and WY0055760, Part I, page 2.)

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, unless all zones are co-mingled simultaneously. The reference well will be sampled at the wellhead for analysis within sixty days of initial production. A copy of the water analysis will be submitted to the BLM Authorized Officer.

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

In-channel downstream impacts are addressed in the WMP for the Big Bend III POD prepared by SWCA for North Finn, LLC.

4.4.2.1. Surface Water Cumulative Effects

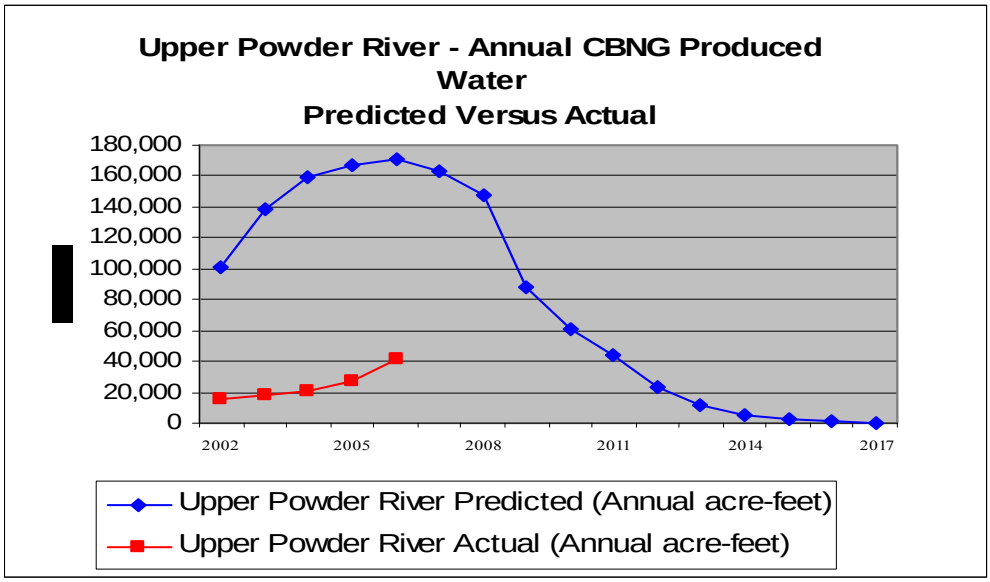
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the Upper Powder River watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of December 2006 all producing CBNG wells in the Upper Powder River watershed have discharged a cumulative volume of 123,984 acre-ft of water compared to the predicted 736,519 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.1 and numerically in Table 4.6 following. This volume is 17 % of the total predicted produced water analyzed in the PRB FEIS for the Upper Powder River watershed.

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

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

Figure 4.1 Actual vs. predicted water production in the Upper Powder River watershed



The PRB FEIS identified downstream irrigation water quality as the primary issue for CBNG produced water. Electrical Conductivity (EC) and SAR are the parameters of concern for suitability of irrigation

water. The water quality analysis in the PRB FEIS was conducted using produced water quality data, where available, from existing wells within each of the ten primary watersheds in the Powder River Basin. These predictions of EC and SAR can only be reevaluated when additional water quality sampling is available.

The PRB FEIS states, "Cumulative effects to the suitability for irrigation of the Powder River would be minimized through the interim Memorandum of Cooperation (MOC) that the Montana and Wyoming DEQ's (Departments of Environmental Quality) have signed. This MOC was developed to ensure that designated uses downstream in Montana would be protected while CBM development in both states continued. As the two states develop a better understanding of the effects of CBM discharges through the enhanced monitoring required by the MOC, they can adjust the permitting approaches to allow more or less discharges to the Powder River drainage. Thus, through the implementation of in-stream monitoring and adaptive management, water quality standards and interstate agreements can be met." (PRB FEIS page 4-117). Ongoing litigation between Wyoming and Montana will determine the final water quality and quantity parameters which will be applied to CBNG produced water disposal in the PRB.

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

1. They are proportional to the actual amount of cumulatively produced water in the Upper Powder River drainage and the total amount that was predicted in the PRB FEIS, which is approximately 17% of that total (see section 4.4.2.1).
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
3. The commitment by the operator to monitor the volume of water discharged.

No additional mitigation measures are required.

