

**FINDING OF NO SIGNIFICANT IMPACT & DECISION RECORD  
FOR  
Nance Petroleum  
Roundup POD**

**ENVIRONMENTAL ASSESSMENT –WY-070-08-019**

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize **Nance Petroleum Corp’s Roundup** Coal Bed Natural Gas (CBNG) POD comprised of the following **54** Applications for Permit to Drill (APDs) for 52 CBNG wells and 2 water injection wells:

	Well Name	Well #	Qtr/Qtr	Sec	Twp	Rng	Lease #
1	HWU ROUNDUP FEDERAL	1-01CK	NENE	1	57N	80W	WYW142104
2	HWU ROUNDUP FEDERAL	1-01KB	NENE	1	57N	80W	WYW142104
3	HWU ROUNDUP FEDERAL	1-03CK	NENW	1	57N	80W	WYW142104
4	HWU ROUNDUP FEDERAL	1-03KB	NENW	1	57N	80W	WYW142104
5	HWU ROUNDUP FEDERAL	1-09CK	NESE	1	57N	80W	WYW142104
6	HWU ROUNDUP FEDERAL	1-09KB	NESE	1	57N	80W	WYW142104
7	HWU ROUNDUP FEDERAL	1-09WIW	NESE	1	57N	80W	WYW142104
8	HWU ROUNDUP FEDERAL	1-11CK	NESW	1	57N	80W	WYW142104
9	HWU ROUNDUP FEDERAL	1-11KB	NESW	1	57N	80W	WYW142104
10	HWU ROUNDUP FEDERAL	2-01CK	NENE	2	57N	80W	WYW142104
11	HWU ROUNDUP FEDERAL	2-01KB	NENE	2	57N	80W	WYW142104
12	HWU ROUNDUP FEDERAL	2-03CK	NENW	2	57N	80W	WYW142104
13	HWU ROUNDUP FEDERAL	2-03KB	NENW	2	57N	80W	WYW142104
14	HWU ROUNDUP FEDERAL	2-11CK	NESW	2	57N	80W	WYW142104
15	HWU ROUNDUP FEDERAL	2-11KB	NESW	2	57N	80W	WYW142104
16	HWU ROUNDUP FEDERAL	2-09CK	NESE	2	57N	80W	WYW142104
17	HWU ROUNDUP FEDERAL	2-09KB	NESE	2	57N	80W	WYW142104
18	HWU ROUNDUP FEDERAL	3-01CK	NENE	3	57N	80W	WYW142848
19	HWU ROUNDUP FEDERAL	3-01KB	NENE	3	57N	80W	WYW142848
20	HWU ROUNDUP FEDERAL	3-09CK	NESE	3	57N	80W	WYW142848
21	HWU ROUNDUP FEDERAL	3-09KB	NESE	3	57N	80W	WYW142848
22	HWU ROUNDUP FEDERAL	10-03CK	NENW	10	57N	80W	WYW142848
23	HWU ROUNDUP FEDERAL	10-03KB	NENW	10	57N	80W	WYW142848
24	HWU ROUNDUP FEDERAL	10-09CK	NESE	10	57N	80W	WYW142848
25	HWU ROUNDUP FEDERAL	10-11CK	NESW	10	57N	80W	WYW142848
26	HWU ROUNDUP FEDERAL	10-11KB	NESW	10	57N	80W	WYW142848
27	HWU ROUNDUP FEDERAL	10-09KB	NESE	10	57N	80W	WYW142848
28	HWU ROUNDUP FEDERAL	10-01CK	NENE	10	57N	80W	WYW142848
29	HWU ROUNDUP FEDERAL	10-01KB	NENE	10	57N	80W	WYW142848
30	HWU ROUNDUP FEDERAL	11-01CK	NENE	11	57N	80W	WYW142104
31	HWU ROUNDUP FEDERAL	11-01KB	NENE	11	57N	80W	WYW142104
32	HWU ROUNDUP FEDERAL	11-1WIW	NENE	11	57N	80W	WYW142104

	Well Name	Well #	Qtr/Qtr	Sec	Twp	Rng	Lease #
33	HWU ROUNDUP FEDERAL	11-03CK	NENW	11	57N	80W	WYW142104
34	HWU ROUNDUP FEDERAL	11-03KB	NENW	11	57N	80W	WYW142104
35	HWU ROUNDUP FEDERAL	11-09CK	NESE	11	57N	80W	WYW142104
36	HWU ROUNDUP FEDERAL	11-09KB	NESE	11	57N	80W	WYW142104
37	HWU ROUNDUP FEDERAL	11-11CK	NESW	11	57N	80W	WYW142104
38	HWU ROUNDUP FEDERAL	11-11KB	NESW	11	57N	80W	WYW142104
39	HWU ROUNDUP FEDERAL	12-01CK	NENE	12	57N	80W	WYW142104
40	HWU ROUNDUP FEDERAL	12-01KB	NENE	12	57N	80W	WYW142104
41	HWU ROUNDUP FEDERAL	12-09CK	NESE	12	57N	80W	WYW142104
42	HWU ROUNDUP FEDERAL	12-09KB	NESE	12	57N	80W	WYW142104
43	HWU ROUNDUP FEDERAL	12-03CK	NENW	12	57N	80W	WYW142104
44	HWU ROUNDUP FEDERAL	12-03KB	NENW	12	57N	80W	WYW142104
45	HWU ROUNDUP FEDERAL	12-11CK	NESW	12	57N	80W	WYW142104
46	HWU ROUNDUP FEDERAL	12-11KB	NESW	12	57N	80W	WYW142104
47	HWU ROUNDUP FEDERAL	13-03CK	NENW	13	57N	80W	WYW142105
48	HWU ROUNDUP FEDERAL	13-03KB	NENW	13	57N	80W	WYW142105
49	HWU ROUNDUP FEDERAL	14-01KB	NENE	14	57N	80W	WYW142105
50	HWU ROUNDUP FEDERAL	14-03CK	NENW	14	57N	80W	WYW142105
51	HWU ROUNDUP FEDERAL	14-03KB	NENW	14	57N	80W	WYW142105
52	HWU ROUNDUP FEDERAL	14-11CK	NESW	14	57N	80W	WYW142105
53	HWU ROUNDUP FEDERAL	14-11KB	NESW	14	57N	80W	WYW142105
54	HWU ROUNDUP FEDERAL	14-01CK	NENE	14	57N	80W	WYW142105

**Nance Petroleum Corp.** proposed 12 impoundments in association with the water management strategy for the Roundup POD. These impoundment locations were inspected and analyzed under this environmental assessment, however, all of these impoundments are proposed as ‘secondary’ and construction will not be authorized at this time. Primary impoundments are those proposed with the intent to construct following approval and required a reclamation bond to be in place prior to authorization. In order for the status of the proposed impoundments to change from secondary to primary, the operator must submit to BLM Sundry (Form 3160-3) and provide the appropriate reclamation bond.

	IMPOUNDMENT Name / Number	Qtr/Qtr	Sec.	TWP	RNG	Capacity (AcreFeet)	Surface Disturbance (Acres)	Lease Number
1	Lower Roundup Draw	SENE	1	57	80	5.72	2	WYW142104
2	PIT 01-10	NWSE	1	57	80	45.3	5.6	WYW142104
3	PIT 01-11A	NESW	1	57	80	45.3	5	WYW142104
4	Upper Weltner Prong	SENE	10	57	80	15.65	3	WYW142848
5	Roundup Draw	SENE	11	57	80	33.75	2	WYW142104
6	PIT 01-11B	NESW	1	57	80	30.7	4	WYW142104
7	Tinder David Draw	SENE	13	57	80	4.77	4	WYW142105
8	PIT 10-01	NENE	10	57	80	30.6	2.9	WYW142848
9	PIT 14-07A	SWNE	14	57	80	21.2	3	WYW142105

	<b>IMPOUNDMENT Name / Number</b>	<b>Qtr/Qtr</b>	<b>Sec.</b>	<b>TWP</b>	<b>RNG</b>	<b>Capacity (AcreFeet)</b>	<b>Surface Disturbance (Acres)</b>	<b>Lease Number</b>
10	PIT 14-07B	SWNE	14	57	80	15.8	1.6	WYW142105
11	PIT 12-14	SESW	12	57	80	58.6	6.5	WYW142104
12	PIT 12-08	SENE	12	57	80	20.5	2	WYW142104

**Rights of Ways:** Nance submitted Rights of Ways applications for 6,630 feet of buried gas pipeline as well as 6,630 feet of road access and buried water pipeline. The following rights of ways for the associated access road and utilities were inspected under this environmental assessment. Authorization of these grants is pending completion of applications.

<b>ROW</b>	<b>Purpose</b>	<b>Legal Description</b>
WYW-169878	Gas pipeline	T57N, R80W, Sec. 11: N2NE T57N, R80W, Sec. 12: N2NE, SWNE, SENW
WYW-169879	Road access and water pipeline	T57N, R80W, Sec. 11: N2NE T57N, R80W, Sec. 12: N2NE, SWNE, SENW

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  
 Nance Petroleum  
 Roundup POD  
 PLAN OF DEVELOPMENT  
 WY-070-08-019**

**INTRODUCTION**

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

**1. PURPOSE AND NEED**

The purpose for the proposal is to quantify reserves and produce coal bed natural gas (CBNG) on three valid 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: **Nance Petroleum Corporation’s Roundup** Plan of Development (POD) for **52** coal bed natural gas (CBNG) well APD’s and associated infrastructure.

	Well Name	Well #	Qtr/Qtr	Sec	Twp	Rng	Lease #
1	HWU ROUNDUP FEDERAL	1-01CK	NENE	1	57N	80W	WYW142104
2	HWU ROUNDUP FEDERAL	1-01KB	NENE	1	57N	80W	WYW142104
3	HWU ROUNDUP FEDERAL	1-03CK	NENW	1	57N	80W	WYW142104
4	HWU ROUNDUP FEDERAL	1-03KB	NENW	1	57N	80W	WYW142104
5	HWU ROUNDUP FEDERAL	1-09CK	NESE	1	57N	80W	WYW142104
6	HWU ROUNDUP FEDERAL	1-09KB	NESE	1	57N	80W	WYW142104
*7	HWU ROUNDUP FEDERAL	1-09WIW	NESE	1	57N	80W	WYW142104
8	HWU ROUNDUP FEDERAL	1-11CK	NESW	1	57N	80W	WYW142104
9	HWU ROUNDUP FEDERAL	1-11KB	NESW	1	57N	80W	WYW142104
10	HWU ROUNDUP FEDERAL	2-01CK	NENE	2	57N	80W	WYW142104

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29	HWU ROUNDUP FEDERAL	10-01KB	NENE	10	57N	80W	WYW142848
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38	HWU ROUNDUP FEDERAL	11-11KB	NESW	11	57N	80W	WYW142104
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47	HWU ROUNDUP FEDERAL	13-03CK	NENW	13	57N	80W	WYW142105
48	HWU ROUNDUP FEDERAL	13-03KB	NENW	13	57N	80W	WYW142105
49	HWU ROUNDUP FEDERAL	14-01KB	NENE	14	57N	80W	WYW142105
50	HWU ROUNDUP FEDERAL	14-03CK	NENW	14	57N	80W	WYW142105

	Well Name	Well #	Qtr/Qtr	Sec	Twp	Rng	Lease #
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52	HWU ROUNDUP FEDERAL	14-11CK	NESW	14	57N	80W	WYW142105
53	HWU ROUNDUP FEDERAL	14-11KB	NESW	14	57N	80W	WYW142105
54	HWU ROUNDUP FEDERAL	14-01CK	NENE	14	57N	80W	WYW142105

**\*Note: These 2 water injection wells were added to the POD following the onsite inspection.**

Proposed Well Information: There were a total of 52 wells proposed within this POD, the wells are vertical bores proposed on a 160 acre spacing pattern with 2 CBNG wells per location. The 2 water injection wells are also proposed at CBNG locations for a total of 3 wells proposed at these 2 locations. The water injection well APDs were not part of the original POD submittal to BLM and were added following the onsite inspection. Each CK well will produce multiple coal zones from co-mingled Anderson, Dietz, Canyon and Cook coal seams. Each KB well will produce multiple coal zones from commingled Wall, Pawnee, Brewster/Arnold, King and Knoblock coal seams. Proposed well house dimensions are 5 ft wide 5 ft length 5 ft height. Well house color covert green, selected to blend with the surrounding vegetation. Wells are located as follows:

**Water Management Proposal:** The following impoundments were inspected for use in association with the water management strategy for the Roundup POD and analyzed under this environmental assessment, however, all of these impoundments are proposed as ‘secondary’ and are not authorized at this time. Primary impoundments are those proposed with the intent to construct following approval and required a reclamation bond to be in place prior to authorization. In order for the status of the proposed impoundments to change from secondary to primary, the operator must submit to BLM Sundry (Form 3160-3) and provide the appropriate reclamation bond.

