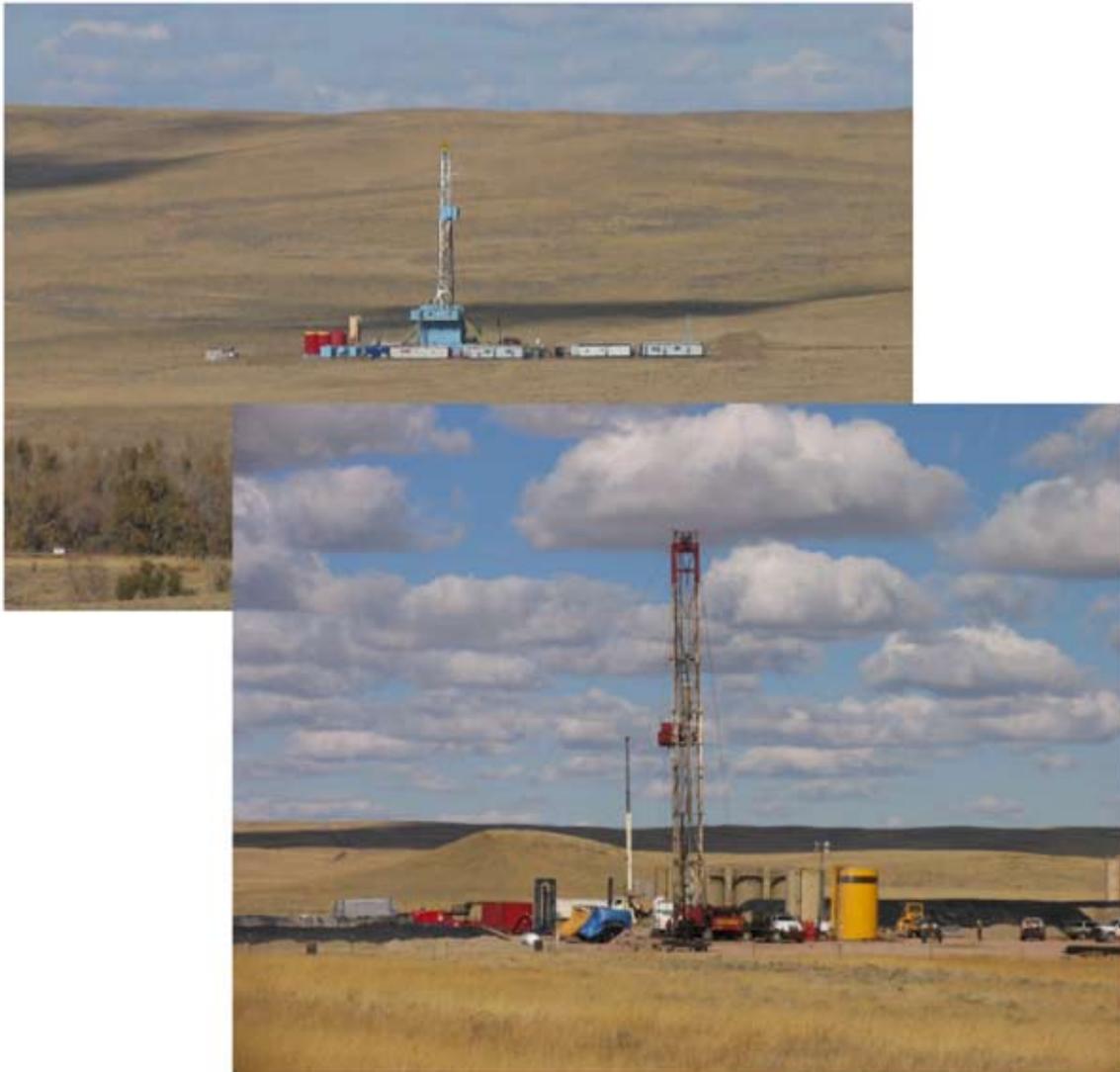


ENVIRONMENTAL ASSESSMENT of Southwestern Production Corporation's Proposed Eight Well Horizontal Drilling Program in the Hornbuckle Field, Converse County, Wyoming



February 2009

The BLM manages more land – 258 million acres – than any other Federal agency. This land, known as the National System of Public Lands, is primarily located in 12 Western States, including Alaska. The Bureau, with a budget of about \$1 billion, also administers 700 million acres of sub-surface mineral estate throughout the nation. The BLM’s multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

BLM/WY/PL-09/017+1310

WY-060-EA09-57

This Environmental Assessment was prepared by Anderson Environmental Consulting, an independent environmental consulting firm, with the guidance, participation, and independent evaluation of the Bureau of Land Management (BLM). The BLM, in accordance with Federal Regulation 40 CFR 1506.5 (a) & (b), is in agreement with the findings of the analysis and approves and takes responsibility for the scope and content of this document.

ENVIRONMENTAL ASSESSMENT

of

**SOUTHWESTERN PRODUCTION CORPORATION'S
EIGHT WELL HORIZONTAL DRILLING PROGRAM
IN THE HORNBUCKLE FIELD**

CONVERSE COUNTY, WYOMING

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February 2009

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1 Figure 2.1a shows the proposed HR Federal #44-20H, GH Federal #44-21H, GH Federal #24-22H and HR Federal #11-18H well locations

2 Figure 2.1b shows the proposed BR Federal #24-26H well location

3 Figure 2.1c shows the proposed BR Federal #44-4H and BR Federal #11-10H well locations

4 Figure 2.1d shows the proposed DCR #34-21H well location

1.0 INTRODUCTION

Southwestern Production Corp. (SWPC) has filed Notices of Staking with the Casper Field Office (CFO), Bureau of Land Management seeking approval to drill eight (8) horizontal oil wells within the existing Hornbuckle Field in Converse County, Wyoming - which is located approximately twenty-six (26) miles northeast of Glenrock in Townships 37 and 38 North, Range 73 West (see Figure 1.1).

This environmental assessment (EA) has been prepared to analyze the eight (8) wells proposed by SWPC within the Hornbuckle Field and is a site specific analysis of the potential impacts that could result from implementation of the Proposed Action or alternatives thereto. The EA assists the Bureau of Land Management in project planning, ensuring compliance with the *National Environmental Policy Act* of 1969 (NEPA), and in making a determination as to whether any “significant” impacts could result from the analyzed actions. “Significance” is defined by NEPA and is found in 40 CFR 1508.27. This EA will assist the Authorized Officer (AO) in making a determination to either issue a Finding of No Significant Impact (FONSI) or begin the preparation of an environmental impact statement (EIS). A FONSI is a document that briefly presents the reasons why implementation of the Proposed Action would not result in significant environmental impacts (effects) beyond those already addressed in the Casper Resource Management Plan and Record of Decision (BLM 2007). If the Authorized Officer determines that this project has significant impacts following the analysis in this EA, then an EIS would be prepared for the project. Otherwise, a Decision Record (DR) may be signed for the EA approving the selected alternative.

1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1.1 Need for the Proposed Action

The project proposal would involve the drilling of eight horizontal oil wells over a period of approximately one year. These wells would be drilled to test the potential of the Sussex Formation for commercial oil production at vertical depths of approximately 10,200 feet. Information gathered from the drilling and evaluation of these wells would ultimately be used to determine if additional horizontal drilling is warranted within the Hornbuckle Field and surrounding area(s).

Oil will remain an integral part of the energy future of the United States until such time as reasonably-priced alternative energy sources have been developed and become readily available. By continuing to develop domestic hydrocarbon reserves, the United States would reduce dependence on foreign sources of energy and maintain an adequate and stable supply of fuel to maintain economic well-being, industrial production, and national security.

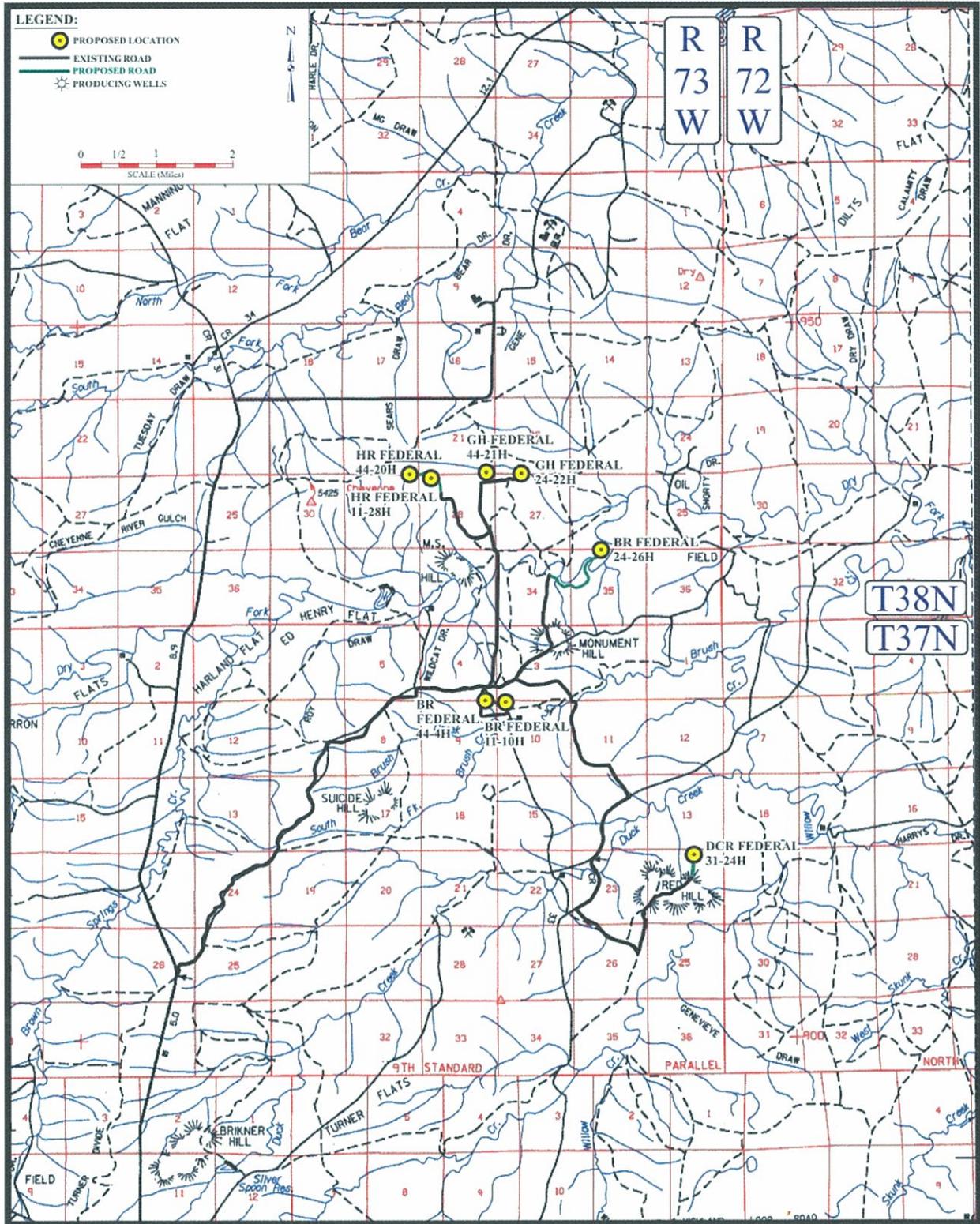


Figure 1.1: General Project Vicinity Map

1.1.2 Purpose of the Proposed Action

The exploration and development of federal oil and gas leases is an integral part of the BLM's oil and gas leasing program under the authority of the *Mineral Leasing Act* (MLA) of 1920 as amended (30 USC 181 et seq.), the *Federal Land Policy and Management Act* (FLPMA) of 1976 (43 USC 1701 et seq.), the *Federal Onshore Oil and Gas Royalty Management Act* (FOOGRMA) of 1982 (30 USC 1701 et seq.), and the *Federal Onshore Oil and Gas Leasing Reform Act* (FOOGLRA) of 1987 (30 USC 226 et seq.). The BLM's oil and gas leasing program is intended to encourage the development of domestic oil and gas reserves, thereby reducing national dependence upon foreign energy supplies. Furthermore, exploration and production of both oil and natural gas is in accordance with the President's National Energy Policy, 2005, as outlined in Executive Order (EO) 13212.

1.2 CONFORMANCE WITH EXISTING LAND USE PLANS

BLM planning for the project area is documented in the Casper Resource Management Plan (RMP) approved in December of 2007 (BLM 2007). The RMP established the following objectives for oil and gas resources:

- MR:2.1 Maintain oil and gas leasing, exploration, and development, while minimizing impacts to other resource values.
- MR:2.4 Facilitate the evaluation of public lands for oil and gas potential.
- MR:3.1 Maintain opportunities to explore and develop federal oil and gas resources and other leasable minerals

The RMP specified the following decisions/management actions to achieve the above objectives:

- Decision 2004 (Leasable Minerals) - The Casper Field Office is open to mineral leasing, including solid leasables and geothermal, unless specifically identified as administratively unavailable for the life of the plan for mineral leasing. These open areas will be managed on a case-by-case basis.
- Appendix D - Oil and Gas Operations, Applications for Permit to Drill (APD) specified "If necessary, site-specific mitigation can be added to the APD as a Condition of Approval (COA) for protection of surface and/or subsurface resource values in the vicinity of the proposed activity".

In accordance with 43 CFR 1610.5-3(a), the Proposed Action has been determined to be in conformance with this plan. The project area has been determined to be suitable for oil and gas leasing and the proposed exploration and development with incorporated mitigation measures to reduce impacts to other resource values is consistent with the land use decisions and resource management goals and objectives.

1.3 RELATIONSHIP TO STATUTES, REGULATIONS, AND OTHER PLANS

This EA has been prepared in accordance with NEPA and is in compliance with all applicable regulations and laws passed subsequent thereto, including the Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508), U.S. Department of the Interior (USDI) requirements contained in *Department Manual 516, Environmental Quality* (USDI 1980), guidelines listed in the *BLM Manual Handbook, H-1790-1* (BLM 1988), and *Guidelines for Assessing and Documenting Cumulative Impacts* (BLM 1994). The proposed project would be consistent with other federal, state and local laws, rules and regulations and SWPC would procure any required permits or easements prior to the commencement of drilling operations and subsequent evaluation of the eight proposed wells as identified in Table 1.1.

Table 1.1

**Major Federal, State and Local Permits and Approvals Required
for the SWPC Horizontal Drilling Project Proposal**

Agency	Permit, Approval or Action
Bureau of Land Management	Approval of the individual Applications for Permit to Drill for operations on federally-owned mineral estate
U.S. Fish and Wildlife Service	Conformance with the Endangered Species Act
Wyoming Game and Fish Department	Coordination on impacts to wildlife and state-sensitive species
Wyoming State Engineer	Approval of permit to appropriate ground/surface water for use in drilling operations
Wyoming Oil and Gas Conservation Commission	Approval of the individual State of Wyoming drilling permit applications
Affected Private Surface Owners	Easements/agreements for surface disturbing operations on privately-owned surface estate

2.0 PROPOSED ACTION AND ALTERNATIVES

This environmental document analyzes the impacts of the Proposed Action and the No Action Alternative for eight additional horizontal wells proposed to be drilled by SWPC on federally-owned mineral estate within the Hornbuckle Field in northern Converse County, Wyoming. These eight wells would test the commercial productivity of the Sussex Formation (Fm) for commercial oil production. The only other alternative considered available or reasonable in this analysis is the No Action Alternative.