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

4.5. Cultural and Paleontological Resources

No eligible historic properties are located in Areas of Effect within the North Finn Big Bend IIIPOD, and no eligible historic properties will be affected by proposed developments. However, if previously unreported 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).

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

Three significant paleontological localities have been identified within potential areas of effect:

1. The proposed road to the #3-22 well passes through a highly sensitive paleontological locality (#UC 84116). This road and well were dropped from the project therefore the locality will not be affected.

2. Due to the finding of a fragment of hyracotherium in the draw east of well #7-15, a construction monitor will be required for the segment of pipeline and/or road in the N1/2SWNE and SWNWNE of Section 15, T43N, R78W. The find is consistent with a large vertebrate locality immediately to the south which is not in the Area of Effect.

3. The access road to wells #3-15, 5-15 and 11-15 passes through a significant paleontological locality (#UC 84125). Monitoring is required for the road construction in the NESESW, NWSWSE and SWNWSE of Section 10.

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Neil Neumiller	Petroleum Engineer	North Finn, LLC	YES
Brent Sobotka	Hydrologist	SWCA Environmental Consultants	YES
Georgia Knauss	Environmental Specialist	SWCA Environmental Consultants	YES

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.

7. REFERENCES AND AUTHORITIES

Audubon Watch List. Mountain Plover (*Charadrius montanus*). http://audubon2.org/webapp/watchlist/viewSpecies.jsp?id=139

Avian Power Line Interaction Committee. 2006. Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute. Washington, D.C. 125pp.

Agnew, W. D. 1983. Flora and Fauna Associated with Prairie Dog Ecosystems. Unpublished thesis. Colorado State University, Fort Collins. 47pp.

Agnew, W. D. 1988. Arthropod Consumption by Small Mammals on Prairie Dog Colonies and Adjacent Ungrazed Mixed-grass Prairie in Western South Dakota. Eighth Great Plains Wildlife Damage Control Workshop Proceedings. USDA Forest Service General Technical Report RM 154. pgs. 81-87.

Agnew, W., D. W. Uresk. and R. M. Mansen. 1986. Flora and Fauna Associated with Prairie Dog Colonies and Adjacent Ungrazed Mixed-grass Prairie in Western South Dakota. Journal of Range Management 39, pgs 135-139

AHPIS, Animal and Plant Health Inspection Service. 2002. General information available online at http://www.aphis.usda.gov/lpa/issues/wnv/wnv.html.

Apa, A. D. 1985. Efficiency of Two Black-tailed Prairie Dog Rodenticides and Their Impacts on Non-target Bird Species. Unpublished thesis, South Dakota State University Brookings. 71pp.

Avian Power Line Interaction Committee. 1996. Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996. Edison Electric Institute. Washington, D.C. 125pp.

Bennett, Robert A. 2004. Instruction Memorandum No. WY-2005-057: Statement of Policy Regarding Sage-Grouse Management Definitions, and Use of Protective Stipulations, and Conditions of Approval. Bureau of Land Management, Wyoming State Office. Cheyenne, WY.

Bennet, Bob. 2004. Statement of Policy Regarding Sage-Grouse Management Definitions, and Use of Protective Stipulations, and Conditions of Approval (COAs). BLM (State Director, Wyoming). Cheyenne, WY. 7pp.

Bills, Thomas E. 2004. Powder River Basin Oil & Gas Project Semi-Annual Report: May 1, 2003 – October 31, 2003. BLM Buffalo Field Office. Buffalo, WY. 8pp.

Barko, Valerie A., James H.Shaw, David M. Lesie. 1999. Birds Associated with Black-tailed Prairie Dog Colonies in Southern Shortgrass Prairie. The Southwestern Naturalist 44(4):484-489

Barko, Valerie A., Michael W. Palmer, Jeffery Stewart, and David M. Engle. 2001. Vascular Plant Communities Associated with Black-tailed Prairie Dog Colonies in Southern Shortgrass Prairie. Oklahoma Academy of Science. 81:11-19

Braun, C.E., O.O. Oedekoven, and C.L. Aldridge. 2002. Oil and Gas Development in Western north America: Effects on Sagebrush Steppe Avifauna with Particular Emphasis on Sage Grouse. In: Transactions of the 67th North American Wildlife and Natural Resources Conference. pp337-349.

Bruan, C.E. 1986. Changes in sage grouse lek counts with the advent of surface coal mining. Proceedings: issues and technology in the management of impacted western wildlife. 2: 227-231.