	IMPOUNDMENT Name / Number	Qtr/Qtr	Sec.	TWP	RNG	Capacity (AcreFeet)	Surface Disturbance (Acres)	Lease Number
1	Lower Roundup Draw	SENE	1	57	80	5.72	2	WYW142104
2	PIT 01-10	NWSE	1	57	80	45.3	5.6	WYW142104
3	PIT 01-11A	NESW	1	57	80	45.3	5	WYW142104
4	Upper Weltner Prong	SENE	10	57	80	15.65	3	WYW142848
5	Roundup Draw	SENE	11	57	80	33.75	2	WYW142104
6	PIT 01-11B	NESW	1	57	80	30.7	4	WYW142104
7	Tinder David Draw	SENE	13	57	80	4.77	4	WYW142105
8	PIT 10-01	NENE	10	57	80	30.6	2.9	WYW142848
9	PIT 14-07A	SWNE	14	57	80	21.2	3	WYW142105
10	PIT 14-07B	SWNE	14	57	80	15.8	1.6	WYW142105
11	PIT 12-14	SESW	12	57	80	58.6	6.5	WYW142104
12	PIT 12-08	SENE	12	57	80	20.5	2	WYW142104

**Rights of Ways:** The disturbance for the following rights-of-ways for the associated access road and utilities were inspected and analyzed under this environmental assessment as proposed with the POD. The operator submitted the applications rights-of-ways following the onsite inspection and completion of those applications is pending at this time.

ROW Grant#	Purpose	Legal Description
WYW-169878	Gas pipeline	T57N, R80W, Sec. 11: N2NE T57N, R80W, Sec. 12: N2NE, SWNE, SENW
WYW-169879	Road access and water pipeline	T57N, R80W, Sec. 11: N2NE T57N, R80W, Sec. 12: N2NE, SWNE, SENW

County: **Sheridan**

Applicant: **Nance Petroleum Corporation**

Surface Owners: **BLM & Padlock Ranch**

**Project Description:**

The proposed action involves the following:

- Drilling of **52** total federal CBM wells; 26 CB wells within the Anderson, Dietz, Canyon and Cook coal zones and **26 KB wells within the** Wall, Pawnee, Brewster/Arnold, King and Knoblock coal zones to depths ranging from 1,109 to 2,370 feet. Multiple seams will be produced by a combination of **co-locating wells** (multiple wells at a single location each targeting a single formation) and **co-mingling production** (a single well per location capable of producing from multiple coal seams).

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

- Well metering shall be accomplished by a combination of **telemetry and well visitation**. Metering would entail at least 4 visits per month to each **well and more frequently dependent on individual well complications as the operator has personnel are in the field daily during daylight hours**.
- A Water Management Plan (WMP) that involves the following infrastructure and strategy:
  - From May to October water from the Roundup POD may be sent to the existing 58-80-27-05 off-channel pit for use in the existing center pivot irrigation system in Randall Prong POD.
  - Year round, all or a portion of the water produced from the Roundup POD will be re-injected at 2 water injection wells completed in the Roland shallow coal seam at depths ranging from 250 to 350 feet.
- An unimproved and improved road network comprised of existing and proposed access roads.
- An above ground power line network was planned and designed by KLJ engineering in coordination with Pearl Field Services and is to be constructed by a **contractor to be selected following well completion**. If the proposed route is altered, then the new route will be proposed via sundry application and analyzed in a separate NEPA action. Power line construction **has not** been scheduled and **will not** be completed before the CBNG wells are producing. If the power line network is not completed before the wells are in production, then temporary diesel generators

shall be placed at the 8 proposed power drop locations.

- A storage tank of 500 to 1,000 gallon capacity shall be located with each diesel generator. Generators are projected to be in operation for 4 to 6 months. Fuel deliveries are anticipated to be 2 times per week. Noise level is expected to be 92 to 96 decibels at 1 meter distance.
- A buried gas, water and power line network will be constructed and an existing compression facility located outside of the project area will be utilized. No central metering facilities are proposed with this POD; it is anticipated that the gas will be metered at each well head location.

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

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

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

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

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

### **2.3. Alternative C – Environmentally Preferred**

Alternative C represents a modification of Alternative B based on the operator and BLM working cooperatively to reduce environmental impacts. The description of Alternative C is the same as Alternative B with the addition of the project modifications identified by BLM and the operator following the initial project proposal (Alternative B). During the field on-site inspections, 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 Roundup POD are listed below under 2.3.1:

### 2.3.1. Changes as a result of the on-sites

**Table 2.3.1. Surface Use changes as a result of the on-site inspection**

Well #	Qtr/Qtr	Sec	Twp	Rng	Changes/Comments
1-01CK/KB	NENE	1	57N	80W	Add gabion basket at outlet of 57-80-01-07 culvert. Rip-rap will be placed at the sized culverts along the road accessing 01-01 wells to prevent erosion. Increase turning radius transition from access road to well location for safety.
1-09CK/KB/WIW	NESE	1	57N	80W	Add 01-09WIW well at this location. Culvert crossing 57-80-01-09 on improved road needs a larger culvert approximately 48-inch diameter. If the chosen culvert does not pass the 25-year discharge, an armored dip can be constructed in the embankment such that the culvert and armored dip together pass the 25-year discharge.
10-01CK/KB	NENE	10	57N	80W	BLM recommended an alternative well location to avoid sage brush and facilitate better telemetry reception. Nance agreed to a location about 300' north next to the proposed 10-01 Pit. BLM agreed with the condition that Nance minimize the access/corridor to primitive with maximum width of 30'.
10-03CK/KB	NENW	10	57N	80W	Realignment of the start of access shifting SW about 300' to avoid steep slopes and sagebrush. Pad ends will be rounded to avoid chasing fill down slope & topsoil will be placed at the north end of the pad. New pad design required.
10-09CK/KB	NESE	10	57N	80W	BLM recommended withdrawing the designed road segment realigning the entire access road to follow the contour to the east with an improved road and then dropping below sagebrush with the primitive road to the west in order to minimize disturbance. The operator agreed.
10-11CK/KB	NESW	10	57N	80W	Nance will access the well from the E. Badger POD utilizing the existing primitive road with 2 spot upgrades where slopes exceed 12% for less than 300'. The proposed utility corridor is withdrawn. The utilities will follow the existing primitive road to the Upper Weltner Prong reservoir, cross the channel below the dam and tie into Roundup POD at the 10-03 well location.
11-01CK/KB/WIW	NENE	11	57N	80W	Add 11-01WIW at this location. Shift the Channel crossing on BLM surface upstream about 50' to avoid steeper slopes
11-03CK/KB	NENW	11	57N	80W	Rip-rap will be placed at the sized culverts along the road accessing 11-03 wells to prevent erosion.
11-09CK/KB	NESE	11	57N	80W	The access will be realigned to the west and avoid steep grade and the spot upgrade was withdrawn.
11-11CK/KB	NESW	11	57N	80W	Add broken back to culvert 57-80-11-03A below headcut including a rock gabion to reduce water velocity and prevent erosion. Withdraw design road segment at the 57-80-11-11 culvert location shifting the crossing downstream with realigned access. Crossing reduced to a spot upgrade with a typical culvert crossing.
12-03CK/KB	NENW	12	57N	80W	The KB well will be moved approximately 100 feet south to accommodate more work space area.

Well #	Qtr/Qtr	Sec	Twp	Rng	Changes/Comments
12-11CK/KB	NESW	12	57N	80W	BLM recommended moving the location about 250 feet south to avoid steep slopes, highly erosive soils & sagebrush; the operator and landowner agreed. This is a tight location and a slot or pad will be authorized as an eyebrow location adjacent to the main access road facilitating a pullout area.
13-03CK/KB	NENW	13	57N	80W	The water line to the 57-80 12-14 Pit, if sundried in as a primary impoundment, will come off the access road to reduce its length and avoid steep slope.
14-11CK/KB	NESW	14	57N	80W	The landowner & operator want to reduce the status of this road from engineered to improved in order to minimize the road width. BLM recommended realigning the road to follow the contour and avoiding the slopes or redesign the road with a narrower width as any changes must meet BLM 9113 standards.
2-09CK/KB	NESE	2	57N	80W	BLM recommended moving the location west and off the ridge top about 200 feet to avoid erosive soils and to provide adequate work space. Nance requested a rig slot at the alternate location due to side slope and rough ground; BLM agreed.
2-11CK/KB	NESW	2	57N	80W	Rip-rap will be placed at the sized culverts along the road accessing 02-21 wells to prevent erosion.
3-01CK/KB	NENE	3	57N	80W	A low water crossing was added at the drainage crossing for the access from the west.
3-09CK/KB	NESE	3	57N	80W	The engineered road design was withdrawn for alternate access utilizing existing fire break. The alternate route avoids the majority of the sagebrush and steep slopes/highly erosive soils. BLM recommended an alternate well location outside of sage about 300 feet SW adjacent to the alternate access route. Nance agreed to the move.

**Table 2.3.2-Water Management changes made during the onsite inspection.**

Impoundment Name	Qtr/Qtr	Sec	Twp	Rng	comments
Upper Weltner Prong	SENW	10	57N	80W	Utilities from the 10-11 location will be run below the dam and tie into the Roundup POD @ the 10-03 location
PIT 12-14	SESW	12	57N	80W	The water line to the 12-14 Pit was rerouted to begin from the 13-03CK/KB well access road to reduce the water line length and avoid steep slopes.
General	Project wide	Project wide	57N	80W	All 12 proposed impoundments submitted as primary impoundments are to be changes to secondary. Reclamation bonds are not required at this time.

**2.3.2. Programmatic mitigation measures identified in the PRB FEIS ROD**

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

#### **2.3.2.1. Groundwater**

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

#### **2.3.2.2. Surface Water**

1. Channel Crossings:
  - a) Minimize channel disturbance as much as possible by limiting pipeline and road crossings.
  - b) Avoid running pipelines and access roads within floodplains or parallel to a stream channel.
  - c) Channel crossings by road and pipelines will be constructed perpendicular to flow. Culverts will be installed at appropriate locations for streams and channels crossed by roads as specified in the BLM Manual 9112-Bridges and Major Culverts and Manual 9113-Roads. Streams will be crossed perpendicular to flow, where possible, and all stream crossing structures will be designed to carry the 25-year discharge event or other capacities as directed by the BLM.
  - d) Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.
2. Low water crossings will be constructed at original streambed elevation in a manner that will prevent any blockage or restriction of the existing channel. Material removed will be stockpiled for use in reclamation of the crossings.
3. Concerns regarding the quality of the discharged CBNG water on downstream irrigation use may require operators to increase the amount of storage of CBNG water during the irrigation months and allow more surface discharge during the non-irrigation months.
4. The operator will supply a copy of the complete approved SW-4, SW-3, or SW-CBNG permits to BLM as they are issued by WSEO for impoundments.

#### **2.3.2.3. Vegetation**

1. Temporarily fence reseeded areas, if not already fenced, for at least two complete growing seasons to insure reclamation success on problematic sites (e.g. close to livestock watering source, erosive soils etc.). This is applicable as a performance based measure for those areas identified with poor reclamation potential. See table 4.1.

#### **2.3.2.4. Soils**

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

#### **2.3.2.5. Wildlife**

1. For any surface-disturbing activities proposed in sagebrush shrublands, the Companies will conduct clearance surveys for sage grouse breeding activity during the sage grouse's breeding season before initiating the activities. The surveys must encompass all sagebrush shrublands within 0.5 mile of the proposed activities.
2. The Companies will locate facilities so that noise from the facilities at any nearby sage grouse or sharp-tailed grouse display grounds does not exceed 49 decibels (10 dBA above background noise) at the display ground.

3. Containment impoundments will be fenced to exclude wildlife and livestock. If they are not fenced, they will be designed and constructed to prevent entrapment and drowning.
4. All stock tanks shall include a ramp to enable trapped small birds and mammals to escape. See Idaho BLM Technical Bulletin 89-4 entitled Wildlife Watering and Escape Ramps on Livestock Water Developments: Suggestions and Recommendations.

#### **2.3.2.6. Threatened, Endangered, or Sensitive Species**

##### **2.3.2.6.1. Bald Eagle**

1. Special habitats for raptors, including wintering bald eagles, will be identified and considered during the review of Sundry Notices.
2. Additional mitigation measures may be necessary if the site-specific project is determined by a BLM biologist to have adverse effects to bald eagles or their habitat.

##### **2.3.2.6.2. Black-footed Ferret**

1. Prairie dog colonies will be avoided wherever possible.

##### **2.3.2.6.3. Ute Ladies'-tresses Orchid**

1. Moist soils near wetlands, streams, lakes, or springs in the project area will be promptly revegetated if construction activities impact the vegetation in these areas. Revegetation will be designed to avoid the establishment of noxious weeds.