2.1 THE PROPOSED ACTION

SWPC is proposing to drill eight horizontal oil wells within the Hornbuckle Field at the surface locations identified in Table 2.1 and shown in Figures 2.1a-d. The proposed bottom hole location for each well is also provided in Table 2.1.

Table 2.1

Proposed Horizontal Sussex Fm Wells in the Hornbuckle Field

Well Name and Number	Surface and Bottom Hole Locations of Proposed Wells					Surface Ownership
	Surface Hole	Bottom Hole	Section	Township	Range	
BR Federal 44-4H	SE¼SE¼	NW¼NE¼	4	37 North	73 West	David Blaylock
BR Federal 11-10H	NW¼NW¼	SE¼SW¼	10	37 North	73 West	David Blaylock
DCR Federal 31-24H	NW¼NE¼	SE¼SE¼	24	37 North	73 West	Duck Creek Ranch
HR Federal 44-20H	SE¼SE¼	NW¼NE¼	20	38 North	73 West	Hornbuckle Ranch
GH Federal 44-21H	SE¼SE¼	NW¼NE¼	21	38 North	73 West	Hardy Ranch
GH Federal 24-22H	SE¼SW¼	NW¼NW¼	22	38 North	73 West	Hardy Ranch
BR Federal 24-26H	SE¼SW¼	NW¼NW¼	26	38 North	73 West	David Blaylock
HR Federal 11-28H	NW¼NW¼	SE¼SW¼	28	38 North	73 West	Hornbuckle Ranch

All of the proposed horizontal wells would be drilled on private surface estate as indicated above, with portions of the horizontal well bores drilled through federal mineral estate and subject to one or more federal mineral leases in each respective horizontal well bore (lateral).

Drilling operations in the Hornbuckle Field would be initiated as soon as all of the necessary permits have been obtained (subject to any timing restrictions for the protection of wildlife on specific drilling permits). It is anticipated that all eight wells would be drilled within one year of permit approval.

All lease and/or unit operations would be conducted in full compliance with all applicable laws, regulations (43 CFR 3100), *Onshore Oil and Gas Orders*, the approved plan of operations and any applicable Notices to Lessees.