Bruan, C.E. 1998. Sage-grouse declines in the western North America: what are the prolems? Western Association of Fish and Wildlife Agencies Proceedings 78: 139-156.

Bruns Stuckrahm , Donna M., Theresa E. Olson and Elizabeth K. Harper.1993. Plant Species in Black-tailed Prairie Dog Townsin Billings County, North Dakota. Prairie Naturalist 25(2) June 1993 173-183

Byer, Timothy. 2006. Personal Communication. Wildlife Biologist. Thunder Basin National Grasslands. USDA Forest Service, Douglas, WY.

Clark, Tim W., Dan Hinckley and Terrell Rich. 1989. The Prairie Dog Ecosystem: Managing For Biological Diversity. Montana BLM Wildlife Technical Bulletin No.2 pp 55.

Campbell, Thomas and Tim Clark. 1981. Colony Characteristics and Vertebrate Associates of White-tailed and Black-tailed Prairie Dogs. American Midland Naturalist, Vol. 105, No. 2 (April 1981). pgs 269-276.

Canfield, J. E., L. J. Lyon, J. M. Hillis, and M. J. Thompson. 1999. Ungulates. Chapter 6 in Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana, coordinated by G. Joslin and H. Youmans. Committee on Effects of Recreation on Wildlife, Montana Chapter of

The Wildlife Society.

Clark, T. W., T. M. Campbell, D. G. Socha, and D. E. Casey. 1982. Prairie Dog Colony attributes and Associated Vertebrate Species. Great Basin Naturalist 42: 572-582.

Code of Federal Regulations (CFR)
1. 40 CFR All Parts and Sections inclusive Protection of Environment. Revised as of July 1, 2004.
2. 43 CFR All Parts and Sections inclusive - Public Lands: Interior. Revised as of October 1, 2006.

Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage grouse populations and their habitat. Wildlife Society Bulletin 28: 967-985.

Connelly, J.W., S.T. Knick, M.A. Schroeder, and S.J. Stiver. 2004. Conservation assessment of greater sage-grouse and sage brush habitats. Western Association of Fish and Wildlife Agencies. Unpublished report. Cheyenne, Wyoming, USA. http://sagemap.wr.usgs.gov/Docs/Greater_Sage-grouse_Conservation_Assessment_060404.pdf

Cornish, Todd; Terry Creekmore; Walter Cook; and Elizabeth Williams. 2003. "West Nile Virus - Wildlife Mortality in Wyoming 2002-2003". In: The Wildlife Society Wyoming Chapter Program and Abstracts for the Annual Meeting at the Inn in Lander, WY November 18-21, 2003. Wildlife Society Wyoming Chapter. 17pp.

Cornish, Todd; Terry Creekmore; Walter Cook; and Elizabeth Williams. 2003. "West Nile Virus - Wildlife Mortality in Wyoming 2002-2003". In: The Wildlife Society Wyoming Chapter Program and Abstracts for the Annual Meeting at the Inn in Lander, WY November 18-21, 2003. Wildlife Society Wyoming Chapter. 17pp.

Cornish, Todd. Personal Communication. Wyoming State Veterinary Laboratory, University of Wyoming. Laramie, WY. (307) 742-6638. tcornish@uwyo.edu.

Danvir, Rick E. 2002. Sage Grouse Ecology and Management in Northern Utah Sagebrush-Steppe: A Deseret Land and Livestock Wildlife Research Report. Deseret Land and Livestock Ranch and the Utah Foundation for Quality Resource Management. Woodruff, UT.

Defenders of Wildlife. http://www.defenders.org/wildlife_and_habitat/wildlife/burrowing_owl.php

Deisch, M. S., D. W. Uresk, and R. L. Lindor. 1989. Effects of Two Prairie Dog Rodenticides on Ground Dwelling Invertebrates in Western South Dakota. Ninth Great Plains Wildlife Damage Control Workshop Proceedings. USDA Forest Service General Technical Report RM. Pgs 171-181.

Desmond, Martha J., J.A.Savidge and K.M. Eskridge. 2000. Correlations Between Burrowing Owl and Black-tailed Prairie Dog Declines: A 7-Year Analysis. Journal of Wildlife Management 64(4):1067-1075

Dickson, Tom. 2004. The Swift Fox's Speedy Return. Montana Outdoors July-Aug 2004. http://fwp.mt.gov/mtoutdoors/HTML/Articles/2004/SwiftFox.htm

Easdale, Guymen. 2007. Onsite Notes for Big Bend 3 BLM Buffalo Field Office. Buffalo, WY.