##### **2.3.2.7. Visual Resources**

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

##### **2.3.2.8. Noise**

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

##### **2.3.2.9. Air Quality**

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

### 2.3.3. Site specific mitigation measures

#### Surface Use Protective Measures

1. All changes made at the onsite will be followed. They have all been incorporated into the operator's plan of development. See Section 2.3., "Changes as a result of the onsite" on pages 10-11.
2. All **Nance Petroleum Corporation** representatives and contractors will have a copy of the approved POD map and conditions of approval with them at all times while conducting activities within the **Roundup POD** project area.
3. The approval of this project does not grant authority to use off lease Federal Lands. No access or surface activity is allowed on or off the affected leases on Federal lands until rights-of-way grants become authorized.
4. The operator will follow the guidance provided in the Wyoming Policy on Reclamation (IM WY-90-231) specifically the following:  
Reclamation Standards:
  1. 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.
  2. 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.
  3. 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.
  4. The reclaimed landscape shall have characteristics that approximate the visual quality of the adjacent area with regard to location, scale, shape, color and orientation of major landscape features and meet the needs of the planned post disturbance land use.
5. Provide 4" of aggregate where grades exceed 8%.
6. Surfacing material will be from a permitted pit. The parent material (rock) must be crushed and screened to meet road grade W standards as set forth in Wyoming Supplement to BLM Road Manual 9113.
7. The culvert locations will be staked prior to construction. The culvert invert grade and finished road grade will be clearly indicated on the stakes. Culverts will be installed on natural ground, or on a designed flow line of a ditch. The minimum cover over culverts will be 12" or one-half the diameter whichever is greater. Drainage laterals in the form of culverts or waterbars shall be placed according to the following spacing:

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

8. Top soil will be segregated for all excavation including the entire disturbance area for constructed pads and excavated areas for rig leveling, reserve pits, constructed roads, spot upgrades, reservoir upgrades, outfalls and utility trenches. This requirement will be waived for trenches installed with wheel trenchers.
9. All permanent above-ground structures (e.g., production equipment, tanks, etc.) not subject to safety requirements will be painted to blend with the natural color of the landscape. The paint used will be a color which simulates “Standard Environmental Colors.” The color selected for the Roundup POD is Covert Green.
10. If produced water is to be applied to road surfaces as dust abatement, the operator needs an approved Wyoming Oil & Gas Commission Facility Information for Road Application of Waste and Waste Water (Form 20) along with the proposed action describing locations, application rates, etc. Form 20 is available at <http://wogcc.state.wy.us>.
11. “Roughed-in” or “Pioneer” roads shall be constructed according to the line and grade shown in the approved engineering design. Non-engineered roads shall be constructed to a line and grade established to meet the BLM Gold Book and 9113 guidelines as approved in the MSUP, and shaped according to an approved design template for that road.
  - a. Improved roads with utility corridor will not exceed a working width of 45 feet with a blading/clearing width not to exceed 30 ft unless a specific design is included in the plan and profile section of the master surface use plan.
  - b. Primitive roads (2-tracks) with utility corridor will not exceed a working width of 30 feet with a blading/clearing width not to exceed 20 ft. Construction of primitive roads access/utility corridor within the POD will minimize impact to sagebrush by minimizing road width, mowing and wheel trenching
12. Adequate drainage control must be in place at all stages of construction and culverts installed as soon as feasible.
13. Final grading and surfacing shall occur immediately after utility installation is complete. All rills, gullies, and other surface defects shall be ripped to the full depth of erosion across the entire width of the roadway prior to final grading and surfacing.
14. Horizontal curves with radius less than 220 feet require curve widening as follows:
 

Turning Radius (ft)	Min. Curve Widening (ft)	Widened Lane Width (ft)
220 +	0	12
120 to 219	2	14
90 to 119	4	16
50 to 89	8	20
15. All roads, well pads, rig slots, culverts, spot upgrades and locations where engineered construction will occur will be completely slope staked for the pre-construction meeting.
16. Disturbance for pipelines and utility corridors adjacent to access roads will be contained within the disturbance allowed for road construction.
17. Pipeline installation and/or corridors without road access will not exceed a disturbance width of 40 feet with clearing and blading not to exceed 30 feet.

18. Utility corridors will be expediently reclaimed following construction and maintained in a professional and workmanship manner avoiding tire rutting, settling and erosion.
19. A minimum 20 foot undisturbed vegetative buffer will be maintained for erosion features and drainages along the access roads to the following well locations: 01-01CK/KB and 11-03CK/KB
20. Mowing at the well site where a constructed pad is not approved as designed will be minimized to a 35 foot radius of the well(s) stake.
21. The operator will maintain well drilling, completion and associated construction operations within a 100 foot by 200 foot work area for those locations where a constructed pad is not approved as designed.
22. The following impoundments are considered secondary and may not be constructed prior to submittal of the appropriate bond to BLM under sundry notice Form 3160-5 for change of status:

	<b>IMPOUNDMENT Name / Number</b>	<b>Qtr/Qtr</b>	<b>Sec.</b>	<b>TWP</b>	<b>RNG</b>	<b>Capacity (Acre Feet)</b>	<b>Surface Disturbance (Acres)</b>	<b>Lease Number</b>
1	Lower Roundup Draw	SENE	1	57	80	5.72	2	WYW142104
2	PIT 01-10	NWSE	1	57	80	45.3	5.6	WYW142104
3	PIT 01-11A	NESW	1	57	80	45.3	5	WYW142104
4	Upper Weltner Prong	SENE	10	57	80	15.65	3	WYW142848
5	Roundup Draw	SENE	11	57	80	33.75	2	WYW142104
6	PIT 01-11B	NESW	1	57	80	30.7	4	WYW142104
7	Tinder David Draw	SENE	13	57	80	4.77	4	WYW142105
8	PIT 10-01	NENE	10	57	80	30.6	2.9	WYW142848
9	PIT 14-07A	SWNE	14	57	80	21.2	3	WYW142105
10	PIT 14-07B	SWNE	14	57	80	15.8	1.6	WYW142105
11	PIT 12-14	SESW	12	57	80	58.6	6.5	WYW142104
12	PIT 12-08	SENE	12	57	80	20.5	2	WYW142104

23. Reserve pits containing frozen fluids will not be closed. See “Operations/Maintenance”, COA #11 of the Conditions of Approval document for further clarification.
24. Top soil will be segregated for all excavation including the entire disturbance area for constructed pads and excavated areas for rig slots, reserve pits, constructed roads, spot upgrades, reservoir upgrades, outfalls and utility trenches. Segregation will not be required for trenches installed with wheel trenchers.
25. Segregated top soil will be redistributed once the instillation of gas, water and electrical utilities is complete at the well head.
26. No surface disturbance will be authorized on federal lands prior to the approval of a Pesticide Use Plan (PUP) form WY-04-9222-1 submitted by the operator to the Buffalo Field Office.
27. Disturbance areas mentioned below have fragile soils and erosive conditions that shall be stabilized in a manner which eliminates erosion until a self-perpetuating non-weed native plant

community has stabilized the site. Stabilization efforts shall be finished within 30 days of the completion of construction activities.

- Well site(s): Drilling fluids will be removed from reserve pits immediately following well drilling activities to expedite pit closure.
  - 03-01CK/KB
  - 02-03CK./KB
  - 0-03CK/KB
  - 14-03CK/KB
  - 11-09CK/KB
  - 12-11CK/KB
- Road / Pipeline segments associated with well(s):
  - 03-01CK/KB beginning at VS8 and ending at the well location
  - 10-03CK/KB beginning at VS10 and ending at the well location
  - 14-03CK/KB beginning at VS17 and ending at the well location
  - 11-09CK/KB beginning at VS11 and ending at the well location
- Roads and Pipeline segment(s):
  - the main access road and corridor between LVS12 and VS14

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

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

\*PLS = pure live seed

\*Northern Plains adapted species

\*Double this rate if broadcast seeding

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

**Civil Engineering & Access Roads**

1. Gabion mattresses shall be installed at the sized culverts on the roads accessing wells 01-01, 02-11, and 11-03. Drawings shall be submitted to the BLM at the pre-construction meeting showing the upstream water surface at these crossings for the 10- and 25-year discharge.
2. The crossing on the improved road just north of well 01-09 shall be sized. Armoring shall be provided at the exit as needed to protect the channel from erosion from the 25-year discharge. A

drawing shall be submitted to the BLM at the pre-construction meeting showing the upstream water surface at this crossing for the 10- and 25-year discharge.

3. Culverts used for channel crossings shall be 18-inches in diameter or larger.
4. Culverts used for cross-drain/flow-relief shall be 12-inches in diameter or larger.
5. Culverts 18-inches and smaller shall have 6-inches or more cover if the culvert material is thick-walled SDR pipe or pipe of equal or greater crushing resistance. All CMP culverts and culverts larger than 18-inches in diameter shall have 12 inches of cover or one-half the diameter, whichever is greater.

**Wildlife Protective Measures**

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 condition will be implemented on an annual basis for the duration of surface disturbing activities.** This timing limitation will affect the following proposed wells and their associated infrastructure:

<i>Township/Range</i>	<i>Section</i>	<i>Affected Wells and Infrastructure</i>
58/79	6	ALL proposed pipeline ROW, road/corridor & overhead powerline installation within the SWNW of this section.

- 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 disturbance 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 disturbance 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. Nests to be checked are within a 0.5 mile or less of the proposed development.
  - d. If an undocumented raptor nest is located during project construction or operation, the Buffalo Field Office (307-684-1100) shall be notified within 24 hours.
  - e.

2. No surface disturbing activity shall occur within 0.25 miles of all identified burrowing owl nests from April 15 through August 31, annually, prior to a burrowing owl nest occupancy survey for the current breeding season. A 0.25 mile buffer will be applied if a burrowing owl nest is identified. This condition will be implemented on an annual basis for the duration of surface disturbing activities within the prairie dog town(s). This timing limitation will affect the following proposed wells and their associated infrastructure:

<i>Township/Range</i>	<i>Section</i>	<i>Affected Wells and Infrastructure</i>
58/80	1	Wells: 01-09CK, 01-09KB & 01-09WIW

3. The following conditions will alleviate impacts to sage grouse:
  - a. No surface disturbing activities are permitted within 2 miles of any greater sage-grouse leks between March 1 and June 15, prior to completion of a greater sage-grouse lek survey. **This condition will be implemented on an annual basis for the duration of**

**surface disturbing activities.** This timing limitation will affect the following wells and infrastructure:

<b>Township/Range</b>	<b>Section</b>	<b>Affected Wells and Infrastructure</b>
57/79	7	ALL proposed overhead powerline within the <b>north ½ SW</b> of this section.
57/80	1	<b>Wells: 01-01 CK &amp; KB, 01-03 CK &amp; KB, 01-09 CK, KB &amp; WIW, 01-11 CK &amp; KB</b> ALL proposed road/corridor & overhead powerline installation within the <b>Entire section with exception of the south ½ SWSW and south ½ SESE.</b>
57/80	2	<b>Wells: 02-01 CK &amp; KB, 02-03 CK &amp; KB, 02-09 CK &amp; KB</b> ALL proposed road/corridor installation within the <b>Entire section with exception of the SESE and SW.</b>
57/80	11	ALL proposed road/corridor installation within the <b>SESE</b> of this section.
57/80	12	<b>Wells: 12-01 CK &amp; KB, 12-09 CK &amp; KB, 12-11 CK &amp; KB</b> ALL proposed road/corridor & overhead powerline installation within the <b>Entire section with exception of the NENW .</b>
57/80	13	<b>Wells: 13-03 CK &amp; KB</b> ALL proposed overhead powerline installation within the <b>Entire section.</b>
57/80	14	<b>Wells: 14-01 CK &amp; KB</b> ALL proposed road/corridor & overhead powerline installation within <b>SENE and NENE</b> of this section.

- a. If an active sage grouse lek is identified during the survey, the 2 mile timing restriction (March 1-June 15) will be applied and surface disturbing activities will not be permitted until after the nesting season. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the 2 mile buffer until the following breeding season (March 1). The required sage grouse survey will be conducted by a biologist following the most current WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.
  - b. Creation of raptor hunting perches will be avoided within 0.5 mile of documented sage grouse and sharp-tailed grouse lek sites. Perch inhibitors will be installed to deter avian predators from preying on sage grouse.
4. The following conditions will alleviate impacts to sharp-tailed grouse:
- a. Sharp-tailed grouse surveys are required throughout the project area for the current breeding season and results reviewed by a BLM biologist. If an active lek is identified during the survey, the 0.64 mile timing restriction (April 1 to May 31) will be applied and surface disturbing activities will not be permitted until after the nesting season. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the buffer until the following breeding season (April 1). The required sharp-tailed grouse survey will be conducted by a biologist following WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist.
  - b. Creation of raptor hunting perches will be avoided within 0.64 miles of documented sharp-tailed grouse lek sites. Perch inhibitors will be installed to deter avian predators from preying on grouse.