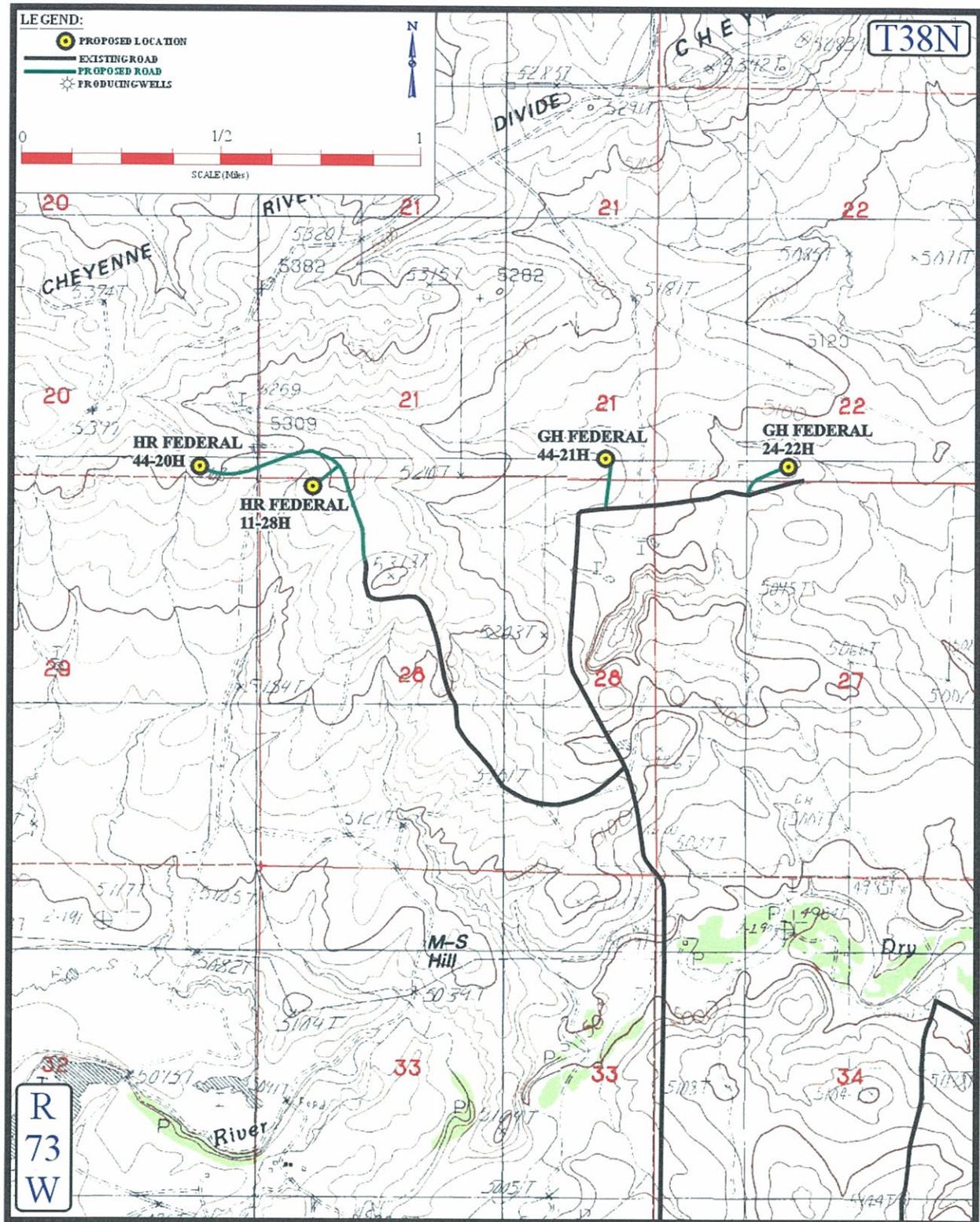


Figure 2.1a: Horizontal Sussex Fm Wells Proposed by SWPC in the Hornbuckle Field

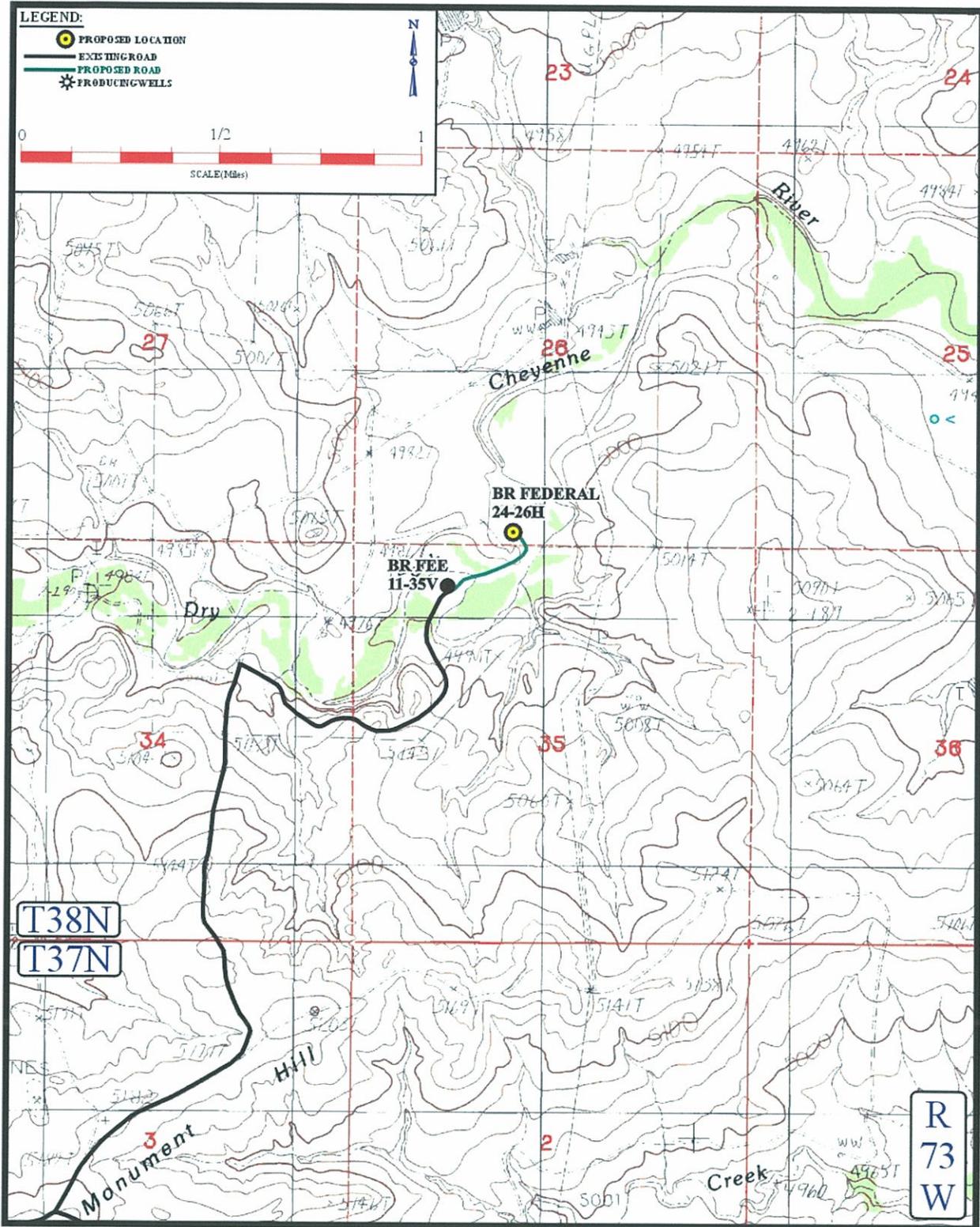


Figure 2.1b: Horizontal Sussex Fm Wells Proposed by SWPC in the Hornbuckle Field

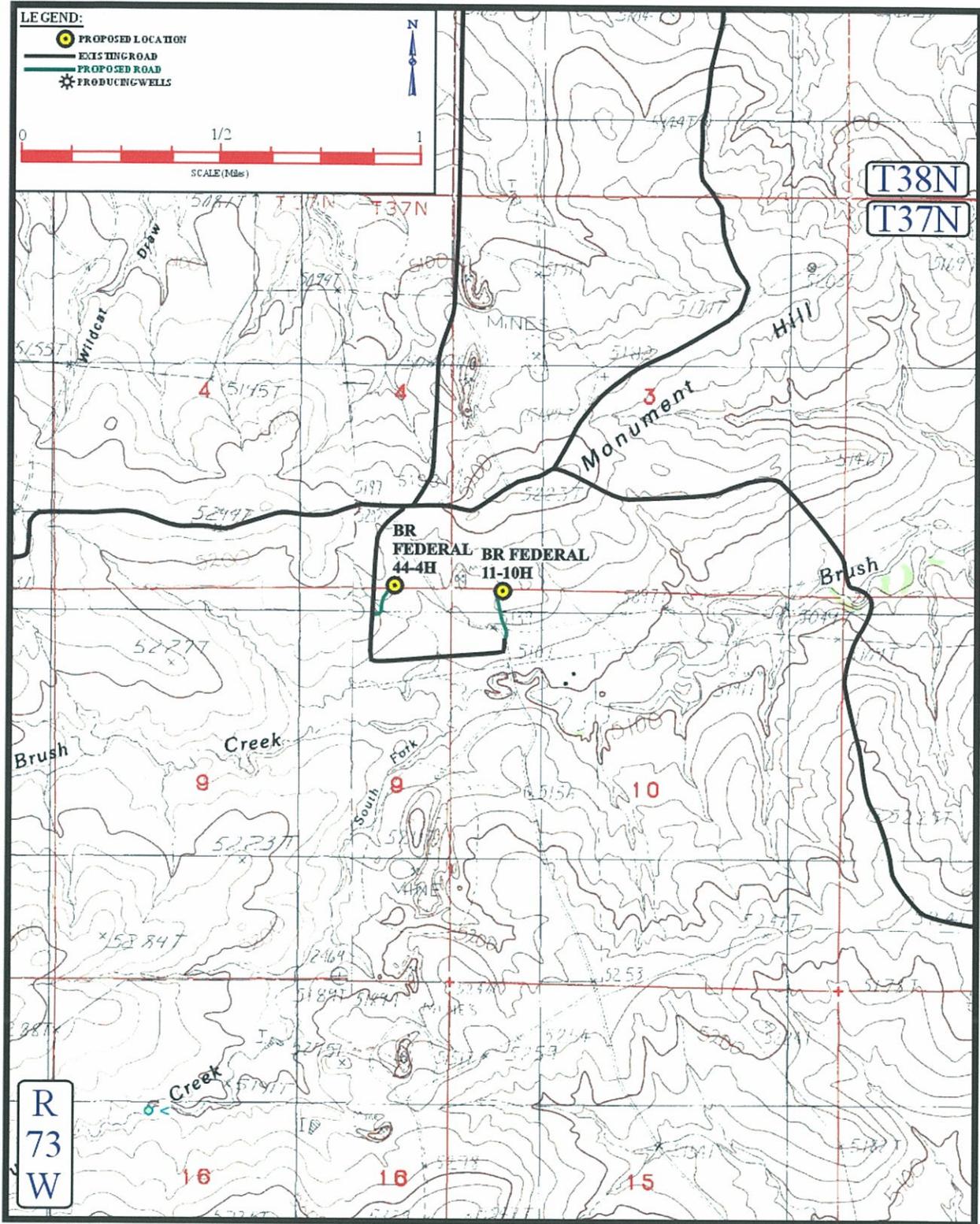


Figure 2.1c: Horizontal Sussex Fm Wells Proposed by SWPC in the Hornbuckle Field

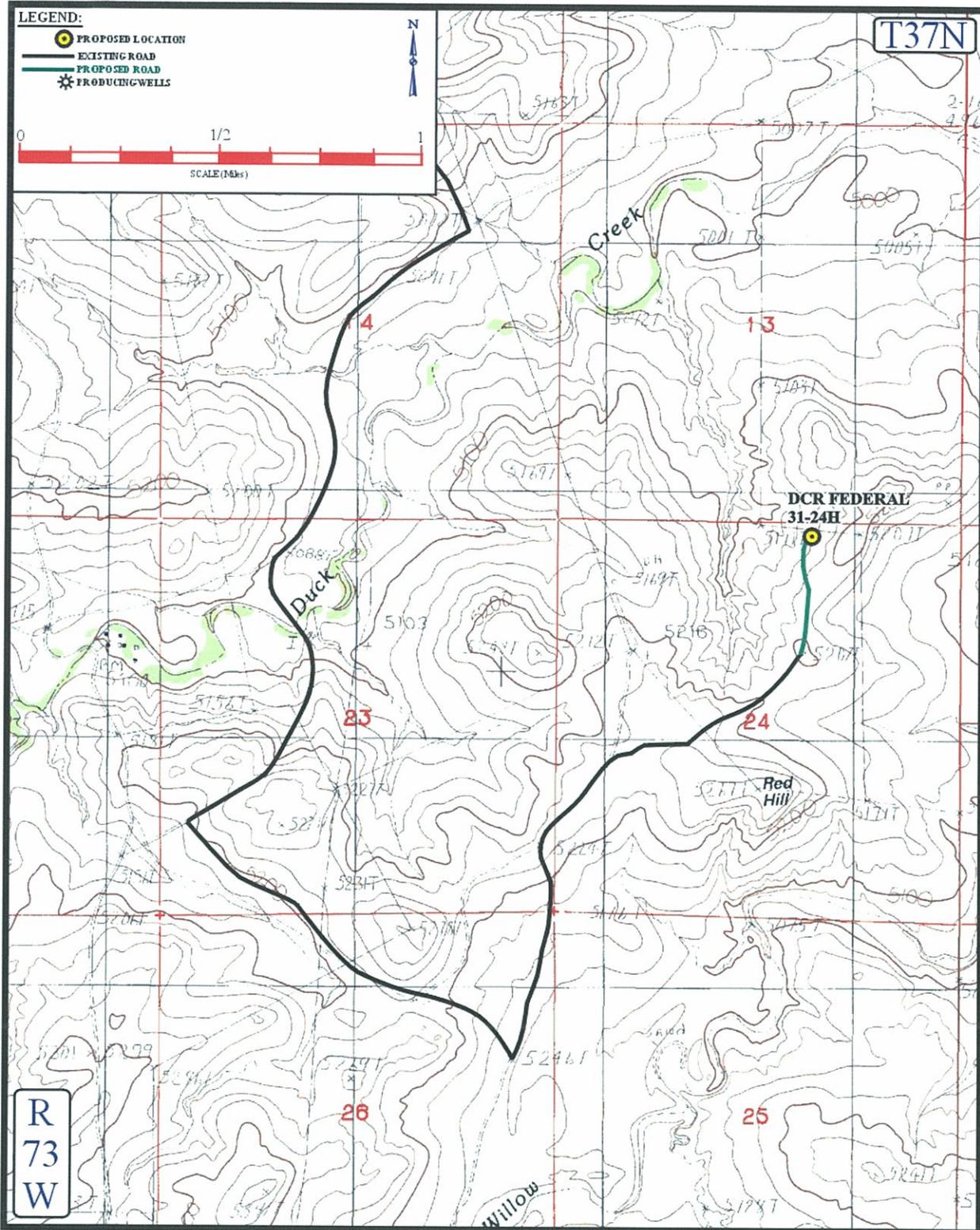


Figure 2.1d: Horizontal Sussex Fm Wells Proposed by SWPC in the Hornbuckle Field

2.1.1 Construction Activities

Construction activities for each proposed well location and access road route would follow practices and procedures outlined in each individual Application for Permit to Drill (APD) and any Conditions of Approval (COAs) appended thereto by the BLM. Access road and well pad construction activities would follow guidelines and standards as set forth in the joint BLM/U.S. Forest Service (USFS) publication: *Surface Operating Standards for Oil and Gas Exploration and Development* (Fourth Edition) and/or the contractual requirements of the affected private (fee) surface owner(s).

2.1.1.1. Access Roads

Access to the Hornbuckle Field would generally be obtained via the Ross Road (Converse County Road #31) and then via existing, upgraded oilfield roads (crowned and ditched with gravel running surfaces) within the field. Access to the eight proposed horizontal Sussex Fm. well locations from existing roads within the Hornbuckle Field would require the construction of approximately 6,600 feet (1.25 miles) of new access road and the reconstruction of approximately 5,000 feet (0.95 miles) of existing two-track trail, resulting in the initial disturbance of an additional 10.65 acres of surface estate (based on a maximum disturbed road width of 40 feet). Table 2.2 provides the amount of road to be constructed or reconstructed for access to each of the eight proposed well locations.

Table 2.2

**Proposed Access Roads to the Eight Proposed
Horizontal Wells in the Hornbuckle Field**

Well Name and Number	Upgraded Road	New Road	Total Road
BR Federal 44-4H	0'	500'	500'
BR Federal 11-10H	0'	600'	600'
DCR Federal 31-24H	3,000'	1,500'	4,500'
HR Federal 44-20H	600'	1,300'	1,900'
GH Federal 44-21H	0'	500'	500'
GH Federal 24-22H	0'	600'	600'
BR Federal 24-26H	0'	1,200'	1,200'
HR Federal 11-28H	1,400'	400'	1,800'
TOTALS	5,000'	6,600'	11,800'

Whenever possible, access roads would be designed and constructed to disturb less than the 40 foot right-of-way (ROW) width referenced above so long as traffic and safety concerns could be

satisfied. The existing access roads would be maintained as necessary to accommodate appropriate year-round traffic and prevent unnecessary erosion. Roads would be constructed in accordance with BLM manual section 9113 and/or the roading standards outlined in the joint BLM/USFS publication: *Surface Operating Standards for Oil and Gas Exploration and Development* (Fourth Edition) and would be designed by a professional engineer as necessary or required by the BLM.

Topsoil would be stripped from the access road corridor as directed by the affected fee surface owner(s) prior to the commencement of construction activities, with the stockpiled topsoil redistributed on the “outslope” areas of the borrow ditch following completion of road construction activities. These borrow ditch areas would then be reseeded as soon as practical thereafter with a seed mixture to be recommended by either the private surface owner or the BLM.

In the event that commercial production is established from any/all of the proposed horizontal wells, the access roads would be graveled with a minimum of four inches of gravel as necessary or required by either the private surface owner or the BLM and the roadway would remain in place for the productive life of the well. The gravel would be obtained from the Collins Limestone Quarry located in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ of Section 30 in Township 30 North, Range 68 West.

2.1.1.2. Well Locations

Major components of the proposed well pad would include:

- a leveled area suitable for placement/support of the drilling rig and related equipment; and
- a series of three earthen reserve pit(s) designed to contain drilling fluids, drilled cuttings, fluids produced during the drilling operation and fluids used/produced during the completion operation

Construction activities for each well would follow practices and procedures outlined in each individual APD and any Conditions of Approval (COAs) appended thereto by the BLM. Well pad construction activities would follow guidelines and standards as set forth in the joint BLM/U.S. Forest Service (USFS) publication: *Surface Operating Standards for Oil and Gas Exploration and Development* (Fourth Edition). Sufficient topsoil to facilitate revegetation would be segregated from subsoil materials during construction and stockpiled for future reclamation of the disturbed areas. The salvaged topsoil would be evenly distributed over those disturbed surfaces subject to reclamation upon termination of drilling and completion operations as part of the reclamation and revegetation program. Topsoil stockpiles would be stabilized with vegetation (annual ryegrass) until used for reclamation purposes as necessary or required by either the private surface owner or the BLM.

After the topsoil has been removed, the well pad would be graded to produce a level working platform around the drill hole for support of the rig substructure. The excavated soil material (subsoil) would be utilized in overall pad construction, with the finished well pad graded to allow for positive drainage of natural water (e.g., rain and/or snow melt) away from the drill site.

The level area of the well pad required for drilling and completion operations (including the reserve pit) would be approximately 460' x 341' (3.60 acres) in overall size. Minor deviations would occur in the overall size of individual well locations due to topographic constraints and efforts by both BLM, SWPC and the private surface owners to limit surface disturbances in certain circumstances (including, but not limited to, areas of extensive cuts and/or fills, proximity to ephemeral drainages, etc.) as determined at the time of the on-site inspections. Construction of all eight well locations would result in approximately 38.39 acres of additional surface disturbance within the existing Hornbuckle Field (see Table 2.3).

Erosion control would be maintained through prompt revegetation and by constructing surface water drainage control structures such as berms, diversion ditches and waterbars as necessary on the proposed well location(s).

Table 2.3 provides a summary of surface disturbance associated with well pad and access road construction for each of the eight proposed well locations.

Table 2.3

Acres of Surface Disturbance Directly Associated with the Proposed SWPC Horizontal Drilling Program

Well Name and Number	Access Road ¹	Well Location ²	Total Disturbance
BR Federal 44-4H	0.46	4.50	4.96
BR Federal 11-10H	0.55	4.85	5.40
DCR Federal 31-24H	4.13	5.13	9.26
HR Federal 44-20H	1.75	4.78	6.53
GH Federal 44-21H	0.46	4.76	5.22
GH Federal 24-22H	0.55	4.53	5.08
BR Federal 24-26H	1.10	4.44	5.54
HR Federal 11-28H	1.65	5.40	7.05
TOTALS	10.65	38.39	49.04

1 Based upon a 40-foot total disturbed road ROW width

2 Including cut/fill slopes and soil stockpiles

2.1.2 Drilling Operations

To facilitate the drilling of the proposed horizontal wells, SWPC would utilize a rotary drilling rig rated for drilling operations to a measured depth of approximately 14,500 feet. Rig transport and on-site assembly would be completed in approximately seven days per well and actual drilling

operations would require approximately thirty-five days/well to reach the target depth. The proposed drilling operation would not penetrate any formation known or suspected to contain concentrations of hydrogen sulfide (H₂S) gas.

Human waste generated during operations would be collected in standard portable chemical toilets or service trailers located on-site and would be transported off-site to a state-approved wastewater treatment site upon completion of operations. Non-human waste would be collected in enclosed containers and disposed of at a state-approved solid waste disposal facility.

2.1.2.1 Drilling Fluids System

The actual drilling operation would utilize a fresh-water based mud system with additives to drill the surface hole (surface to approximately 3,200'). Basically, this system involves drilling with water and utilizing non-hazardous additives such as bentonite to minimize down hole problems. On the average, SWPC would utilize approximately 1.27 barrels of water (42 gallons/barrel) per foot of hole drilled (or approximately 170,688 gallons/well) to drill the initial 3,200 feet of hole, with this water obtained from a commercial source in the immediate area. The fresh water based mud system would use a separate reserve pit approximately 60' X 60' x 8' to contain the cuttings and fluids used/generated during the drilling of the surface hole.

Upon setting and cementing of the surface casing string, SWPC would switch to an oil invert mud system (approximately 80% diesel fuel and 20% water) to drill the remainder of the hole, with approximately 155,400 gallons of diesel fuel and 31,080 gallons of water used in the invert mud system. SWPC would clean and re-use as much of the oil invert mud as possible during the drilling operation. Upon completion of drilling operations, the oil invert mud would be recycled and used in successive drilling programs, with any free fluids remaining in the reserve pit removed and hauled to an approved disposal site as indicated below. . The oil based mud (OBM) system would use a separate reserve pit approximately 100' X 80' x 8' to contain the OBM cuttings and fluids.

Use of an oil-invert mud system would reduce the potential for hole sloughing while drilling through water-sensitive formations (shales). Drilling fluids utilized in the oil-based mud system would be contained in steel tanks on location designed specifically for the containment of these oil-based fluids. These fluids would be recycled during the drilling operation by centrifuging the returns to separate the drilled cuttings from the oil-based fluids. The centrifuged cuttings would be deposited into a separate, lined reserve pit for disposal and the fluids would be recycled back into the mud system (steel tanks) for continued use in the drilling operation. Upon completion of drilling operations, any remaining oil-based fluids would be removed from the well location and disposed of in accordance with BLM and/or Wyoming Oil and Gas Conservation Commission (WOGCC) rules and regulations pertaining thereto. A plastic/vinyl liner would be placed underneath all steel tanks designed for the storage and/or mixing of the oil-based drilling fluids.

As stated above, cuttings generated in conjunction with the drilling operation would be contained in a separate reserve pit to be constructed on each individual well location. The reserve pit(s) would be lined with an impervious (plastic/vinyl) liner in order to prevent drilling fluids loss through seepage and contamination of the underlying soil material by the oil-based cuttings. The liner

would be installed with sufficient bedding (either straw or dirt) to cover any rocks, would overlap the pit walls, extend under the mud tanks, and would be covered with dirt and/or rocks to hold it in place. Prior to the commencement of drilling operations, the reserve pit(s) would be fenced on the three non-working sides, with the fourth side of the pits (location side) fenced immediately following removal of the drilling rig in order to protect both wildlife and livestock or as otherwise directed by the affected fee surface owner(s). Fencing would be installed in accordance with guidelines contained in the joint BLM/USFS publication: *Surface Operating Standards for Oil and Gas Exploration and Development*, Fourth Edition and would be maintained until such time as the reserve pits have been backfilled.

SWPC intends to utilize the Soli-Bond, Inc. (or a similar) solidification technique for the processing and disposal of oil-based cuttings generated in conjunction with the drilling operation. Use of the Soli-Bond processing technique would render these drilled cuttings into an inert, solid mass that would be buried in place in the reserve pits with a minimum of four feet of overburden upon completion of the solidification process. Solidification of all pits would be in accordance with WOGCC rules and regulations pertaining thereto using a WOGCC approved contractor for solidification and pit closure.

Solidification would be accomplished through the controlled addition of a non-toxic, chemically reactive, Portland-cement based reagent (or fly ash) to the drilled cuttings to form a homogenous slurry similar to brick mortar. Oily substances that could be present in the drilled cuttings (waste) would be broken up into small droplets or particles and dispersed throughout the reagent/waste mixture during the mixing phase of the process. After the mixing phase, an irreversible cementitious reaction begins to occur between the reagent and water present (or added) to the waste, ultimately causing the reagent/waste mixture to be transformed into a solid granular material within forty-eight hours after initial processing. Any dispersed particles of hydrocarbons within the processed granules are locked in place in their isolated state within the reacted cementitious matrix of each granule which prevents them from re-coalescing and suddenly being released to the environment at significant rates in the future. Moreover, the alkaline nature of the cementitious mixture chemically stabilizes various metals that may be present in the processed waste, primarily by transforming them into less soluble metal hydroxides and other less soluble compounds.

2.1.2.2 Casing and Cementing Operations

As indicated above, surface casing would be set at an approximate depth of 3,200 feet and cemented back to the surface during the drilling operations. This would serve to isolate all near surface fresh water aquifers which could occur in the immediate project area. Intermediate casing would be set to a measured depth (MD) of approximately 10,488 feet and would also be cemented in place, with the top of cement designed to be above the top of the Parkman Fm. This procedure would eliminate any possibility for fluid communication between potential hydrocarbon bearing zones below the Teapot Fm and any near-surface fresh water aquifers which may be encountered down hole. The cementing operations would be conducted in full compliance with *Onshore Oil and Gas Order Number 2*.

2.1.3 Completion and Evaluation Operations

Once a well has been drilled and cased, a completion (work-over) unit would be moved onto the well location and completion operations would commence. These completion operations would generally require an average of thirty days for a well of this depth and would typically consist of cleaning out the well bore, pressure testing the casing, perforating and fracturing (as appropriate) the Sussex Fm in the horizontal portion of the hole and running production tubing in the event that commercial production is established there from.

