FINDING OF NO SIGNIFICANT IMPACT & DECISION RECORD
FOR
Devon Energy Production Company L.P.
Harrier Plan of Development
Juniper Draw Unit
ENVIRONMENTAL ASSESSMENT –WY-070-EA08-189

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize Devon's Harrier Coal Bed Natural Gas (CBNG) POD comprised of the following 22 Applications for Permit to Drill (APDs):

	Well Name	Well #	QTR	SEC	TWP	RNG	Lease
1	HARRIER JDFU	12G-298	SWNW	2	49N	78W	WYW141662
2	HARRIER JDFU	12M-298	SWNW	2	49N	78W	WYW141662
3	HARRIER JDFU	21G-298	NENW	2	49N	78W	WYW141662
4	HARRIER JDFU	21M-298	NENW	2	49N	78W	WYW141662
5	HARRIER JDFU	32G-298	SWNE	2	49N	78W	WYW137652
6	HARRIER JDFU	32M-298	SWNE	2	49N	78W	WYW137652
7	HARRIER JDFU	*42G-298	SENE	2	49N	78W	WYW137652
8	HARRIER JDFU	*42M-298	SENE	2	49N	78W	WYW137652
9	HARRIER JDFU	12G-398	SWNW	3	49N	78W	WYW143569
10	HARRIER JDFU	12M-398	SWNW	3	49N	78W	WYW143569
11	HARRIER JDFU	21G-398	NENW	3	49N	78W	WYW143569
12	HARRIER JDFU	21M-398	NENW	3	49N	78W	WYW143569
13	HARRIER JDFU	23G-398	NESW	3	49N	78W	WYW145628
14	HARRIER JDFU	23M-398	NESW	3	49N	78W	WYW145628
15	HARRIER JDFU	32G-398	SWNE	3	49N	78W	WYW144229
16	HARRIER JDFU	32M-398	SWNE	3	49N	78W	WYW144229
17	HARRIER JDFU	34G-398	SWSE	3	49N	78W	WYW143569
18	HARRIER JDFU	34M-398	SWSE	3	49N	78W	WYW143569
19	HARRIER JDFU	41G-398	NENE	3	49N	78W	WYW144229
20	HARRIER JDFU	41M-398	NENE	3	49N	78W	WYW144229
21	HARRIER JDFU	43G-398	NESE	3	49N	78W	WYW143569
22	HARRIER JDFU	43M-398	NESE	3	49N	78W	WYW143569

* The following wells will not be approved until 10/26/08 in accordance with 43 CFR 3162.3-1 (d), which require a 30 day public posting: 42G-298 and 42M-298.

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
Devon Energy Production Company L.P.
Harrier Plan of Development
Juniper Draw Unit
ENVIRONMENTAL ASSESSMENT –WY-070-EA08-189

INTRODUCTION

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

1. PURPOSE AND NEED

The purpose for the proposal is to produce coal bed natural gas (CBNG) on 5 federal oil and gas mineral leases issued to the applicant by the BLM.

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

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

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Alternative A - No Action

A No Action Alternative was considered in the PRB FEIS, Volume 1, pages 2-54 through 2-62. This alternative would consist of no new federal wells. An oil and gas lease grants the lessee the "right and privilege to drill for, mine, extract, remove, and dispose of all oil and gas deposits" in the lease lands, "subject to the terms and conditions incorporated in the lease." Thus, under this alternative, the operator's proposal would be denied.

2.2. Alternative B Proposed Action

Proposed Action Title/Type: Devon's Harrier Plan of Development (POD) for 22 coal bed natural gas well APD`s and associated infrastructure.

Proposed Well Information: There are 22 wells proposed within this POD, the wells are vertical bores proposed on an 80 acre spacing pattern with 2 wells per location. Each well will be capable of producing from the 3 targeted coal seams. Proposed well house dimensions are 4 ft wide x 4 ft length x 4 ft height. Well house color is Carlsbad Canyon, selected to blend with the surrounding vegetation. Wells are located as follows:

	Well Name	Well #	QTR	SEC	TWP	RNG	Lease
1	HARRIER JDFU	12G-298	SWNW	2	49N	78W	WYW141662
2	HARRIER JDFU	12M-298	SWNW	2	49N	78W	WYW141662
3	HARRIER JDFU	21G-298	NENW	2	49N	78W	WYW141662
4	HARRIER JDFU	21M-298	NENW	2	49N	78W	WYW141662
5	HARRIER JDFU	32G-298	SWNE	2	49N	78W	WYW137652
6	HARRIER JDFU	32M-298	SWNE	2	49N	78W	WYW137652
7	HARRIER JDFU	42G-298	SENE	2	49N	78W	WYW137652
8	HARRIER JDFU	42M-298	SENE	2	49N	78W	WYW137652
9	HARRIER JDFU	12G-398	SWNW	3	49N	78W	WYW143569
10	HARRIER JDFU	12M-398	SWNW	3	49N	78W	WYW143569
11	HARRIER JDFU	21G-398	NENW	3	49N	78W	WYW143569
12	HARRIER JDFU	21M-398	NENW	3	49N	78W	WYW143569
13	HARRIER JDFU	23G-398	NESW	3	49N	78W	WYW145628
14	HARRIER JDFU	23M-398	NESW	3	49N	78W	WYW145628
15	HARRIER JDFU	32G-398	SWNE	3	49N	78W	WYW144229
16	HARRIER JDFU	32M-398	SWNE	3	49N	78W	WYW144229
17	HARRIER JDFU	34G-398	SWSE	3	49N	78W	WYW143569
18	HARRIER JDFU	34M-398	SWSE	3	49N	78W	WYW143569
19	HARRIER JDFU	41G-398	NENE	3	49N	78W	WYW144229
20	HARRIER JDFU	41M-398	NENE	3	49N	78W	WYW144229
21	HARRIER JDFU	43G-398	NESE	3	49N	78W	WYW143569
22	HARRIER JDFU	43M-398	NESE	3	49N	78W	WYW143569

County: Johnson

Applicant: Devon Energy Production Company L.P.

Surface Owners: Tear Drop Cattle Company, John Christian, Bureau of Land Management

Project Description:
The proposed action involves the following:

- Drilling of 22 total federal CBM wells to the Upper Big George, Middle Big George and Lower Big George coal zones to depths of approximately 1200 feet, 1300 feet, and 1500 feet, respectively. Each well will be capable of producing from all three coal seams, with two wells at each location.

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

- Well metering shall be accomplished by telemetry and well visitation. Metering would entail 20 visits per month to each well.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: The water produced from this action will be added to existing, previously analyzed infrastructure which includes 18 existing discharge points to 19 existing impoundments and 1existing EMIT produced water treatment facility (under EMIT's WYPDES permit(# WY0051934) within the Upper Powder River watershed. Existing infrastructure and impoundments are from the approved Kestrel and Juniper Draw PODs. The original Harrier plan, submitted 03-12-08, included subsurface drip irrigation along the Powder River. However, this alternative was withdrawn prior to the Operator Initial Meeting (OIM) due to potential conflicts with cultural issues.

- 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 right-of-way application or sundry 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 13 power drops.

  A storage tank of 1000 gallon capacity shall be located with each diesel generator. Generators are projected to be in operation for 1 to 1 ½ years. Fuel deliveries are anticipated to be 2 times per month. Decibel ratings on the commonly used generators will be consulted prior to generator installments. Any generator exceeding stated COA decibel levels will have noise dampeners installed, enclosed with in a generator building or sound attenuated models will be used.

- A buried gas, water and power line network.

For a detailed description of design features, construction practices and water management strategies associated with the proposed action, refer to the Master Surface Use Plan (MSUP), Drilling Plan and WMP in the POD and individual APDs. Also see the subject POD and/or APDs for maps showing the proposed well locations and associated facilities described above. More information on CBNG well drilling, production and standard practices is also available in the PRB FEIS, Volume 1, pages 2-9 through 2-40 (January 2003).