**2.4. Alternatives considered but not analyzed in detail**

<b>Alternative</b>	<b>Analysis</b>	<b>Comments</b>
Class V Shallow Injection Systems	Soils and Hydraulic analysis engineering and cost evaluation.	Uncertain regulatory compliance as determined by the engineering analysis of the geologic integrity. Not cost effective.
Treatment & Discharge	General engineering, cost feasibility estimates and regulatory review.	Lack of surface waters for mixing. Concern by Wyoming & Montana DEQ over change in hydraulic balance in Hanging Woman Creek Basin.
Direct Discharge to Channel	Regulatory review.	Same as treatment & discharge.
Misters	Conceptual analysis and evaluation of analogs.	Concern regarding elevating the soil salinity.

**3. DESCRIPTION OF AFFECTED ENVIRONMENT**

Applications to drill were initially received on **April 17, 2007**. Field inspections of the proposed **Roundup POD** CBNG project were conducted on July 19, 2007 to inspect impoundment locations and October 23, 24 & 25, 2007 to inspect the well locations, access roads and utility corridors.

The following personnel were in attendance:

Representing BLM:

- Jim Verplancke, Natural Resource Specialist
- Hilaire Peck, Civil Engineer
- Mike McKinley, Hydrologist

Representing the operator:

- Jesse Martin, Nance Petroleum Corp.
- Eric Rolli, Pearl Field Services
- Kimberlee L. Bonnet, Pearl Field Services
- Joey L. Sheeley, Pearl Field Services
- Bill Kovar, Pearl Field Services

Representing the Landowners:

Don Luse, Padlock Ranch

This section describes the environment that would be affected by implementation of the Alternatives described in Section 2. Aspects of the affected environment described in this section focus on the relevant major issues. Certain critical environmental components require analysis under BLM policy. These items are presented below in Table 3.1.

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

<b>Mandatory Item</b>	<b>Potentially Impacted</b>	<b>No Impact</b>	<b>Not Present On Site</b>	<b>BLM Evaluator</b>
Threatened and Endangered Species		X		Jim Verplancke
Floodplains			X	Jim Verplancke Mike McKinley

Mandatory Item	Potentially Impacted	No Impact	Not Present On Site	BLM Evaluator
Wilderness Values			X	Jim Verplancke
ACECs			X	Jim Verplancke
Water Resources	X			Jim Verplancke Mike McKinley
Air Quality	X			Jim Verplancke
Cultural or Historical Values			X	G.L. "Buck" Damone III
Prime or Unique Farmlands			X	Jim Verplancke
Wild & Scenic Rivers			X	Jim Verplancke
Wetland/Riparian			X	Jim Verplancke Mike McKinley
Native American Religious Concerns			X	G.L. "Buck" Damone III
Hazardous Wastes or Solids		X		Jim Verplancke
Invasive, Nonnative Species	X			Jim Verplancke
Environmental Justice		X		Jim Verplancke

### 3.1. Topographic Characteristics of Project Area

The project area is located approximately 30 miles northeast of Sheridan, WY in north-central Sheridan County, Township 57 North, Range 80 West, Sections 1, 2, 3, 10, 11, 12, 13 & 14, Sixth Principal Meridian. The project area includes private and federal surface overlaying federal minerals. The project area is bordered with Nance's existing PODs: East Badger POD to the east and west as well as Box Elder, West Antelope, and Hanging Woman Basin PODs to the north. The Roundup POD lies in the north half of the federal Hanging Woman Unit operated by Kennedy Oil who has proposed plans to develop the southern half of the Unit.

Elevations within the project area range from 3,800 to 4,265 ft above sea level. The topography throughout the project area consists of a valley bottom abruptly rising to sloping ridges and draws. Ephemeral tributaries of Roundup Draw, Hanging Woman Creek, Spring Creek, and two forks of Waddle Creek (Randall Prong and Weltner Prong) drain the project area. The climate is semi-arid, 15-19 inch Northern Precipitation Zone of precipitation. Typically 60% of which occurs between May and September.

Land cover within the POD consists of sagebrush shrubland (90%) and grasslands (10%). Native vegetative species in the upland areas are Wyoming big-sagebrush, bluebunch wheatgrass, needleandthread, western wheatgrass, threadleaf sedge, and blue grama. Lowland areas are comprised of ephemeral stream channels predominantly vegetated by silver sagebrush, green needlegrass, western wheatgrass, and various native forbs. Scattered, isolated stands of cottonwood, box elder, and elm trees exist in the project area as well. Historic land uses within the project area include CBNG development and cattle grazing.

### 3.2. Vegetation & Soils

Soils within the project area were identified from the *Sheridan County Survey Area, Wyoming (WY633)*. The soil survey was performed by the Natural Resource Conservation Service according to National

Cooperative Soil Survey standards. Pertinent information for analysis was obtained from the published soil survey and the National Soils Information System (NASIS) database for the area.

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

**Table 3.2 - Reclamation Potential**

Reclamation Potential	Acres	% of Project Area
Poor	2468.7580	58%
Moderate	1256.6720	30%
Well	527.5650	12%
Total acres	4252.9950	100%

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

**Table 3.3 – Soil Map Unit Types**

Map Unit Symbol	Map Unit Name	Acres	%
173	LAMBMAN-HARGREAVE ASSOCIATION, 3 TO 15 PERCENT SLOPES	871	20%
269	SHINGLE-THEEDLE-KISHONA ASSOCIATION, MOIST, 3 TO 30 PERCENT SLOPES	809	19%
263	SHINGLE-SAMDAY CLAY LOAMS, MOIST, 3 TO 55 PERCENT SLOPES	508	12%
305	WORFKA-SHINGLE-SAMDAY COMPLEX, MOIST, 6 TO 30 PERCENT SLOPES	363	9%
115	BIDMAN, MOIST-ULM LOAMS, 0 TO 6 PERCENT SLOPES	336	8%
240	RENOHILL, MOIST-WYARNO ASSOCIATION, 6 TO 9 PERCENT SLOPES	272	6%
267	SHINGLE-THEEDLE LOAMS, MOIST, 45 TO 75 PERCENT SLOPES	193	5%
203	PARMLEED-BIDMAN ASSOCIATION, MOIST, 9 TO 25 PERCENT SLOPES	152	4%
202	PARMLEED-BIDMAN ASSOCIATION, MOIST, 3 TO 9 PERCENT SLOPES	141	3%
169	JONPOL-PLATMAK ASSOCIATION, 0 TO 9 PERCENT SLOPES	86	2%
261	SHINGLE, MOIST-ROCK OUTCROP COMPLEX, 30 TO 50 PERCENT SLOPES	83	2%
237	RENOHILL, MOIST-ULM ASSOCIATION, 3 TO 10 PERCENT SLOPES	66	2%
319	ZIGWEID-KISHONA-CAMBRIA COMPLEX, MOIST, 3 TO 6 PERCENT SLOPES	57	1%
146	GAYHART-BAHL ASSOCIATION, MOIST, 6 TO 15 PERCENT SLOPES	56	1%
304	WORFKA-SHINGLE-SAMDAY COMPLEX, 6 TO 30 PERCENT SLOPES	44	1%
213	PLATMAK LOAM, 3 TO 6 PERCENT SLOPES	36	1%
118	CAMBRIA-FORKWOOD COMPLEX, MOIST, 0 TO 9 PERCENT SLOPES	30	1%
128	CUSHMAN-FORKWOOD ASSOCIATION, MOIST, 0 TO 9 PERCENT SLOPES	29	1%
157	HAVERDAD LOAM, MOIST, SALINE, 0 TO 3 PERCENT SLOPES	28	1%

Map Unit Symbol	Map Unit Name	Acres	%
120	CEDAK-RECLUSE ASSOCIATION, 6 TO 9 PERCENT SLOPES	22	1%
212	PLATMAK LOAM, 0 TO 3 PERCENT SLOPES	18	0%
282	THEEDLE-KISHONA ASSOCIATION, MOIST, 6 TO 9 PERCENT SLOPES	15	0%
155	HAVERDAD LOAM, MOIST, 0 TO 3 PERCENT SLOPES	10	0%
274	SHINGLE-WORF COMPLEX, MOIST, 9 TO 15 PERCENT SLOPES	8	0%
309	WYARNO CLAY LOAM, 0 TO 3 PERCENT SLOPES	6	0%
318	ZIGWEID-KISHONA-CAMBRIA COMPLEX, MOIST, 0 TO 3 PERCENT SLOPES	5	0%
321	WATER	5	0%
131	CUSHMAN-WORF ASSOCIATION, MOIST, 3 TO 15 PERCENT SLOPES	2	0%
129	CUSHMAN-FORKWOOD ASSOCIATION, MOIST, 9 TO 15 PERCENT SLOPES	2	0%

Note: Additional site specific soil information is included in the Ecological Site interpretations which follow in Section 3.2.2.

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

**Table 3.4 – Map Units and Ecological Sites**

Ecological Site Description	Map Unit Symbol(s)	Acres	%
LOAMY 15-19" NP	118, 120, 128, 129, 131, 169, 202, 203, 212, 213, 269, 282, 318, 319	1404	33%
SHALLOW LOAMY 15-19" NP	261, 274	1155	27%
SHALLOW SANDY 15-19" NP	173	871	20%
CLAYEY 15-19" NP	237, 240, 309	344	8%
Loamy 10-14" NP	115	336	8%
Clayey 10-14" NP	146	56	1%
SHALLOW LOAMY 10-14" NP	304	44	1%
SALINE LOWLAND (10-14 NP)	157	28	1%
LOWLAND 15-19" NP	155	10	0%
WATER	321	5	0%
Total		4253	100%

### **3.2.1. Dominant Ecological Sites and Plant Communities identified in this POD**

#### **3.2.1.1. Loamy**

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

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

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

#### **3.2.1.2. Shallow Loamy**

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

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

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

#### **3.2.1.3. Mixed Sagebrush/Grass**

The plant community present on both the loamy and shallow loamy ecological sites is *Mixed Sagebrush/Grass*. Compared to the HCPC, sagebrush and blue grama have increased. Production of the cool season grasses and bluebunch wheatgrass have decreased. Cheatgrass has invaded the site.

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

A summary of the ecological sites within the project area are listed in the table 3.4 along with the individual acreage and the percentage of the total area identified within the POD boundary.

### **3.2.2. Invasive Species**

The Wyoming Energy Resource Information Clearinghouse (WERIC) web site ([www.weric.info](http://www.weric.info)) did not have data available for the Roundup POD area. However, the operator and BLM observed the following infestations of state-listed noxious weed species during the field investigations:

- Leafy spurge
- Russian knapweed
- Scotch thistle
- Canada thistle
- Hound's tongue
- Black henbane

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 SWCA Environmental Consultants (2006) and ARCADIS (2007). SWCA Environmental Consultants and ARCADIS performed surveys for bald eagles, mountain plover, sharp-tailed grouse, greater sage-grouse, raptor nests and prairie dog colonies according to protocol in 2006 and 2007, respectively. Surveys were conducted for Ute ladies'-tresses orchid habitat.

A BLM biologist conducted field visits on October 23, 24, & 25, 2007. During this time, the biologist reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project adjustment recommendations where wildlife issues arose.

Wildlife species common to the habitat types present are identified in the 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 Roundup project area include pronghorn antelope, mule deer, and elk. The WGFD has determined that the project area contains Yearlong range for pronghorn antelope, and Winter-Yearlong range for mule deer. Elk within the project area are likely escapees from a private herd managed by the Padlock Ranch. The WGFD is not managing for an elk population in this area. 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. **Winter-Yearlong** use is when a population or a portion of a population of animals makes general use of the documented suitable habitat sites within this range on a year-round basis. During the winter months there is a significant influx of additional animals into the area from other seasonal ranges. **Yearlong** use is when a population of animals makes general use of suitable documented habitat sites within the range on a year round basis. Animals may leave the area under severe conditions

#### **3.3.2. Aquatics**

The project area is drained by ephemeral tributaries of the Tongue River. There are no springs within the project area currently on record with the WSEO or mapped on the USGS 1:24,000 OTO Ranch, Wyoming-Montana or Roundup Draw, Wyoming-Montana Quadrangles that cover the project area (Nance 2007). Fish that have been identified in the Tongue River watershed are listed in the PRB FEIS (3-156-159).

#### **3.3.3. Migratory Birds**

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

##### **3.3.3.1. Raptors**

Four raptor nest sites were identified by SWCA Environmental Consultants (2006) within 0.5 mile of the project area. Eight raptor nests were identified by and ARCADIS (2007) and BLM within 0.5 mile of the project area, of the eight nests four were active in 2007.