In certain instances, it may be necessary to hydraulically fracture selected intervals in the Sussex Fm in order to “stimulate” production. These hydraulic fracturing (frac) jobs would typically consist of pumping a mixture of sand and some form of transport medium (water, nitrogen, etc.) down hole under extreme pressure with this mixture forced through the existing perforations into the formation. As the formation is fractured, the resultant fissures (fractures) are filled with sand which props them open and facilitates the flow of oil/gas into the well bore and subsequently to the surface. Upon completion of the fracturing, the well would be flowed back to the surface in an attempt to recover as much of the fracture fluids as possible and to clean excess sand out of the perforations prior to setting production equipment on location and commencing production. All fluids utilized in the completion procedure would either be captured in a separate reserve pit to be constructed on the well location or in test (frac) tanks situated on the well location, with these fluids ultimately disposed of in strict accordance with both BLM and WOGCC rules and regulations applicable thereto.

2.1.4 Production Operations

Production equipment required on the individual well locations would typically include the following equipment:

- a pumping unit at the well head;
- a vertical heater/treater;
- a tank battery (which generally consists of two to four 400 barrel steel tanks);
- a flare/production pit; and
- a dehydrator and meter run for gas sales where applicable.

All permanent above ground production facilities installed on the producing well location would be painted Shale Green (Munsell standard color #5Y 4/2) or another of the standard environmental colors recommended by the Rocky Mountain Five-State Interagency Committee to be selected at the discretion of the BLM. A dike would be constructed completely around those production facilities designed to hold fluids (i.e., production tanks and/or heater/treater). These dikes would be constructed of compacted subsoil, be impervious, hold 110% of the capacity of the largest tank, and would be independent of the back cut. Load out lines would be

located within the tank battery dike and would have a heavy screen-covered drip barrel installed under the outlet. A metal staircase would be placed over the dike to protect the dike as well as support the tanker truck flexible hose.

Oil produced from each well would be collected in tanks installed on the individual well locations and would be periodically trucked to a pre-existing oil terminal for sales. The frequency of trucking activities would depend solely upon the amount of oil being produced from the wells. Recent production tests from the HR Federal #44-29 indicate that commercial quantities of natural gas may be expected from some horizontal completions in the Sussex Fm. SWPC has indicated that gas sales from these wells would be accomplished under a third-party agreement where the purchaser would run a sales line to the well location and the custody transfer of the gas would occur at a meter run to be installed on the producing well location. SWPC would encourage the purchaser to install these lines adjacent (parallel) to pre-existing roads to the extent possible, but the ultimate placement of these sales lines would be dictated by the location of the main transmission lines and any contractual agreements between the affected private surface owners and the gas purchaser. SWPC would not require any federal approvals for gas sales under this third party agreement. In those cases where commercial quantities of gas were not encountered, small (non-commercial) volumes of gas would be flared in accordance with Notice to Lessees (NTL) 4A. Any water produced in conjunction with the hydrocarbon stream would be captured in tanks on the well location and periodically trucked to an approved disposal site. As above, the frequency of trucking activities would depend solely upon the volumes of water produced from each individual well.

2.1.5 Interim Reclamation for Production

All disturbed surfaces would be reclaimed as soon as possible after the initial disturbance. This reclamation would consist primarily of backfilling the reserve pits, leveling and recontouring of “non-working” disturbed areas, redistribution of stockpiled topsoil over these disturbed areas, installation of erosion control measures, and reseeding as recommended by the BLM and/or private surface owner. Approximately 1.38 acres of the well pad (an area equal to 300’ X 200’) would be required for long-term production operations, the remaining 2.22 acres of the constructed well pad would be reclaimed as indicated above. Solidification and subsequent reclamation of the reserve pit(s) would be accomplished as soon as possible following well completion. Solidification would be accomplished as outlined in Section 2.1.2.1 and the pit would be backfilled immediately upon completion of the solidification process.

Interim reclamation of the well location including reduction of the cut and fill slopes, redistribution of the stockpiled topsoil over the recontoured slopes, and reseeding of these disturbed areas would be accomplished within a maximum of two years following the termination of drilling and completion operations. As indicated above, approximately 2.22 acres of the existing well pad would be reclaimed and reseeded in accordance with the guidelines contained in the approved APD.

Likewise, topsoil stockpiled in conjunction with initial road construction would be re-distributed over the outslope areas of the borrow ditches and these areas would also be reseeded as recommended in the approved APD. Reclamation of these outslope areas along the access road

would reduce the overall disturbed road ROW width from approximately 40 feet to approximately 28 feet and would reduce the long-term disturbance associated with the access road ROW to approximately 7.46 acres for all eight well locations.

The working area(s) of the well pad and the access road running surface would be surfaced with gravel or crushed rock and these surfacing materials would be obtained from a previously approved location within the general area. As stated in Section 2.1.1.1, crushed rock (gravel) is currently being obtained from the Collins Limestone Quarry located in the NE¹/₄NW¹/₄ of Section 30 in Township 30 North, Range 68 West.

2.1.6 Abandonment and Reclamation

Upon final abandonment, all existing surface facilities would be removed from the well location, the well bore would be physically plugged with cement as directed by the BLM, and a dry hole marker would be set in accordance with existing regulations and direction contained in the approved APD. Upon completion of plugging operations, both the access road and remaining “work” areas of each abandoned well location would be scarified and recontoured, erosion control measures would be installed as necessary, and all recontoured (disturbed) areas would be reseeded as recommended by the BLM and/or private surface owner. However, there may be certain circumstances where the private surface owner may wish to retain specific access roads for future use at the time of final abandonment.

2.1.7 Hazardous Materials

SWPC has reviewed the Environmental Protection Agency’s (EPA’s) Consolidated List of Chemicals Subject to Reporting Under Title III of the *Superfund Amendments and Reauthorization Act* (SARA) of 1986 (as amended) to identify any hazardous substances proposed for production, use, storage, transport, or disposal by this project, as well as the EPA’s List of Extremely Hazardous Substances as defined in 40 CFR 355 (as amended) and has determined that none of the materials listed as hazardous and/or extremely hazardous would be used or generated by this project.

2.1.8 Field Camps

No man camp is proposed in conjunction with horizontal drilling operations as currently proposed in the Hornbuckle Field. Personnel would commute to the project site daily, most likely from either the Casper or Douglas areas.

Self-contained trailers may be sited on the individual well locations to house key personnel during the drilling operation; however, these trailers would be temporary in nature and would be removed following the termination of drilling and completion operations on each individual well.

2.3 THE NO ACTION ALTERNATIVE

Under the No Action Alternative, the Proposed Action would not be implemented and the eight wells as currently proposed in the Hornbuckle Field would not be approved. Current land use practices would continue, and minerals within the Hornbuckle Field would continue to be available for oil and gas exploration and development. Should future development be proposed, those actions would require individual NEPA analyses on a case-by-case basis.

3.0 AFFECTED ENVIRONMENT

This chapter describes the affected environment in the vicinity of the Proposed Action (the project area) as it exists today, where pertinent existing development, impacts, and disturbances are described. This description is organized by resource with descriptive information taken from a wide range of sources including the BLM and various other federal and state agencies as appropriate.

Critical elements of the human environment, their status in the Project Area, and their potential to be affected by the Proposed Action are listed in Table 3.1.

Table 3.1
Critical Elements of the Human Environment ¹

Critical Element	Status on the Project Area	Addressed in Text of EA
Air Quality	Not Affected	Yes ²
Areas of Critical Environmental Concern	None Present	No
Cultural Resources	Potentially Affected	Yes
Environmental Justice	Not Affected	Yes
Farmlands, prime or unique	None Present	No
Floodplains	Not Affected	Yes ²
Native American Religious Concerns	Not Affected	No
Invasive Non-Native Species	Potentially Affected	Yes
Threatened and Endangered Species	Potentially Affected	Yes
Wastes, hazardous or solid	None Present	No
Water Quality (surface and ground water)	Potentially Affected	Yes ²
Wetland/Riparian Zones	Not Affected	No
Wild and Scenic Rivers	None Present	No
Wilderness	None Present	No

¹ From the BLM NEPA Handbook H-1790-1 (BLM 1988, 1999).

² Briefly discussed in Section 3.1: Environmental Elements Considered with Minor Effects.

3.1 ENVIRONMENTAL ELEMENTS CONSIDERED WITH MINOR EFFECTS

The following resources would not be adversely affected by implementation of the Proposed Action. As a consequence, these resources will be addressed briefly in this section but will not be addressed in Chapter 4.0 (Environmental Consequences).

3.1.1 Air Quality

The Wyoming Department of Environmental Quality (WDEQ) operates a series of State and Local Air Monitoring Sites (SLAMS) through the state with the nearest SLAMS sites located in the city of Casper (approximately 42 miles southwest of the project area) and at the Antelope Coal Mine in Converse County (approximately 23 miles northeast of the project area). The Casper SLAMS site measures PM₁₀ (particulate matter less than 10 microns in size) and the Antelope Coal Mine SLAMS site monitors PM_{2.5} (particulate matter less than 2.5 microns in size) and NO_x (nitrogen oxides). A third SLAMS site in south Campbell County (approximately 75 miles north/northeast of the project area) also measures ozone (O₃) levels, in addition to PM₁₀ and NO_x. Data collected at the three referenced SLAMS sites through 2007 show that all of these monitors are in attainment with National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) increment standards (WDEQ 2008).

Construction emissions associated with the Proposed Action would include PM₁₀, SO₂, NO_x, CO, and VOCs. These emissions would result primarily from construction, drilling and completion activities, would be temporary in nature, would occur in isolation at each proposed well location and would generate an almost undetectable level of emissions that would be limited to the near-field with no impact in the far-field (BLM 2005). As a result, emissions resulting from the construction and drilling of the eight proposed wells in the Hornbuckle Field would be short-term in nature and would not have a long-term or lasting effect upon air quality or visibility within the airshed of the Hornbuckle Field, Converse County, or the State of Wyoming.

While no air quality analyses have been conducted in this general area, analyses conducted in Natrona County, Wyoming in conjunction with environmental analyses of the Cave Gulch-Bullfrog-Waltman Natural Gas Development Project (BLM 1997), the Cooper Reservoir Natural Gas Development Project (BLM 1998), and the Wallace Creek Extension 3D Vibroseis Project (BLM 2002) concluded that no significant impacts would occur to air quality or the air shed as a result of the activities proposed in conjunction with these respective projects.

3.1.2 Floodplains

The access road to the proposed BR Federal #24-26H crosses the Dry Fork Cheyenne River (Dry Fork) and the well location falls on a terrace above (north of) the Dry Fork. Soils along the Dry Fork in the vicinity of the Proposed Action are identified as the Clarkelen-Haverdad-Bigwinder complex (Soil Map Unit #109), which are found primarily on flood plains and on low terraces along major streams (NRCS 1986). As stated in Section 3.1.7.1, the Dry Fork is ephemeral in nature within the overall project area and surface water is not generally present therein except during periods of runoff from snow melt or heavy precipitation events in the area. Likewise a review of floodplain maps created by the Federal Emergency management Agency (FEMA) did not identify any jurisdictional floodplains in the project area (FEMA 2009).

3.1.3 Range Management

The Proposed Action would not result in any new construction activity (surface disturbance) on federal lands. While no federal lands would be affected by the Proposed Action, the long-term disturbance of approximately 18.86 acres of private surface estate would translate into a concomitant loss of forage as discussed in Section 3.1.6. This loss of forage would reduce the amount of grazing available for domestic livestock production for each of the affected private surface owners. Likewise, road construction associated with the Proposed Action would impact existing range improvements and oilfield-related traffic on those roads would create dust, could result in collisions with domestic livestock, and could generally disrupt ranching activities on the affected properties.

In this regard, agreements negotiated between SWPC and the affected surface owners for access to and construction of the proposed roads and well locations would provide for compensation to these owners for the surface disturbance associated with the Proposed Action thereby offsetting these impacts. These agreements typically also include operational provisions designed to mitigate impacts to existing range improvements, livestock losses resulting from operations, noxious weed invasion, etc. that may adversely affect their ranching activities.

3.1.4 Recreation

The general project area consists of a mosaic of fee, state, and federal lands, with those federal lands located within the project area isolated due to a lack of a public access thereto and access is strictly controlled by the private surface owners in the area. Moreover, considering that there are no special recreation management areas or developed recreational sites within the project area and the ownership patterns, recreational opportunities are somewhat limited and would not be adversely affected by the Proposed Action.

3.1.5 Socio-Economics

Neither the economy of Converse County nor the quality of life for the residents thereof would be adversely affected by the Proposed Action. As described in Chapter 2.0, additional oil/gas exploration and development activity in the Hornbuckle Field would not result in an increase in the local workforce, with a concomitant burden on the resources of Converse County and/or the infrastructure thereof. In point of fact, implementation of the Proposed Action would actually have a positive impact on the economy of Converse County through increased revenues generated by additional hydrocarbon production should any/all of the proposed wells prove to be commercially productive.

3.1.6 Vegetation

Considering that there are no threatened or endangered plant species or species proposed for listing as either threatened or endangered plant species known to occur within the overall project

area (see Section 4.5.1.4), the long-term disturbance of 18.86 acres (see note below) over the life of the project (LOP) does not represent a significant impact to plant communities within the project area.

NOTE: The long-term disturbance figures referenced above are derived from those areas that have not been reclaimed within five years of initial disturbance. In this regard, approximately 71% of each well pad and 30% of each forty foot access road ROW are expected to be reclaimed in the short-term resulting in the following long-term disturbance: 11.40 acres for well locations and 7.46 acres for access roads (or a 62% overall reduction in initial disturbance as a result of interim reclamation activities).

3.1.7 Water Resources

3.1.7.1 Ground Water Resources

A review of the electronic records of the office of the Wyoming State Engineer (WSE) revealed that there are twelve permitted water wells within a one mile radius of the eight horizontal oil wells proposed by SWPC in the Hornbuckle Field. Information on these existing water wells is provided in Table 3.2.

The average depth of these water wells is 327 feet, with actual depths ranging from a minimum of 125 feet to a maximum depth of 636 feet. As stated in Section 2.1.2, SWPC intends to drill the surface hole with a fresh water mud system and then set approximately 3,200 feet of steel surface casing, which would be cemented in place from top to bottom, thereby preventing any potential communication between and/or cross-contamination of the near surface water aquifers in the project area. The use a fresh water mud system to drill the surface hole would eliminate any potential for contamination of near surface water aquifers from the oil-based mud system utilized for drilling operations below 3,200 feet.

The potential for the contamination of near-surface water aquifers from the use of OBM in the mud system has been eliminated through the techniques outlined in Section 2.1.2.1 which include the use of an impermeable plastic/vinyl pit liner during the actual drilling operation combined with recycling of the OBM fluids and the solidification of the “contaminated” cuttings upon completion of operations.