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

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

1. Comply with all applicable Federal, State and Local laws and regulations.
2. Obtain the necessary permits for the drilling, completion and production of these wells including water rights appropriations, the installation of water management facilities, water discharge permits, and relevant air quality permits.
3. Offer water well agreements to the owners of record for permitted water wells within ½ mile of a federal CBNG producing well in the POD
4. Provide water analysis from a designated reference well in each coal zone.
5. 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 Harrier POD are listed below under 2.3.1:

2.3.1. Changes as a result of the on-sites

Well # (twin locations)	QTR/QTR	Sec.	T	R	On-site Notes
12G/M-298*	SWNW	2	49N	78W	operator requested location move. new location: no pad, access North to 41-398 location rerouted to stay off of knife ridge with highly erosive soils, required engineered, new route template design, better soils
21G/M-298	NENW	2	49N	78W	location moved: proximity to a raptor nest. new location, no pad, will now be a twin well location. Access to North removed, all access will come from the South.
32G/M-298	SWNE	2	49N	78W	access rerouted: new route better soils, better reclamation potential
41G/M-298	NENE	2	49N	78W	location/access moved rerouted: 3 resource concerns; Archeology: visual resource management issue with historic site, Wildlife: proximity to Golden Eagle nest, >25% slopes, highly erosive soils
12G/M-398	SWNW	3	49N	78W	operator requested location move to resolve previous protest issue, engineered pad, access reroute: template
21G/M-398	NENW	3	49N	78W	location moved to avoid sage grouse habitat
23G/M-398	NESW	3	49N	78W	location moved, decrease cut/fill of engineered pad, access rerouted, new route less disturbance, stay off steep side slopes with highly erosive soils, new access and location shallower slopes with better soils

Well # (twin locations)	QTR/QTR	Sec.	T	R	On-site Notes
34G/M-398	SWSE	3	49N	78W	location moved, decrease cut/fill of engineered pad, access rerouted, new route less disturbance slopes 10%, better soils, engineered pad
41G/M-398	NENE	3	49N	78W	access to South to 12-298 rerouted to stay off knife ridge with highly erosive soils, access to North removed, all access will come from the South

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. Surface Water

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

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

2.3.2.2. Wetland/Riparian

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

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

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

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

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

complete.

2.3.2.3. Wildlife

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

2.3.2.4. Threatened, Endangered, or Sensitive Species

2.3.2.4.1. Mountain Plover

1. A mountain plover nesting survey shall be conducted following U.S. Fish and Wildlife Service protocol within occupied black-tailed prairie dog colonies prior to permit authorization.

   Outside of occupied black-tailed prairie dog colonies, a mountain plover nesting survey following U.S. Fish and Wildlife Service protocol is encouraged prior to construction initiation, as project modifications can be made if necessary to protect nesting plovers and natural gas production. If requested in writing, then authorization may be granted for construction activities to occur between August 1 and March 15, outside the mountain plover breeding season. A mountain plover nesting survey following U.S. Fish and Wildlife Service protocol shall be conducted during the first available survey period (May 1 – June 15). Additional measures such as monitoring and activity restrictions may be applied if mountain plovers are documented.

2. A disturbance-free buffer zone of 0.25 mile will be established around all occupied mountain plover nesting habitat between March 15 and July 31.

3. 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.

4. Construction of ancillary facilities (for example, compressor stations, 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.

5. 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.

6. 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.

7. 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.

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

2.3.3. Site specific mitigation measures

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

General

1. Please contact Eric Holborn – Natural Resource Specialist, @ (307) 684-1044, Bureau of Land Management, Buffalo, if there are any questions concerning surface use COAs.

Surface Use

1. Engineered road locations will be evaluated at the pre-construct meeting. If field adjustments are identified that require new engineered drawings, new drawings will be submitted prior to beginning of construction.

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 w**h**ich simulates "Standard Environmental Colors." The color selected for the Harrier POD is Carlsbad Canyon, (Munsell Soil Color 2.5Y 6/2).

3. To address frozen pit fluids that hinder interim reclamation it will be required:

   Wells drilled from October 31-March 31, at the completion of drilling operations, pit fluids will be vacuumed out.

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

   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.

5. 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 different specific mix desired by the surface owner, use the following:

Shallow Loamy Ecological Site Seed Mix		
Species	**% in Mix**	**Lbs PLS***
Thickspike Wheatgrass (Elymus lanceolatus ssp. lanceolatus)	50	6.0
Bluebunch wheatgrass (Pseudoroegneria spicata ssp. Spicata)	35	4.2
Prairie coneflower (Ratibida columnifera)	5	0.6
White or purple prairie clover (Dalea candidum, purpureum)	5	0.6
Rocky Mountain beeplant (Cleome serrulata)	5	0.6
Totals	**100%**	**12 lbs/acre**

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 operator is responsible for having the licensed professional engineer certify that the actual construction of the road meets the design criteria and is constructed to Bureau standards.

Wildlife

Burrowing Owls

1. The following conditions will alleviate impacts to burrowing owls:
   A burrowing owl survey will be required in suitable burrowing owl habitat (i.e. active and inactive prairie dog colonies) between April 15 and June 15. If a burrowing owl nest if identified, a 0.25 mile buffer will be applied to the nest and no surface disturbing activity shall occur within 0.25 miles of all identified prairie dog colonies from April 15 to August 31, annually, prior to a burrowing owl nest occupancy survey for the current breeding season. This condition will be implemented on an annual basis for the duration of surface disturbing activities within the prairie dog town(s). This timing limitation will then be in effect, annually, unless surveys determine the nest(s) to be inactive.

Mountain Plover

1. The following conditions will alleviate impacts to mountain plovers:
   a. No surface disturbing activities are permitted in the prairie dog colonies listed in Table 5 of this EA, from March 15-July 31, unless a mountain plover nesting survey has been conducted during the current breeding season. This timing limitation will be in effect unless surveys determine no plovers are present. This timing limitation will affect the following

Township/Range	Section	Wells and Infrastructure
49/78	3	Wells: 34G/M-398; 43G/M-398; the proposed template road in the SE of section 3

b. Mountain plover nesting surveys shall be conducted by a biologist following the most current USFWS Mountain Plover Survey Guidelines (the survey period is May 1-June 15). All survey results must be submitted in writing to the BFO and approved prior to initiation of surface disturbing activities.
c. If occupied mountain plover habitat is identified, then a seasonal disturbance-free buffer of ¼ mile shall be maintained between March 15 and July 31. If no mountain plover observations are identified, then surface disturbing activities may be permitted within suitable habitat until the following breeding season (March 15).

Raptors

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

Township/Range	Section	Wells and Infrastructure
49/78	02	Well: 42G/M-298; 32G/M-298; 21G/M-298; 12G/M-298
49/78	03	Wells: 41G/M-398; 34G/M-398; 23G/M-398; 32G/M-398

   b. Surveys to document nest occupancy shall be conducted by a biologist following BLM protocol, between April 15 and June 30. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities. Surveys outside this window may not depict nesting activity. If a survey identifies active raptor nests, a 0.5 mile timing buffer will be implemented. The timing buffer restricts surface disturbing activities within 0.5 mile of occupied raptor nests from February 1 to July 31.
   c. Nest productivity checks shall be completed for the first five years following project completion. The productivity checks shall be conducted no earlier than June 1 or later than June 30 and any evidence of nesting success or production shall be recorded. Survey results will be submitted to a Buffalo BLM biologist in writing no later than July 31 of each survey year. This applies to the nests listed in Table 4 of this EA.

Sage Grouse

1. The following conditions will alleviate impacts to sage-grouse:
   a. No surface disturbing activities are permitted within 2 miles of sage grouse lek(s) between March 1 and June 15, prior to completion of a greater sage grouse lek survey**.** This condition will be implemented on an annual basis for the duration of surface disturbing activities. This timing limitation will affect the **ENTIRE** project area ***except*** the following wells: 21G/M-298, 32G/M-298, 42G/M-298.
      i. If an active lek is identified during the survey, the 2 mile timing restriction (March 1-June 15) will be applied and surface disturbing activities will not be permitted until after the nesting season. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the 2 mile buffer until the following breeding season (March 1). The required sage grouse survey will be conducted by a biologist following the most current WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.
   b. Well metering, maintenance and other site visits within 2.0 miles of documented sage grouse lek sites should be minimized as much as possible during the breeding season (March 1– June 15).

2.4. Alternatives considered but not analyzed in detail

Construction of additional impoundments was considered but eliminated due to steep topography, erosive soils, and limited storage capacity.

The original Harrier plan, submitted 03-12-08, included subsurface drip irrigation along the Powder River. However, this alternative was withdrawn prior to the Operator Initial Meeting (OIM) due to potential conflicts with cultural issues.