**Table 3.6.** Documented raptor nests within the Roundup project area in 2006 and 2007.

<b>BLM ID#</b>	<b>SPECIES</b>	<b>UTM (NAD 83)</b>	<b>LEGAL LOCATION</b>	<b>SUBSTRATE</b>	<b>CONDITION</b>	<b>STATUS IN 2006</b>	<b>STATUS IN 2007</b>
3781	Great-horned owl	38716E 4977580N	SESW Sec. 6 T57N, R79W	Box Elder, live	Excellent	Active	Inactive
3286	Great-horned owl	380743E 4978941N	NESW Sec. 33 T58N, R80W	Juniper, live	Good	Active	Inactive
376	Unknown	382551E 4978606N	SWSE Sec. 34 T58N, R80W	Unknown	Gone	Gone	Gone
3241	Red-tailed hawk	387076E 4977328N	NESW Sec. 6 T57N, R79W	Cottonwood, live	Good	Active	Active
4451	Unknown Raptor	387422E 4976228N	SWNE Sec. 7 T57N, R80W	Box Elder, live	Poor	Inactive	Inactive
5132	Swainson's Hawk	386729E 4975013N	SWSW Sec. 7 T57N, R80W	Box Elder, live	Good	NA	Active
5133	Red-tailed hawk	386150E 4974341N	SENE Sec.13 T57N, R80W	Box Elder, live	Good	NA	Active
3237	Great-Horned owl	387097E 4978897N	NWSW Sec. 15 T57N, R80W	Cottonwood, live	Good	Active	Active

### 3.3.4. Threatened and Endangered and Sensitive Species

#### 3.3.4.1. Threatened and Endangered Species

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

##### 3.3.4.1.1. Black-footed ferret

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

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

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

Four black-tailed prairie dog colonies were identified during site visits by ARCADIS and SWCA within the project area as indicated below in table 4.1. The project area is located approximately 15 miles from the Arvada complex, the nearest potential reintroduction area. Habitat of sufficient size to support a ferret population is not present within the Roundup project area.

**Table 3.7** Black-tailed Prairie Dog Colonies within the Roundup project area in 2006 and 2007.

UTM (NAD 83)	LEGAL LOCATION	ACRES
381851E 4977868N	NWNW Section 3, T57N, R80W	7.7
385621E 4977319N	NWSE Section 1, T57N, R80W	17.9
382905E 4976479N	NENE Section 10, T57N, R80W	5.7
386496E 4977187N	NWSW Section 6, T57N, R79W	8.1

##### 3.3.4.1.2. Ute's Ladies Tresses Orchid

This orchid is listed as Threatened under the Endangered Species Act. It is extremely rare and occurs in moist, sub-irrigated or seasonally flooded soils at elevations between 1,780 and 6,800 feet above sea level. Habitat includes wet meadows, abandoned stream channels, valley bottoms, gravel bars, and near lakes or perennial streams that become inundated during large precipitation events. Prior to 2005, only four orchid populations had been documented within Wyoming. Five additional sites were located in 2005 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.

Roundup Draw, Hanging Woman Creek, Spring Creek, and two forks of Waddle Creek (Randall Prong and Weltner Prong) and their tributaries are ephemeral. There are no springs within the POD area currently on record with the WSEO or mapped on the USGS 1:24,000 quadrangles that cover the POD area (Nance 2007). Suitable orchid habitat is not present within the Roundup POD project area.

#### **3.3.4.2. Sensitive Species**

The USDI Bureau of Land Management (BLM) Wyoming has prepared a list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate. The authority for this policy and guidance comes from the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and the Department Manual 235.1.1A.

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

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

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 that require sagebrush for some part of their life cycle. Sagebrush obligate bird species within the Powder River Basin, listed as sensitive species by BLM (Wyoming), include sage-grouse, Brewer's sparrow, sage thrasher, and sage sparrow. Sage sparrows, Brewer's sparrows, and sage thrashers all require sagebrush for nesting, with nests typically located in the sagebrush canopy. Sage thrashers usually nest in tall dense clumps of sagebrush within areas having some bare ground for foraging. Sage sparrows prefer large continuous stands of sagebrush, and Brewer's sparrows are associated closely with sagebrush habitats having abundant scattered shrubs and short grass (Page and Ritter 1999). Other sagebrush obligate species include pygmy rabbit, sagebrush vole, pronghorn antelope, and sagebrush lizard.

##### **3.3.4.2.1. Bald eagle**

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

Bald eagle nesting habitat is generally found in areas that support large mature trees. Eagles typically will build their nests in the crown of mature trees that are close to a reliable prey source. This species feeds primarily on fish, waterfowl, and carrion. In more arid environments, such as the Powder River Basin, prairie dogs, ground squirrels, and lagomorphs (hares and rabbits) can make up the primary prey base. The diets of wintering bald eagles can be more varied. In addition to prairie dogs, ground squirrels, and

lagomorphs, domestic sheep and big game carcasses may provide a significant food source in some areas. Historically, sheep carcasses from large domestic sheep ranches provided a reliable winter food source within the Powder River Basin (Patterson and Anderson 1985). Today, few large sheep operations remain in the Powder River Basin. Wintering bald eagles may congregate in roosting areas generally made up of several large trees clumped together in stands of upland conifers, along wooded riparian corridors, or in isolated groups. Bald eagles often share these roost sites with golden eagles as well.

Potential habitat within the Roundup project area consists of scattered or isolated cottonwood and box elder trees along the Main Prong Hanging Woman Creek, Middle Prong Hanging Woman Creek and the Weltner Prong and Randall Prongs of Waddle Creek. Due to the lack of shelter and horizontal structure, these habitats are marginal. Multiple small prairie dog colonies in the area could provide a potential prey base, but no eagles have been recorded foraging in the colonies to date. The Tongue River is located Approximately 15 miles west of the project area. No bald eagle roost sites or nests were observed within or surrounding the project area. In addition to lack of roosting and nesting habitat, the lack of fish bearing water bodies and significant terrestrial prey base in the area make it highly unlikely that bald eagles would roost or nest within the Roundup project area (ARCADIS 2007). No observations of individuals were documented by BLM, ARCADIS or SWCA within 3 miles of the project area during the 2005 to 2007 surveys.

#### **3.3.4.2.2. Black-tailed prairie dog**

On August 12, 2004, the U.S. Fish and Wildlife Service removed the black-tailed prairie dog's Candidate status. The Buffalo Field Office however will consider prairie dogs as a sensitive species and continue to afford this species the protections described in the FEIS. The black-tailed prairie dog is a diurnal rodent inhabiting prairie and desert grasslands of the Great Plains. Their decline is related to multiple factors including, habitat destruction, poisoning, and Sylvatic plague. Four black-tailed prairie dog colonies with a total combined acreage of 39.4 acres exist within the project area. See Table 3.7 for locations of black-tailed prairie dog colonies.

#### **3.3.4.2.3. Burrowing owls**

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

The western burrowing owl has declined significantly throughout its range in North America. Current population estimates for the United States are not well known but trend data suggest significant declines across their range. The last official population estimate placed them at less than 10,000 breeding pairs. The majority of the mid-western and western states within the owl's range have recognized that western burrowing owls are in trouble. It is listed as a sensitive species by the Bureau of Land Management throughout the west and by the U.S. Fish and Wildlife Service. 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 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) although juveniles will continue to hunt with and associate with parents until migration (early September through early November) (Haug 1985).

Two burrowing owl nests were identified within a half mile of the project area in 2007. One is located in a small 7.71 acre prairie dog colony located in SWNW; Section 3; T57N, R80W. Another burrowing owl nest was located in a small 2.9 acre prairie dog colony located in NWSW; Section 6; T57N, R79W that was subsequently removed by the installation of an off channel pit the operator constructed for storage of CBNG water.

**Table 3.8** Burrowing Owl Nest locations within the Roundup project area in 2006 and 2007.

BLM ID#	SPECIES	UTM (NAD 83)	LEGAL LOCATION	SUBSTRATE	CONDITION	STATUS IN 2006	STATUS IN 2007
New	Burrowing Owl	386510E 4977250N	NWSW Sec. 6, T57N, R 79W	Abandoned Burrow	Unknown	Active	Inactive
67	Burrowing Owl	381866E 4977875N	SWNW Sec. 3 T57N, R80W	Abandoned Burrow	Unknown	Active	Inactive

#### 3.3.4.2.4. Grouse

##### 3.3.4.2.4.1. Greater Sage-grouse

The greater sage-grouse is listed as a sensitive species by BLM (Wyoming). In recent years, seven petitions have been submitted to the U.S. Fish and Wildlife Service (FWS) to list greater sage-grouse as Threatened or Endangered. On January 12<sup>th</sup>, 2005, the USFWS issued a decision that the listing of the greater sage-grouse was “not warranted” following a Status Review. The decision document supporting this outcome noted the need to continue or expand all conservation efforts to conserve sage-grouse. A judge recently 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). Sage-grouse attend traditional courtship areas called leks which are in or adjacent to sagebrush dominated habitat. Several lek sites form clusters defined as a lek complex.

A complex is represented by a group of leks that are relatively close and represents part or all of a single breeding population and between which male sage grouse may be expected to interchange from one day to the next. Lek sites within a complex are usually < 3 km from one another. Lek complexes are clearly spatially separated from adjacent lek complexes by 6 km (Schroeder et al. 2000).

Suitable sage-grouse habitat is present throughout the project area. The Roundup project area is suited for sage-grouse breeding, nesting, and wintering grounds. Habitats within the project area, especially the moderately dense stands of sagebrush grasslands scattered throughout the project area have potential to support sage-grouse throughout the year. Moist draws and tributaries within the project area may provide brood rearing and late summer habitat, while other areas of higher sagebrush densities provide potential for nesting sage-grouse. BLM, SWCA and ARCADIS records identified four sage grouse leks within 3 miles of the Roundup POD. Hanging Woman Early Prong, Hanging Woman West Fork, Hanging Woman, and Hanging Woman Middle Fork are located within 3.2 kilometers of each other. This placement of leks might indicate a lek complex. All four lek sites are identified below (Table 6).

**Table 3.9 Sage-grouse leks surrounding the Roundup project area.**

<b>LEK NAME</b>	<b>LEGAL LOCATION</b>	<b>STATUS IN 2006 (PEAK MALES)</b>	<b>STATUS IN 2007 (PEAK MALES)</b>	<b>DISTANCE FROM PROJECT AREA (MILES)</b>
Hanging Woman West Fork	SESW Sec. 25 T58N, R80W	22	0	0.1
Hanging Woman	NENE Sec. 8 T57N, R79W	0	0	1.9
Hanging Woman Middle Fork	SWSE Sec. 8 T57N, R79W	12	0	1.6
Hanging Woman Early Prong	SWSE Sec. 18 T57N, R79W	26	0	1.0

**3.3.4.2.4.2. Sharp-tailed grouse**

Sharp-tailed grouse inhabit short and mixed-grass prairie, sagebrush shrublands, woodland edges, and river canyons. In Wyoming, this species is common where grasslands are intermixed with other shrublands, especially wooded draws, shrubby riparian areas, and wet meadows (PRB FEIS 3-148). Typical breeding habitat for sharp-tailed grouse consists of mixed prairie grasslands, mountain foothills, shrublands, willows, and irrigated native meadows (Cerovski et al. 2004). Height and density of vegetation and shrubs are important factors determining nesting and early brood rearing habitat.

The project area was considered to be more suitable for sage grouse nesting than for sharp-tailed breeding and nesting habitat, primarily due to the dominance of big sagebrush cover (ARCADIS 2007). One sharp-tailed grouse lek is located within 3 miles of the project area. This one lek site is identified below (Table 7) with peak male counts as recorded by ARCADIS.

**Table 3.10 Sharp-tailed grouse leks surrounding the Roundup project area.**

<b>LEK NAME</b>	<b>LEGAL LOCATION</b>	<b>STATUS IN 2006 (PEAK MALES)</b>	<b>STATUS IN 2007 (PEAK MALES)</b>	<b>DISTANCE FROM PROJECT AREA (MILES)</b>
West Prong Hanging Woman	NWNE Sec. 31 T58N, R79W	0	0	1.0

**3.3.4.2.5. Mountain plover**

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

Suitable mountain plover habitat is questionable within the project area. Positive plover nesting habitat features were found within the project area mainly in the form of the four active black-tailed prairie dog colonies ranging in size from 7.7 to 17.9 acres which contained short vegetative height and >30% bare ground in 2007. These colonies were surveyed for plover during optimum observation hours on May 8, May 26, and June 9, 2007. High prairie dog densities allowed for short vegetative height throughout the growing season. Breeding or nesting plovers were not observed in 2007 (ARCADIS 2007). The only potential breeding habitats encountered during the 2007 surveys were the prairie dog colonies and they

are relatively small and surrounded by rough terrain. The majority of the project area consisted of negative habitat images such as uneven and steep terrain and mixed grass scrublands containing vegetative structure greater than four inches (ARCADIS 2007).

### 3.4. West Nile Virus

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

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

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

**Table 3.11 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 Antelope Draw, Tiner David Draw, Weltner Prong of Waddle Creek, West Prong of Hanging Woman Creek, and Roundup Draw, all of which are tributaries to the Upper Tongue 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 respective drainage areas in the Roundup POD are within portions of 5 watersheds and are as follows: Antelope Draw (2.65 sq. miles); Tiner David Draw (1.81 sq. miles); Weltner Prong of Waddle Creek (8.34 sq. miles); West Prong of Hanging Woman Creek (3.26 sq. miles), and Roundup Draw (4.59 sq. miles). Areas of erosion include headcuts in the channel bottom and sidecuts typically along the outside of meanders or parallel to entrenched coulees. Dendritic drainage patterns dominate the watersheds with little or no deposition of alluvial sediments in the uplands.

