FINDING OF NO SIGNIFICANT IMPACT & DECISION RECORD
FOR
Lance
Stewart Draw
ENVIRONMENTAL ASSESSMENT –WY-070-EA070-115

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize Lance's Stewart DrawCoal Bed Natural Gas (CBNG) POD comprised of the following 11 Applications for Permit to Drill (APDs), as follows:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	Stewart Draw	21-1	NENW	1	51N	79W	WYW142088
2	Stewart Draw	33-1	NWSE	1	51N	79W	WYW154849
3	Stewart Draw	34-1	SWSE	1	51N	79W	WYW154849
4	Stewart Draw	41-1	NENE	1	51N	79W	WYW142088
5	Stewart Draw	43-1	NESE	1	51N	79W	WYW142088
6	Stewart Draw	12-12	SWNW	12	51N	79W	WYW142088
7	Stewart Draw	14-12	SWSW	12	51N	79W	WYW142088
8	Stewart Draw	21-12	NENW	12	51N	79W	WYW142088
9	Stewart Draw	23-12	NESW	12	51N	79W	WYW142088
10	Stewart Draw	31-12	NWNE	12	51N	79W	WYW142088
11	Stewart Draw	34-12	SWSE	12	51N	79W	WYW142088

The following impoundments were approved as part of the water management plan for this project:

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Lease Number
1	11-18-5178	NWNW	18	51	78	WYW142091
2	32-1-5179	SWNE	1	51	79	WYW142091
3	11-13-5179	NWNW	13	51	79	WYW142091
4	21-13-5179	NENW	13	51	79	WYW142091
5	33-18-5178	NWSE	18	51	78	WYW142091
6	44-18-5178	SESE	18	51	78	WYW142091
7	Pit 13-6-5178	NWSW	6	51	78	WYW146244
8	Pit 11-7-5178	NWNW	7	51	78	WYW142088
9	Pit 23-12-5179	NESW	12	51	79	WYW142088
10	Pit 11-13-51-79	NWNW	13	51	79	WYW142091

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
Lance
Stewart Draw
PLAN OF DEVELOPMENT
WY-070-EA070-115

INTRODUCTION

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

1. PURPOSE AND NEED

The purpose for the proposal is to quantify reserves and produce coal bed natural gas (CBNG) on four 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: Lance Stewart Draw Plan of Development (POD) for 14 coal bed natural gas well APD`s and associated infrastructure.

Proposed Well Information: There are 14 wells proposed within this POD, as follows:

Lance O&G	Stewart Draw	21-1	NENW	1	51N	79W	WYW142088
Lance O&G	Stewart Draw	23-1	NESW	1	51N	79W	WYW154849
Lance O&G	Stewart Draw	32-1	SWNE	1	51N	79W	WYW142088

Lance O&G	Stewart Draw	34-1	SWSE	1	51N	79W	WYW154849
Lance O&G	Stewart Draw	41-1	NENE	1	51N	79W	WYW142088
Lance O&G	Stewart Draw	43-1	NESE	1	51N	79W	WYW142088
Lance O&G	Stewart Draw	12-12	SWNW	12	51N	79W	WYW142088
Lance O&G	Stewart Draw	14-12	SWSW	12	51N	79W	WYW142088
Lance O&G	Stewart Draw	21-12	NENW	12	51N	79W	WYW142088
Lance O&G	Stewart Draw	23-12	NESW	12	51N	79W	WYW142088
Lance O&G	Stewart Draw	34-12	SWSE	12	51N	79W	WYW142088
Lance O&G	Stewart Draw	32-12	SWNE	12	51N	79W	WYW142088
Lance O&G	Stewart Draw	41-12	NENE	12	51N	79W	WYW142088
Lance O&G	Stewart Draw	43-12	NESE	12	51N	79W	WYW142088

The following impoundments were approved as part of the water management plan for this project:

	IMPOUNDMENT Name / Number	**Qtr/Qtr**	**Section**	**TWP**	**RNG**	**Lease Number**
1	11-18-5178	NWNW	18	51	78	WYW142091
2	32-1-5179	SWNE	1	51	79	WYW142091
3	11-13-5179	NWNW	13	51	79	WYW142091
4	21-13-5179	NENW	13	51	79	WYW142091
5	33-18-5178	NWSE	18	51	78	WYW142091
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8	Pit 11-7-5178	NWNW	7	51	78	WYW142088
9	Pit 23-12-5179	NESW	12	51	79	WYW142088
10	Pit 11-13-51-79	NWNW	13	51	79	WYW142091

County: Johnson

Applicant: Lance

Surface Owners: BLM, Crescent M Cattle Co. (Neal Schuman)

Project Description:
The proposed action involves the following:

- Drilling of 14 total federal CBM wells in Big George, and coal zones to depths of approximately 2700 feet.

- An unimproved and improved road network.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: 10 discharge points and 10 stock water impoundments within the Crazy Woman Creek watershed that will provide full containment of CBNG discharge water. One on-channel reservoir is existing, and 5 new on-channel reservoirs and 4 new off-channel pits are proposed.

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 Water Management Plan(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 MSRP, 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

Modifications, or alternatives, to the original proposal received from the operator, were identified as the result of the pre-approval inspections(s).

Implementation of committed mitigation measures contained in the Master Surface Use Plan, Drilling Program and Water Management Plan, in addition to the Standard COA contained in the PRB FEIS Record of Decision Appendix A, are incorporated and analyzed in this alternative.

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. 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 or minimize environmental effects of the operator's proposal. The specific changes identified for the Stewart Draw POD are listed below under 2.3.1:

2.3.1. Changes as a result of the on-sites

Well ID	Aliquot	Section	T/R	Notes
33-1	NWSE	1	51/79	32-1 was moved to this location
31-12	NWNE	12	51/79	41-12 was moved to this location
43-12	NESE	12	51/79	dropped well
23-1	NESW	1	51/79	dropped well
32-12	SWNE	12	51/79	dropped well

The wells listed above were dropped/moved due to steep topography and low potential for successful reclamation.

The original proposed access road in Section 1 was proposed to cross a steep ravine and head upslope on a steep and narrow ridge. This access road was dropped at the request of the landowner (Neal Schuman). An existing access road in Sections 2, 11, and 12 will be used. Note this road crosses Crazy Woman Creek and then parallels the creek near the cottonwood dominated riparian area.

Reservoir P12-12 was dropped from the plan due to poor site conditions and small size.

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.

The above changes and mitigation measures to the proposed action resulting from the on-site will be analyzed in Alternative C.

2.3.2.1. Groundwater

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

2.3.2.2. Surface Water

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

2. Low water crossings will be constructed at original streambed elevation in a manner that will prevent any blockage or restriction of the existing channel. Material removed will be stockpiled for use in reclamation of the crossings.

3. 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.

4. The operator will supply to the BLM copies of the WYPDES permits for this POD as soon as they available from WDEQ.

2.3.2.3. Soils

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

2.3.2.4. Wetland/Riparian

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

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

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

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

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

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

3. The Companies will locate impoundments to avoid sagebrush shrublands, where practical.

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

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

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

2.3.2.6. Threatened, Endangered, or Sensitive Species

2.3.2.6.1. Bald Eagle

1. Site-specific project areas will be evaluated for suitable bald eagle nesting and roosting habitat prior to permit approval. Suitable nesting habitat is any mature stand of conifer or cottonwood trees in association with rivers, streams, reservoirs, lakes or any significant body of water. Suitable roosting habitat is defined as any mature stands of conifer or cottonwood trees.