2.5. Summary of Alternatives

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

Table 2.5 Summary of the Alternatives

Facility	Alternative A (No Action) Existing Number or Miles	Alternative B (Original Proposal) Proposed Number or Miles	Alternative C (Environmental Alt.) Revised Number or Miles
Total CBNG Wells	1 shut-in	21	22
Well Locations			
Nonconstructed		6	2
Constructed		5	9
Slotted			
Conventional Wells	0	0	0
Gather/Metering Facilities	0	0	0
Compressors	0	0	0
Ancillary (Staging/Storage Areas)	0	0	0
Template/Spot Upgrade Roads	0		
No Corridor		.3	.4
With Corridor		1.4	1.4
Engineered Roads	0		
No Corridor		1	0
With Corridor		1	1.5
Primitive Roads	0		
No Corridor		0	0
With Corridor		.06	.4
Buried Utilities	0		
No Corridor		.9	0
With Corridor		2.5	3.3
Overhead Powerlines	0	1.1	.8
Communication Sites	0	0	0
Monitor Wells	0	0	0
LAD	0	0	0

Facility	Alternative A (No Action) Existing Number or Miles	Alternative B (Original Proposal) Proposed Number or Miles	Alternative C (Environmental Alt.) Revised Number or Miles
SDI	0	0	0
Treatment Facilities	0	0	0
Impoundments (Outside POD Boundary) On-channel Off-channel	19	0	0
Water Discharge Points (Outside POD Boundary)	18	0	0
Channel Disturbance Headcut Mitigation Channel Modification			
TOTAL ACRES DISTURBANCE	**0**	**38.6**	**24.7**

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on March 12, 2008 Field inspections of the proposed Harrier CBNG project were conducted on August 12, 2008 by;

NAME	TITLE	AGENCY
Eric Holborn	Natural Resource Specialist	BLM
Chris Durham	Wildlife Biologist	BLM
Don Brewer	Wildlife Biologist	BLM
Wendy Sutton	Archeologist	BLM
Mike McKinley	Hydrologist	BLM
Ted Hammersma	Civil Engineer Technician	BLM
Rick Taylor	Construction Foremen	Devon Energy
Doug Wentworth	Drilling Supervisor	Devon Energy
Randy Maxey	Regulatory Advisor (Project Manager)	Devon Energy
Nathan Kuhnert	Regulatory Specialist (Hydrologist)	Devon Energy
Steve Mooney	Production Foremen	Devon Energy
Ron Hays	Petroleum Engineer	Devon Energy
Kim Walker	Petroleum Engineer Technician	Devon Energy
Carol Chadwick	Civil Engineer	Chadwick Engineering
Peter Angelos	Surveyor	LSI

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	Chris Durham
Floodplains		x		Eric Holborn
Wilderness Values			x	Eric Holborn
ACECs			x	Eric Holborn
Water Resources	x			Mike McKinley
Air Quality	x			Eric Holborn
Cultural or Historical Values		x		Wendy Sutton
Prime or Unique Farmlands			x	Eric Holborn
Wild & Scenic Rivers			x	Eric Holborn
Wetland/Riparian		x		Eric Holborn
Native American Religious Concerns			x	Wendy Sutton
Hazardous Wastes or Solids		x		Eric Holborn
Invasive, Nonnative Species	x			Eric Holborn
Environmental Justice		x		Eric Holborn

3.1. Topographic Characteristics of Project Area

The Harrier Plan of Development area is located in far eastern Johnson County, Wyoming, immediately north and east of Interstate- 90's Indian Creek exit. The development area is located within the Dry Creek watershed, which is a tributary to the Upper Powder River. The area is semi-badland country with many erosional features (buttes, badlands, break valleys, and canyons) and sparse vegetation. The elevation changes and presence of woody species provide a windbreak effect while also capturing additional moisture; vegetation from semi-desert to woodland, are supported.

This is an area of extensive existing CBNG development, as well as some existing conventional oil and gas production. Most of the roads which will be used for access to the proposed wells were constructed or improved to accommodate the current Fee or State of Wyoming minerals production and/or existing cattle operations.

3.2. Vegetation & Soils

General vegetation communities within the project area consist of sagebrush/grassland. Wyoming big sagebrush intermixed with various native bunch grasses dominates the vegetative composition of the project area. Grass species consist of needle and thread, western wheatgrass, cheatgrass, threadleaf sedge, little bluestem, and buffalo grass. Broom snakeweed, rubber rabbitbrush, and prickly pear are found interspersed throughout the area. Juniper trees were observed along incised draws, cottonwood trees and willows were observed in draw bottoms and along the Powder River flood plain. Differences in dominant species within the project area vary with soil type, aspect, and topography.

Soils within the project area were identified from the *North Johnson County Survey Area, Wyoming (WY719).* 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 soils and landforms of this area present distinct challenges for reclamation. According to Soil Survey Geographical Data (SSURGO) soils within the POD boundary, are shown to have soil mapping units identified as being vulnerable to degradation (having a low reclamation potential) due to steep slopes and/or highly erosive soils. Soils differ with topographic location, slope and elevation. Topsoil depths to be salvaged for reclamation range from 2 to 4 inches on ridges to 8 inches in bottomland. Erosion

potential varies from moderate to severe depending on the soil type, vegetative cover and slope. Reclamation potential of soils also varies throughout the project area. Areas with limited reclamation capability and/or highly erosive soils were identified by BLM specialists and the operator during the pre-approval onsite inspection.

The main soil limitations in the project area include: depth to bedrock, low organic matter content, soil droughtiness, low water holding capacity, and high erosion potential especially in areas of steep slopes.

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

Map Units and Ecological Sites

Map Unit	Ecological Site
639	LOAMY (10-14NP)
684	SHALLOW CLAYEY (10-14NP)
707	LOAMY (10-14NP)
708	LOAMY (10-14NP)
709	LOAMY (10-14NP)
718	SANDY (10-14NP)

Dominant Ecological Sites and Plant Communities, identified in the POD area, by dominant soil series are: ***Shallow Clayey and Loamy 10-14" precipitation zone Northern Plains.***

The *shallow clayey sites* occur on slopes and ridge tops on landforms which include hill sides, ridges and escarpments in the 10-14"precipitation zone. The soils of this site are shallow (less than 20" to bedrock) well drained soils that formed in alluvium or residuum derived from unspecified shale. These soils have moderate to slow permeability and may occur on all slopes. The bedrock is clay shale which is virtually impenetrable to plant roots. The main soil limitations include depth to bedrock and clay content.

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

The present plant community, for the project area, for both identified ecological sites, is defined as; Mixed Sagebrush/Grass. Big sagebrush is a significant component of this plant community. Cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Dominant grasses include rhizomatous wheatgrasses, and green needlegrass. Forbs, commonly found in this plant community, include Louisiana sagewort (cudweed), plains wallflower, hairy goldaster, slimflower scurfpea, and scarlet globemallow. Plains pricklypear and winterfat can also occur. Cheatgrass (downy brome) has invaded the project area.

3.2.1. Wetlands/Riparian

Riparian areas within the Harrier project area can be found along unnamed tributaries and portions of Dry Creek, due to discharge from flow-through reservoirs. Also along the banks of the Powder River riparian environment exists primarily due to natural flow. The existing reservoirs (approved Kestrel POD)

in the Indian Creek drainage are generally full-containment, however there is a potential for water to resurface downstream of on-channel impoundment creating a wetland environment.

3.2.2. Invasive Species

A search of inventory databases on the Wyoming Energy Resource Information Clearinghouse (WERIC) web site (www.weric.info) showed no state-listed noxious weeds and/or weed species of concern. The WERIC database was created cooperatively by the University of Wyoming, BLM and county Weed and Pest offices.

The operator has documented (see Weed Management Plan in the Harrier POD) the following State of Wyoming and Johnson County, noxious weeds in the project area: Scotch thistle, Canada thistle, field bind weed, skeleton leaf bursage, Russian knapweed, spotted knapweed, diffuse knapweed, and black henbane (species of concern).

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 ICF Jones and Stokes (Formerly: *Thunderbird Wildlife Consulting & Thunderbird Jones & Stokes*) (Brown & Vetter 2003, 2004, 2005, 2006, 2007, 2008). ICF Jones and Stokes performed surveys for bald eagles, mountain plover, sharp-tailed grouse, greater sage-grouse, raptor nests, and prairie dog colonies according to Powder River Basin Interagency Working Group (PRBIWG) accepted protocol in 2003, 2004, 2005, 2006, 2007, and 2008. Surveys were conducted for Ute ladies'-tresses orchid habitat during ground visits in 2003. No formal surveys were conducted for the orchid. PRB IWG accepted protocol is available on the CBM Clearinghouse website (www.cbmclearinghouse.info).

A BLM biologist conducted field visits on August 12, 2008. During this time, the biologist reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project modification recommendations where wildlife issues arose.

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

3.3.1. Big Game

Big game species expected to be within the Harrier project area include pronghorn antelope and mule deer. Small groups of antelope were observed each day of the BLM onsite visits. The WGFD has determined that the project area contains yearlong range for pronghorn antelope and winter-yearlong range for mule deer.

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. **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. Populations of

pronghorn antelope and mule deer within their respective hunt areas are above WGFD objectives. 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 Dry Creek, an ephemeral tributary of the Powder River. Fish that have been identified in the Powder River watershed are listed in the PRB FEIS (3-156-159).