It should be noted that the Wyoming Oil and Gas Conservation Commission (WOGCC) required SWPC to use a closed mud system for drilling operations on the BR Fee #11-35V (located in the NW¼NW¼ of Section 35, T38N, R73W) as the well was located in close proximity to the Dry Fork Cheyenne River at a ground elevation of 4,955.6 feet. The proposed BR Federal #24-26H is also located in fairly close proximity to the Dry Fork Cheyenne River at an elevation of 4,949.6 feet. SWPC has indicated that they would drill a test hole on the location to determine the depth to ground water. Should ground water be encountered within twenty feet of the surface in the test hole, a closed mud system would used during the drilling operation to prevent any shallow ground water contamination in accordance with Chapter 1, Section 2(kk) of the rules and regulations of the WOGCC (WOGCC 2008).

Table 3.2

Existing Water Wells within a One Mile Radius of the Eight Horizontal Wells Proposed in the Hornbuckle Field ¹

Permit Number	Permit Type	Legal Location of Water Well				Well Depth
		Quarter	Section	Township	Range	
P14637P	Stock	NW¼SE¼	19	37 North	72 West	???
P70818W	Miscellaneous	NW¼NW¼	4	37 North	73 West	140'
P23698W	Domestic	NE¼NW¼	10	37 North	73 West	300'
P68591W	Domestic	SE¼NW¼	10	37 North	73 West	300'
P9159P	Stock	SE¼NE¼	14	37 North	73 West	250'
P617W	Stock	SW¼NW¼	20	38 North	73 West	125'
P48800W	Stock	SW¼SW¼	21	38 North	73 West	400'
P1363W	Stock	NE¼SW¼	23	38 North	73 West	636'
P617W	Industrial ²	SW¼NW¼	27	38 North	73 West	370'
P19973P	Stock	SW¼SW¼	27	38 North	73 West	410'
P9164P	Stock	SE¼NE¼	29	38 North	73 West	???
P19974P	Stock	SW¼SE¼	33	38 North	73 West	340'

1 Water wells within a one mile radius of the proposed surface well location. Data gathered from the computerized records of the Wyoming State Engineer's Office: <http://seo.state.wy.us>.

2 Primary water source well for drilling operations in the Hornbuckle Field

3.1.7.2 Surface Water Resources

There are no perennial (flowing) streams within the overall project area, so there is a limited potential for surface water contamination as a result of operations associated with the Proposed Action. Construction and reclamation techniques outlined in Chapter 2 combined with any Conditions of Approval (COAs) applied to individual permit approvals would minimize the potential impact to surface water resources and resultant water quality resulting from oil/gas exploration activities associated with the Proposed Action. As a consequence, we do not anticipate any adverse impacts to surface or sub-surface water quality as a result of the Proposed Action.

3.1.8 Wetland/Riparian Habitat

A review of the National Wetland Inventory (NWI) maps maintained by the U.S. Fish and Wildlife Service (USFWS) did not identify any jurisdictional wetlands that would be impacted by activities associated with the Proposed Action (WYNDD 2009).

3.1.9 Visual Resources

The overall project area is within a Class IV Visual Resource Management (VRM) area where changes may subordinate the original composition and character of the basic elements of the landscape, but must reflect what could be a natural occurrence within the characteristic landscape (BLM 1982). No impacts to Visual Resources would result from the Proposed Action considering that the project area is well removed from public roads within this area of northern Converse County, combined with the fact that all permanent above-the-ground structures (not subject to safety considerations) would be painted a flat, non-reflective earth tone color (see Section 2.1.4).

3.2 GENERAL SETTING OF THE PROJECT AREA

The general project area is located approximately twenty (20) miles west of Bill, Wyoming and twenty-seven miles north/northeast of Glenrock, Wyoming at elevations ranging from 4,950' at the proposed BR Federal #24-26H well location to 5,315' at the proposed HR Federal #44-20H well location. The project area is situated on the southern flank of the Cheyenne River Divide in an area of gently to moderately rolling uplands. Drainage in the area is generally to the northeast via three intermittent tributaries of the Cheyenne River including (from north to south) the Dry Fork Cheyenne River, Brush Creek and Duck Creek.

The eight proposed wells are situated within the Powder River Basin, a Level IV Eco-Region located within the Northwestern Great Plains Level III Eco-Region - an area of rolling plains (short-grass prairie) that is predominately used for dryland farming and livestock grazing (EPA 2009). Mean annual precipitation in the Powder River Basin (1961-1990) averaged between eleven and fifteen inches, mean annual temperature (1961-1990) averaged between 45° and 50° Fahrenheit (F) with 151 to 170 annual days with a minimum temperature at 32°F or below and 29 to 35 annual days with a maximum temperature above 90°F (Curtis et al. 2004).

The Powder River Basin Eco-Region is a generally classified as a western mixed-grass/short-grass prairie with vegetation in the specific project area characterized by blue grama (*Bouteloua gracilis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), fringed sagewort (*Artemisia frigida*), green needlegrass (*Nassella viridula*), Hood's phlox (*Phlox hoodii*), little bluestem (*Schizachyrium scoparium*), prairie junegrass (*Koeleria macrantha*), prairie sandreed (*Calamovilfa longifolia*), needle-and-thread (*Stipa comata*), threadleaf sedge (*Carex filifolia*) and western wheatgrass (*Pascopyrum smithii*). Non-grass/forb species found in the upland areas include prickly pear cactus (*Opuntia* sp.), sagebrush (*Artemisia* sp.), yucca (*Yucca* sp.) and

broom snakeweed (*Gutierrezia saraothrae*), with cottonwood trees (*Populus* sp.) found along the major drainages including Duck Creek and the Dry Fork Cheyenne River.

3.3 EXISTING DEVELOPMENT IN THE HORNBUCKLE FIELD PROJECT AREA

The Hornbuckle Field is situated in Townships 37 and 38 North, Range 73 West and encompasses approximately 24,320 acres (+/-) in northern Converse County, Wyoming. The field was discovered in 1983 with the completion of the Highland Flats Federal #32-2 in the Sussex Formation by Louisiana Land and Exploration Company. The Highland Flats Federal #32-2 was drilled in the SW¼NE¼ of Section 2 in Township 37 North, Range 73 West to a total depth of 13,500 feet to test the productive potential of the Dakota Formation, but was subsequently plugged back to 11,800 feet and completed in the Sussex and First Frontier Formations. Initial production from the Highland Flats Federal #32-2 was reported as 55 BOPD (barrels of oil per day) and 49 MCF (thousand cubic feet) of natural gas. There are currently 44 wells producing from the Sussex Formation in the field with cumulative production of 3,822,452 BO (barrels of oil) and 1,424,491 MCF of natural gas. SWPC currently has three horizontal wells producing from the Sussex Formation in the Hornbuckle Field (WOGCC 2009). Existing (producing) wells within the Hornbuckle Field are identified in Table 3.3.

Table 3.3

Producing Wells in the Hornbuckle Field ¹

Well Name and Number	Legal Location of Well				Producing Formation(s)	Well Status ²
	Quarter	Section	Township	Range		
Highland Flats #12-2	SW¼NW¼	2	37 North	73 West	Sussex	POW
Highland Flats #14-2	SW¼SW¼	2	37 North	73 West	Sussex	POW
Highland Flats #31-3	SW¼NE¼	2	37 North	73 West	Sussex	POW
Highland Flats #34-2	SW¼SE¼	2	37 North	73 West	Sussex/Parkman	PGW
Highland Flats #22-3	SE¼NW¼	3	37 North	73 West	Sussex	POW
Highland Flats #31-3	NW¼NE¼	3	37 North	73 West	Sussex	POW
Highland Flats #43-3	NE¼SE¼	3	37 North	73 West	Sussex	POW
BB & B #31-10	NW¼NE¼	10	37 North	73 West	Sussex	POW
Baker #1	SE¼SE¼	10	37 North	73 West	Sussex	POW
BB & B #11-11	NW¼NW¼	11	37 North	73 West	Sussex	POW
Baker #11-7	SW¼NE¼	11	37 North	73 West	Sussex	POW
Highland Flats #13-11	NW¼SW¼	11	37 North	73 West	Sussex	POW
Highland Flats #34-11	SW¼SE¼	11	37 North	73 West	Sussex	POW
Highland Flats #13-13	SW¼NE¼	13	37 North	73 West	Sussex	POW
Highland Flats #23-14	NE¼SW¼	14	37 North	73 West	Sussex	POW
Reynolds Fee #34-14	SW¼SE¼	14	37 North	73 West	Sussex	POW
State #11-14	N½NW¼	14	37 North	73 West	Sussex	POW
State #31-14	NW¼NE¼	14	37 North	73 West	Sussex	POW
Ukelele #42-15	SE¼NE¼	15	37 North	73 West	Sussex	POW

Table 3.3 - Continued

Producing Wells in the Hornbuckle Field

Well Name and Number	Legal Location of Well				Producing Formation(s)	Well Status ²
	Quarter	Section	Township	Range		
Reynolds Fee #21-23	NE¼NW¼	23	37 North	73 West	Sussex	POW
Reynolds State #B-23	E½SW¼	23	37 North	73 West	Sussex	POW
State #33-23	NW¼SE¼	23	37 North	73 West	Sussex	POW
State #41-23	NE¼NE¼	23	37 North	73 West	Sussex	POW
Duck Federal #13-24	NW¼SW¼	24	37 North	73 West	Sussex	POW
Federal-P #11-24	NW¼NW¼	24	37 North	73 West	Muddy	POW
State #A-25	SE¼SW¼	25	37 North	73 West	Teapot	POW
Reynolds #21-26	NE¼NW¼	26	37 North	73 West	Sussex	POW
State #B-26	NE¼SE¼	26	37 North	73 West	Sussex	POW
Buckle #24-27	SE¼SW¼	27	38 North	73 West	Sussex	POW
HR Federal #31-27H	NW¼NE¼	27	38 North	73 West	Horizontal Sussex	POW
HR Fee #11-27V	NW¼NW¼	27	38 North	73 West	Sussex	POW
Buckle #44-28	SE¼SE¼	28	38 North	73 West	Sussex	POW
Hornbuckle #28-1	NE¼SW¼	28	38 North	73 West	Sussex	POW
HR Fee #41-28V	NE¼NE¼	28	38 North	73 West	Sussex	POW
HR Federal #44-29H	SE¼SE¼	29	38 North	73 West	Horizontal Sussex	POW
Baker Fee #42-33	SE¼NE¼	33	38 North	73 West	Sussex	POW
HR Fee #21-33H	NE¼NW¼	33	38 North	73 West	Horizontal Sussex	POW
Blaylock Federal #13-35A	SE¼NE¼	34	38 North	73 West	Sussex	POW
Blaylock Fee #42-34V	SE¼NE¼	34	38 North	73 West	Sussex	POW
Highland Flats #12-34	SE¼NW¼	34	38 North	73 West	Sussex	POW
Highland Flats #14-34	SW¼SW¼	34	38 North	73 West	Sussex	POW
Highland Flats Fee #23-34	NE¼SW¼	34	38 North	73 West	Sussex	POW
Highland Flats #34-34	SW¼SE¼	34	38 North	73 West	Sussex	POW
BR Fee #11-35V	NW¼NW¼	35	38 North	73 West	Sussex	POW

1 Information from the Wyoming Oil and Gas Commission website: <http://wogcc.state.wy.us/>

2 POW = Producing Oil Well
PGW = Producing Gas Well

3.4 CULTURAL RESOURCES

Cultural resource inventories have been conducted on each of the eight wells proposed in conjunction with the Proposed Action including the access road routes required for access thereto. These inventories were conducted in compliance with the *National Historic Preservation Act* (NHPA) and included all lands within the proposed project area that may be affected by surface disturbing activities associated with the construction of the individual well

locations and access road routes. A synopsis of these cultural inventories is provided in Table 3.4 and includes the project name, acres inventoried, and the number of sites recorded.

Table 3.4

Results of the Cultural Resource Inventories Conducted for the Eight Horizontal Wells Proposed by SWPC in the Hornbuckle Field

Well Name and Number	Acres Surveyed for Cultural Materials				Sites Identified	Eligible Sites
	Location	Access	Pipelines	Other		
BR Federal 44-4H	10.00	0.43	-----	-----	0	0
BR Federal 11-10H ¹	10.00	1.10	-----	-----	0	0
HR Federal 44-20H	10.00	10.30	-----	-----	0	0
GH Federal 44-21H	10.00	0.70	-----	-----	0	0
GH Federal 24-22H	10.00	2.00	-----	-----	0	0
DCR Federal 31-24H	10.00	12.50	-----	-----	0	0
BR Federal 24-26H	10.00	2.00	-----	-----	0	0
HR Federal #11-28	10.00	3.44	-----	-----	0	0
TOTALS	80.00	32.47	-----	-----	0	0

¹ One isolate was identified in conjunction with the inventory of the BR Federal #11-10H project.

As indicated above, no cultural sites were identified in conjunction with these inventories. Copies of the individual cultural resource inventory reports are currently on file with both the BLM’s CFO in Casper, Wyoming and the Wyoming State Historic Preservation Office (SHPO) in Laramie, Wyoming.

3.5 INVASIVE, NON-NATIVE SPECIES

Non-native plant species that are difficult to control, easily spread, and injurious to public health, crops, livestock, land or other property have been designated as noxious weeds under the Wyoming Weed and Pest Control Act of 1973. Prohibited noxious weeds pursuant to W.S. 11-12-104 are identified in Table 3.5.

To our knowledge, no surveys have been conducted within the Hornbuckle Field or the surrounding area to determine either the presence or absence of those noxious weeds identified in Table 3.5.

Table 3.5**Invasive Non-Native Species (Noxious Weeds)¹**

Common Name	Scientific Name
Field bindweed	<i>Convolvulus arvensis</i> L.
Canada thistle	<i>Cirsium arvense</i> L.
Leafy spurge	<i>Euphorbia esula</i> L.
Perennial sowthistle	<i>Sonchus arvensis</i> L.
Quackgrass	<i>Agropyron repens</i> (L.) Beauv.
Hoary cress (whitetop)	<i>Cardaria draba</i> and <i>Cardaria pubescens</i> (L.) Desv.
Perennial pepperweed (giant whitetop)	<i>Lepidium latifolium</i> L.
Ox-eye daisy	<i>Chrysanthemum leucanthemum</i> L.
Skeletonleaf bursage	<i>Franseria discolor</i> Nutt.
Russian knapweed	<i>Centaurea repens</i> L.
Yellow toadflax	<i>Linaria vulgaris</i> L.
Dalmatian toadflax	<i>Linaria dalmatica</i> (L.) Mill.
Scotch thistle	<i>Onopordum acanthium</i> L.
Musk thistle	<i>Carduus nutans</i> L.
Common burdock	<i>Arctium minus</i> (Hill) Bernh.
Plumeless thistle	<i>Carduus acanthoides</i> L.
Dyers woad	<i>Isatis tinctoria</i> L.
Houndstongue	<i>Cynoglossum officinale</i> L.
Spotted knapweed	<i>Centaurea maculosa</i> Lam.
Diffuse knapweed	<i>Centaurea diffusa</i> Lam.
Purple loosestrife	<i>Lythrum salicaria</i> L.
Saltcedar	<i>Tamaxix</i> ssp.
Common St. Johnswort	<i>Hypericum perforatum</i>
Common tansy	<i>Tanacetum vulgare</i>
Russian olive	<i>Elaeagnus angustifolia</i> L.