Geist, V. 1978. Behavior. Big Game of North America; ecology and management. Stackpole Books, Harrisburg, Pennsylvania.

Grenier, Martin. 2003. An Evaluation of Black-footed Ferret Block Clearances in Wyoming: Completion Report. Wyoming Game and Fish Department. Lander, WY. 16pp

Grenier, Martin, Bob Oakleaf, Kelli Taylor and Michelle Hymas. 2004. Inventory and Monitoring of the Black-tailed Prairie Dogs in Wyoming-Status of Colonies Completion Report. Wyoming Game and Fish Department

Hall, E.R. 1981.The Mammals of North America. John Wiley and Sons, Inc. New York 2:601-1181-90.

Hall, F., and E. Haney. 1997. Distribution and trend of sage-grouse (*Centrocercus ur ophasianus*) in relation to overhead transmission lines in northeast California. Draft document. California Department of Fish and Game.

Hanf, J.M., P.A. Schmidt, E.B. Groshens. 1994. Sage grouse in the high desertof central Oregon: results of a study, 1988-1993. USDI Bureau of Land Management, Prineville, Oregon, USA.

Hartzler, J.E. 1974. Predation and daily timing of sage-grouse leks. The Auk 91: 532-536.

Hausleitner, D. 2003. Population dynamics, habitat use and movements of greater sage-grouse in Moffat County, Colorado. Thesis, University of Idaho, Moscow, Idaho, USA.

Heidel, Bonnie. Botanist. Wyoming Natural Diversity Database. University of Wyoming. Laramie, WY

Holloran, Matthew J.; Brian J. Heath; Alison G. Lyon; Steven J. Slater; Jarren L. Kuppiers; and Stanley H. Anderson. 2005. Greater sage-grouse nesting habitat selection and success in Wyoming. J. Wildl. Manage. 69(2):638-649.

Holloran, M.J., and S.H. Anderson. 2004. Sage-grouse response to natural gas field development in northwestern Wyoming. Page 16 in Proceedings of the 24th Meeting of the Western Agencies Sage and Columbian Sharp-tailed Grouse Technical Committee. Wenatchee, Washington. USA.

Hoogland, J.L.1981. Nepotism and cooperative breeding in the black-tailed dog (Sciuridea: Cynomys ludovicianus). In Natural selection and social behavior: Recent research and new theory, ed. R.D. Alexander and D.W. Tinkle, 238-310 New York Press.

Hunting, Kevin. Mountain Plover (*Charadrius montanus*) California Department of Fish and Game. http://www.prbo.org/calpif/htmldocs/species/grassland/moplacct.html

Ingelfinger, F., and S. Anderson. 2004. Passerine response to roads associated with natural gas extraction in a sagebrush steppe habitat. Western North American Naturalist 64:385-395

Jalkotzy, M.G., P.I. Ross, and M.D. Nasserden. 1997. The Effects of Linear Developments on Wildlife: A Review of Selected Scientific Literature. Arc Wildlife Services Ltd., Calgary, Alberta, Canada.

Jellison, Bert. 2005. Sage-Grouse Restoration Project: Lake DeSmet Conservation District. Wyoming Game and Fish Department. Sheridan, WY.

Kahn, Rick; Fox, Lloyd; Horner, Peggy; Giddings, Brian; Roy, Christiane. 1997. Conservation

Assessment and Conservation Strategy for Swift Fox in the United States. Colorado Division of Wildlife

Kelly Brian T. 2004. Letter to interested parties: Black-footed ferret clearance surveys. U.S. Fish and Wildlife Service (February 2, 2004). Cheyenne, WY. 4pp.

King, J. A. 1955. Social Behavior, Social Organization and Population Dynamics in a Black-tailed Prairie Dog Town in the Black Hills of South Dakota. Contr. Lab. Vert. Biol., University of Michigan. 67pp.