Amphibian and reptile species occur throughout the Basin, but there is little recorded baseline information available about them. Confluence Consulting, Inc. identified the following species present within the Clear Creek and Powder River watersheds: Woodhouse's toad, Northern leopard frog, gopher snake, and garter snake (2004). Because sampling at the upper two sites on Clear Creek occurred late in the season, seasonality may have influenced the lack of reptiles and amphibians observed at these sites.

3.3.3. Migratory Birds

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

3.3.4. Raptors

Raptor species expected to occur in suitable habitats within the Powder River Basin 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, Cooper's hawk, northern goshawk, long-eared owl, and burrowing owl. Most raptor species nest in a variety of habitats including but not limited to; native and non-native grasslands, agricultural lands, live and dead trees, cliff faces, rock outcrops, and tree cavities.

Fifteen raptor nest sites were identified by ICF Jones & Stokes (2008) and BLM within 0.5 mile of the project area. Of these, 4 nests were active in 2008.

Table 3.3. Documented raptor nests within the Harrier project area.

BLM ID	UTMs	Legal	Sub-strate[1]	Year	Con-dition	Status[2]	Species[3]
				2008	Fair	INAC	
				2008	Good	INAC	
				2007	Good	INAC	
1274	400469E 4900921N	S4 T49NR78W	CTL	2006	Good	ACTI	GRHO
				2008		DNLO	
				2008	Poor	INAC	
				2008	Unknown	INAC	
				2007	Fair	INAC	
				2006	Fair	INAC	
2727	406567E 4899014N	S7 T49NR77W	PON	2005	Remnants	INAC	
				2008	Good	ACTI	GOEA
				2008	Gone	INAC	
2730	409009E 4898142N	S8 T49NR77W	CTL	2007	Good	ACTI	GOEA

BLM ID	UTMs	Legal	Sub-strate[1]	Year	Con-dition	Status[2]	Species[3]
				2006	Good	INAC	
				2005	Good	ACTI	GOEA
				2008	Poor	INAC	
				2008	Unknown	UNK	
				2007	Fair	INAC	
				2007	Unknown	UNK	
				2006	Poor	INAC	
2731	409329E 4898664N	S9 T49NR77W	CTL	2005	Fair	INAC	
				2008	Good	ACTI	GOEA
				2008	Excellent	ACTI	GOEA
4380	404188E 4900339N	S2 T49NR78W	PON	2007	Good	INAC	
4819	401601E 4899555N	S3 T49NR78W	CTL	2008	Good	ACTI	RETA
				2008	Good	INAC	
4820	401698E 4899450N	S3 T49NR78W	JUN	2008	Poor	INAC	
				2008	Good	INAC	
4821	401770E 4899437N	S3 T49NR78W	JUN	2008	Poor	ACTI	LOOW
4822	402777E 4899015N	S11 T49NR78W	GHS	2008	Gone	INAC	
				2008	Unknown	INAC	
				2008	Fair	INAC	
5019	402575E 4901168N	S34 T50NR78W	CKB	2007	Unknown	INAC	
				2008	Good	INAC	
				2008	Fair	INAC	
5020	402708E 4900955N	S2 T49NR78W	JUN	2007	Good	INAC	
				2008	Good	ACTI	LOOW
				2008	Poor	INAC	
5021	402912E 4900994N	S2 T49NR78W	JUN	2007	Good	INAC	
				2008	Fair	INAC	
5022	408447E 4899003N	S8 T49NR77W	CTL	2008	Poor	INAC	
				2008	Poor	INAC	
				2008	Unknown	UNK	
5153	408459E 4899058N	S8 T49NR77W	CTL	2007	Fair	INAC	
5915	403487E 4901670N	S35 T50NR78W	CTL	2008	Good	ACTI	RETA

Notes:
1 CKB = Creekbank; CTL = Cottonwood Live; GHS = Ground/Hillside; JUN = Juniper; PON = Ponderosa Pine
2 ACTI = Active; DNLO = Did not locate; INAC = Incative; UNK = Unknown
3 GOEA = Golden eagle; GRHO = Great-horned owl; LOOW = Long-eared owl; RETA = Red-tailed hawk

3.3.5. Threatened and Endangered and Sensitive Species

3.3.5.1. Threatened and Endangered Species

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

3.3.5.1.1. Black-footed ferret

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

This nocturnal predator is closely associated with prairie dogs, depending almost entirely upon them for its food. The ferret also uses old prairie dog burrows for dens. Current science indicates that a black-footed ferret population requires at least 1000 acres, separated by no more than 1.5 km, 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).

One new black-tailed prairie dog colony was identified during site visits by IFC Jones & Stokes within the project area in 2007(See Table 5). This colony is isolated from neighboring colonies by greater than 1.5km. One black-tailed prairie dog colony is located within .5 miles of the Harrier POD boundary. The project area is located approximately 9.6 miles west of the Pleasantdale complex, the nearest potential reintroduction area. Black-footed ferret habitat is not present within the Harrier project area.

Table 3.4. Black-tailed prairie dog colonies within and surrounding the Harrier project area.

Legal Location	Size (Acres)
NESE S03, T49N:R78W	1.5
CW S35, T50N:R78W	4.3
Total	**5.8**

3.3.5.1.2. Ute Ladies'-Tresses Orchid

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

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

There are no perennial water-ways within the project area and upland vegetation dominates any defined

channel within the ephemeral draws, including Dry Creek. Soils within the ephemeral drainages are generally characterized as clayey and alkaline (Brown 2008). Suitable orchid habitat is not present within the Harrier project area.

3.3.5.2. Sensitive Species

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

3.3.5.2.1. Prairie dog colony obligates

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

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

3.3.5.2.2. Sagebrush obligates

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

3.3.5.2.3. Bald eagle

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

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

Suitable bald eagle nesting and winter roost habitats have not been identified within the project area, and there are no documented winter roosts or nests within one-mile of the Harrier POD project area.

3.3.5.2.4. Black-tailed prairie dog

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

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

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

One black-tailed prairie dog colony, totaling approximately 1.5 acres was identified during site visits by ICF Jones & Stokes within the project area (See table 5).

3.3.5.2.1. Burrowing owl

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

The western burrowing owl has declined significantly throughout its North American range. Current population estimates for the United States are not well known but trend data suggest significant declines (McDonald et al. 2004). The last official population estimate placed them at less than 10,000 breeding pairs. The majority of the states within the owl's range have recognized that western burrowing owl populations are declining. It is listed as a sensitive species by the BLM throughout the west and by the USDAFS. Primary threats across the North American range of the burrowing owl are habitat loss and fragmentation primarily due to intensive agricultural and urban development, and habitat degradation due

to declines in populations of colonial burrowing mammals (Klute et al. 2003).

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

The BLM BFO databases and the survey information provided by ICF Jones & Stokes indicate no burrowing owl nests within the project area or within 0.25 mile of the Harrier project area in 2008. ICF Jones & Stokes have not observed any burrowing owls during their wildlife surveys. Suitable habitat is extremely limited as there is only one 1.5 acre prairie dog colony within the project area, discovered in 2007.

3.3.5.2.2. Grouse

3.3.5.2.2.1. Greater sage-grouse

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

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

Suitable sage-grouse habitat is present throughout the project area. The project area is dominated by a sagebrush / grassland habitat type. The sagebrush cover type varies from sparse to dense. Approximately 100 percent of the project area meets seasonal habitat requirements and are large enough to meet the landscape scale requirements of the bird (BLM 2008).

BLM records identified 4 sage-grouse leks within 4 miles of the project area. The 4-mile distance was recommended by the State wildlife agencies' ad hoc committee for consideration of oil and gas development effects to nesting habitat (WGFD 2008). These 4 lek sites are identified below (Table 6). Models indicate that the extreme southwestern portion of the project area is within an area of highsage-grouse population density associated lek complexes to the north, south and west of the Harrier POD. (WGFD 2008).

Table 3.5. Sage-grouse leks surrounding the Harrier project area.

LEK NAME	LEGAL LOCATION	OCCUPANCY STATUS	DISTANCE FROM PROJECT FACILITIES (MILES)

LEK NAME	LEGAL LOCATION	OCCUPANCY STATUS	DISTANCE FROM PROJECT FACILITIES (MILES)
Bear Draw	SWSE Sec. 16 T50N, R78W	Occupied	3.2
41-BLM	SE Sec. 36 T50N, R79W	Occupied	3.4
Tear Drop	NESE Sec. 33 T50N, R78W	Occupied	0.8
Tear Drop II	SENW Sec. 32 T50N, R78W	Occupied	1.5

3.3.5.2.2.2. Sharp-tailed grouse

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

The Harrier project area has the potential to support sharp-tailed grouse during most of the year. The mosaic of grasslands and sagebrush-grasslands could provide habitat from April through October. Cottonwoods and junipers could provide buds and berries, respectively, to sustain grouse through the winter. No sharp-tailed grouse leks are documented within or surrounding the project area.