#### **3.5.1. Groundwater**

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

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

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

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

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

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

A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 12 registered stock water wells within ½ mile of a federal CBNG producing well in the POD with depths ranging from 50 to 189 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 PRB FEIS presents the historic mean Electrical Conductivity (EC, in  $\mu\text{mhos/cm}$ ) and Sodium Adsorption Ratio (SAR) by watershed at selected United States Geological Survey (USGS) Gauging Stations in Table 3-11 (PRB FEIS page 3-49). These water quality parameters “illustrate the variability in ambient EC and SAR in streams within the Project Area. The representative stream water quality is used in the impact analysis presented in Chapter 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM produced water of varying chemical composition to surface drainages within the Project Area” (PRB FEIS page 3-48). For the Upper Tongue river Watershed, the EC ranges from 318 at Maximum monthly flow to 731 at Low monthly flow and the SAR ranges from 0.36 at Maximum monthly flow to 0.86 at Low monthly flow. These values were determined at the USGS station located near Decker, MT (PRB FEIS page 3-49).

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

### 3.6. Cultural Resources

Class III cultural resource inventories were conducted for the Roundup POD project prior to on-the-ground project work (BFO project no. 070070116). Foothills Archaeological Consultants conducted a Class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (48CFR190). G.L. "Buck" Damone III, BLM Archeologist, reviewed the report for technical adequacy and compliance with Bureau of Land Management (BLM) standards, and determined it to be adequate. No cultural resources were located in or near the Area of Potential Effect (APE).

## 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

The majority of the proposed disturbance was planned within uplands areas containing loamy and shallow loamy ecological sites. Efforts have been made to avoid soil conditions with limited reclamation potential. However, in those areas where erosion concerns associated with proposed disturbance could not be avoided, mitigation and/or site specific COA's to address soil stabilization in a timely fashion have been applied (See site specific COA # 27). Portions of the project are planned within lowland ecological sites and measures have been taken to provide a minimum 20 foot undisturbed vegetative buffers for riparian areas.

The predominance of shallow soils, steep slopes and climatic limitations throughout the Roundup POD as identified by the NRCS Soil Survey for Northern Sheridan County and the BLM onsite investigations warrant the need for additional reclamation related conditions of approval (COA's) and the use of best management practices (BMP's) to help assure that the reclamation requirements of the Wyoming Reclamation Policy will be met. Table 4.1 identifies those Map Unit Symbols within the Roundup POD with a poor reclamation rating. Surface disturbance within these areas may warrant expedient reclamation and/or performance based mitigation measures to ensure adequate stabilization and timely re-vegetation. During the onsite inspection, those areas that demonstrated highly erosive feature were recommended by BLM to be avoided. Where avoidance was not possible and/or feasible to the operator, site specific COA#25 has been applied to ensure expedient reclamation and stabilization measures is implemented. Programmatic mitigation measure 2.3.2.3 Vegetation may also be applied as a performance based measure.

**Table 4.1 – Soil Map Units with Poor reclamation potential**

MUSYM	Reclamation Rating	Acres
173	Poor	871
261	Poor	82.5
263	Poor	508.3
267	Poor	193.4
269	Poor	809
321	Poor	4.6

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

- Mixing of horizons occurs where construction on roads, pipelines or other activities take place. Mixing may result in removal or relocation of organic matter and nutrients to depths where it would be unavailable for vegetative use. Soils which are more susceptible to wind and water

erosion may be moved to the surface. Soil structure may be destroyed, which may impact infiltration rates. Less desirable inorganic compounds such as carbonates, salts or weathered materials may be relocated and limit re-vegetation. This drastically disturbed site may change the ecological integrity of the site and the recommended seed mix.

- Loss of soil vegetation cover, biologic crusts, organic matter, and productivity.
- Soil erosion would also affect soil health and productivity. Erosion rates are site specific and are dependent on soil, climate, topography and cover.
- Soil compaction is the collapse of soil pores resulting in decreased infiltration and increased erosion potential. Factors affecting compaction include soil texture, moisture, organic matter, clay content and soil type, pressure exerted, and the number of passes by vehicle traffic or machinery. Compaction may be remediated by plowing or ripping.
- Modification of hill slope hydrology.

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

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the 26 proposed well locations, 18 can be drilled without a well pad being constructed, 1 will require a 30 x 120 foot rig slot, and 7 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the (18) wells without constructed pads would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), construction of 2 reserve pits, construction (estimated approximate size of 12 ft wide x 30 ft long x 13 ft deep), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 18 wells would involve approximately 0.46 acre/well for 8.3 total acres. The one well with a rig slot proposed would disturb approximately 0.5 acres. The other 7 wells requiring cut & fill pad construction would disturb approximately 0.7 acres/well pad for a total of 4.9 acres. The total estimated disturbance for all 54 wells would be 13.7 acres.

Approximately 8.97 miles of improved roads would be constructed to provide access to various well locations. Approximately 2.52 miles of new and existing two-track trails would be utilized to access well sites. The majority of proposed pipelines (gas and water) have been located in "disturbance corridors." Disturbance corridors involve the combining of 2 or more utility lines (water, gas, power) in a common trench, usually along access routes. This practice results in less surface disturbance and overall environmental impacts. Approximately 1.49 miles of pipeline would be constructed outside of corridors. Expedient reclamation of disturbed land with stockpiled topsoil, proper seedbed preparation techniques, and appropriate seed mixes, along with utilization of erosion control measures (e.g., waterbars, water wings, culverts, rip-rap, gabions etc.) would ensure land productivity/stability is regained and maximized.

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

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

Table 4.2 summarizes the proposed surface disturbance.

**Table 4.2 - SUMMARY OF DISTURBANCE**

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Nonconstructed Pad	18	Site specific	8.3	Long Term
Rig Slot	1	0.5 acres	0.5	
Constructed Pad	7	0.46 acres	4.9	
Gather/Metering Facilities	0	none	0	Long Term
Screw Compressors	0	existing	0	Long Term
Monitor Wells	0	0.1/acre	0	Long Term
Impoundments	12		40.6	Long Term Not to be included in total disturbance at this time.
(*Secondary) On-channel	4	Site Specific	10.0	
(*Secondary) Off-channel	8	Site Specific	30.6	
Water Discharge Points	12	*Included in Impoundment disturbance	0.12	
Channel Disturbance				
Drainage Crossings	20	Site Specific	0.45	
Headcut Mitigation*	0	None	0.0	
Channel Modification	0	None	0.0	
Improved Roads				Long Term
With Corridor	8.97	50' Width or Site Specific	54.4	
2-Track Roads				Long Term
With Corridor	2.52	40' Width or Site Specific	12.2	
Pipelines				Short Term
No Corridor	1.49	40' Width or Site Specific	7.2	
With Corridor	0.67		3.2	
Buried Power Cable				Short Term
No Corridor	0.18	20' Width or Site Specific	0.44	
Overhead Powerlines	6.55	30' Width	23.8	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

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Re-surfacing water from the impoundments will potentially allow for wetland-riparian species establishment. Continuous high stream flows into wetlands and riparian areas would change the

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

However, all 12 of the proposed impoundments are secondary (not authorized for construction) and will not exhibit impacts until they are constructed.

#### **4.1.2. Invasive Species**

Based on the investigations performed during the Roundup 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. Weed Spraying – Spot Spraying – Spring & Fall
  - a. Identify all noxious weeds within disturbed areas
  - b. Application rates as per Sheridan County Weed & Pest recommendation:
    - i. Spring applications: 1 quart Tordon 22k, 1 quart 2-4D and 1 quart wetting agent per acre
    - ii. Fall applications: 10 ounces Plateau per acre
    - iii. Residual effects of the chemical combination(s) will control weeds annually
2. Preventive practices such as washing the undercarriage of vehicles may also be implemented to minimize seed transport and dispersal.
3. Education of personnel utilizing the “Weed Handbook” issued by the Wyoming Weed & Pest Council.

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 Tongue River** drainage, which is approximately 49% of the total predicted in the PRB FEIS.
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
- The commitment by the operator to monitor the volume of water flowing into Antelope Draw, Tiner David Draw, Weltner Prong of Waddle Creek, West Prong of Hanging Woman Creek, and Roundup Draw and to construct additional downstream reservoirs, if necessary, to prevent significant volumes of water from flowing into the Upper Tongue River Watershed.
- The WMP for the Roundup POD proposes that produced water will not contribute significantly to flows downstream by either being applied at an agronomic rate through a center pivot, or injected.

#### **4.2. Wildlife**

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

However, not all the BLM's recommendations to reduce effects were accepted by the operator and/or no feasible alternative materialized through the NEPA process. Approximately 6.6 miles of linear disturbance, 12 non-constructed well locations and 3 engineered well pads are proposed within moderately dense to dense sagebrush/shrubland habitat with sagebrush ranging from 10 to 36 inches high. Alternative C will result in direct loss of approximately 40.1 acres of sagebrush/shrubland habitat.

The post onsite deficiency letter identified three wells and five road/pipeline corridors which Nance Petroleum Corporation agreed to move. In addition, the operator modified the WMP by changing the status of all 12 proposed impoundments to secondary where these impoundment locations will be included in the analysis but authorized at this time.

The specific changes identified to alleviate impacts to wildlife for the Roundup project are listed below:

1. The 12-11 CK & KB wells were moved about 250' south to avoid steep slopes, highly erosive soils & reduce disturbance to sage-grouse habitat.
2. The 03-09 designed access road was withdrawn for an alternate access utilizing an existing fire break; alternate route avoids majority of the sage-grouse habitat and steep slopes/erosive soils.
3. The 10-03 access was realigned to shift SW about 300' to avoid steep slopes and sage-grouse habitat.
4. The 10-11 cross country utility corridor was re-routed to follow an existing primitive road.
5. The 10-09 access was realigned to minimize disturbance and avoid sage grouse habitat.

##### **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. Although the Wyoming Game and Fish Department does not manage the population, there are resident elk within the project area. Winter-Yearlong range for elk would be directly disturbed as well. 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 (elk, mule deer, and pronghorn antelope) would likely be displaced from the project area during drilling and construction. A study in central Wyoming reported that mineral drilling activities displaced mule deer by more than 0.5 miles (Hiatt and Baker 1981). The WGFD feels a well density of eight wells per section creates a high level of impact for big game and that avoidance zones around mineral facilities overlap creating contiguous avoidance areas (WGFD 2004). A multi-year study on the Pinedale Anticline suggests not only do mule deer avoid mineral activities, but after three years of drilling activity the deer have not accepted the disturbance (Madson 2005).

Big game animals are expected to return to the project area following construction; however, populations will likely be lower than prior to project implementation as the human activities associated with operation and maintenance continue to displace big game. Mule deer and elk 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). Likewise BLM has modeled that elk will avoid roads by more than 0.5 miles and wells by more than 1.7 miles (Roberts 2006). Madson (2006) cites a recent Jack Morrow Hills study reporting 1.7 mi avoidance, while Powell (2002) in an earlier Jack Morrow Hills study reported 1.24 mi avoidance from oil and gas activity.

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

#### **4.2.1.1. Cumulative effects**

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

#### **4.2.2. Aquatics Direct and Indirect Effects**

Produced water is to be discharged into 1 existing impoundment (West Antelope 58-80-27-05 PIT). Water from this impoundment is then utilized for land application by three center pivot irrigation systems adjacent to the impoundment during the frost free months. If a reservoir were to discharge, it is unlikely produced water will reach a fish-bearing stream. It is unlikely downstream species would be affected.

#### **4.2.2.1. Cumulative effects**

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-247. 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 area of habitat is also qualitatively altered (Temple and Wilcox 1986). Ingelfinger (2004) identified that the density of breeding Brewer's sparrows declined by 36% and breeding sage sparrows declined by 57% within 100 m of dirt roads within a natural gas field. Effects occurred along roads with light traffic volume (<12 vehicles per day). The increasing density of roads constructed in developing natural gas fields exacerbated the problem creating substantial areas of impact where indirect habitat losses (displacement) were much greater than the direct physical habitat losses.

Reclamation activities that occur in the spring may be detrimental to migratory bird survival. Those species that are edge-sensitive will be displaced further away from vegetative edges due to increased human activity, causing otherwise suitable habitat to be abandoned due to maximization of the carrying-capacity of the interior habitat. Birds displaced from the edges of this habitat will have no place to relocate. One of the 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, virtually all of the remaining habitat may be so close to edges so that virtually no habitat interior 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. Additional direct and indirect effects to migratory birds are discussed in the PRB FEIS (4-231-235).