Knowles, Craig, S. Stoner, and S. Gieb. 1982. Selective Use of Black-tailed Prairie Dog Towns By Mountain Plovers. Condor 84:71-74

Konig, Weick and Becking. 1999. Owls: A Guide to the owls of the World. Yale University Press

Korfanta, N.M.; Mc Donald, R.S. and Levins, C.F. 2004. Burrowing owl (Athene cunicularia) population genetics: A comparison of North American forms and migratory habits. Auk 122(2):464-478. [English with Spanish abstract] DOI10.1642/0004-8038(2005)122[0464:BOACPG] 2.0CO;2 PDF fulltext (http://www.uwyo.edu/dbmcb/abstracts/KorfantaBuOwGEnetics.pdf)

Litzel, R. 2004. Personal communication [January 6 phone conversation with Jim Sparks]. Johnson County Weed and Pest District.

Lowham, H.W. Streamflows in Wyoming WRIR 88-4045 U.S. Geological Survey 1988

Lustig, Thomas D., March. 2003. Where Would You Like the Holes Drilled into Your Crucial Winter Range? Transactions of the 67th North American Wildlife and Natural Resources Conference.

Lyon, A.G. 2000. The potential effects of natural gas development on sage-grouse near Pinedale, Wyoming. Thesis, University of Wyoming, Laramie, USA.

Lyon, A.G., and S.H. Anderson.2003. Potential gas development impacts on sage grouse nest initiation and movement. Wildlife Society Bulletin 31:486-491.

Lyon, Jack L., October. 1979. Habitat Effectiveness for Elk as Influenced By Roads and Cover. Journal of Forestry. October, 1979.

Mackie, R.J., D.E. Pac, K.L. Hamlin, and G.L. Dusek. 1998. Ecology and Management of Mule Deer and White-tailed Deer in Montana. Montana Fish, Wildlife and Parks. Helena, Montana.

Marra PP, Griffing SM, McLean RG. West Nile virus and wildlife health. Emerg Infect Dis [serial online] 2003 Jul. Available from: URL: http://www.cdc.gov/ncidod/vol9no7/03-0277.htm.

McCraken, J. G., D. W. Uresk and R. M. Mansen. 1985. Burrowing Owl Foods in Conata Basin, South Dakota. Great Basin Naturalist 45: 287-290.

Miller, K.A Peak-Flow Characteristics of Wyoming Streams WRIR 03-4107 U.S. Geological Survey 2003

Mooney, A. 2004. Personal Communication [January 6 phone conversation with Jim Sparks]. Campbell County Weed and Pest District.

Moynahan, Brendan J.; Mark S. Lindberg; Jay J. Rotella; and Jack Ward Thomas. In Press. Factors Affecting Nest Survival of Greater Sage-Grouse in Northcentral Montana. J. Wildl. Manage.

Moynahan, Brendan J. and Mark S. Lindberg. 2004. Nest Locations of Greater Sage-Grouse in Relation to Leks in North-Central Montana. *Presented at* Montana Sage-Grouse Workshop, Montana Chapter of The Wildlife Society, Billings.

Murkin, James W. 1990. Instruction Memorandum No. WY-90-564: Resource Management Plan Action and Wyoming BLM Standard Mitigation Guidelines for Surface Disturbing Activities. Bureau of Land Management, Wyoming State Office. Cheyenne, WY.

Naugle, David E.; Brett L. Walker; and Kevin E. Doherty. 2006. Sage Grouse Population Response to Coal-bed Natural Gas Development in the Powder River Basin: Interim Progress Report on Region-wide Lek Analyses. May 26, 2006. University of Montana. Missoula, MT. 10pp.

Naugle, David E.; Cameron L. Aldridge; Brett L. Walker; Todd E. Cornish; Brendan J. Moynahan; Matt J. Holloran; Kimberly Brown; Gregory D. Johnson; Edward T. Schmidtmann; Richard T. Mayer; Cecilia Y. Kato; Marc R. Matchett; Thomas J. Christiansen; Walter E. Cook; Terry Creekmore; Roxanne D. Falise; E. Thomas Rinkes; and Mark S. Boyce. 2004. West Nile virus: Pending Crisis of Greater Sage-grouse. Ecology Letters. 7:704-713.

Oakleaf, Bob. January 13, 1988. Letter to BFAT: Preliminary BFF Reintroduction Site Analysis, Meeteetse Management Plan Assignments. Wyoming Game and Fish Department. Lander, WY. 10pp.