2. Special habitats for raptors, including wintering bald eagles, will be identified and considered during the review of the APD/POD or Sundry Notices.

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

4. A disturbance-free buffer zone of at least 0.5 mile will be established year round for all bald eagle nests. This buffer may be adjusted based on topographic features, visibility, disturbance and human activity levels, land use plans, and other factors. A seasonal minimal disturbance buffer zone of at least 1-mile will be established for all bald eagle nest sites (February 1 – August 15). These buffer zone restrictions will be based on site specific information and coordinated with the Service's Wyoming Field Office which will provide written agreement.

5. A year-round disturbance-free buffer zone of at least 0.5 mile will be established year round for all bald eagle roost sites. This buffer may be adjusted based on topographic features, visibility, disturbance and human activity levels, land use plans, and other factors. A seasonal minimal disturbance buffer zone of at least 1-mile will be established for all bald eagle roost sites (November 1 – April 15). These buffer zone restrictions will be based on site specific information and coordinated with the Service's Wyoming Field Office which will provide written agreement.

6. Weed treatment and limited reclamation activities (i.e. seeding) may occur within a 0.5 to 1.0 mile radius of active bald eagle nests between May 15 and June 15. Operators must contact the authorizing agency who will coordinate with and receive written confirmation from the Service before application of this measure.

2.3.2.6.2. Mountain Plover

1. Site-specific project areas will be evaluated for suitable mountain plover nesting habitat prior to permit approval. Flat areas of short-grass prairie or low shrubs with a prevalence of bare ground characterize suitable mountain plover nesting habitat. Typically the vegetation height is less than 4 inches, and bare ground is greater than 30 percent. In the event that a mountain plover is located during construction or operation, the USFWS' Wyoming Field Office (307-772-2374) and the USFWS' Law Enforcement Office (307-261-6365) will be notified within 24 hours.

2. No project activities shall occur in suitable nesting habitat prior to surveys for nesting mountain plovers conducted in compliance with the most recent Mountain Plover Survey Guidelines (USFWS 2002). An approved biologist will conduct the surveys. Project activities shall be limited within identified nesting areas in a manner to avoid the abandonment of these areas.

3. Project-related features that encourage or enhance the hunting efficiency of predators of mountain plover will not be constructed within ¼ mile of occupied mountain plover nesting habitat.

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

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

6. Project related features that encourage or enhance the hunting efficiency of avian mountain plover predators shall not be constructed within 0.5 mile of documented mountain plover nesting habitat. Creation of hunting perches or nest sites for avian predators within 0.5 of identified nesting areas shall be avoided by burying powerlines, using the lowest possible structures for fences and other structures, and by incorporating perch-inhibiting devices into their design. No capped and abandoned well markers within 0.5 mile of mountain plover nesting areas shall be taller than 4 feet or will have perch inhibiting devices installed to avoid creating raptor hunting perches.

7. Where possible, roads will be located outside of mountain plover nesting habitat. Maximum allowed travel speed on roads within 0.5 mile of identified mountain plover nesting areas shall not exceed 25 miles per hour from March 15 to July 31.

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

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

10. To minimize destruction of nests and disturbance to breeding mountain plovers from reclamation activities, no grading, seeding, or other ground-disturbing activities shall occur from April 10 to July 10 unless surveys consistent with the most recent approved mountain plover survey guidelines (currently USFWS 2002) find that no mountain plovers are nesting in the area.

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. Companies operating in areas identified with weed infestations or suitable Ute ladies'- tresses orchid habitat will be required to submit an integrated pest management plan prior to APD approval. Mitigation will be determined on a site-specific basis and may include such measures as spraying herbicides prior to entering areas and washing vehicles before leaving infested areas. Infestation areas of noxious weeds have been identified through the county Weed and Pest Districts and are available at the Buffalo BLM office.

3. If reclamation or weed treatment is proposed within suitable Ute ladies'-tresses habitat and during the orchid's growing season (July 1 – September 30) then a survey for the orchid, according to FWS protocol, shall be conducted prior to treatment. If any orchids are found, in order to minimize potential effects, the Service shall be consulted with prior to implementation.

2.3.2.7. Visual Resources

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

2.3.2.8. Noise

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

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

2.3.2.9. Air Quality

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

2.3.3. Site specific mitigation measures

General

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

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

Surface Use

1. 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 Stewart Draw POD is Covert Green, (18-0617 TPX).

2. To minimize disturbance in sagebrush habitat, digging in wheel wells for the rig, constructing drilling pits, and trenching pipelines is the only surface disturbance authorized for the following wells and infrastructure; Feds 43-1, 41-1, 34-1, 33-1, 21-1, and 12-12. No other blading is authorized

3. The Fed 33-1 location will need a lined pit.

4. Due to fragile soils and or steep topography, the following well sites and their access roads will need additional erosion mitigation Feds 21-1, 41-1, 43-1, 23-12, and 34-12.

5. Every effort will be made to keep the road corridor tight in sagebrush habitat. Disturbance will be minimized at the following well sites and their road access roads: 34-12, 23-12, 21-1, 41-1, and 43-1. The Stewart Draw POD roads and roads with corridor will have no more than: 14 feet running width, 25 feet blading/clearing width, and 40 feet total disturbance.

6. The following well sites will have an engineered pad: 33-1, 34-1, 41-1, 23-12, 31-12, and 34-12.

7. The following well sites will have a slotted pad: 43-1, 12-12, and 14-12.

8. The following well sites will be drilled "as is", that is no slot or pad construction: 21-1 and 21-12.

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

10. The operator will follow the guidance provided in the Wyoming Policy on Reclamation (IM WY-90-231) specifically the following:
    1. The reclaimed area shall be stable and exhibit none of the following characteristics: large rills or gullies, perceptible soil movement or head cutting in drainages, and/or 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 successful onsite establishment of species included in the planting mixture or other desirable species AND 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.

11. 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:

Loamy/Clay Loamy Sites (Includes Shallow sites):

Species*	Lbs./Ac. PLS (pure live seed)
Western Wheatgrass	4
Thickspike Wheatgrass	3
Bluebunch Wheatgrass	4
Green Needlegrass	3
Fourwing Saltbush	1
Purple or White Prairie Clover	.5
Scarlet Globemallow	.1
Total	15.6

Sandy Sites:

Species*	Lbs./Ac. PLS
Thickspike Wheatgrass	4
Bluebunch Wheatgrass	4
Needle and Thread Grass	2
Indian Ricegrass	1
Prairie Sandreed	1
Purple or White Prairie Clover	.5
Fourwing Saltbush	1
Rocky Mountain Penstemon	.1
Scarlet Globemallow	.1
Total	13.7

*Varieties planted will be suitable/adaptable to Powder River Basin
*Double this rate if broadcast seeding

Note: Well sites 21-1, 34-1, and 21-12 are loamy, all other well sites are sandy-loam.

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

Wildlife

1. The following conditions will minimize the impacts to wintering bald eagles:
    a. No construction activities requiring the use of the main access route along Crazy Woman Creek shall take place during the winter roosting period (November 1 – April 1) to protect this documented roosting area.
    b. Following construction, use of the main access road along Crazy Woman Creek during the winter season (November 1 – April 1) will be limited to one day per month and a single vehicle for metering, monitoring, and maintenance. Eagle observations made during the authorized monthly use shall be recorded and reported in writing.
    c. Any use of the main access road along Crazy Woman Creek outside these conditions must be requested in writing, and will likely be limited to emergencies. Outside these conditions, the only time Lance is authorized to use the Crazy Woman Creek road without written authorization is human health and safety emergencies.

d. An exception to these conditions may be granted if seasonal conditions are such that the bald eagles are not using the area. Bald eagle use may be evaluated by performing aerial surveys prior to and during the winter roosting season. Exceptions must be requested in writing.