**4.2.3.1. Cumulative effects**

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

**4.2.4. Raptors Direct and Indirect Effects**

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

**Table 4.3** Infrastructure within close proximity to documented raptor nests within the Roundup project area (Timing limitations will apply to this infrastructure).

BLM ID#	UTM (NAD 83)	SPECIES	2007 STATUS	WELL / PIT NUMBER	DISTANCE (MILES)
3781	38716E 4977580N	Great-horned owl	Active	Gas pipeline	0.17
				Roundup POD main access road, utility corridor and overhead powerline	0.24

BLM ID#	UTM (NAD 83)	SPECIES	2007 STATUS	WELL / PIT NUMBER	DISTANCE (MILES)
				located in SWNW Sec. 6 T57N, R79W	
3241	387076E 4977328N	Red-tailed hawk	Active	Roundup POD main access road, utility corridor and overhead powerline located in SWNW Sec. 6 T57N, R79W	0.30

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 03-01CK / KB wells were proposed within 0.42 miles of nest BLM ID 376. The nest was documented in 2003 but was not surveyed 2004-2005 and was documented as gone in 2006 and 2007 surveys. It is likely that the nest is abandoned protective measures will not be implemented for this well location.

#### 4.2.4.1. Cumulative effects

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

#### 4.2.5. Threatened and Endangered and Sensitive Species

Threatened and Endangered Species potentially affected by the proposed project area are further discussed following the table.

##### 4.2.5.1. Threatened and Endangered and Sensitive Species

4.2.5.2. Table 4.4 Summary of Threatened and Endangered Species Habitat and Project Effects.

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

**Presence**

**K** Known, documented observation within project area.

**S** Habitat suitable and species suspected, to occur within the project area.

**NS** Habitat suitable but species is not suspected to occur within the project area.

**NP** Habitat not present and species unlikely to occur within the project area.

**Effect Determinations**

**LAA** Likely to adversely affect

**NE** No Effect.

**NLAA** May Affect, not likely to adversely effect individuals or habitat.

#### **4.2.5.2.1. Black-footed ferret**

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

#### **4.2.5.2.2. Ute’s Ladies Tresses Orchid**

Four of the impoundments are on-channel located within ephemeral drainages of Roundup Draw, Tiner David Draw and Waddle Creek Weltner Prong. Remaining eight proposed impoundments are located in upland habitats. All of the impoundments are proposed as secondary impoundments and will not be constructed at this time. There are no springs within the POD area. Currently suitable habitat is not present within the Roundup project area.

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

#### **4.2.6. Sensitive Species Direct and Indirect Effects**

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

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. 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) also increases the potential predation impact of ~~predation~~ on sage-grouse and other sagebrush-breeding birds (Knick et al. 2003)

Fragmentation of shrubsteppe habitat is a major disruption that has consequences for obligate species (Braun et al. 1976; Rotenberry & Wiens 1980a). In fragmented habitats, suitable area remains only as a remnant surrounded by unusable environment (Urban and Shugart 1984; Fahrig & Paloheimo 1988). Populations of obligate species decline because areas of suitable habitat decrease (Temple & Cary 1988) or because of lower reproduction or higher mortality in remaining habitats (Robinson 1992; Porneluzi et al. 1993). Fragmentation of shrubsteppe has the further potential to affect significantly the conservation of shrub-obligate species because of the permanence of disturbance (Knick and Rotenberry 1995).

**Table 4.5 Summary of Sensitive Species Habitat and Project Effects.**

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

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

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Plants				
Porter's sagebrush ( <i>Artemisia porteri</i> )	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes 5300-6500 ft.	NP	NI	Habitat not present.
William's wafer parsnip ( <i>Cymopterus williamsii</i> )	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.

**MIH** 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

#### **4.2.6.1. Bald eagle**

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

There are no existing overhead three-phase distribution lines within the project area. The wire spacing is required to be in compliance with the Avian Power Line Interaction Committee's (2006) suggested practices and with the Service's standards (USFWS 2002). Nance is proposing 6.55 miles of overhead three-phase distribution lines. There are currently no improved roads within the project area, with 8.97 miles proposed.

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

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 effect bald eagles.

Produced water will be stored in 12 proposed impoundments which may attract eagles if reliable prey is present, most likely in the form of waterfowl. The effect of the impoundments on eagles is unknown. The impoundments could prove to be a benefit (e.g. increased food supply) or an adverse effect (e.g. contaminants, proximity of power lines and/or roads to water). Eagle use of impoundments should be reported to determine the need for any future management.

#### **4.2.6.2. Black-tailed prairie dog**

A main access route is existing along the prairie dog colony in Section 1, T57N, R80W. This access route will be used by project traffic on a regular basis. A pipeline corridor and overhead power lines are proposed along this route. Three impoundments are proposed next to this colony along its southern edge.

The presence of a reservoir will limit colony expansion. Well houses and power poles may provide habitats for mammal and avian predators increasing prairie dog predation. Mineral related traffic on the adjacent roads may result in prairie dog road mortalities. During construction of these facilities, there is the possibility that the prairie dogs within these colonies may be killed as a direct result of the earth moving equipment. Constant noise and movement of equipment and the destruction of burrows puts considerable stress on the animals and will cause an increase in prairie dog mortalities. During the

construction of these facilities individuals are exposed more frequently to predators and have less protective cover.

Individuals that survive the excavation process will likely be displaced. As the prairie dog town grows in size, prairie dogs move from an area of high population density to an area of low population density. 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).

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

#### **4.2.6.3. Burrowing owl**

A main access route exists along the prairie dog colony in Section 6, T57N, R79W, containing the burrowing owl nest. This access route will be used by project traffic on a regular basis. A pipeline corridor and overhead power lines are proposed along this route. The operator constructed an off-channel impoundment following the 2007 surveys at the nest location for private (fee) mineral development and likely removed the nest. It is unclear at this time whether the burrowing owls have relocated to a nest within this prairie dog colony or relocated to a new area. During the onsite inspection, burrowing owl sign was observed at a burrow within 300 feet of the original nest site which may be a secondary nest or a new nest.

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

The United States Department of Agriculture Forest Service on the Thunder Basin National Grasslands in Campbell County, WY with which the BLM coordinated with 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, issued on July 6, 2006 directs the BLM BFO and all other BLM 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.

**Table 4.6** Infrastructure within close proximity to documented Burrowing Owl nests within the Roundup project area (Timing limitations will apply to this infrastructure).

BLM ID#	UTM (NAD 83)	SPECIES	2007 STATUS	WELL / PIT NUMBER	DISTANCE (MILES)
None (New nest)	386510E 4977250N	Burrowing Owl	Inactive	Roundup POD main access road, utility corridor and overhead powerline located in SWNW Sec. 6 T57N, R79W	0.12 0.22
				Wells 01-09CK, 01-09KB & 01-09WIW	0.23

To reduce the risk of decreased productivity or nest failure, the BLM BFO requires a one-quarter mile radius timing limitation during the breeding season around active Burrowing Owl nests and recommends all infrastructure requiring human visitation to be avoid burrowing owl habitat. The main access into the Roundup POD, associated utility corridor and overhead powerline within the ¼ mile of the burrowing owl nest are proposed along the northern edge of the black-tail prairie dog colony. The nest and black-tail prairie dog colony are situated in a depression surrounded by hillsides and out of line of sight from the 01-09 well location.

#### 4.2.6.4. Grouse

##### 4.2.6.4.1. Greater sage-grouse

Four leks are present within 3 miles of the Roundup project area. Three of the four leks including Hanging Woman Early Prong, Hanging Woman West Fork and Hanging Woman Middle Fork were active in 2006 (Thomas 2006, SWCA 2006, ARCADIS 2006). The Hanging Woman lek was last reported active in 2004. Greater sage-grouse habitat is being directly lost with the addition of well sites, roads, pipelines, power lines, impoundments and other infrastructure (Theiele 2005, Oedekoven 2004). Sage grouse avoidance of CBNG infrastructure results in even greater indirect habitat loss. The Wyoming Game and Fish Department (WGFD) feels a well density of eight wells per section creates a high level of impact for sage grouse and that sage-grouse avoidance zones around mineral facilities overlap creating contiguous avoidance areas (WGFD 2004).

The presence of overhead power lines and roads within the project area may adversely affect sage grouse. Leks within 0.25 mile of new powerlines constructed for coalbed natural gas development in the Powder River Basin of Wyoming had significantly lower growth rates, as measured by recruitment of new males onto the lek, compared to leks further from these lines (Braun et al. 2002). Braun (1998) reported that the presence of powerlines may limit sage-grouse use within 0.6 mile in otherwise suitable habitat. In this way, the proposed powerlines within the project area will impact 2,000 to 2,500 acres of otherwise suitable habitat. Furthermore, studies indicate that leks disappeared within 1.4 miles after a new transmission line was erected and lek attendance declined within 2-3 miles (Stinson et al. 2004). The proposed powerlines associated with the Roundup project area, therefore, will likely cause the abandonment of 2 occupied leks and reduced lek attendance at 2 additional occupied leks.

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

Another concern with CBNG is that reservoirs created for water disposal provide habitat for mosquitoes associated with West Nile virus (Oedekoven 2004). West Nile virus represents a significant new stressor which in 2003 reduced late summer survival of sage-grouse an average of 25% within four populations including the Powder River Basin (Naugle et al. 2004). Powder River Basin grouse losses during 2004

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

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

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

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

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

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

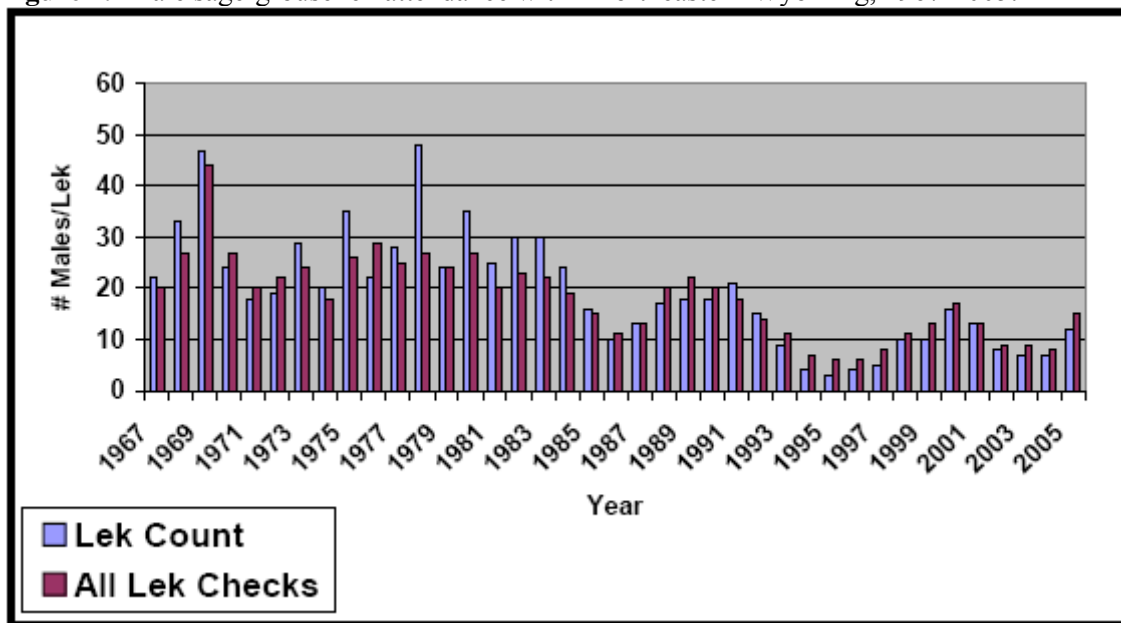
Although modifications the Roundup POD will reduce effects to sage grouse, not all of the BLM recommendations were incorporated into the plan. Approximately 68.5 acres of direct sage brush habitat loss will occur as a result of this project. Habitat fragmentation will result along 4.95 miles of proposed

overhead powerlines and 7.35 miles of proposed roads/utility corridors.

Cumulative habitat loss and fragmentation has been substantial within the area surrounding the Roundup POD beginning as early as October 2004 by previous Nance CBNG developments with nearly 100 miles of existing Oil & Gas roads, 31.7 miles of existing overhead powerlines, 2 compressor sites and 38 existing CBNG produced water storage impoundments. The absence of males observed during the 2007 sage grouse lek survey at the 4 surrounding leks may be a reflection of adverse to sage grouse due to CBNG development in the Hanging Woman Basin.

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

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



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

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

overlap creating contiguous avoidance areas (WGFD 2004).

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

#### **4.2.6.4.2. Sharp-tailed grouse**

One sharp-tailed grouse lek is located within 3 miles of the project area. Effects to sharp-tailed grouse are likely to be similar to those to greater sage-grouse. The absence of males observed during the 2006 and 2007 sharp-tailed grouse lek survey at the lek may be a reflection of adverse effects to sharp-tailed grouse due to CBNG development in the Hanging Woman Basin. As indicated above, the area has extensive development resulting in considerable fragmentation of the prairie/shrubland habitat.