Oedekoven, Olin O. 2004. Sheridan Region Wyoming Game and Fish Department: Annual Sage-Grouse Completion Report for 2004. Wyoming Game and Fish Department. Gillette, WY.

O'gara, Bart W. and Jim D. Yoakum. 1992. Pronghorn Management Guidelines. U.S. Department of the Interior, Fish and Wildlife Service.

Olson, Sally and Daniel Edge. 1984. Nest Site Selection by Mountain Plovers in North Central Montana. Journal of Range Management 38(3) May 1995 280-282

Patterson, Craig T. and Stanley H. Anderson. 1985. Distributions of Eagles and a Survey for Habitat Characteristics of Communal Roosts of Bald Eagles (Haliaeetus leucocephalus) Wintering in Northeastern Wyoming. Wyoming Cooperative Fishery and Wildlife Research Unit. University of Wyoming. Laramie, WY.

Reading, R. P., S. R. Beissinger, J. J. Grensten, and T. W. Clark. 1989. Attributes of Black-tailed Prairie Dog Colonies in North Central Montana with Management Recommendations for the Conservation of Biodiversity. Montana BLM Wildlife Technical Bulletin No. 2. pgs 13-28.

Reading, R., and Randy Matchet. 1997. Attributes of Black-tailed Prairie Dog Colonies in Northcentral Montana. Journal of Wildlife Management 61(3): 664-673.

Remington, T.E., and C.E. Braun. 1991. How surface coal mining affects Sage Grouse, North Park, Colorado. Proceedings: issues and technology in the management of impacted western wildlife 5:128-132.

Riddle, P., and C. Oakley. 1973. The Impact of Severe Winters and Fences on Antelope Mortality in South Central Wyoming. West. Association State Fish and Game Comm. Proc. 53.

Rinkes, T. 2003. Personal communication [Draft notes from Annual Sage-Grouse and Sagebrush Species of Concern Meeting]. Bureau of land Management Wildlife Biologist/Sage Grouse Coordinator.

Rogers, Brad. Personal Communication. Fish and Wildlife Biologist. U.S. Fish and Wildlife Service, Cheyenne Field Office. Cheyenne, WY.

Romin, Laura A., and Muck, James A. May 1999. Utah Field Office Guidelines For Raptor Protection From Human And Land Use Disturbances. U.S. Fish and Wildlife Service, Salt Lake City, Utah

Rost, Gregory R. and James A. Bailey. 1979. Distribution of Mule Deer and Elk in Relation to Roads. Journal of Wildlife Management. 43.

Rowland, M. M., M. Leu, , S. P. Finn, S. Hanser, L. H. Suring, J. M. Boyd, C. W. Meinke, S. T. Knick, and M. J. Wisdom. 2005. Assessment of threats to sagebrush habitats and associated species of concern in the Wyoming Basins. Version 1.1, June 2005, unpublished report on file at USGS Biological Resources Discipline, Snake River Field Station, 970 Lusk St., Boise, ID 83706.

Russell, Robin E. and James K. Detling 2003. Grasshoppers (Orthoptera: Acrididae) and Black-tailed Prairie Dogs (Sciuridae: Cynomys ludovicianus(Ord):Assocations between Two Rangeland Heribivores. Journal of the Kansas Entomological Society 76(4), 2003. pp578-587

Ryder, T.J. and L.L. Irwin. 1987. Winter Habitat Relationships of Pronghorns in South Central Wyoming. Journal of Wildlife Management, 51.

Samuel,D.E. and B.B. Nelson 1982. Foxes. Pages 475-490 in J.A. Chapman and G.A. Feldhamer, eds. Wild Mammals of North America: Biology, Management, and Economics. Johns Hopkins Univ. Press. Baltimore1147 pp.

Scott-Brown, J.M., S. Herrero, and J. Reynolds. 1987. Swift fox. Pages 432-441in M.Novak. J.A. Baker, M.E. Obbard, and B.Malloch, eds. Wild furbearer management and conservation in North America. TrappersAssoc., North Bay

Sharps, Jon C. and Daniel W. Uresk. 1990. Ecological Review of Black-tailed Prairie Dogs and Associated Species in Western South Dakota. Great Basin Naturalist 50(4) 339-345

Sheldon, Daly and Fred Lindzey. 2003. "Movement and Dispersion of Pronghorn in Relation to Fences". In: Program and Abstracts for the Annual Meeting at the Inn in Lander, WY:

Skeel, M.A., J. Keith, and C.S.Palaschunk2001. A population decline recorded byOperation Burrowing Owl in Saskatchewan. Journal of Raptor Research 35:399-407.