3.3.5.2.3. Mountain plover

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

Suitable mountain plover habitat may be present in the prairie dog colony in NESE Section 3, T49N:R78W. This colony was not discovered until 2007, and is thought to be only recently occupied.

3.3.5.2.4. Swift Fox

The swift fox is native to the grassland prairies of North America. The original range of the species was influenced primarily by the extent of the shortgrass prairie and midgrass prairie ecosystems. The swift fox range primarily follows the distribution of the black-tailed prairie dog. Swift fox populations have been reduced to about 40 percent of their former range. The swift fox was removed from the Federal list of candidate species in January 2001 due to the implementation of the Swift Fox Conservation Plan. It remains a BLM sensitive species and as such, recommendations for mitigation contained within the Swift Fox Conservation Plan will be applied to the project in order to uphold the direction set forth in the BLM Manual 6840.

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

Suitable swift fox habitat may exist in the project area in or adjacent to the recently documented prairie dog colony in NESE Section 3, T49N:R78W. For prairie dog colony locations, refer to the prairie dog

section of this document. No dens were identified within 0.5 mile of the project area by ICF Jones & Stokes.

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 3.6 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. For a detailed description of the project area see section 3.1 of this document.

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 PRB FEIS 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 PRB FEIS. 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 6 registered stock, domestic or miscellaneous water wells within ½ mile of a federal CBNG producing well in the POD with depths ranging from 40 to 2,500 feet. For additional information on water, please refer to the PRB FEIS (January 2003), Chapter 3, Affected Environment pages 3-1 through 3-36 (groundwater).

3.5.2. Surface Water

The project area is within the Dry Creek drainage which is tributary to the Upper Powder River watershed. Most of the drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt) to intermittent (flowing only at certain times of the year when it receives water from alluvial groundwater, springs, or other surface source – PRB FEIS Chapter 9 Glossary). The channels are primarily well vegetated grassy swales, without defined bed and bank.

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 1,797 at Maximum monthly flow to 3,400 at Low monthly flow and the SAR ranges from 4.76 at Maximum monthly flow to 7.83 at Low monthly flow. These values were determined at the USGS station located at Arvada, WY (PRB FEIS page 3-49).

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

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

3.6. Cultural Resources

Class III cultural resource inventories were conducted for the Juniper Draw Harrier POD project, following the Secretary of the Interior's Guidelines and Standards. A Class III inventory specifically for the project was conducted by Greer Services (BLM project no. 70070074). The inventory covered

approximately 840 acres; this inventory recorded, rerecorded, or revisited 3 sites and 7 isolates. Sites and isolates are defined as specified by the *2006 State Protocol Between the Wyoming Bureau of Land Management State Director and the Wyoming State Historic Preservation Officer*. Additional Class III inventories within the project area were also consulted during the review of the proposed action (BLM project nos. 70050085, 70070071, 70070127, and 70070137). The following cultural resources are located in or near the APE (area of potential effect).

Table 3.5 Cultural Resources Inventory Results

Site Number	Site Type	National Register Eligibility
48JO1267	Site	E
48JO3693	Site	NE
48JO3694	Site	E
48IR1	Isolate	NE
48IR2	Isolate	NE
48IR3	Isolate	NE
48IR4	Isolate	NE
48IR5	Isolate	NE
48IR7	Isolate	NE

Two wells (41-298 M & G) and associated infrastructure were initially proposed near eligible site, 48JO1267. Site 48JO1267 had previously been recommended as eligible to the NRHP with "setting" considered a contributing aspect of integrity. In part to avoid adverse visual impacts to this site, the wells and infrastructure were redesigned (moved) during the onsite on 8/12/2008, such that they fall outside of the view shed of site 48JO1267. It was also noted during the onsite that site 48JO3694 (recommended as eligible to the NRHP) could be an attractive location for construction crews to congregate or explore. For this reason, existing requirements that crews restrict their activities to approved well pad and infrastructure location will be emphasized during pre-construction meetings.

3.7. Air Qual**ity**

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

Existing air pollutant emission sources within the region include following:

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

- Dust (particulate matter) from coal mines;
- NOx, particulate matter, and other emissions from diesel trains and,
- SO2 and NOx from power plants.

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

4. ENVIRONMENTAL CONSEQUENCES

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

4.1. Vegetation & Soils Direct and Indirect Effects

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the 11 proposed well locations (two wells per location), 2 can be drilled without a well pad being constructed and 9 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the 2 locations without constructed pads would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (estimated approximate size of 15 x 50 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 2 locations would involve approximately 0.9 acre/well for 1.8 total acres. The other 9 locations requiring cut & fill pad construction would disturb approximately 0.7 acres/location for a total of 5.6 acres. The total estimated disturbance for all 11 locations would be 7.4 acres.

Approximately 3.4 miles of improved roads would be constructed to provide access to various well locations. Approximately 0.4 miles of new primitive road 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. Expedient reclamation of disturbed land with stockpiled topsoil, proper seedbed preparation techniques, and appropriate seed mixes, along with utilization of erosion control measures (e.g., waterbars, water wings, culverts, rip-rap, gabions etc.) would ensure land productivity/stability is regained and maximized.

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

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

Table 4.1 summarizes the proposed surface disturbance.

Table 4.1 - SUMMARY OF DISTURBANCE

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Nonconstructed Pad	2	0.9ac/location	1.8	Short term

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Constructed Pad	9	0.7ac/location	6.3	Long Term
Gather/Metering Facilities	0	Site Specific	0	Long Term
Screw Compressors	0	Site Specific	0	Long Term
Monitor Wells	0	0.1/acre	0	Long Term
Impoundments	0 0		0.0	Long Term
On-channel	0	Site Specific	0.0	
Off-channel		Site Specific	0.0	
Water Discharge Points		Site Specific or 0.01 ac/WDP	0.0	
Channel Disturbance				
Headcut Mitigation*	0	Site Specific	0.0	
Channel Modification	0	Site Specific	0.0	
Improved Roads				Long Term
No Corridor	2.0	25 feet	6.1	
With Corridor	1.4	35 feet	6.0	
2-Track Roads				Long Term
No Corridor	0		0	
With Corridor	0.4	35 feet	1.8	
Pipelines		20' Width or Site Specific		Short Term
No Corridor	0.0		0	
With Corridor	0.0		0	
Buried Power Cable		12' Width or Site Specific		Short Term
No Corridor	0		0	
Overhead Powerlines	0.8	50' Width	4.9	Long Term
Additional Disturbance	0	Site Specific	0	

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

4.1.1. Wetland/Riparian

Identified wetland/riparian areas within the Harrier project area are limited to the banks of the Powder River and its tributaries receiving discharged produced CBNG water. No water has been discharged to Indian Creek associated with the Juniper Draw and Kestrel PODs.

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74), however in this POD there is potential that the total volume could be discharged direct to the channel. Continuous high stream flows into wetlands and riparian areas would change the composition of species and dynamics of the food web. The shallow groundwater table would rise closer to the surface with increased and continuous stream flows augmented by produced water discharges. Vegetation in riparian areas, such as cottonwood trees, that cannot tolerate year-round inundated root zones would die

and would not be replaced. Other plant species in riparian areas and wetland edges that favor inundated root zones would flourish, thus changing the plant community composition and the associated animal species. A rise in the shallow ground groundwater table would also influence the hydrology of wetlands by reducing or eliminating the seasonal drying periods that affect recruitment of plant species and species composition of benthic and water column invertebrates. These changes to the aquatic food web base would affect the higher trophic levels of fish and waterfowl abundance and species richness for wetlands and riparian areas." (PRB FEIS Page 4-175).

4.1.2. Invasive Species

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

1. Administer herbicides.
2. Incorporate weed prevention and control measures into environmental restoration and infrastructure maintenance activities (for specifics see Integrated Pest Management Plan (IPMP) in the POD.
3. Initiate a weed education policy to assist contractors and field employees in the identification of noxious weeds and to create an awareness of the impacts of noxious weeds and invasive plants.

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

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

4.1.3. Cumulative Effects

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

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

- They are proportional to the actual amount of cumulatively produced water in the Upper Powder River drainage, which is approximately 18.5% of the total predicted in the PRB FEIS.
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
- The WMP for the Harrier proposes that produced water will not contribute significantly to flows downstream.

No additional mitigation measures are required.