#### **4.2.6.4.3. Mountain plover**

Suitable mountain plover habitat is not present within the project area. The project should not affect mountain plovers as disturbance is not proposed within suitable habitat.

#### **4.2.6.4.4. Cumulative effects**

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

### **4.3. West Nile Virus Direct and Indirect Effects**

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

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

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

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

### **4.4. Water Resources**

The operator has submitted a comprehensive WMP for this project. It is incorporated-by-reference into this EA pursuant to 40 CFR 1502.21. The WMP incorporates sound water management practices, monitoring of downstream impacts within the **Upper Tongue River** watershed and 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 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 25.0 gpm per well or 1,300.0 gpm (2.9 cfs or 2,097 acre-feet per year) for this POD. The PRB FEIS projected the total amount of water that was anticipated to be produced from CBNG development per year (Table 2-8 Projected Amount of Water Produced from CBM Wells Under Alternatives 1, 2A and 2B pg 2-26). For the Upper Tongue River drainage, the projected volume produced within the watershed area was 22,351 acre-feet in 2006 (maximum production). As such, the volume of water resulting from the production of these wells is 9.4% 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 39% to groundwater aquifers and coal zones in the Upper Tongue River drainage area (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 507 gpm will infiltrate at or near the discharge points and impoundments (818 acre feet per year). However, all 12 of the proposed impoundments are secondary (not authorized for construction) and will not exhibit impacts until they are constructed. The 2 proposed injection wells target the Roland coal and will provide shallow ground water for future stock water use. 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 50 to 189 feet compared to 446-1,386 feet to the Anderson, Dietz, Canyon, Cook, and 1,099-2,220 feet to the Wall, Pawnee, Brewster/Arnold, King, and Knobloch. As mitigation, the operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence (½ mile of a federal CBNG producing well) of the proposed wells.

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

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

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

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

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ has developed a guidance document, "Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments" (June 14, 2004) which can be accessed on their website. This guidance document became effective August 1, 2004, and is currently being revised as the "Compliance Monitoring and Siting Requirements for Unlined Coalbed Methane Produced Water Impoundments" which should be approved by June, 2006. Approximately 800 new impoundments have been investigated to date with 102 impoundments in 52 permits that have gone into compliance monitoring. The Wyoming DEQ has established an Impoundment Task Force which is in the process of drafting an "Impoundment Monitoring Plan" to investigate the potential for existing impoundments to have impacted shallow groundwater. Drilling at selected existing impoundments was completed in 2006. A draft report "Anticipated and Observed Impacts to Groundwater Associated with the Construction and Use of Infiltration Impoundments in the Powder River Basin" is currently being reviewed. For WYPDES permits received by DEQ after the August 1<sup>st</sup> effective date, the BLM will require that operators comply with the requirements outlined in the current approved DEQ compliance monitoring guidance document prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

#### **4.4.1.1. Groundwater Cumulative Effects:**

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

Development of CBNG through 2018 (and coal mining through 2033) would remove 4 million acre-feet of groundwater from the coal zone aquifer (PRB FEIS page 4-65). This volume of water "...cumulatively represents 0.5 percent of the recoverable groundwater stored in the Wasatch – Tongue River sands and coals (nearly 750 million acre-feet, from Table 3-5). All of the groundwater projected to be removed during reasonably foreseeable CBNG development and coal mining would represent less than 0.3 percent of the total recoverable groundwater in the Wasatch and Fort Union Formations within the PRB (nearly 1.4 billion acre-feet, from Table 3-5)." (PRB FEIS page 4-65). No additional mitigation is necessary.

#### **4.4.2. Surface Water**

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

**Table 4.7 Comparison of Regulated Water Quality Parameters to Predicted Water Quality**

Predicted Values	TDS, mg/l	SAR	EC, $\mu$ mhos/cm
Most Restrictive Proposed Limit –		0.5	500
Least Restrictive Proposed Limit		10	2,500
Primary Watershed at Decker, MT Gauging station		0.36	318
Historic Data Average at Maximum Flow		0.86	731
Historic Data Average at Minimum Flow			
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 # WYW0052407			
At discharge point	5,000		7,500
Predicted Produced Water Quality Co-mingled Coal Zones	1,330	49.9	1,950

Based on the analysis performed in the PRB FEIS, the primary beneficial use of the surface water in the Powder River Basin is the irrigation of crops (PRB FEIS pg 4-69). The water quality projected for this POD is 1,330.0 mg/l TDS which is within the WDEQ criteria for agricultural use (2000 mg/l TDS).

The quality for the water produced from the Anderson, Dietz, Canyon, Cook, Wall, Pawnee, Brewster/Arnold, King, and Knobloch target coal zones from these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of 25.0 gallons per minute (gpm) is projected is to be produced from these 26 well pad locations, for a total of 1,300.0 gpm for the POD. See Table 4.5.

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

There are 12 discharge points proposed for this project. They have been appropriately sited and utilize appropriate water erosion dissipation designs. Existing and proposed water management facilities were evaluated for compliance with best management practices during the onsite.

To manage the produced water, 12 impoundments (327.89 acre-ft.) would potentially be constructed within the project area. These impoundments will disturb approximately 41.6 acres including the dam structures. Of these water impoundments, 4 would be on-channel reservoirs disturbing 10.0 acres, and 8 would be off-channel ponds disturbing 31.6 acres. The off-channel impoundments would result in evaporation and infiltration of CBNG water. Criteria identified in “Off-Channel, Unlined CBNG Produced Water Pit Siting Guidelines for the Powder River Basin, Wyoming” (WDEQ, 2002) was used to locate these impoundments. Monitoring may be required based upon WYDEQ findings relative to “Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments” (June 14, 2004). Existing impoundments will be upgraded and proposed impoundments will be constructed to meet the requirements of the WSEO, WDEQ and the needs of the operator and the landowner. All water management facilities were evaluated for compliance with best management practices during the onsite.

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

4-74). Consequently, the volume of water produced from these wells may result in the addition of 0.44 cfs below the lowest reservoir (after infiltration and evapotranspiration losses). The operator has committed to monitor the condition of channels and address any problems resulting from discharge. Discharge from the impoundments will potentially allow for streambed enhancement through wetland-riparian species establishment. Sedimentation will occur in the impoundments, but would be controlled through a concerted monitoring and maintenance program. Phased reclamation plans for the impoundments will be submitted and approved on a site-specific, case-by-case basis as they are no longer needed for disposal of CBNG water, as required by BLM applied COAs.

Alternative (2A), the approved alternative in the Record of Decision for the PRB FEIS, states that the peak production of water discharged to the surface will occur in 2006 at a total contribution to the mainstem of the Upper Tongue River of 5 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 26 wells is anticipated to be a total of 1,300.0 gpm or 2.9 cfs to impoundments. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and full-containment the produced water re-surfacing in Antelope Draw, Tiner David Draw, Weltner Prong of Waddle Creek, West Prong of Hanging Woman Creek, and Roundup Draw drainages from this action (0.44 cfs) may add a maximum 0.35 cfs to the Upper Tongue River flows, or 7% of the predicted total CBNG produced water contribution. This incremental volume is statistically below the measurement capabilities for the volume of flow of the Upper Tongue River watershed (refer to Statistical Methods in Water Resources U.S. Geological Survey, Techniques of Water-Resources Investigations Book 4, Chapter A3 2002, D.R. Helsel and R.M. Hirsch authors). For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

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

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

**Permit effluent limits were set at (WYPDES permit No. WYW0052407):**

<i>Total Petroleum Hydrocarbons</i>	<i>10 mg/l max</i>
<i>pH</i>	<i>6.5 to 8.5</i>
<i>TDS</i>	<i>5,000 mg/l max</i>
<i>Specific Conductance</i>	<i>7,500 mg/l max</i>
<i>Sulfates</i>	<i>3,000 mg/l max</i>
<i>Radium 226</i>	<i>60 pCi/l max</i>
<i>Total Selenium</i>	<i>50 µg/l max</i>
<i>Total Arsenic</i>	<i>200 µg/l max</i>

The WYPDES permit also addresses existing downstream concerns, such as irrigation use, in the COA 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. 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 (page 9) for the **Roundup** POD prepared by Pearl Field Services for **Nance Petroleum Corporation**.

**4.4.2.1. Surface Water Cumulative Effects**

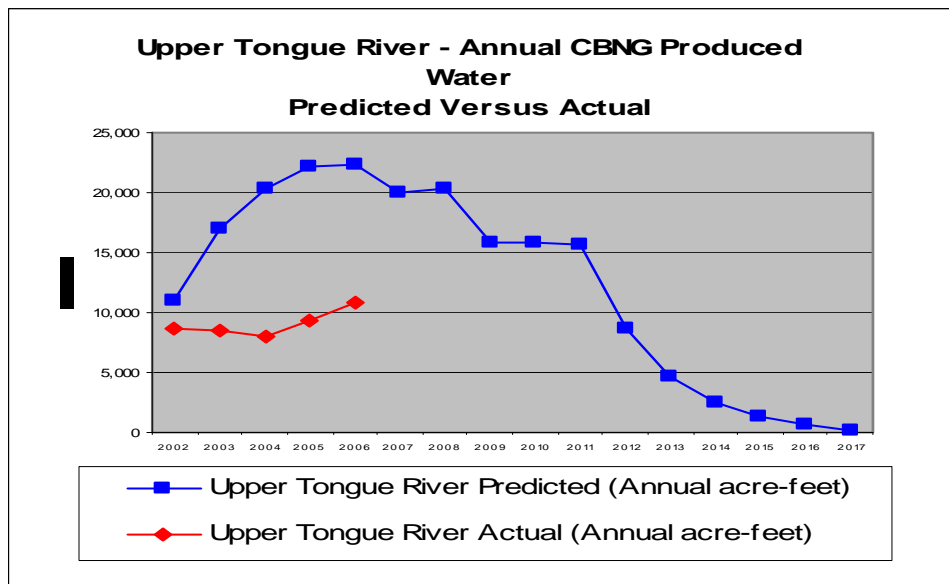
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the **Upper Tongue River** watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of March 2007 all producing CBNG wells in the **Upper Tongue River** watershed have discharged a cumulative volume of 45,412 acre-ft of water compared to the predicted 92,725 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 **49.0%** of the total predicted produced water analyzed in the PRB FEIS for the **Upper Tongue River** watershed.

**Table 4.8 Actual vs predicted water production in the Upper Tongue River watershed 2006 Data Update 3-16-07**

Year	Upper Tongue River Predicted (Annual acre-feet)	Upper Tongue River Predicted (Cum acre-feet from 2002)	Upper Tongue River Actual (Annual acre-feet)		Upper Tongue River Actual (Cumulative acre-feet beginning 2002)	
			Ac-ft	% of Predicted	Ac-ft	% of Predicted
2002	11,019	11,019	8,675	78.7	8,675	78.7
2003	16,950	27,969	8,574	50.6	17,248	61.7
2004	20,272	48,241	7,971	39.3	25,220	52.3
2005	22,133	70,374	9,397	42.5	34,617	49.2
2006	22,351	92,725	10,795	48.3	45,412	49.0
2007	19,945	112,670				
2008	20,282	132,952				
2009	15,782	148,734				
2010	15,782	164,516				
2011	15,654	180,170				
2012	8,646	188,816				
2013	4,721	193,537				
2014	2,522	196,059				
2015	1,290	197,349				
2016	601	197,950				
2017	214	198,164				
<b>Total</b>	<b>198,164</b>		<b>45,412</b>			

**Figure 4.1 Actual vs predicted water production in the Upper Tongue River watershed**



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

The PRB FEIS states, “Cumulative effects to the suitability for irrigation of the Powder River would be minimized through the interim Memorandum of Cooperation (MOC) that the Montana and Wyoming DEQ’s (Departments of Environmental Quality) have signed. This MOC was developed to ensure that designated uses downstream in Montana would be protected while CBM development in both states continued. However, this MOC has expired and has not been renewed. The EPA has approved the Montana Surface Water Standards for EC and SAR and as such the WDEQ is responsible for ensuring that the Montana standards are met at the state line under the Clean Water Act (CWA). Thus, through the implementation of in-stream monitoring and adaptive management, water quality standards and interstate agreements can be met.” (PRB FEIS page 4-117)

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

1. They are proportional to the actual amount of cumulatively produced water in the **Upper Tongue River** drainage, which is approximately 49% 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 Tongue River** watershed and page 117 for cumulative effects common to all sub-watersheds.

**4.5. Cultural Resources**

There are no archeological sites within the APE of the proposed project. Following the Wyoming State Protocol Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 12/17/07 that no historic properties exist within the APE.

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

**5. CONSULTATION/COORDINATION**

Contact	Title	Organization	Present at Onsite
Tim Thomas	Wildlife Biologist	Wyoming Game & Fish Dept.	No
Mary Hopkins	Wyoming SHPO	Wyoming SHPO	No

**6. OTHER PERMITS REQUIRED**

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

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