Slovkin, J.M. 1982. Habitat Requirements and Evaluations. Elk of North America. Stackpole Books, Harrisburg, Pennsylvania.

Stromberg, Mark Robert.1975. Habitat Relationships of the Black-tailed Prairie Dog (*Cyomys ludovicianus*):

The National Environmental Policy Act of 1969 (NEPA), as amended (Pub. L. 91-90, 42 U.S.C. 4321 et

seq.).

Thiele, Dan. 2005. Northeast Wyoming Local Working Group Area: Annual Sage-Grouse Completion Report for 2005. Wyoming Game and Fish Department. Buffalo, WY. 42pp.

Turbak, Gray. 2004. Prairie Home Companions National Wildlife Federation Dec/Jan 2004, vol.42 no. 1

Uresk, D. W. and J. C. Sharps. 1986. Denning Habitat and Diet of the Swift Fox in Western South Dakota. Great Basin Naturalist 46: 249-253.

U.S. Department of the Interior, Bureau of Land Management and Office of the Solicitor (editors). 2001. The Federal Land Policy and Management Act, as amended. Public Law 94-579.

U.S. Department of the Interior 2001 , Bureau of Land Management, Buffalo Field Office, Approved Resource Management Plan for Public Lands Administered by the Bureau of Land Management Buffalo Field Office April 2001.

U.S. Department of the Interior 2003, Bureau of Land Management, Powder River Oil and Gas Project Environmental Impact Statement and Resource Management Plan Amendment. April 30, 2003.

U.S. Department of the Interior 2007, US Fish and Wildlife Service, Reinitiation of Formal Consultation for Powder River Oil and Gas Project. March 23, 2007

U.S. Department of the Interior, Fish and Wildlife Service. 2002. Final Biological and Conference Opinion for the Powder River Oil and Gas Project, Campbell, Converse, Johnson, and Sheridan Counties (WY6633). U.S. Fish and Wildlife Service. December 17, 2002. Cheyenne, WY. 58pp.

U.S. Department of the Interior, Fish and Wildlife Service (USFWS). 1989. Black-footed ferret Survey Guidelines for Compliance with the Endangered Species Act. Denver, CO and Albuquerque, NM.

Walker B, Naugle D, Rinkes T. 2003. The Response of Sage Grouse to Coal-bed Methane Development and West Nile virus in the Powder River Basin: Is There a Link ? Page 6 in: Program and Abstracts for the Annual Wildlife Society Meeting, Wyoming Chapter.

WDEQ, June 14, 2004. Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments

Wellicome, T.I. and G.L Holroyd.2001. The second international Burrowing Owl symposium: background and context. Journal of Raptor Research 35:269-273

Whicker, April D., and James Detling. 1988. Ecological Consequences of Prairie Dog Disturbances. BioScience Dec. 1988 Vol. 38 No.11 778-785

Wyoming Game and Fish Department (WGFD). 2004. Minimum Recommendations for Development of Oil and Gas Resources within Crucial and Important Wildlife Habitats on BLM Lands. WGFD. Cheyenne, WY

WGFD. 2003. Wyoming Greater Sage-Grouse Conservation Plan. WGFD. Cheyenne, WY

Wuerthner, George. 1996. Viewpoint: The black-tailed prairie dog-headed for exticion? Journal of Range

Management 50:459-466

Wyoming Game and Fish Department. 2002. Draft Wyoming Greater Sage Grouse- Grouse Conservation Plan. July 10, 2002. Located on the Internet at: http://gf.state.wy.us/htlm/sagegrouse.htm

8. LIST OF INTERDISCIPLINARY TEAM PREPARERS AND REVIEWERS

Amy Shepperson, Natural Resource Specialist
Ben Adams, Hydrologist
Amber Bryan, Petroleum Engineer
Becky Wilkerson, Legal Instruments Examiner
BJ Earle, Archaeologist
Guymen Easdale, Wildlife Biologist
Gerald Queen, Geologist
Buddy Green, Assistant Field Manager, Resources
Paul Beels, Associate Field Manager, Minerals & Lands
Chris E. Hanson, Field Manager

Interdisciplinary Team Lead: Amy Shepperson