4.2. Wildlife (Alternative C – Environmentally Preferred)

EFFECTS ANALYSIS

4.2.1. Big Game Direct and Indirect Effects

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

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

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

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

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

4.2.1.1. Big Game Cumulative effects

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

4.2.2. Aquatics Direct and Indirect Effects

The water produced from this action will be added to existing, previously analyzed infrastructure which includes existing discharge points and 1existing EMIT produced water treatment facility (under EMIT's WYPDES permit(# WY0051934) within the Upper Powder River watershed. Existing infrastructure and impoundments from approved PODs (Kestrel and Juniper Draw) may also be utilized as part of this water management strategy. Additional water will be added to the water management infrastructure analyzed in

adjacent project areas. This additional utilization of previously approved surface discharge areas may extend the duration of impacts to aquatic species addressed in the analysis for the Kestrel and Juniper Draw PODs.

4.2.2.1. Aquatics Cumulative effects

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

4.2.3. Migratory Birds Direct and Indirect Effects

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

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

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

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.

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

4.2.3.1. Migratory Birds Cumulative effects

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

4.2.4. Raptors Direct and Indirect Effects

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

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

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

The 41M-298 and 41G-298 wells (single location), located within 0.25 mile of nest 4380, was relocated to move the location out of line-of-sight of this nest. The access is now out of line-of-sight, and power will be buried.

The 21GM-298 well was relocated NW to provide a 0.25 mile buffer for nest 5021, and to move the location out of line of sight. All access will now come from the south, out of line of sight of this nest and nests 5019 and 5020.

The 41M & 41G-398 wells (single location) are within 0.25 miles of nests 5019, 5020 & 5021 but are located out of line of sight and separated by a steep ridge.

Table 5. Proposed infrastructure within close proximity (0.5 mile) to documented raptor nests within the Harrier project area.

BLM ID#	**AMOUNT AND TYPE OF INFRASTRUCTURE**	
	Within 0.25 mile	*Within 0.25 to 0.5 mile*
4380	2 wells (1 location)(41M & 41G-298) 1 access/pipeline	2 wells (1 location)(32G & 32M-298) 1 access/pipeline
5021	2 wells (1 location) (41M & 41G-398)	2 wells (1 location)(12G & 12M-298) 1 access/pipeline
5019	2 wells (1 location) (41M & 41G-398)	2 wells (1 location)(12G & 12M-298) 1 access/pipeline

BLM ID#	AMOUNT AND TYPE OF INFRASTRUCTURE	
	Within 0.25 mile	*Within 0.25 to 0.5 mile*
5020	2 wells (1 location) (41M & 41G-398)	2 wells (1 location)(12G & 12M-298) 1 access/pipeline
4819		4 wells (2 locations)(23G & 23M-398; 34G & 34M-398) 1 access/pipeline
4820		4 wells (2 locations)(23G & 23M-398; 34G & 34M-398) 1 access/pipeline
4821		4 wells (2 locations)(23G & 23M-398; 34G & 34M-398) 1 access/pipeline

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

4.2.4.1. Raptors Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-221.

4.2.5. Threatened and Endangered and Sensitive Species

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

4.2.5.1. Threatened and Endangered Species

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

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

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

Project Effects
LAA Likely to adversely affect

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

4.2.5.1.1. Black-Footed Ferret Direct and Indirect Effects

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

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

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

No springs have been identified within the project area. Suitable habitat is not present within the Harrier project area. Implementation of the proposed coal bed natural gas project will have "***no effect***" on the Ute ladies'- tresses orchid as suitable habitat is not present.

4.2.5.2. Sensitive Species Direct and Indirect Effects

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

4.2.5.2.1. Prairie dog colony obligates

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

4.2.5.2.2. Sagebrush obligates

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

Fragmentation of shrubsteppe habitat is a major disruption that has consequences for sagebrush-obligate species (Braun et al. 1976; Rotenberry & Wiens 1980a). In fragmented habitats, suitable habitat area

remains only as a remnants surrounded by unusable environments (Urban and Shugart 1984; Fahrig & Paloheimo 1988). Populations of sagebrush-obligate species decline because areas of suitable habitat decrease (Temple & Cary 1988), because of lower reproduction, and/or because of higher mortality in remaining habitats (Robinson 1992; Porneluzi et al. 1993). Fragmentation of shrubsteppe has the further potential to affect the conservation of shrub-obligate species because of the permanence of disturbance (Knick and Rotenberry 1995). Several decades are required to reestablish ecologically functioning mature sagebrush communities. Due to this, some sagebrush obligate species may not return until after habitat reestablishment.

Table 4.3 Summary of Sensitive Species Habitat and Project Effects.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Amphibians				
Northern leopard frog (*Rana pipiens*)	Beaver ponds, permanent water in plains and foothills	NP	NI	Additional water will affect existing waterways.
Spotted frog (*Ranus pretiosa*)	Mountain ponds, sloughs, and 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.	NP	NI	Habitat not present
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	NS	MIIH	No Active nest present.
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	K	WIPV	Sagebrush cover and 4 leks 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	NP	NI	Habitat not present.
Mountain plover (*Charadrius montanus*)	Short-grass prairie with slopes < 5%	NS	MIIH	Prairie dog colonies will be affected.
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	NS	NI	Habitat not present.
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 colonies 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	S	MIIH	Prairie dog colonies will be affected.
Townsend's big-eared bat (*Corynorhinus townsendii*)	Caves and mines.	NP	NI	Habitat not present.

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

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

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

4.2.5.2.1. Bald eagle Direct and Indirect Effects

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

Devon Energy is proposing an additional 0.8 miles of overhead three-phase distribution lines. There are currently 0 miles of improved roads within the project area, with 3.3 miles proposed.

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

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

4.2.5.2.2. Black-tailed prairie dog Direct and Indirect Effects

The 43M & 43G-398 well location is proposed within 0.25 miles of the prairie dog colony in SE section 03, T49N, R78W. One road / pipeline corridor, accessing 10 wells is proposed within this prairie dog colony. These access / pipeline corridors is co-located with an existing road. Any alternative locations for these facilities would cause unnecessary additional surface disturbance.

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

4.2.5.2.3. Burrowing owl Direct and Indirect Effects

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

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

While the prairie dog town in NESE Section 3, T49N:R78W is only 1.5 acres, its recent discovery may indicate colonization form a nearby colony that has not been recorded.

4.2.5.2.4. Grouse

4.2.5.2.4.1. Greater sage-grouse Direct and Indirect Effects

Four leks are located within four miles of the Harrier project area. The proposed action will adversely impact breeding, nesting, brood rearing, and late summer habitat. Proposed project elements that are anticipated to negatively impact grouse are approximately: 22 CBNG wells on 11 locations, 3.3 miles of new roads, and 3.3 miles of new pipelines, .8 miles of overhead power lines, and increased vehicle traffic on established roads. Using 0.6 miles as a distance for impacts (Holloran et al. 2007, Aldridge and Boyce 2007), effective sage-grouse habitat loss will be 1267 acres from access / pipeline corridors, and 13acres from 11 well locations. Additively, since each well location has an associated road and/or pipeline corridor and in many cases wells are closer than 0.6 miles to each other, approximately 1280 acres within the POD boundaries will be affected.

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

All accesses originally proposed from the north of the Harrier POD project area have been dropped to reduce surface disturbance, reduce effects to sage-grouse habitat, and decrease the potential for further disruptive activity in the vicinity of the Tear Drop lek.

The 21G & 21M-398 wells (single location) were moved approximately 480 feet west and southwest to consolidate disturbance and reduce impacts to undisturbed sage-grouse habitat.

4.2.5.2.4.1.1. Greater sage-grouse Cumulative Effects

The sage-grouse cumulative impact assessment area for this project encompasses a four mile radius from the Tear Drop, Tear Drop 2, 41-BLM, and Bear Draw sage-grouse leks. In addition to the direct impacts to sage-grouse habitat that will be created by the federal wells and associated infrastructure the project area does contain existing fee, state, and federal fluid mineral development. As of September 15, 2008, there are approximately 381 existing wells and associated infrastructure within four miles of the four leks - an area of 93 square miles. The existing well density is approximately 4.1 wells/section. Due to this

level of development there is a strong potential that the population(s) breeding at these leks may become extirpated without the additional federal development.

There are 327 proposed wells (22 are the wells from this project) within four miles of the 4 leks. With the addition of the proposed wells that are not associated with this proposed action, the well density within four miles of the 4 leks increases to 7.1 wells/section. With approval of alternative C (22 proposed well locations) the well density increases to 7.3 wells/section.