2. If any dead or injured sensitive species is located during construction or operation, the BLM Buffalo Field Office (307-684-1100) shall be notified within 24 hours.
3. The Record of Decision for the Powder River Basin EIS includes a programmatic mitigation measure that states, "The companies will conduct clearance surveys for threatened and endangered or other special-concern species at the optimum time" (M32). The measure requires companies to coordinate with the BLM before November 1 annually to review the potential for disturbance and to agree on inventory parameters. Should this project not be completed by November 1, Lance will coordinate with the BLM to determine if additional surveys will be required. The contract biologist shall contact the BLM prior to initiating any wildlife surveys.
4. The following conditions will minimize the impacts to raptors:
    a. No surface disturbing activity will be allowed within ½ mile of the documented nest sites from February 1 through July 31, annually, prior to a raptor nest occupancy survey for the current breeding season. The timing restriction may be removed from inactive nests upon consultation with BLM. This timing restriction affects the following wells as well as nearby reservoirs and infrastructure:

Nest	Proposed Wells and Infrastructure Affected
4051	Use of Crazy Woman Creek access road by heavy trucks and equipment including water tenders, pipe trucks, drill rigs, etc. Any vehicles traveling this road section shall not stop within the timing limitation area.
4053	14-12-5179 and access road corridor
4116	21-1-5179 and access road corridor leading to 23-1-5179
4117,4118	Improved road along Crazy Woman Creek, sec 2. Any vehicles traveling this road section shall not stop within the timing limitation area.

    b. 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.
    c. Well metering, maintenance and other site visits within 0.5 miles of raptor nests shall be minimized as much as possible during the breeding season (February 1 – July 31), and restricted to between 0900 and 1500 hours.
    d. Nest productivity checks shall be completed for all raptor nests within the Stewart Draw POD listed in the table below. The productivity checks shall be initiated in 2007 and 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/production shall be recorded. Survey results will be submitted to a Buffalo BLM biologist in writing no later than July 31 of each year.

BLM ID	UTM East	UTM North	Species	Substrate
4051	393275	4918850	RTHA	CTL
4116	395650	4920243	LEOW	JUN
4117	394525	4920039	GOEA	CTL
4119	395744	4918382	PRFA	CLF
4120	395806	4918345	Unk	CLF

5. The following conditions will minimize impacts to sage-grouse:
    a. Sage-grouse surveys are required throughout the project area for the current breeding season and results reviewed by a BLM biologist. This condition will be implemented on an annual basis for the duration of surface disturbing activities.

b. If an active lek is identified during the survey, the 2 mile timing restriction (March 1-June 15) will be applied and surface disturbing activities will not be permitted until after the nesting season.
c. If the Fleetwood lek is active the 2 mile timing restriction (March 1-June 15) will be applied to the following infrastructure;

Township Range	Section	Affected Infrastructure
T51N R79W	12	Well 23-12, Well14-12, Pit 23-12
T51N R79W	13	Reservoir 11-13

d. If either the Alvaro or Crazy Woman lek is active the 2 mile timing restriction (March 1-June 15) will be applied to the following infrastructure;

Township Range	Section	Affected Infrastructure
T51N R79W	1	Well 21-1, Well 33-1, Well 34-1, Well 41-1, Well 43-1,Pit 33-1

Water Management

If excessive seepage or slope instability develops at the large headcut downstream of Reservoir 21-13-5179 after receiving CBNG water, the use of this reservoir will be discontinued. Seepage control at the reservoir site may be attempted, but disturbance of the headcut site to construct a seepage collection system will not be allowed. This site should be monitored for seepage on a weekly basis for at least 3 months after the reservoir is constructed, and monthly thereafter.

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on 2/28/2006. Field inspections of the proposed Stewart Draw CBNG project were conducted on 10/17/2006 by Mary Mondragon-Anadarko; Coleen Faber, Craig Klaasen, Daryl Gentry, Colt Rodeman, Nick Mathias-Lance, Carol Chadwick-CE Consultant; Ray Moores-WWC, Jim Snyder, Casey Freise, Thomas Bills, Al Sprague, BJ Earle, Arnie Irwin, Chris Williams-BLM; Neal Schuman-private land owner.

This section describes the environment that would be affected by implementation of the Alternatives described in Section 2. Aspects of the affected environment described in this section focus on the

relevant major issues. Certain critical environmental components require analysis under BLM policy. These items are presented below in Table 3.1.

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

Mandatory Item	Potentially Impacted	No Impact	Not Present On Site	BLM Evaluator
Threatened and Endangered Species	X			Thomas Bills
Floodplains		X		Chris Williams,
Wilderness Values			X	Jim Snyder
ACECs			X	Jim Snyder
Water Resources	X			Chris Williams,
Air Quality		X		Jim Snyder
Cultural or Historical Values		X		BJ Earle
Prime or Unique Farmlands			X	Jim Snyder
Wild & Scenic Rivers			X	Jim Snyder
Wetland/Riparian		X		Chris Williams,
Native American Religious Concerns			X	BJ Earle
Hazardous Wastes or Solids		X		Jim Snyder
Invasive, Nonnative Species	X			Jim Snyder
Environmental Justice		X		Jim Snyder

3.1. Topographic Characteristics of Project Area

The Stewart Draw POD project area is located within the northeastern portion of Johnson County approximately 16 miles East of Buffalo, WY in the lower Crazy Woman Creek area. The project is east and north of the Black Diamond North and South Crazy Woman Creek POD's. The topography consists of sharply eroded shaley-sand formations dissected by steep erosive ephemeral drainages. There are two parallel and prominent 'knife-back' ridges running northwest that dominate the project area.

3.2. Vegetation & Soils

3.2.1. Soils

Soils within the project area were identified from the *North Johnson County Survey Area, Wyoming (WY719).* The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards. Pertinent information for analysis was obtained from the published soil survey and the National Soils Information System (NASIS) database for the area.

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.

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. A soil map can be found in the project file.

Table 3.2 – Soil Map Unit Types

MAP Unit Symbol	Map Unit Name	Acres	Percent
607	Haverdad loam, 0 to 3 percent slopes	286	5%
613	Haverdad-Kishona loams, 0 to 3 percent slopes	118	2%
614	Forkwood loam, 0 to 6 percent slopes	107	2%
615	Cambria-Kishona-Zigweid loams, 6 to 15 percent slopes	315	6%
622	Cambria-Kishona-Zigweid loams, 0 to 6 percent slopes	99	2%
639	Forkwood-Cushman loams, 0 to 6 percent slopes	32	1%
640	Forkwood-Cushman loams, 6 to 15 percent slopes	174	3%
641	Forkwood-Ulm loams, 0 to 6 percent slopes	55	1%
649	Haverdad-Clarkelen complex, 0 to 3 percent slopes	244	4%
679	Cambria-Zigweid-Kishona loams, 3 to 6 percent slopes	6	<1%
684	Samday-Shingle-Badland complex, 10 to 45 percent slopes	2723	49%
685	Kishona-Cambria-Zigweid loams, 6 to 15 percent slopes	55	1%
707	Theedle-Kishona loams, 6 to 20 percent slopes	269	5%
708	Theedle-Kishona-Shingle loams, 3 to 30 percent slopes	1082	19%

3.2.2 Vegetation

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

Table 3.3 – Ecological Sites

Ecological sites	Acres	Percent
SHALLOW CLAYEY (10-14NP)	2723	49%
LOAMY (10-14NP)	2194	39%
LOWLAND (10-14NP)	648	12%

The soils of a Shallow Clayey (10-14NP) Ecological site are shallow (less than 20" to bedrock) well drained soils that formed in alluvium or residuum derived from unspecified shale. These soils have moderate to slow permeability and may occur on all slopes. The bedrock is clay shale which is virtually impenetrable to plant roots. The main soil limitations include depth to bedrock and clay content.