1 From the Wyoming Weed and Pest Council website: www.wyoweed.org.

3.6 SOILS

The Powder River Basin exhibits a wide range of soils which are directly associated with the topography. Variations in soils are due to the differing origins of parent materials, different climatic conditions, and the effects of different types of vegetation. In this regard, a Third Order Soils Inventory of Converse County, Wyoming Northern Part has been published by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS 1986). As a result of this inventory, soils within the project area have been mapped and classified.

Table 3.6 provides information concerning those soil mapping units (SMUs) encountered at each individual well location and access road route proposed within the Hornbuckle Field.

Table 3.6

Soil Mapping Units to be Impacted by the Proposed Action

Well Name and Number	Affected Soil Mapping Units		
	Well Location	New Road	Reconstructed Road
BR Federal 44-4H	137	137	n/a
BR Federal 11-10H	122	122	n/a
DCR Federal 31-24H	105	149	149
HR Federal 44-20H	137	137, 149	122, 137
GH Federal 44-21H	122	122, 137	n/a
GH Federal 24-22H	121	121	117, 227
BR Federal 24-26H	109	109	n/a
HR Federal 11-28H	122	122	137

Table 3.7 provides additional information concerning the physical characteristics of each affected SMU as identified above. Additional information regarding the physical characteristics of individual soils within each of these soil mapping units may be obtained from the *Soil Survey of Converse County, Wyoming, Northern Part* published by the U.S. Department of Agriculture, Natural Resources Conservation Service in 1986 in cooperation with the U.S. Forest Service, U.S. Department of the Interior, BLM and the Wyoming Agricultural Experiment Station (NRCS 1986).

3.7 WILDLIFE

3.7.1 Big Game Species

Two big game species, pronghorn antelope (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*), inhabit the general project area. Antelope and mule deer populations residing in the area are classified within the North Converse Herd Unit, which includes antelope hunt areas 25 and 26 and deer hunt area 22. The Hornbuckle Field is specifically located within antelope hunt area 26. Herd objectives for both antelope and mule deer in the North Converse Herd Unit are 28,000 and 9,100 post hunt animals, respectively. The 2007 estimated populations for the North Converse Herd Unit were 31,028 antelope and 9,300 mule deer. Antelope populations in the North Converse Herd Unit are approximately 8% above herd objectives, while mule deer populations are approximately 2% above herd objectives. There are no crucial antelope or mule deer habitats located within the Hornbuckle Field project area (WGFD 2008).

Table 3.7

Summary of the Physical Characteristics of Individual Soil Mapping Units in the Hornbuckle Field Project Area ¹

Soil Map Unit #	Soil Map Unit Name	Slope Phase	Topography	Soil Series	Soil Depth	Rooting Depth	Available Water Capacity	Permeability	Runoff Potential	Water Erosion Hazard	Wind Erosion Hazard
105	Cambria-Cushman complex	6 to 15%	Back slopes of rolling hills and adjacent foot slopes	50% Cambria fine sandy loam	deep	> 60 in.	high	moderate	medium	severe	moderate
				30% Cushman loam	moderately deep	20 - 40 in.	low	moderate	medium	severe	moderate
109	Clarkelen-Haverdad-Bigwinder complex	0 to 3%	Flood plains and low terraces on major streams	35% Clarkelen sandy loam	deep	> 60 in.	moderate	mod. rapid	slow	moderate	moderate
				25% Haverdad fine sandy loam	deep	> 60 in.	moderate	moderate	slow	moderate	moderate
				25% Bigwinder fine sandy loam	deep	> 60 in.	high	moderate	slow	moderate	moderate
121	Hiland-Bowbac sandy loams	0 to 6%	Foot slopes and pediment slopes	70% Hiland sandy loam	deep	> 60 in.	moderate	moderate	slow	slight	moderate
				20% Bowbac sandy loam	moderately deep	20 - 40 in.	low	moderate	medium	moderate	moderate
122	Hiland-Bowbac complex	6 to 15%	Ridges and back slopes of rolling uplands	60% Hiland sandy clay loam	deep	> 60 in.	moderate	moderate	medium	moderate	moderate
				30% Bowbac sandy loam	mod. deep	20 - 40 in.	low	moderate	medium	moderate	moderate
136	Tassel-Terro-Rock outcrop complex ²	15 to 30%	Hilly to steep areas on upland ridgetops, shoulder slopes, and back slopes	40% Tassel loamy fine sand	shallow	6 - 20 in.	very low	mod. rapid	medium	moderate	severe
				20% Terro sandy loam	moderately deep	20 - 40 in.	low	mod. rapid	slow	moderate	moderate
				20% Rock outcrop	---	---	---	---	---	---	---
137	Tassel-Tullock-Vonalee association	6 to 30%	Ridges and hill slopes in an area of rolling to steep uplands	40% Tassel loamy fine sand	shallow	6 - 20 in.	very low	mod. rapid	medium	moderate	severe
				20% Tullock loamy sand	moderately deep	20 - 40 in.	very low	rapid	medium	moderate	severe
				20% Vonalee loamy sand	deep	> 60 in.	low	mod. rapid	medium	moderate	severe
149	Worf-Shingle-Tassel complex	3 to 30%	Ridgetops and shoulder slopes of undulating to steep uplands on partially stabilized escarpments	35% Worf loamy sand	shallow	8 - 20 in.	very low	moderate	medium	moderate	severe
				30% Shingle clay loam	shallow	4 - 20 in.	low	moderate	rapid	severe	slight
				20% Tassel fine sandy loam	shallow	6 - 20 in.	very low	mod. rapid	medium	moderate	moderate

NOTES: ¹ Information obtained from the *Soil Survey of Converse County, Wyoming, Northern Part* published ca 1986 by the United States Department of Agriculture - Natural Resources Conservation Service (NRCS 1986).

² SMU 136 - Rock outcrop consists of exposures of mostly soft, calcareous sandstone on knolls and narrow ridges.

3.7.2 BLM Sensitive Species

BLM sensitive species are generally those species that are in need of special management considerations. Table 3.8 contains a listing of those BLM sensitive species that may occur in Wyoming and their habitat preferences.

BLM sensitive animal and plant species potentially occurring in the Hornbuckle Field include ferruginous hawk, greater sage-grouse, sage thrasher, loggerhead shrike, Brewer's sparrow and sage sparrow. Two of these sensitive species are more likely to occur within the Hornbuckle Field than the remaining species based upon both prior observations and a review of habitat types therein. These species include ferruginous hawk and greater sage-grouse. A brief discussion of these two individual species is presented below:

- Ferruginous hawk (*Buteo regalis*). As discussed in Section 3.7.3 below, there is little information regarding historic raptor nesting activity within the overall project area. Inventories conducted in conjunction with specific project proposals have identified two historic ferruginous hawk nests in close proximity to well proposed in conjunction with the Proposed Action. Past breeding activity at these historic nests is unknown.
- Greater sage-grouse (*Centrocercus urophasianus*). Sage grouse populations in the general project area are included in Upland Game Bird Management Area 35 and declined throughout the Casper (WGFD) Region from the early 1980's through the mid-1990's, with this decline generally attributed to various forms of habitat degradation. Nonetheless, it would appear that sage grouse numbers in the Casper Region have increased slightly since 1996 (WGFD 2003).

There are no historic greater sage-grouse leks known to exist within approximately nine miles of the proposed project area (WGFD 2003). As stated in Section 3.2, the general project area is predominately a western mixed grass/short-grass prairie exhibiting a paucity of sagebrush habitats that would be considered as suitable nesting and brood-rearing habitat for greater sage grouse - which is borne out by the fact that there are no known historic leks in the general area. As there are no known leks within a five-mile radius of the Proposed Action, there will be no significant impacts to greater sage grouse breeding or nesting habitat; consequently, the species will not be discussed further in this analysis document.

3.7.3 Raptor Species

There has not been a comprehensive inventory of raptor nesting activity within and/or adjacent to those lands included within the Hornbuckle Field. Individual inventories have been conducted on a case-by-case basis in response to both past and present activities proposed by SWPC and other operators in the Hornbuckle Field, but these inventories were generally limited to an inventory of historic nests located within a one-half mile radius of each proposed well location and access road route.

Table 3.8

Wyoming BLM Sensitive Species and Habitat Preferences

Species		Preferred Habitat	Likely to Occur ¹
Common Name	Scientific Name		
MAMMALS			
Long-eared Myotis	<i>Myotis evotis</i>	Conifer and deciduous forests, caves and mines	N
Fringed Myotis	<i>Myotis thysanodess</i>	Conifer forests, woodland-chaparral, caves and mines	N
Spotted Bat	<i>Euderma maculatum</i>	Cliffs over perennial water, basin-prairie shrub	N
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	Forests, basin-prairie shrub, caves and mines	N
White-tailed Prairie Dog	<i>Cynomys leucurus</i>	Basin-prairie shrub, grasslands	N
Black-tailed Prairie Dog	<i>Cynomys ludovicianus</i>	Basin-prairie shrub, grasslands	N
Swift Fox	<i>Vulpes velox</i>	Grasslands	N
Preble's Meadow Jumping Mouse	<i>Zapus hudsonicus preblei</i>	Riparian habitats along the southern Rocky Mountain front	N
BIRDS			
White-faced Ibis	<i>Plegadis chihi</i>	Marshes, wet meadows	N
Trumpeter Swan	<i>Cygnus buccinator</i>	Lakes, ponds, rivers	N
Bald eagle	<i>Haliaeetus leucocephalus</i>	Conifer and deciduous forests, trees, grasslands	N
Northern Goshawk	<i>Accipiter gentilis</i>	Conifer and deciduous forests	N
Ferruginous Hawk	<i>Buteo regalis</i>	Basin-prairie shrub, grassland, rock outcrops	Y
Peregrine Falcon	<i>Falco peregrinus</i>	Tall cliffs	N
Greater Sage-grouse	<i>Centrocercus urophasianus</i>	Basin-prairie shrub, mountain-foothill shrub	Y
Long-billed Curlew	<i>Numenius americanus</i>	Grasslands, plains, foothills, wet meadows	N
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Open woodlands, streamside willow and alder groves	N
Burrowing Owl	<i>Athene cunicularia</i>	Grasslands, basin-prairie shrub	N
Sage Thrasher	<i>Oreoscoptes montanus</i>	Basin-prairie shrub, mountain-foothill shrub	Y
Loggerhead Shrike	<i>Lanius ludovicianus</i>	Basin-prairie shrub, mountain-foothill shrub	Y
Brewer's Sparrow	<i>Spizella breweri</i>	Basin-prairie shrub	Y
Sage sparrow	<i>Amphispiza billineata</i>	Basin-prairie shrub, mountain-foothill shrub	Y
Baird's Sparrow	<i>Ammodramus bairdii</i>	Grasslands, weedy fields	N
Mountain Plover	<i>Charadrius montanus</i>	Shortgrass, great basin-foothills grassland, and sagebrush-grasslands	N
AMPHIBIANS			
Northern Leopard Frog	<i>Rana pipiens</i>	Beaver ponds, permanent water in plains and foothills	N
PLANTS			
Laramie Columbine	<i>Aquilegia laramiensis</i>	Crevices of granite boulders and cliffs 6,400-8,000'	N
Porter's Sagebrush	<i>Artemisia porteri</i>	Sparsely vegetated badlands of ashy or tuffaceous mudstone and clay slopes; 5,300 to 6,500 feet	N
Many-stemmed Spider Flower	<i>Cleome multicaulis</i>	Semi-moist, open saline banks of shallow ponds, lakes with Baltic rush and bulrush, 5,900 feet	N
Williams' Wafer Parsnip	<i>Cymopterus williamsii</i>	Open ridge tops & upper slopes with exposed limestone outcrops or rockslides, 6,000 to 8,300 feet	N
Laramie False Sagebrush	<i>Sphaeromeria simplex</i>	Cushion plant communities on rocky limestone ridges & gentle slopes, 7,500 to 8,600 feet	N

¹ Key: Y = Likely to occur in or in the vicinity of the Hornbuckle Field based on habitat.
N = Not likely to occur in or in the vicinity of the WCU Pilot Project area based on habitat.

In this regard, a previously unrecorded ferruginous hawk nest was discovered on October 22, 2008 directly north of the DCR Federal #31-24H well location in conjunction with the on-site inspection thereon. The nest is located approximately in the SW¹/₄SE¹/₄SE¹/₄ of Section 13 in Township 37 North, Range 73 West approximately 500 feet north/northwest of the proposed well location. Nesting activity at this nest in past years is unknown. Additional raptor nests known to occur within the project area include the following:

- Ferruginous hawk nest located in the SE¹/₄SE¹/₄SW¹/₄ of Section 21 in Township 38 North, Range 73 West or approximately 0.25 mile east/northeast of the proposed HR Federal #11-28H well location (the nest is also less than 0.5 miles from the proposed HR 44-21H well location and less than 0.5 miles from the proposed access road route to the proposed HR Federal #44-20 well location); and
- Red-tailed hawk (*Buteo jamaicensis*) nest located in the NW¹/₄NE¹/₄NW¹/₄ of Section 35 in Township 38 North, Range 73 West or approximately 0.25 mile southwest of the proposed BR Federal #24-26H well location.

3.7.4 Threatened and Endangered Species

Threatened and/or endangered (T/E) species include those species which are in danger of extinction due to habitat degradation and drastic population declines and which have subsequently been listed as threatened or endangered pursuant to the *Endangered Species Act* (ESA) of 1973 (as amended). Those T/E species which may potentially occur within the general area (BLM 2006, BLM 2008a, BLM 2008b) include:

- Black-footed ferret (*Mustela nigripes*) - Status: Endangered.
- Preble's meadow jumping mouse (*Zapus hudsonius preblei*) - Status: Threatened.
- Ute ladies'-tresses (*Spiranthes diluvialis*) - Status: Threatened.
- North Platte River Species (those species which may occur in the downstream riverine habitats of the North Platte River in Nebraska and that could be adversely affected by water depletions in the North Platte River system resulting from project-related activities) including:
 - 1) Interior least tern (*Sterna antillarum*) - Status: Endangered;
 - 2) Piping plover (*Charadrium melodus*) - Status: Threatened;
 - 3) Pallid sturgeon (*Scaphirhynchus albus*) - Status: Endangered;
 - 4) Eskimo curlew (*Numenius borealis*) - Status: Endangered; and
 - 5) Western prairie fringed orchid (*Platanthera praeclara*) - Status: Threatened.

3.7.5 Migratory Bird Species

Habitats in the Hornbuckle Field area are primarily sagebrush-dominated uplands (shrub-steppe) with interspersed shortgrass prairie. Wyoming Partners in Flight (PIF) priority species potentially occurring in the shrub-steppe (SS) and shortgrass prairie (SGP) habitat types are listed in Table 3.9 (Nicholoff 2003).