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

The Powder River Basin Oil and Gas Project FEIS (BLM 2003) concluded that "Activities associated with the proposed project would affect sage-grouse in several ways. These effects may include: (1) increased direct mortality (including legal hunting, poaching, and collision with power lines and vehicles); (2) the introduction of new perches for raptors and thus the potential change in rate of predation; (3) direct loss or degradation of habitats; (4) indirect disturbance resulting from human activity (including harassment, displacement, and noise); (5) habitat fragmentation (particularly through construction of roads); and (6) changes in population (pg. 4-257)." The FEIS goes on to state that "implementation of several mitigation measures would reduce the extent of each impact addressed by those measures. Despite these measures, the synergistic effect of several impacts would likely result in a downward trend for the sage-grouse population, and may contribute to the array of cumulative effects that may lead to its federal listing. Local populations may be extirpated in areas of concentrated development, but viability across the Project Area (Powder River Basin) or the entire range of the species is not likely to be compromised (pg. 4-270)."

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

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

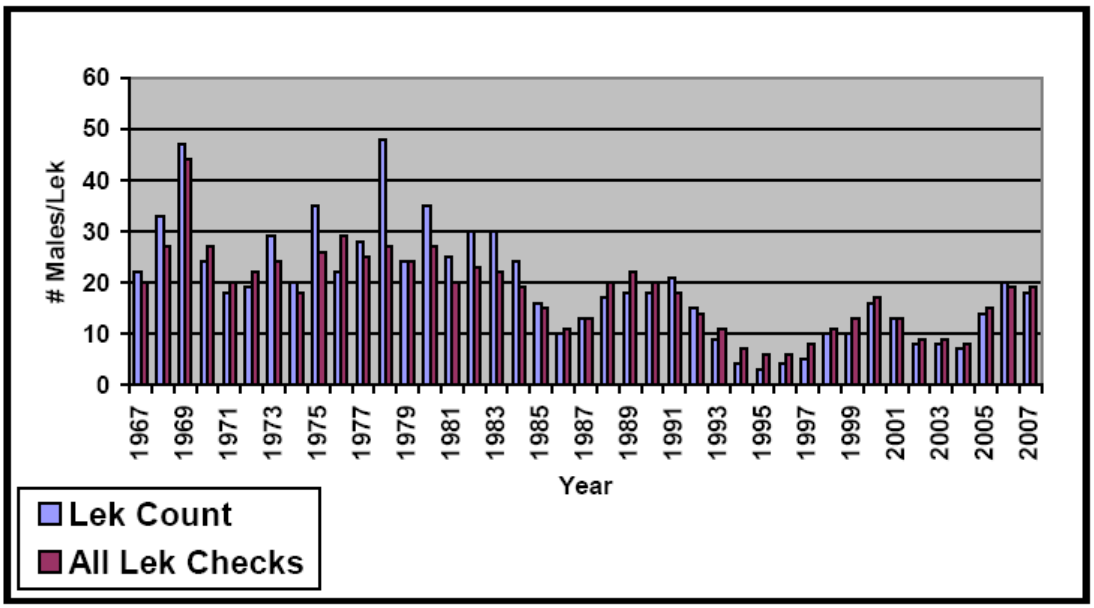
and Wyoming, (State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development 2008), research indicates that oil or gas development exceeding approximately 1 well pad per square mile with the associated infrastructure, results in calculable impacts on breeding populations, as measured by the number of male sage-grouse attending leks (Holloran 2005, Walker et al. 2007)

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

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

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

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



The BFO Resource Management Plan (BLM 2001) and the Powder River Basin Oil and Gas Project Record of Decision (BLM 2003) include a two-mile timing limitation within sage-grouse nesting habitat.

The two-mile measure originated with the Western Association of Fish and Wildlife Agencies (WAFWA) (BLM 2004). BLM Wyoming adopted the two-mile recommendation in 1990 (BLM 1990). The two-mile recommendation was based on early research which indicated between 59 and 87 percent of sage-grouse nests were located within two miles of a lek (BLM 2004). These studies were conducted within prime, contiguous sage-grouse habitat such as Idaho's Snake River plain.

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

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

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

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

4.2.5.2.5. Sharp-tailed grouse Direct and Indirect Effects

Effects similar to sage-grouse.

4.2.5.2.6. Mountain plover Direct and Indirect Effects

Suitable mountain plover habitat may be in or adjacent to the prairie dog colony in NESE Section 3, T49N:R78W. See Black-tailed prairie dog Direct and Indirect Effects of this EA for affects to mountain plover habitat.

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

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

Mountain plovers have been forced to seek habitat with similar qualities that may be poor quality habitat when loss or alteration of their natural breeding habitat (predominately prairie dog colonies) occurs, such as heavily grazed land, burned fields, fallow agriculture lands, roads, oil and gas well pads and pipelines. These areas could become reproductive sinks. Adult mountain plovers may breed there, lay eggs and hatch chicks; however, the young may not reach fledging age due to the poor quality of the habitat. Recent analysis of the USWFS Breeding Bird Survey (BBS) data suggests that mountain plover populations have declined at an annual rate of 3.7 % over the last 30 years which represents a cumulative decline of 63% during the last 25 years (Knopf and Rupert 1995). An analysis of direct and indirect impacts to mountain plover due to oil and gas development is included in the PRB FEIS (4-254-255).

4.2.5.2.7. Swift Fox Direct and Indirect Effects

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

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

Though habitat may be limited in the project area, the recent discovery of a 1.5 acre prairie dog colony within the Harrier POD boundary may indicate additional prairie dog colonies that have not been recorded.

4.2.5.3. Sensitive Species Cumulative effects

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

PRB FEIS, Volume 2, Chapter 4, page 4-271.

4.3. West Nile Virus

The water produced from this action will be added to existing, previously analyzed infrastructure which includes 1 existing discharge point and 1existing EMIT produced water treatment facility (under EMIT's WYPDES permit(# WY0051934) within the Upper Powder River watershed. Existing infrastructure and impoundments from approved PODs (Kestrel and Juniper Draw) may also be utilized as part of this water management strategy. Though no further mosquito habitat will be created in the Harrier POD, additional water will be added to the water management infrastructure analyzed in adjacent project areas. This additional utilization of previously approved surface discharge areas may extend the duration of WNv related impacts addressed in the analysis for the Kestrel and Juniper Draw PODs.

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 commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Qualified hydrologists, in consultation with the BLM, developed the water management plan. Adherence with the plan, in addition to BLM applied mitigation (in the form of COAs), would reduce project area and downstream impacts from proposed water management strategies. The water management strategy for the Harrier POD includes the addition of the produced water to an existing infrastructure that includes water treatment (EMITS) with discharge direct to the Powder River, discharge to containment impoundments and periodic pulse releases of the impoundments to ephemeral drainages.

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 3.91 gpm per well or 86.02 gpm (0.19 cfs or 13.9 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 171,423 acre-feet in 2006 (maximum production). As such, the volume of water resulting from the production of these wells is 0.08% of the total volume projected for 2006. This volume of produced water is also within the predicted parameters of the PRB FEIS.

4.4.1. Groundwater

The PRB FEIS predicts an infiltration rate of 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 34.4 gpm will infiltrate at or near the discharge points and impoundments (55.5 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 40 to 2,500 feet compared to 1,000 to 2,100 feet to the Big George. 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.

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

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ developed a guidance document, "Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments" (June 14, 2004). This guidance document became effective August 1, 2004, and was revised as the "Compliance Monitoring and Siting Requirements for Unlined Coalbed Methane Produced Water Impoundments" which was approved in June, 2006. The BLM requires that operators comply with the requirements outlined in the current approved DEQ compliance monitoring guidance document prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

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

4.4.1.1. Groundwater Cumulative Effects:

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

Development of CBNG through 2018 (and coal mining through 2033) would remove 4 million acre-feet

of groundwater from the coal zone aquifer (PRB FEIS page 4-65). This volume of water "…cumulatively represents 0.5 percent of the recoverable groundwater stored in the Wasatch – Tongue River sands and coals (nearly 750 million acre-feet, from Table 3-5). All of the groundwater projected to be removed during reasonably foreseeable CBNG development and coal mining would represent less than 0.3 percent of the total recoverable groundwater in the Wasatch and Fort Union Formations within the PRB (nearly 1.4 billion acre-feet, from Table 3-5)." (PRB FEIS page 4-65). No additional mitigation is necessary.

4.4.2. Surface Water

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

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

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** μmhos/cm
Most Restrictive Proposed Limit –		2	1,000
Least Restrictive Proposed Limit		10	3,200
Primary Watershed at Arvada, WY Gauging station			
Historic Data Average at Maximum Flow		4.76	1,797
Historic Data Average at Minimum Flow		7.83	3,400
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8)			
Drinking Water (Class I)	500		
Agricultural Use (Class II)	2,000	8	
Livestock Use (Class III)	5,000		
WDEQ Water Quality Requirement for WYPDES Permit # WY0048020			
At discharge point	5,000	10	7,500
WYPDES Permit # WY0050504			
At discharge point	5,000	26*	7,500
WYPDES Permit # WY0055212			
At discharge point	5,000	N/A	7,500
Predicted Produced Water Quality			
Big George Coal Zone	2,070	35.9	3,250

* SAR value is daily maximum at irrigation compliance point.