The 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 Wheatgrass, Green Needlegrass community. Potential vegetation is about 80% grasses or grasslike plants, 10% forbs, and 10% woody plants. The state is dominated by cool season midgrasses. The major grasses include rhizomatous wheatgrasses, green needlegrasses, and bluebunch wheatgrass.

The vegetation identified in the field indicates that the primary plant community is a Mixed Sagebrush/Grass Plant Community. Vegetative species identified at onsite: needleandthread (*Stipa comata*), Wyoming big sage (*Artemisia tridentata wyomingensis*), needleandthread (*Stipa comata*), western wheatgrass (*Agropyron smithii*), prairie junegrass (*Koeteria macrantha*), prickley pear cactus (*Opuntia*), and threadleaf sedge (*Carex filifolia*).

Loamy Sites:
This site occurs on land nearly level up to 50% slopes on landforms which include hill slopes and the associated alluvial fans and stream terraces, in the 15-17 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. These soils have moderate permeability and may occur on all slopes.

The Historic Climax Plant Community for this site would be a Rhizomatous Needleandthread/Big Bluestem Plant Community. The potential vegetation is about 75% grasses or grass-like plants, 15% forbs, and 10% woody plants. A mix of warm and cool season mid-grasses dominate the state.

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

Dominant grasses identified include: blue grama, prairie junegrass, needleandthread, western wheatgrass, and cheat grass. Other vegetative species identified at onsite: Wyoming big sagebrush, rabbitbrush, prickly pear cactus, scarlet globemallow, fringed sagewort, and thistle.

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.

3.2.2. Wetlands/Riparian
There are three major ephemeral drainages draining to the northwest within the POD boundary. These ephemeral drainages have enhanced riparian vegetation including cottonwood stands. Their channels are mostly continuous well-defined with relatively steep gradients. Substantial wetlands are not found within the POD area.

3.2.3. Invasive Species
State listed noxious weeds and invasive plants indentified by a search of inventory maps and/or databases or during subsequent field investigation by the operator and the Johnson County Weed and Pest District include Russian knapweed, leafy spurge, and cheat grass.

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 initial wildlife inventory surveys were performed by Big Horn Environmental Consultants (Big Horn 2006). Surveys for sage-grouse leks, mountain plovers, raptor nests, and prairie dog colonies were conducted in spring 2006. Big Horn conducted bald eagle winter surveys in January 2007.

A BLM biologist conducted field visits on October 17, 2006 and February 15, 2007. During this time, he reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project adjustment recommendations where wildlife issues arose.

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

3.3.1. Big Game

Big game species expected to be within the Stewart Draw project area include pronghorn antelope, mule deer, and white-tailed deer.

The entire Stewart Draw project area is designated as pronghorn yearlong range. Pronghorn belong to the Ucross herd unit, which is bounded by Interstate 90 on the south and west, the Powder River on the east, and Sheridan County Road 131 and US Highway 14 on the north. Pronghorn populations have been increasing since 1998 with a 2004 population estimate of 4,145 animals, and a herd objective of 2,500 (WGFD 2004).

The WGFD has designated the entire Stewart Draw project area as mule deer winter-yearlong range. Mule deer belong to the Powder River herd unit, which includes the entire Powder River Basin oil and gas project area north of Interstate 90. The 2004 estimated herd population was 56,000 with a population objective of 52,000 (WGFD 2004). The Powder River mule deer herd exhibited a dramatic population decrease between 2000 and 2002, with a low estimate of 38,574 in 2002. Severe summer drought was the primary factor in the population decline, being displayed through poor fawn survival and adult deer entering winter in poor body condition (WGFD 2004). Habitat fragmentation resulting from CBNG development was also identified as a factor in the population decline. Better range conditions in 2003 allowed for increased fawn survival in 2003 which with favorable weather conditions the population increase was predicted to continue (WGFD 2004).

The WGFD has designated the riparian corridor along Crazy Woman Creek as yearlong range for white-tailed deer. White-tailed deer belong to the Powder River herd unit, which includes nearly the entire Powder River Basin oil and gas project area. The 2004 estimated herd population was 12,716 with a population objective of 8,000 (WGFD 2004).

Populations of pronghorn and both deer species within their respective hunt areas are above WGFD objectives. A herd of more than six mule deer were observed in the eastern section of the POD during the October field visit.

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

3.3.2. Aquatics

The water management strategy is for surface disposal to be contained within existing and proposed reservoirs located within Stewart Draw and unnamed tributaries of Crazy Woman Creek (Aspenlieder 2006). Lance has committed in their water management plan to containment of all CBNG water produced from the Stewart Draw POD (Aspenlieder 2006). Stewart Draw and the unnamed tributaries are ephemeral streams which flow mainly in response to precipitation (Aspenlieder 2006).

Amphibian and reptile species occur throughout the Basin, but there is little recorded baseline information available about them.

3.3.3. Migratory Birds

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

3.3.4. Raptors

Five raptor nests have been documented within one-half mile of the delineated POD boundary and an additional red-tailed hawk nest is present along the Crazy Woman Creek main access road. Four of the nests were active in 2006. Well 21-1-5179 is proposed 340 feet from a ravine where long-eared owls (4116) nested in 2006, a pipeline is proposed within the ravine. An existing road, proposed for upgrading, runs parallel to Crazy Woman Creek in section 2 and comes within 650 feet of a golden eagle nest active in 2006 (4117). Five wells were proposed within one-half mile of the active prairie falcon nest (4119) and an inactive nest (4120) in section 12; well 32-12-5179 the closest and only well visible from the nests was dropped because of rough topography. Well 14-12-5179 is proposed within one-half mile and visible from a golden eagle nest (4053) inactive in 2006. The main access road along Crazy Woman Creek passes within 250 feet of a red-tailed hawk nest (4051) active in 2006.

BLM ID	UTM East	UTM North	Species	Substrate	Activity 2006	Condition
4051	393275	4918850	RTHA	CTL	Active	Good
4053	394682	4917164	GOEA	JUN	Inactive	Excellent
4116	395650	4920243	LEOW	JUN	Active	Good
4117	394525	4920039	GOEA	CTL	Active	Good
4119	395744	4918382	PRFA	CLF	Active	Good
4120	395806	4918345	Unk	CLF	Inactive	Poor

3.3.5. Threatened and Endangered and Sensitive Species

3.3.5.1. Threatened and Endangered Species

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

3.3.5.1.1. Black-footed ferret

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

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

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

The WGFD documented three prairie dog colonies within the northwest corner of the Stewart Draw project area in 1994, the total area of these colonies was 166 acres. Big Horn identified only one of these colonies as active in 2006 (Big Horn 2006).

3.3.5.1.2. Bald eagle

On February 14, 1978, the bald eagle was federally listed as Endangered in all of the continental United States except for Minnesota, Wisconsin, Michigan, Oregon, and Washington. In these states the bald eagle was listed as Threatened. On July 12, 1995 the eagle's status was changed to Threatened throughout the United States. Species-wide populations are recovering from earlier declines, and the bald eagle was proposed for de-listing in 2000, a final decision is expected in June 2007.