The Hornbuckle Field lies in an area directly south of latitude 43°10'00"N and directly east of longitude 105°40'00"W. Species distribution as reported in *The Atlas of Birds, Mammals, Reptiles and Amphibians in Wyoming* (WGFD 1999) includes a compilation of observations mapped by latitude and longitude, with the State of Wyoming divided into 28 different regions, where these observations are reported within a specific region of the state. These regions are based upon a one degree separation of both latitude and longitude. As a consequence, the Hornbuckle Field falls with Wyoming Distribution Area (latilongs) 13 as defined by WGFD (1999). Avian distribution data for the PIF priority species potentially occurring within the Hornbuckle Field is included in Table 3.9. Only those birds that have been classified by WGFD (1999) as confirmed breeders (nest and/or young observed), with circumstantial evidence of breeding (nest and/or young not located), or that have been observed at any time (season) within the general area (but without any evidence of breeding) are included in the list. Breeding Bird Survey (BBS) data for survey routes within Wyoming were included in this database (WGFD 1999).

Most of the birds listed in Table 3.9 typically nest either on the ground or in shrubs; thus activities associated with the Proposed Action may have the potential to destroy individual nests, eggs, and/or young of some of these species. Projected losses are indeterminate as there are no Breeding Bird Survey (BBS) routes located within the immediate vicinity of the Hornbuckle Field which could provide information on breeding bird densities within the shrub-steppe and shortgrass prairie habitats encountered within the overall project area. Concerns regarding the decline of both migratory and non-migratory bird populations both locally and on a continental scale have resulted in a nationwide bird conservation planning effort. Management goals and objectives for bird conservation are found in the following documents:

- 1) Land Bird Strategic Plan;
- 2) Presidential Executive Order (EO) 13186 dated January 17, 2001; and
- 3) Proposed Memorandum of Understanding associated with the above Presidential EO.

Bird Conservation Plans prepared at the state and regional levels also include objectives for bird conservation. As evidenced by EO 13186, there has been national direction to implement actions that incorporate these goals.

Table 3.9

**List of Partners In Flight (PIF) Priority Bird Species
Potentially Found Within the Hornbuckle Field Project Area**

Common Name	Scientific Name	Habitat Type	Distribution Area ¹
-------------	-----------------	--------------	--------------------------------

Level I Species (Conservation Action)

Ferruginous Hawk	<i>Buteo regalis</i>	SS/SGP	B
Greater Sage Grouse	<i>Centrocercus urophasianus</i>	SS	B
Mountain Plover	<i>Charadrius montanus</i>	SS/SGP	B
Upland Sandpiper	<i>Bartramia longicauda</i>	SGP	B
Long-billed Curlew	<i>Numenius Americana</i>	SGP	O
Burrowing Owl	<i>Athene cunicularia</i>	SGP	B
Short-eared Owl	<i>Asio flammeus</i>	SGP	B
Baird's Sparrow	<i>Ammodramus bairdii</i>	SGP	b
Brewer's Sparrow	<i>Spizella breweri</i>	SS	B
Sage Sparrow	<i>Amphispiza belli</i>	SS	B
McCown's Longspur	<i>Calcarius mccownii</i>	SS/SGP	B

Level II Species (Monitoring)

Black-chinned Hummingbird	<i>Archilochus alexandri</i>	SS	N
Loggerhead Shrike	<i>Lanius ludovicianus</i>	SS	B
Sage Thrasher	<i>Oreoscoptes montanus</i>	SS	B
Vesper Sparrow	<i>Pooecetes gramineus</i>	SS	B
Lark Sparrow	<i>Chondestes grammacus</i>	SS	B
Lark Bunting	<i>Calamospiza melanocorys</i>	SGP	B
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	SGP	B
Dickcissel	<i>Spiza Americana</i>	SGP	O
Bobolink	<i>Dolichonyx oryzivorus</i>	SGP	O

Level III Species (Local Interest)

Common Poorwill	<i>Phalaenoptilus nuttallii</i>	SS	b
Say's Phoebe	<i>Sayornis saya</i>	SS	B

1 Definitions for those symbols used to report Wyoming avian distribution are as follows:

B: Nest or young dependent upon parent birds observed.

b: Circumstantial evidence of breeding.

O: The species has been observed, but there was no evidence of nesting.

N: The species has not been observed in the area.

3.8 ENVIRONMENTAL JUSTICE

Neither the Proposed Action nor the No Action Alternative would disproportionately affect minority or low income people, and is not discussed further in this EA. The proposed project would provide some additional employment opportunities for a small number of workers in Converse County, thereby contributing to the local economy.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

The potential environmental consequences of construction, drilling, completion, and maintenance activities associated with the Proposed Action and No Action Alternative are discussed for each potentially affected resource. An environmental impact is defined as a change in the quality or quantity of a given resource due to a modification in the existing environment resulting from project-related activities. Impacts can be beneficial or adverse; a primary (direct) result or a secondary (indirect) result of an action; long-term (more than five years) or short-term (less than five years); and can vary in degree from a slightly discernable change to a total change in the environment.

In accordance with 40 CFR 1502.16, this chapter includes a discussion of the potential environmental consequences of the Proposed Action and the No Action Alternative on each of the affected resources. Potential impacts are quantified when possible; however, when impacts are not quantifiable appropriate adjectives are used to best describe the level of impact and appropriate mitigation measures are suggested where appropriate.

4.2 CULTURAL RESOURCES

Cultural resources, including archaeological and historic sites, on lands subject to federal authority are protected by various laws, rules and regulations commencing with the *Antiquities Act* of 1906. Specific directives concerning Cultural Resource Management can be found in *Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines* (Federal Register 1983) and BLM Manual Section 8100. Prior to the initiation of any federal action, cultural resources must be inventoried and evaluated to determine their eligibility for inclusion in the NRHP. NRHP criteria (36 CFR 60.4) for determining eligibility define four criteria of significance based upon "...the quality of significance in American history, architecture, archaeology, and culture present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association; and that:

- are associated with events that have made a significant contribution to the broad patterns of our society; or
- are associated with the lives of persons significant in our past; or
- embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- have yielded, or may be likely to yield, information important in prehistory or history”.

Cultural properties are generally not eligible for inclusion in the NRHP if they lack diagnostic artifacts, subsurface remains, or structural features. Furthermore, sites that cannot be placed in a temporal context or shown to be related to other sites are usually not eligible and therefore are discharged from management.

4.2.1 The Proposed Action

As indicated in Section 3.4, Class III cultural resource inventories have been completed on those areas that would be disturbed in conjunction with access to and construction of the eight wells proposed in the Hornbuckle Field. Approximately 112.47 acres were inventoried in conjunction with the Proposed Action and no cultural sites were identified in conjunction with these inventories. Any unanticipated discoveries of cultural resources made during construction activities would be evaluated according to standard procedures and project personnel would be prohibited from collecting any artifacts or disturbing any significant cultural resources in the area. As a consequence, impacts to cultural resources would likely be negligible to nonexistent.

4.2.2 The No Action Alternative

Under the No Action Alternative, there would be no project-related surface disturbance and impacts to cultural resources would remain at current levels.

4.2.3 Mitigation and Monitoring

Measures for the protection of cultural resources are included in both the Multi-Point Surface Use and Operation Plan (SUP) and Conditions of Approval (COAs) for the individual APD's. These measures include, but are not necessarily limited to, the following:

- SWPC would be responsible for informing all persons associated with this project that they shall be subject to prosecution for damaging, altering, excavating or removing any archaeological, historical, or vertebrate fossil objects on-site. If archaeological, historical, or vertebrate fossil materials are discovered, the operator would suspend all operations that further disturb such materials and immediately contact the Authorized Officer. Operations would not resume until written authorization to proceed is issued by the Authorized Officer.

Within five working days, the Authorized Officer would evaluate the discovery and inform SWPC of actions that would be necessary to prevent loss of significant cultural or scientific values.

SWPC would be responsible for the cost of any mitigation required by the Authorized Officer. The Authorized Officer would provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the Authorized Officer that the required mitigation has been completed, the operator would be allowed to resume operations.

4.3 INVASIVE, NON-NATIVE SPECIES

The disturbance of existing, native vegetation would create opportunities for the establishment of invasive, non-native (invasive) species. Invasive species are easily established and commonly found on all newly disturbed and reclaimed sites throughout Wyoming. These species are fast growing, can out-compete native species, can increase the danger of wildfires, and can prevent the establishment of native species including grasses, forbs and, and shrubs.

Several species of invasive plant species have become established on disturbed sites throughout central Wyoming including, but not necessarily limited to, Canada thistle (*Cirsium arvense*), cheatgrass (*Bromus tectorum*), halogeton (*Halogeton glomeratus*), musk thistle (*Carduus nutans*) and Russian knapweed (*Centaurea repens*) and the ongoing drought conditions experienced in central Wyoming over the past several years would appear to have exacerbated the proliferation of these invasive species on recently reclaimed areas.. If allowed to become established, infestations of these invasive species could provide seed sources for the invasion of adjacent, neighboring lands and could impact forage production on these affected lands for both domestic livestock and wildlife.

4.3.1 The Proposed Action

Construction activities associated with the Proposed Action would result in the short-term disturbance of approximately 49.04 acres of surface estate. The invasion of these newly-disturbed areas by invasive plant species would be a potential impact resulting from surface disturbing activities associated with additional horizontal drilling operations in the Hornbuckle Field.

Private surface owners across Wyoming recognize the threat from infestations of invasive species and it is commonplace for surface use agreements between these private surface owners and the oil/gas operators to contain fairly strict provisions for ongoing treatment of any infestations of invasive species occurring on those lands disturbed in conjunction with oil/gas exploration and development activities. In this regard, SWPC has included language in their individual APDs stating that they agree to control any infestations of invasive plant species that are identified on those areas disturbed in conjunction with project-related activities. Considering the somewhat limited amount of surface disturbance which would be associated with the Proposed Action and the commitment from SWPC to control potential infestations of invasive species on these disturbed lands, the potential for widespread infestation is considered to be negligible.

4.3.2 The No Action Alternative

Under the No Action Alternative, the 49.04 acres of initial surface disturbance associated with the Proposed Action would not occur thereby eliminating the potential spread of noxious weeds to areas not previously infested with these species.

4.3.3 Mitigation and Monitoring

No mitigation is recommended.

4.4 SOILS

Impacts that could result from surface disturbing activities associated with the Proposed Action would include the removal of vegetation, subsequent exposure and disturbance of the soil, mixing of soil horizons, an increase in the susceptibility of the soil to wind/water erosion, loss of the soil resource, and a long-term alteration in the topography of the affected areas(s). The initial disturbance of the soil, in association with the potential loss of soil through erosion, could ultimately reduce both the quantity and productivity of topsoil available for reclamation operations. However, all available topsoil would be salvaged during initial construction and stockpiled for later revegetation in order to assure that the natural fertility and reclamation potential of the topsoil resource is not reduced.

Increased surface runoff and water erosion would primarily occur in the short-term and would decline over time due to natural stabilization and surface crusting. Soil and climatic factors in the overall area, combined with utilization of technological and/or mechanical applications designed to enhance revegetation would generally ensure stabilization of each disturbed area within one to two years after initial disturbance.

4.4.1 The Proposed Action

Construction of the eight well locations proposed by SWPC in the Hornbuckle Field would account for approximately 71% of the initial surface disturbance associated with the Proposed Action. Using the calculations for surface disturbance presented in Table 2.3, well location surface disturbance by SMU is provided below:

- SMU 105: 5.13 acres;
- SMU 109: 4.44 acres;
- SMU 121: 4.53 acres;
- SMU 122: 15.01 acres; and
- SMU 137: 9.28 acres.

As shown above, approximately 64% of the surface disturbance resulting from well pad construction would occur in SMUs 122 and 137. As shown in Table 3.7, soils in the Hiland-Bowbac complex (SMU 122) generally exhibit a moderate hazard for both wind and water erosion, while the soils in the Tassel-Tullock-Vonalee association generally exhibit a severe hazard of wind erosion and a moderate hazard for water erosion (NRCS 1986). Soils included in

these two SMUs also represent the primary soils encountered on/along the proposed access road routes as well (see Table 2.3). The hazard of wind and water erosion would increase as the degree of slope increases; however, all of the proposed well locations and their associated access road routes are situated on relatively gentle slopes.

A detailed analysis of projected soil erosion rates was conducted for the *Cave Gulch-Bullfrog-Waltman Natural Gas Development Project* (BLM 1997). The Modified Soil Loss Equation (MSLE) was used to calculate soil erosion, and erosion rates were determined based on general assumptions of conditions and operating procedures for the comparison of alternatives. These calculations suggest that soil erosion can be reduced significantly with the application of Best Management Practices (BMP) as referenced in BLM Instruction Memorandum 2004-124 (www.blm.gov/bmp) and the joint BLM/U.S. Forest Service (USFS) publication: *Surface Operating Standards for Oil and Gas Exploration and Development* (Fourth Edition). Table 4.1 provides estimated erosion rates based upon the 1997 Cave Gulch analysis.

Table 4.1

Estimated Erosion Rates per Acre of Surface Disturbance Calculated Both With and Without the Application of Best Management Practices in Tons/Acre/Year

Type of Disturbance	Bare Soil Surface - BMP Not Applied	BMP Applied - Erosion After One Year	BMP Applied - Erosion After Five Years
Individual Well Pads	13.8 tons/acre/year	1.5 tons/acre/year	0.2 tons/acre/year
Access Roads	5.8 tons/acre/year	2.3 tons/acre/year	0.5 tons/acre/year

Source: Soils, Water, and Vegetation Resources Technical Report. Report prepared for the *Cave Gulch-Bullfrog-Waltman Natural Gas Development Project EIS* (Grah 1997).

As demonstrated above, implementation of BMP for reclamation and erosion control would result in a 95% reduction in erosion in the first year and a 96% reduction in erosion by the fifth year, with implementation of BMP resulting in an overall 99% reduction in erosion after five years. These analyses suggest that soil erosion resulting from the Proposed Action could be significantly reduced with the application of BMP for reclamation and stabilization of disturbed soils (BLM 1997, BLM 2003, Grah 1997). Soil characteristics in the area of potential affect (APE) for the Proposed Action were compared with soil characteristics in the Cave Gulch-Bullfrog-Waltman Natural Gas Development Project area (BLM 1997) and were generally found to be similar in terms of soil attributes and erosion factors.

Notwithstanding the generally sensitive nature of the soils encountered in conjunction with the Proposed Action, the initial disturbance of approximately 49.04 acres of the soil resource is not considered as a major impact thereto. As discussed above, successful implementation of BMP in

the reclamation of surface disturbance associated with this project should reduce erosion by 99% after five years.

4.4.2 The No Action Alternative

Under the No Action Alternative there would be no project-related disturbance of soils and soils would remain in their current state.

4.4.3 Mitigation and Monitoring

In order to minimize the overall impact to soil resources within the Hornbuckle Field which could result from surface disturbing activities associated with the Proposed Action, the following mitigation measures are recommended.