Based on the analysis performed in the PRB FEIS, the primary beneficial use of the surface water in the Powder River Basin is the irrigation of crops (PRB FEIS pg 4-69). The water quality projected for this POD is 2,070 mg/l TDS which is not within the WDEQ criteria for agricultural use (2000 mg/l TDS). However direct land application or subsurface drip irrigation 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 3.91 gallons per minute (gpm) is projected is to be produced from these 22 wells, for a total of 86.02 gpm for the POD. See Table 4.5.

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

There are no discharge points proposed for this project.

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). However, the potential for all the water from this project to be treated and discharged makes the apportionment of water volumes difficult. Consequently, the total volume of water produced from these wells may result in the addition of 0.19 cfs to ephemeral channels and the Powder River. 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 will 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 22 wells 0.19 cfs, potentially could reach the mainstem of the Powder River, which would be equivalent to 0.3% of the predicted total CBNG produced water contribution. For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

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

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

Permit effluent limits were set at (EMITs WYPDES WY0051934, Attachment B):

pH	6.5 to 8.5
TDS	5000 mg/l max
Specific Conductance	2500 mg/l max
Dissolved Iron	250 µg/l max
Dissolved Manganese	630 µg/l max
Total Barium	1800 µg/l max
Total Arsenic	7 µg/l max
Sulfates	3,000 mg/l max
Chlorides	150 mg/l
SAR (March-October)	7.0
SAR (November-February)	9.75
Total Flow, MGD	3.23

Permit effluent limits were set at (WYPDES WY0048020, Attachment B):

pH	6.5 to 9.0
TDS	5000 mg/l max
Specific Conductance	7500 mg/l max
Dissolved Iron	1,000 µg/l max
Dissolved Manganese	629 µg/l max
Total Recoverable Barium	1800 µg/l max
Total Recoverable Arsenic	7 µg/l max
Chlorides	150 mg/l
Total Flow, MGD	1.62

Permit effluent limits were set at (WYPDES WY0050504, Attachment B):

Total Petroleum Hydrocarbons	10 mg/l max
pH	6.5 to 8.5
TDS	5000 mg/l max
Specific Conductance	7500 mg/l max
Sulfates	3000 mg/l max
Radium 226	1 pCi/l max
Dissolved Iron	299 µg/l max
Dissolved Manganese	629 µg/l max
Total Barium	1800 µg/l max
Total Arsenic	7 µg/l max
Chlorides	46 mg/l
Total Flow, MGD	0.48

Permit effluent limits were set at (WYPDES WY0055212, Attachment B):

pH	6.5 to 9.0
TDS	5000 mg/l max
Specific Conductance	7500 mg/l max
Dissolved Iron	1,000 µg/l max
Dissolved Manganese	629 µg/l max
Total recoverable Barium	1800 µg/l max
Total Recoverable Arsenic	7 µg/l max
Chlorides	150 mg/l
Total Flow, MGD	0.55

The WYPDES permits also address existing downstream concerns, such as irrigation use, in the COAs for the permit.

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 a reference well has been submitted with a previous POD within 6 miles of the nearest producing well within the Harrier POD. 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 Harrier POD prepared by Western Water Consultants Devon Energy Production Company, L.P.

4.4.2.1. Surface Water Cumulative Effects

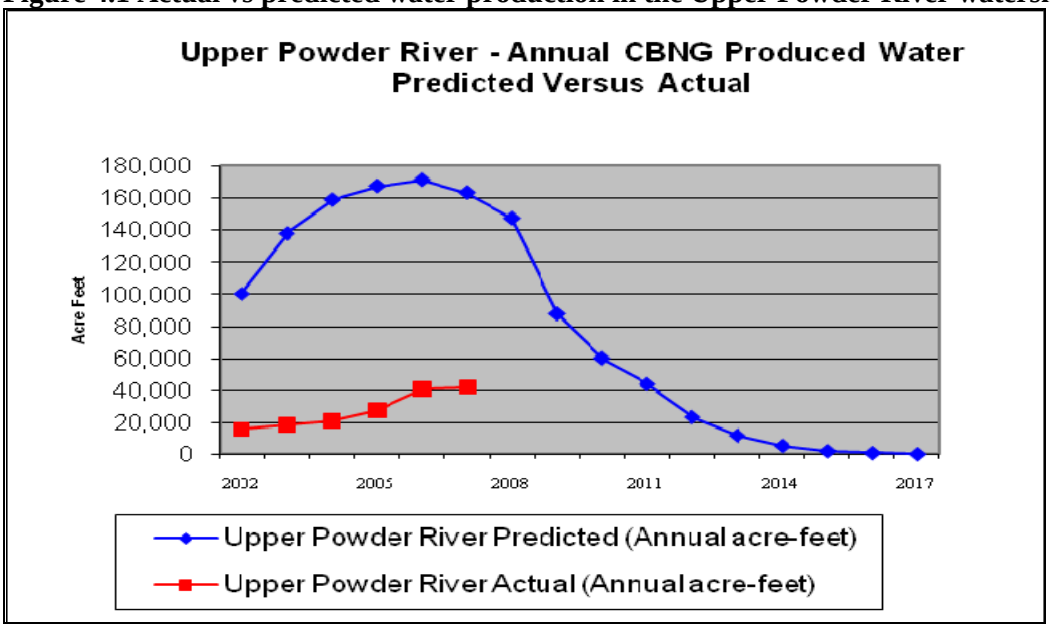
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the Upper Powder River watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of December 2007 all producing CBNG wells in the Upper Powder River watershed have discharged a cumulative volume of 166,096 acre-ft of water compared to the predicted 900,040 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.1 and Table 4.6 following. This volume is 18.5% 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 *2007 Data Update 3-08-08*

Year	Upper Powder River Predicted (Annual acre-feet)	Upper Powder River Predicted (Cumulative acre-feet from 2002)	Upper Powder River Actual (Annual acre-feet)		Upper Powder River Actual (Cumulative acre-feet from 2002)	
			A-ft	% of Predicted	A-Ft	% of Predicted
2002	100,512	100,512	15,846	15.8	15,846	15.8
2003	137,942	238,454	18,578	13.5	34,424	14.4
2004	159,034	397,488	20,991	13.2	55,414	13.9
2005	167,608	565,096	27,640	16.5	83,054	14.7
2006	171,423	736,519	40,930	23.9	123,984	16.8
2007	163,521	900,040	42,112	25.8	166,096	18.5
2008	147,481	1,047,521				
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**		**166,096**			

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. However, this MOC has expired and has not been renewed. The EPA has approved the Montana Surface Water Standards for EC and SAR and as such the WDEQ is responsible for ensuring that the Montana standards are met at the state line under the Clean Water Act (CWA). Thus, through the implementation of in-stream monitoring and adaptive management, water quality standards and interstate agreements can be met." (PRB FEIS page 4-117)

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

1. They are proportional to the actual amount of cumulatively produced water in the Upper Powder River drainage, which is approximately 18.5% of the total predicted in the PRB FEIS.
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
3. The commitment by the operator to monitor the volume of water discharged.

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 Resources

BLM review, conducted by Wendy Sutton, has determined that 2 isolates will be impacted by the current project. The impacted isolates IR6 and IR7 have been recommended as not eligible to the National Register of Historic Places. As such, these resources are not considered historic properties; therefore, impacts to these resources result in no historic properties affected. Following the Wyoming State Protocol, Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 9/27/2008 that the proposed project would result in no historic properties affected/no effect (DBU_WY_2008_2254).

Two wells (41-298 M & G) and associated infrastructure were initially proposed near eligible site, 48JO1267. Site 48JO1267 had previously been recommended as eligible to the NRHP with "setting" considered a contributing aspect of integrity. In part to avoid adverse visual impacts to this site, the wells and infrastructure were redesigned (moved) during the onsite on 8/12/2008, such that they fall outside of the view shed of site 48JO1267. It was also noted during the onsite that site 48JO3694 (recommended as eligible to the NRHP) could be an attractive location for construction crews to congregate or explore. For this reason, existing requirements that crews restrict their activities to approved well pad and infrastructure location will be emphasized during pre-construction meetings.

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

4.6. Air Quality

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

5. OTHER PERMITS REQUIRED

A number of other permits are required from Wyoming State and other Federal agencies. These permits are identified in Table A-1 in the PRB FEIS Record of Decision.

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