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

Cottonwoods along Crazy Woman Creek provide suitable nesting, roosting, and perching habitat. The primary access for the POD is an existing two-track road which parallels Crazy Woman Creek running through the floodplain. Seventeen bald eagles were observed along this route by BLM personnel on February 15, 2007. BLM and Lance personnel saw a similar number of eagles during a field review the previous week. Big Horn Environmental Consultants have also documented high numbers of bald eagles along this stretch of Crazy Woman Creek. Groups of six or more eagles have been recorded along this stretch of Crazy Woman Creek on four different days during January and February 2007. The project area and a one-mile buffer were surveyed for bald eagle nests in spring 2006; no bald eagles were identified (Big Horn 2006).

Bald Eagle Observations along the Crazy Woman Creek Access Road

Date	Bald Eagle Total
1/6/2006	1
12/6/2006	1
1/13/2007	7
1/16/2007	11
1/18/2007	17
1/25/2007	1
2/15/2007	17

3.3.5.1.3. 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.

A habitat assessment was conducted by Big Horn Environmental Consultants (Big Horn 2006). Crazy Woman Creek is the only perennial water within the project area, all other drainages are ephemeral and do not provide habitat. The soils along Crazy Woman Creek are predominantly heavy clays. No physical disturbance of Crazy Woman is planned; the POD's main access will use an existing low water crossing.

3.3.5.2. Sensitive Species

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

3.3.5.2.1. Black-tailed prairie dog

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

The WGFD documented three prairie dog colonies along Crazy Woman Creek in 1994; the total area of these colonies was 166 acres. Big Horn Environmental Consultants identified only one of these colonies as active in 2006 (Big Horn 2006). An existing two-track road proposed for improvements passes through the prairie dog colonies.

3.3.5.2.2. Greater sage-grouse

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

Suitable sage-grouse habitat is present in limited quantities scattered through out the project area. The majority of the Stewart Draw project area is too rough for sage-grouse. Ground transects through the project area revealed little sage-grouse sign. Winter pellets and evidence of brood usage were located along a ridge and grass slope in section 12. Three occupied leks (Alvaro, Crazy Woman Creek, and Fleetwood Draw) are located within two miles of the Stewart Draw POD. Fleetwood Draw was the only one of the three leks actively attended by male grouse in 2006.

3.3.5.2.3. 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.

Mountain plover breeding and nesting habitat is limited to the prairie dog colonies along Crazy Woman Creek. Big Horn Environmental Consultants (Bighorn 2006) conducted mountain plover nesting surveys in spring 2006 but did not locate any plovers.

3.4. West Nile Virus

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

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

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

Table 3.4 Historical West Nile Virus Information

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

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

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

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

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

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

3.5. Water Resources

The project area is within the Crazy Woman Creek drainage system, approximately 15 miles upstream of the confluence with the Powder River. Crazy Woman Creek drains 945 square miles. Stewart Draw (3.9 square miles) and several other small (2 square miles or less) unnamed tributaries to Crazy Woman Creek drain the POD area. All are generally oriented parallel to each other, drain to the northwest and are ephemeral streams.

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 1 registered stock and domestic water well within ½ mile of a federal CBNG producing well in the POD with a depth of 190 feet. For additional information on water, please refer to the PRB FEIS (January 2003), Chapter 3, Affected Environment pages 3-1 through 3-36 (groundwater).

3.5.2. Surface Water

The project area is within Stewart Draw and several small unnamed tributaries to Crazy Woman Creek watershed. All drainages in the POD area are ephemeral (flowing only in response to a precipitation event or snow melt – PRB FEIS Chapter 9 Glossary). The channels range from primarily well-vegetated grassy swales, without defined bed and bank, to incised channels with erodible banks and flat channel bottoms.

The PRB FEIS presents the historic mean Electrical Conductivity (EC, in μmhos/cm) and Sodium Adsorption Ratio (SAR) by watershed at selected United States Geological Survey (USGS) Gauging Stations in Table 3-11. (PRB FEIS page 3-49). These water quality parameters "illustrate the variability in ambient EC and SAR in streams within the Project Area. The representative stream water quality is

used in the impact analysis presented in Chapter 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM produced water of varying chemical composition to surface drainages within the Project Area" (PRB FEIS page 3-48). For the Crazy Woman Creek watershed, the EC ranges from 1,066 at Maximum monthly flow to 1,937 at Low monthly flow and the SAR ranges from 1.29 at Maximum monthly flow to 2.26 at Low monthly flow. These values were determined at the USGS station located at Upper Station near Arvada (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 Stewart Draw project prior to on-the-ground project work (BFO Inventory No. 70060204, supplemented by previously approved block and linear inventory #70050263). A total of 1867.81 acres was inventoried for this project. Three sites and three Isolated Resource Finds were reported. The project was field checked by BJ Earle, and the report was approved and submitted to SHPO on 11/27/2006.

The project area is mapped as Tertiary Wasatch, with a Paleontological sensitivity rating of 5, a high ranking. However, no Paleontological localities are reported in the area, probably due to lack of research. No identified resources of interest to Native American cultural groups or Traditional Cultural Properties are known to occur in the project area, but some prehistoric and early Proto-historic rock cairns may have significance to different Native American groups.

Table 3.5 Cultural Resources Inventory Results

Site Number	Site Type	Eligibility
48 JO 3664	Prehistoric cairns	Unevaluated
48 JO 3677	Historic cairn	Not eligible
48 JO 3678	Historic debris and depression	Not eligible

4. ENVIRONMENTAL CONSEQUENCES

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

4.1. Vegetation & Soils Direct and Indirect Effects

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Direct and indirect effects resulting from well pad, access roads, pipelines, and other activities include: mixing of soil horizons, loss of soil vegetative cover, organic matter and productivity, increased susceptibility of the soil to erosion, soil compaction, and modification of hill/slope hydrology. Soil productivity would be eliminated along improved roads and severely restricted along two track trails until successful final reclamation is achieved. Estimated disturbance associated with this POD is summarized in Table 4.1.

Soil horizon mixing may result where construction of roads, pipelines, or other activities occur. Mixing of horizons may result in moving organic matter and nutrients at depths out of reach of surface plants or render the matter/nutrients inert. Horizon mixing may bring soil texture and structure to the surface and thus create soils more susceptible to wind and water erosion. If soil structure is destroyed, surface infiltration by water and air may be affected. Inorganic compounds, such as carbonates and other salts, or unweathtered material may be brought to the surface which effect seed germination, plant health, and viability.

Soil erosion would affect soil health and productivity. Erosion rates are site specific and are dependent on soil, climate, topography, and cover. Expedient reclamation of disturbed land with salvages topsoil, proper seedbed preparation techniques, and appropriate seed mixes, along with the use of erosion control measures would help ensure soil productivity. Soil stability will result in the shortest amount of time when the aforementioned actions are applied.

Soil compaction by vehicle traffic results in the collapse of soil pore space, reducing the transmissivity of water and air. Compaction decreases infiltration and therefore increases runoff. Increased runoff creates additional hazard of erosion by water. The potential for compaction is greatest when soils are wet. Factors affecting compaction include soil texture, moisture content, organic matter, clay content and type, pressure exerted, and traffic mass and volume. Compaction in these areas may be reduced by remedial action such as plowing or ripping.

Soil disturbances other than permanent facilities would be short term impacts with expedient, successful interim reclamation and site stabilization.

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the 11 proposed well locations, 0 are on existing or reclaimed conventional well pads, 2 can be drilled without a well pad being constructed, 3 can be drilled with a slotted pad, and 6 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the 5 wells without constructed pads would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (estimated approximate size of 50 x 15 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 5 wells would involve approximately 0.2 acre/well for 1.0 total acres. The other 6 wells requiring cut & fill pad construction would disturb approximately 0.62 acres/well pad for a total of 3.71 acres. The total estimated disturbance for all 11 wells would be 4.71 acres. The staging area surface disturbance will be 4 acres. This would be a short-term impact with expedient, successful reclamation and site-stabilization, as committed to by the operator in their POD MSUP and as required by BLM in COAs.

Approximately 6.06 miles of improved roads would be constructed to provide access to various well locations. Approximately 3.79 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. No 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 only 13 or more cause potentially irreversible changes to soil structure, especially in clayey soil types, that reduce permeability for infiltration of rainfall and surface water flows, restrict root growth, limit permeability of gases and moisture, and make tillage difficult." (PRB FEIS page 4-144).

Table 4.1 summarizes the proposed surface disturbance.

Table 4.1 - SUMMARY OF DISTURBANCE

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Nonconstructed Pad	5	0.2/acre	1.0	Long Term
Constructed Pad	6	Site Specific	3.71	
Gather/Metering Facilities	0	Site Specific	0	Long Term
Screw Compressors	0	Site Specific	0.0	Long Term
Monitor Wells	0	0.1/acre	0.0	Long Term
Impoundments	9		26.96	Long Term
On-channel	5	Site Specific	14.8	
Off-channel	4	Site Specific	11.94	
Water Discharge Points	10	Site Specific or 0.01 ac/WDP	0.22	0.22
Channel Disturbance				
Headcut Mitigation*	0	Site Specific	0.0	
Channel Modification	0	Site Specific	0.0	
Improved Roads				Long Term
No Corridor	3.31	40' Width	16.01	
With Corridor	6.06	40' Width	29.38	
2-Track Roads				Long Term
No Corridor	3.6	12' Width	5.24	
With Corridor	0.19	20' Width	0.46	
Pipelines				Short Term
No Corridor				
With Corridor	3.98	20' Width	9.65	
Buried Power Cable	0	12' Width or Site Specific	0	Short Term
No Corridor				
Overhead Powerlines	3.39	15' Width	0.41	Long Term
Additional Disturbance	1	Staging Area	4	Short Term

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

4.1.1. Wetland/Riparian

Wetlands will not be impacted by this project. Stream channels within the POD area are ephemeral with relatively small drainage basins.

4.1.2. Invasive Species

Utilization of existing facilities and 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 Crazy Woman Creek drainage, which is approximately 0.8% of the total predicted in the PRB FEIS.
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
- The WMP for the Stewart Draw proposes to fully contain CBNG discharge such that produced water will not contribute significantly to downstream flows.

No additional mitigation measures are required.

4.2. Wildlife

4.2.1. Big Game Direct and Indirect Effects

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

In addition to the direct habitat loss, big game would likely be displaced from the project area during drilling and construction. A study in central Wyoming reported that mineral drilling activities displaced mule deer by more than 0.5 miles (Hiatt and Baker 1981). The WGFD feels a well density of eight wells

per section creates a high level of impact for big game and that avoidance zones around mineral facilities overlap creating contiguous avoidance areas (WGFD 2004). A multi-year study on the Pinedale Anticline suggests not only do mule deer avoid mineral activities, but after three years of drilling activity the deer have not accepted the disturbance (Madson 2005).

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

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

4.2.1.1. Cumulative effects

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

4.2.2. Aquatics Direct and Indirect Effects

Lance is committed to containment of all CBNG water produced from the Stewart Draw POD (Aspenlieder 2006), therefore produced water is not expected to reach Crazy Woman Creek, a perennial fish bearing stream. There should be no effects to aquatic resources.

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

4.2.2.1. Cumulative effects

The 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. Ingelfinger (2004) reported decreases in the density of breeding Brewer's sparrows and sage sparrows within 100m of active natural gas field roads. The observed effects occurred along roads with light traffic volume (<12 vehicles per day).

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).

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.

Stock tanks provide attractive watering sites for migratory birds, which can become trapped within the tanks and drown. Ramps or similar structures within the tanks can provide a means for trapped birds to escape. 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.

4.2.4. Raptors Direct and Indirect Effects

A timing restriction shall be placed on the drilling of well 21-1-5179 and construction of the associated utility corridor to prevent human disturbance to nest 4116 during the nesting season. The well was not recommended for moving as it is not visible from the nest site. Once constructed and reclaimed there should be no activity associated with the utility corridor, therefore the proposed location was accepted. The proposed road upgrade along Crazy Woman Creek was accepted, as moving the well would increase surface impacts including wildlife habitat loss. Construction timing restrictions and use restrictions on the road designed for bald eagles will also reduce impacts to nesting raptors (nests 4051 & 4053).

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.

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. Given the close proximity of development activities to the nests discussed above operation and maintenance activities during subsequent nesting seasons may result in decreased productivity and possibly nest abandonment. Mitigation was enacted to reduce these risks.

4.2.4.1. Cumulative effects

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

4.2.5. Threatened and Endangered and Sensitive Species

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

4.2.5.1. Threatened and Endangered and Sensitive Species

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

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Endangered				
Black-footed ferret (*Mustela nigripes*)	At least 1000 acres of black-tailed prairie dog colony, separated by no more than 1.5 km.	NP	NE	Sufficient habitat not present.
Threatened				
Bald eagle (*Haliaeetus leucocephalus*)	Mature forest cover often within one mile of large water body.	K	LAA	Occupied habitat present & overhead power proposed.
Ute ladies'-tresses orchid (*Spiranthes diluvialis*)	Riparian areas with permanent water	NP	NE	Potential habitat not being disturbed.

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.

4.2.5.1.1. Black-footed ferret

Because the suitable habitat is not sufficient to sustain a ferret population, implementation of the proposed development will have "**no effect**" on the black-footed ferret.

4.2.5.1.2. Bald eagle

Lance is proposing 0.87 miles of overhead three-phase electric lines and 10.12 miles of improved road.

The presence of overhead power lines and roads may adversely affect foraging bald eagles. Bald eagles forage 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, US Fish and Wildlife 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 2006). 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 2006). 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 recommendations and Service standards minimizes but does not eliminate electrocution risk.

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

Use of the primary access road through the Crazy Woman Creek floodplain will impact winter bald eagle use not only during the project's construction phase, but also during the operation phase as the road is traveled to monitor and maintain CBNG facilities. BLM staff flushed eagles as they traveled this road in a single pick-up truck, as the road passes underneath the cottonwoods where the eagles perch. The road is currently being used to access several existing non-federal CBNG wells within the Crazy Woman Creek floodplain. Additional winter use of the road will continue to disturb eagles and could lead to abandonment of this section of Crazy Woman Creek. To minimize eagle disturbance no construction activities shall be authorized during the winter season (November 1 to April 1); after construction, use of the road will be limited during the winter season to one day per month for metering, monitoring, and maintenance.

The proposed project may affect "**likely to adversely affect**" bald eagles due to the main access road passing through occupied winter roosting habitat and electrocution potential when perching on overhead power lines.

4.2.5.1.3. Ute's Ladies Tresses Orchid

Implementation of the proposed coal bed natural gas project should have "**no effect**" on the Ute ladies'-tresses orchid as suitable habitat is not present.

4.2.5.2. Sensitive Species Direct and Indirect Effects

Table 4.4 Summary of Sensitive Species Habitat and Project Effects.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Amphibians				
Northern leopard frog (*Rana pipiens*)	Beaver ponds, permanent water in plains and foothills	S	MIIH	Discharge points & reservoirs provide habitat.
Spotted frog (*Ranus pretiosa*)	Ponds, sloughs, small streams	NP	NI	Prairie not mountain habitat.
Birds				
Baird's sparrow (*Ammodramus bairdii*)	Grasslands, weedy fields	S	MIIH	Sagebrush cover will be affected.
Brewer's sparrow (*Spizella breweri*)	Basin-prairie shrub	S	MIIH	Sagebrush cover will be affected.
Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	S	MIIH	Prairie dog colonies present.
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	S	MIIH	Grassland and shrubland habitats will be affected.
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	K	MIIH	Sagebrush cover will be affected.
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.
Long-billed curlew (*Numenius americanus*)	Grasslands, plains, foothills, wet meadows	S	MIIH	Grasslands will be affected.
Mountain plover (*Charadrius montanus*)	Short-grass prairie with slopes < 5%	S	MIIH	Prairie dog colonies present.
Northern goshawk (*Accipiter gentilis*)	Conifer and deciduous forests	NP	NI	Conifer forest habitat not present.
Peregrine falcon (*Falco peregrinus*)	cliffs	NP	NI	No nesting habitat present.

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

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

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

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

4.2.5.2.1. Black-tailed prairie dog

An existing two-track road proposed for improvement passes through the prairie dog colonies. Because it is an existing road on private surface, and re-routing would cause greater resource impacts, no attempt was made to re-route the road. There will be direct habitat loss associated with the road, and vehicle traffic will increase prairie dog mortality.

4.2.5.2.2. Greater sage-grouse

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

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

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

Another concern with CBNG is that reservoirs created for water disposal provide habitat for mosquitoes associated with West Nile virus (Oedekoven 2004). West Nile virus represents a significant new stressor which in 2003 reduced late summer survival of sage-grouse an average of 25% within four populations including the Powder River Basin (Naugle et al. 2004). Powder River Basin grouse losses during 2004 and 2005 were not as severe. Summer 2003 was warm and dry, more conducive to West Nile virus replication and transmission than the cooler summers of 2004 and 2005 (Cornish pers. Comm..).

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

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

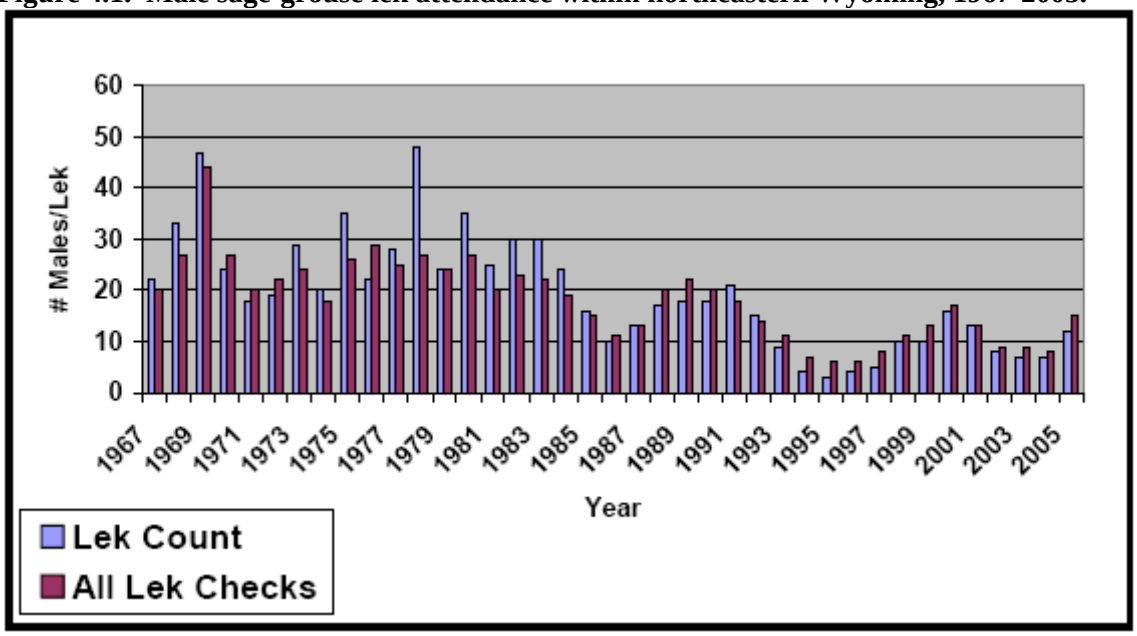
Additional studies, across more of the sage-grouse's range, indicate that many populations nest much farther than two miles from the lek of breeding (Bennett 2004). Holloran and Anderson (2005), in their Upper Green River Basin study area, reported only 45% of their sage grouse hens nested within 3 km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

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

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

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

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



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

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

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

4.2.5.2.3. Mountain plover

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

resulting in increased mountain plover predation. CBNG infrastructure such as the well houses, roads, pipe line corridors, and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes. An analysis of direct and indirect impacts to mountain plover due to oil and gas development is included in the PRB FEIS (4-254-255).

4.2.5.3. Cumulative effects

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

4.3. West Nile Virus Direct and Indirect Effects

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

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

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

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

4.4. Water Resources

The operator has submitted a comprehensive WMP for this project. It is incorporated-by-reference into this EA pursuant to 40 CFR 1502.21. The WMP incorporates sound water management practices, monitoring of downstream impacts within the Crazy Woman Creek 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), should minimize project area and downstream potential impacts from proposed water management strategies.

The WDEQ has assumed primacy from United States Environmental Protection Agency for maintaining the water quality in the waters of the state. The WSEO has authority for regulating water rights issues and permitting impoundments for the containment of surface waters of the state.

The maximum water production is predicted to be 15.0 gpm per well or 165 gpm (0.37 cfs or 267 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 Crazy Woman Creek drainage, the volume produced within the watershed area was 392 acre-feet in 2006 (maximum production is estimated in 2006 at 21,135 acre-feet). As such, the volume of water resulting from the production of these wells is 1.9% 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 43% to groundwater aquifers and coal zones in the Crazy Woman Creek drainage area (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 23.7 gpm will infiltrate at or near the discharge points and impoundments (38.1 acre feet per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, "the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater." (PRB FEIS pg 4-54). Therefore, the chemical nature and the volume of the discharged water may not degrade the groundwater quality.

The PRB FEIS predicts that one of the environmental consequences of coal bed natural gas production is possible impacts to the groundwater. "The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers." (PRB FEIS page 4-1). In the process of dewatering the coal zone to increase natural gas recovery rates, this project may have some effect on the static water level of wells in the area. The single permitted water well in the area produces from a depth of 190 feet compared to 1,200 feet to the Big George (1,400 feet to the Anderson, 1,750 feet to the Werner, 1,950 feet to the Gates, and 2,050 feet to the Wall). 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 and Siting Requirements for Unlined Coalbed Methane Produced Water Impoundments" which was approved September, 2006. For WYPDES permits received by DEQ after the August 1st effective date, the BLM requires that operators comply

with the current approved DEQ compliance monitoring guidance document prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

4.4.1.1. Groundwater Cumulative Effects:

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

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

4.4.2. Surface Water

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

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

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** µmhos/cm
Most Restrictive Proposed Limit –		2.0	1,000
Least Restrictive Proposed Limit		10	3,200
Primary Watershed at 06316400 Gauging station Historic Data Average at Maximum Flow Historic Data Average at Minimum Flow		 1.29 2.26	 1,066 1,937
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8) Drinking Water (Class I) Agricultural Use (Class II) Livestock Use (Class III)	 500 2,000 5,000	 8	
WDEQ Water Quality Requirement for NPDES Permit # WY0052191 At discharge point	5,000	2.0	1,760
Predicted Produced Water Quality Big George Coal Zone	2,550	52.9	4,050

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 2550.0 mg/l TDS which is not within the WDEQ criteria for agricultural use (2000 mg/l TDS).

The quality for the water produced from the Big George target coal zone from these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of 15.0 gallons per minute (gpm) is projected is to be produced from these 11 wells, for a total of 165 gpm for the POD. See Table 4.5 .

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

There are 10 discharge points proposed for this project. They have been appropriately sited and utilize appropriate water erosion dissipation designs. Existing and proposed water management facilities were evaluated for compliance with best management practices during the onsite.

To manage the produced water, 9 proposed impoundments (105.3 acre feet) would potentially be constructed within the project area. These impoundments will disturb approximately 26.7 acres including the dam structures. Of these water impoundments, 5 would be on-channel reservoirs disturbing 14.8 acres, and 4 would be off-channel ponds disturbing 11.9 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). One existing impoundment 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 0.05 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 Crazy Woman Creek of 14 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 11 wells is anticipated to be a total of 165 gpm or 0.37 cfs to impoundments. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and full containment, the produced water re-surfacing in the small tributaries to Crazy Woman Creek from this action (0.30 cfs) may add a maximum 0.04 cfs to the Crazy Woman Creek flows, or 0.003% of the predicted total CBNG produced water contribution. This incremental volume is statistically below the measurement capabilities for the volume of flow of the Crazy Woman Creek streamflow (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). The addition of the water produced from these wells will not impact the water quantity in the mainstem of the Crazy Woman Creek. 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).

In the WMP portion of the POD, the operator provided an analysis of the potential development in the watershed above the project area (WMP page 3). This POD is located in headwater areas of small tributaries to Crazy Woman Creek. For an example calculations based on Stewart Draw, a tributary to Crazy Woman Creek, the watershed above the POD (3.9 sq mi) with an assumed density of 1 wells per location every 80 acres, the potential exists for the development of 31 wells which could produce a maximum flow rate of 465 gpm (1.1 cfs) of water. The BLM agrees with the operator that this is not expected to occur because:

1. New wells will be phased in over several years, and
2. A decline in well discharge generally occurs after several months of operation.

The potential maximum flow rate of produced water within the project area watershed, 1.1 cfs, is much less than the volume of runoff estimated from the 2-year storm event for Stewart Draw of 115 cfs. Therefore, the estimated flow rate of water produced from the full development in the watershed above the project area is significantly less than the natural runoff from the area.

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

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

Typical permit effluent limits set in WYPDES permits for Crazy Woman Creek area as follows:

Total Petroleum Hydrocarbons	10 mg/l max
pH	6.5 to 8.5
Total Dissolved Solids	5000 mg/l max
Specific Conductance	7500 mg/l max
Sulfates	3000 mg/l max
Radium 226	1 pCi/l max
Dissolved iron	299.7 µg/l max
Dissolved manganese	629 µg/l max
Total Barium	1800 µg/l max
Total Arsenic	7 µg/l max
Chlorides	46 mg/l

The WYPDES permit also addresses existing downstream concerns, such as irrigation use, in the COA for the permit. The designated point of compliance identified for this permit is end of pipe.

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.

The development of coal bed natural gas and the production and discharge of water in the area surrounding the existing natural spring may affect the flow rate or water quality of the spring.

In-channel downstream impacts are addressed in the WMP for the Stewart Draw POD prepared by WWC Engineering for Lance Oil & Gas Company, Inc.

4.4.2.1. Surface Water Cumulative Effects

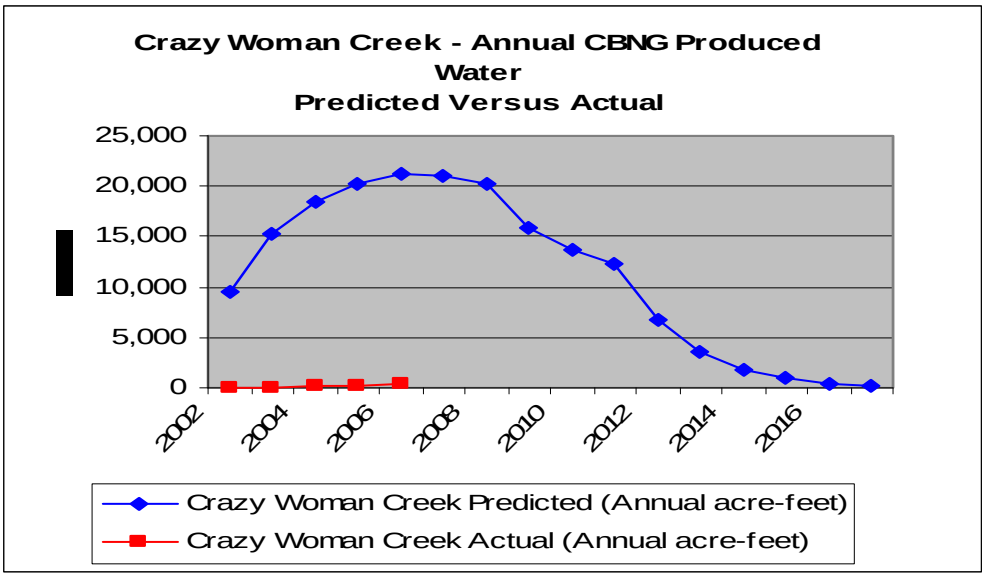
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the Crazy Woman Creek watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of December 2006, all producing CBNG wells in the Crazy Woman Creek watershed have discharged a cumulative volume of 635 acre-ft of water compared to the predicted 84,427 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Table 4.6 and Figure 4.1 following. This volume is 0.8 % of the total predicted produced water analyzed in the PRB FEIS for the Crazy Woman Creek watershed.

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

Year	Crazy Woman Creek Predicted (Annual acre-feet)	Crazy Woman Creek Predicted (Cumulative acre-feet from 2002)	Crazy Woman Creek Actual (Annual acre-feet)		Crazy Woman Creek Actual (Cumulative acre-feet from 2002)	
			Actual Ac-ft	% of Predicted	Cum Ac-ft	% of Predicted
2002	9,449	9,449	4	0.0	4	0.0
2003	15,185	24,634	1	0.0	5	0.0
2004	18,418	43,052	126	0.7	130	0.3
2005	20,240	63,292	113	0.6	243	0.4
2006	21,135	84,427	392	1.9	635	0.8
2007	21,036	105,463				
2008	20,279	125,742				
2009	15,962	141,704				
2010	13,716	155,420				
2011	12,240	167,660				
2012	6,731	174,391				
2013	3,629	178,020				
2014	1,881	179,901				
2015	910	180,811				
2016	422	181,233				
2017	150	181,383				
Total	181,383		635			

Figure 4.1 Actual vs predicted water production in the Crazy Woman Creek watershed



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

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

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 Crazy Woman Creek drainage, which is approximately 0.8% of the total predicted in the PRB FEIS.
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
3. The commitment by the operator to contain all CBNG 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 Crazy Woman Creek watershed and page 117 for cumulative effects common to all sub-watersheds.

4.5. Cultural Resources

Of the three cultural sites identified in the project area, two sites are recommended Not eligible to the National Register, and one site remains Unevaluated. However, none of the sites will be affected by developments for this project.

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

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Ray Moores	Project Manager	WWC Engineering	Yes

6. OTHER PERMITS REQUIRED

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

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