1. Construction and/or surface disturbing activities would be prohibited during periods when the soil material is saturated, frozen, or when watershed damage is likely to occur.
2. All available topsoil (e.g., 6 to 12 inches) should be removed (stripped) from areas of new construction and stockpiled for future reclamation of these disturbed areas. This stored topsoil, as well as cut and fill slopes on the well pad, should be secured from erosion through mulching and temporary revegetation if reclamation is not anticipated within one year following initial construction.
3. Unused areas (borrow ditch) along the proposed access road route(s) which would be denuded of existing vegetation during initial construction should be reseeded in order to re-establish vegetative cover and reduce the overall potential for erosion and off-site sedimentation.
4. Sandy soils which are prone to wind and water erosion should be uniformly mulched with certified weed-free native grass, hay, or small grain straw at a rate of two tons/acre. Cotton, jute, or synthetic netting may be applied in steep areas where erosion would be a problem as required by the Authorized Officer in consultation with the affected private surface owner. Mulch would be crimped two to four inches into the soil on the contour, tackified, or incorporated into erosion control blankets to prevent it from blowing or washing away and from entering waterways. Mulch would protect the soil from wind and water erosion, raindrop impact, and surface runoff, and would help hold seeds in place. Mulching may occur prior to or after broadcast seeding but must not occur before drill seeding.

Hydromulch, biodegradable erosion control netting, or matting would be firmly attached to the soil surface on steep slopes where it is unsafe to operate equipment, at sites where soils have 35% or more surface rock content, or on notably unstable areas.

5. All reclaimed surfaces would be left rough and would be mulched as described above to reduce the potential for wind and water erosion. Erosion and sediment control structures

would be installed on reclaimed areas wherever slopes exceed 3:1. Runoff from reclaimed areas on hillsides with 3:1 or greater slopes would be controlled using standard structures including, but not limited to, waterbars, silt fences, geotextile, and/or energy dissipaters. Waterbars would be installed in accordance with standard BLM specifications and would drain into undisturbed vegetation as follows:

- Prior to commencement of reseeding activities, waterbars would be constructed at least one foot deep, on the contour with approximately two feet of drop per one hundred feet of waterbar to ensure drainage, and extended into established vegetation. All waterbars would be constructed with the berm on the downhill side to prevent the soft material from silting in the trench. The initial waterbar should be constructed at the top of the backslope. Subsequent waterbars should follow the following general spacing guidelines:

Waterbar General Spacing Guidelines

% Slope	Spacing Interval (feet)
2% or <	200'
2% - 4%	100'
4% - 5%	75'
5% or >	50'

- Silt fences, if/as necessary, would be placed downslope from reclaimed areas where erosion may impact a water body, and would be installed according to manufacturers' instructions. Energy dissipaters would be used to slow flows wherever water is channelized (e.g., by a waterbar or an interceptor ditch). All runoff and erosion control structures would be inspected and maintained by SWPC on a regular basis until the site is determined to be stable.

It should be noted that some of the mitigation measures recommended above may be included in the Multi-Point Surface Use and Operation Plan (SUP) prepared for each well by SWPC, while others may be included in Lease Notice #1 appended to the approved oil/gas lease. Those mitigation measures not included in either the SUP or Lease Notice #1 will be applied as Conditions of Approval to the individual APD's as necessary to minimize impacts to the soil resource.

4.5 WILDLIFE

Impacts on local wildlife populations would result from direct removal or alteration of habitat, increased human presence associated with additional oil/gas exploration and development activity, and direct wildlife/human interaction. Activities associated with additional exploration and/or development activity within the WCPA would temporarily eliminate approximately 49.04 acres of wildlife habitat, consisting mostly of grasses and forbs. This would result in a

proportionate reduction in the amount of herbaceous and browse forage available to herbivorous species such as antelope and mule deer, as well as a reduction in nesting, feeding and security habitat for game birds (e.g., sage grouse) and those smaller vertebrate species that may inhabit the affected areas. These habitat losses can generally be classified as being either short-term or long-term in duration, with these terms defined below.

- Short-term loss refers to disturbances that would be reclaimed immediately after exploration and/or development activities are completed. Loss or alteration of habitats in grass-shrub meadows and/or on grassy slopes would be considered short-term and are expected to occur in conjunction with lease development.
- Long-term loss would occur in areas that could not be returned to their original vegetative state within a reasonable period of time (three to five years), such as producing well sites and access roads.

4.5.1 The Proposed Action

The removal of 49.04 acres of wildlife habitat in the short-term and 18.86 acres in the long-term would have a negligible impact on wildlife populations because of the small area(s) affected and the relative availability of similar, undisturbed habitats in directly adjacent areas. Once conclusion of operations within the Hornbuckle Field and successful reclamation of these disturbed areas has been achieved, these affected habitats would return to pre-project conditions.

4.5.1.1 Big Game Species

As stated in Section 3.7.1, there are no crucial big game habitats within the APE for the Proposed Action. Rather than direct habitat loss, the greatest impact on wildlife populations would be from displacement of big game species from preferred habitats as a result of increased level(s) of human activity (including vehicular traffic) and associated noise. The extent of this displacement is difficult to predict when one considers that response to noise and human presence varies from species to species as well as among individuals of the same species. In some cases, wildlife species may habituate to noise and human presence after initial exposure, and begin to utilize areas that were formerly avoided. Numerous studies have examined the effects of human presence on big game species (Klein 1974; Irwin and Peek 1979; Ward and Cupal 1979; MacArthur et al. 1982; Brekke 1985) and it is commonly presumed that these effects are detrimental to individual species. However, research on the relationship between displacement from preferred habitats and increased stress due to human harassment (both intentional and otherwise) on overall population dynamics has been inconclusive to date, particularly pertaining to oil/gas exploration and development activity.

In addition to the avoidance response, an increased human presence intensifies the potential for wildlife-human interactions ranging from the harassment of wildlife to poaching and increased legal harvest. Likewise, increased traffic levels on existing access roads could increase the

potential for wildlife-vehicle collisions. These collisions are most frequent where roads traverse areas commonly frequented by game species.

Generally speaking, construction, drilling and completion activities within the Hornbuckle Field would temporarily displace big game animals in the immediate vicinity (up to 0.5 miles) of such activities. However, once these intensive activities have been completed, most big game animals would become acclimated to the reduction in traffic and human activity and would continue to utilize suitable habitat in closer proximity to well pads and access road routes. However, such habitat may not be utilized to the same extent as it was prior to disturbance. It could take 10 to 20 years for some reclaimed areas to attain pre-disturbance shrub conditions and vegetation diversity. However, once all production operations have been terminated, existing facilities abandoned and removed, reclamation and reseeding operations completed, and suitable vegetation has been re-established, big game animals would likely re-occupy all previously disturbed areas within the Hornbuckle Field.

4.5.1.2 BLM Sensitive Species

As stated in Section 3.7.2, there are no greater sage grouse leks known to exist with an approximate nine mile radius of the APE for the Proposed Action and the availability of suitable greater sage grouse nesting and early brood-rearing habitat is limited in this area. An assessment of habitat suitability has been performed in conjunction with the on-site inspections conducted on each of the proposed well locations and access road routes and the results of these assessments are presented in Table 4.2.

Table 4.2

Greater Sage Grouse Nesting and Brood-Rearing Habitat Suitability

Facility Name And Number	Legal Location of Facility				Habitat Suitability	
	Quarter	Section	Township	Range	Road	Location
BR Federal 44-4H	SE¼SE¼	4	37 North	73 West	No	No
BR Federal 11-10H	NW¼NW¼	10	37 North	73 West	No	No
DCR Federal 31-24H	NW¼NE¼	24	37 North	73 West	No	No
HR Federal 44-20H	SE¼SE¼	20	38 North	73 West	No	No
GH Federal 44-21H	SE¼SE¼	21	38 North	73 West	No	No
GH Federal 24-22H	SE¼SW¼	22	38 North	73 West	No	No
BR Federal 24-26H	SE¼SW¼	26	38 North	73 West	No	No
HR Federal 11-28H	NW¼NW¼	28	38 North	73 West	No	No

Considering that there are no known greater sage-grouse leks within nine miles of the proposed project area, and the lack of extensive areas of suitable habitat within the APE, in it is highly unlikely that the Proposed Action would adversely affect greater sage grouse populations or their habitat within the project area.

The potential impacts of the Proposed Action to ferruginous hawks will be discussed in Section 4.5.1.3.

4.5.1.3 Raptor Species

Individual raptor nesting inventories have been conducted for each of the wells proposed in conjunction with the Proposed Action. These inventories have identified three historic nests within the APE, including two ferruginous hawk nests and one red-tailed hawk nest. Recent nesting activity at these historic nest sites is not known.

Surface disturbance and concomitant human intrusion(s) associated with additional oil/gas exploration and development activity within the Hornbuckle Field could have a negative effect upon raptor breeding and/or nesting activities within the APE if these activities were allowed to proceed during the breeding/nesting season. Likewise workover/recompletion activities proposed during critical time periods in the breeding/nesting cycle could result in aborted breeding activity and/or nest abandonment. It should also be noted that construction of the DCR Federal #31-24H well location as currently proposed could result in the permanent abandonment of the historic ferruginous hawk nest identified in the SW¹/₄SE¹/₄SE¹/₄ of Section 13 in Township 37 North, Range 73 West.

4.5.1.4 Threatened and Endangered Species

A search was made of the Wyoming Natural Diversity Database (WYNDD) to determine if sightings for any of the T/E species discussed in Section 3.7.4 have been recorded within Townships 37 and 38 North, Range 73 West - which includes the APE for the Proposed Action and a sizeable buffer zone surrounding the individual wells/roads proposed herein. The WYNDD contained no sightings for these species in the selected townships and ranges (WYNDD 2009).

Those federally-listed species that may occur in the project area were identified in Section 3.7.4 and include the black-footed ferret, Preble's meadow jumping mouse, and Ute ladies'-tresses as well as five species found downstream in the North Platte River drainage that could be affected by water depletions there from (BLM 2006, BLM 2008a, BLM 2008b). Table 4.3 provides a listing of these species and their potential occurrence within the APE. Following is a brief discussion of each species including their habitat preferences and potential for occurrence in the project area.

- Black-footed ferret (*Mustela nigripes*). The black-footed ferret is a potential resident in prairie dog (*Cynomys sp.*) colonies throughout the State of Wyoming with a re-introduced population in the Shirley Basin area of northeastern Carbon County, Wyoming. There are no known prairie dog towns within the APE; consequently, impacts to black-footed ferrets will not occur.

- Preble’s meadow jumping mouse (*Zapus hudsonius preblei*). Preble’s meadow jumping mice, a threatened species, are a potential resident in riparian habitats east of the Laramie Mountains and south of the North Platte River drainages. All subspecies of *Zapus* in Wyoming are strongly associated with riparian areas, and are seldom found outside of heavy vegetation immediately adjacent to flowing streams. Preble’s meadow jumping mice are strongly associated with foothills and plains riparian areas. Heavy herbaceous cover is vital, and the highest densities of *Z. h. preblei* have been recorded in areas with some woody (e.g., cottonwood, willow) overstory. (Beauvais 2001, Keinath et al. 2003). There are no known occurrences of *Z.h. prebeli* recorded within the APE for the proposed project (WYNDD 2009) and the habitat requirements for this species are not present therein.

Table 4.3

Federally Listed Threatened and Endangered Species and Their Potential Occurrence within the Hornbuckle Field APE

Common Name	Scientific Name	Federal Status ¹	Potential Occurrence Within the APE ²
MAMMALS			
Black-footed ferret	<i>Mustela nigripes</i>	E	X
Preble’s meadow jumping mouse	<i>Zapus hudsonius preblei</i>	T	X
BIRDS			
Interior least tern ³	<i>Sterna antillarum</i>	E	X
Piping plover ³	<i>Charadrium melodus</i>	T	X
Eskimo curlew ³	<i>Numenius borealis</i>	E	X
FISH			
Pallid sturgeon ³	<i>Scaphirhynchus albus</i>	E	X
PLANTS			
Ute ladies’-tresses	<i>Spiranthes diluvialis</i>	T	X
Western prairie fringed orchid ³	<i>Plantanthera praeclara</i>	T	X

¹ Federal status: E = listed as federally endangered.
T = listed as federally threatened.

² Species occurrence:

- O = occasional; this species may occur in the HQPA during specific times of the year and may be locally common when suitable food is available; generally not present for extended periods.
- R = rare; species may occur in the HQPA for just a few days or hours (e.g., stopping over during migration), or the species has only occasionally or rarely been sighted in the HQPA. Encounters during the proposed action are very unlikely.
- X = unlikely; there has been no recent historical record of the species’ occurrence in the HQPA; probability of encountering the species during project-related activity is very unlikely.

³ North Platte River species.

- Ute ladies'-tresses (*Spiranthes diluvialis*). Ute ladies'-tresses is a perennial orchid that occurs primarily on moist, sub-irrigated or seasonally flooded soils in valley bottoms, gravel bars, old oxbows, or floodplains bordering springs, lakes, rivers, or perennial streams at elevations between 1,800 and 6,800 feet (Fertig 2000; Keinath et al. 2003; Spackman et al. 1997). Where Ute ladies'-tresses occur in ephemeral drainages, groundwater is typically shallow (i.e., within approximately 18 inches of the ground surface) (BLM 2005).

In Wyoming, *S. diluvialis* is known from Converse, Goshen, Laramie and Niobrara Counties in the Antelope Creek, Horse Creek and Niobrara River watersheds (Fertig 2000, Heidel 2007). Nine occurrences of the species have been recorded in Wyoming, with the closest recorded occurrence of *S. diluvialis* to the project area recorded in northwestern Converse County approximately 20 miles to the north/northwest thereof (Heidel 2007, WYNDD 2009). There are no perennial streams with associated riparian habitats as discussed above within the APE and there have been no occurrences of *S. diluvialis* recorded within the project area (WYNDD 2009).

Surface disturbing activities associated with the Proposed Action would not occur in the drainages of Antelope Creek, Horse Creek or the Niobrara Rivers. Consequently, impacts to *S. diluvialis* are not expected to occur as a result of surface disturbing activities associated with the Proposed Action.

- North Platte River Species. Those five North Platte species identified in Section 3.7.4 (including interior least tern, piping plover, pallid sturgeon, Eskimo curlew and western prairie fringed orchid) that may occur in the downstream riverine habitats of the North Platte River in Nebraska could be adversely affected by surface water depletions (consumption) in the North Platte River system resulting from project-related activities. As stated in Section 2.1.2.1 and Table 3.2, water to be used in drilling operations would be obtained from local sources not connected to the North Platte River. As a consequence, no depletions would result in the North Platte River system and the downstream riverine habitats of these species would not be affected by the Proposed Action.

4.5.1.5 Migratory Bird Species

As previously discussed, surface disturbing activities associated with the Proposed Action would result in the initial disturbance of approximately 49.04 acres of western mixed grass/short-grass prairie which provides a source of food, security cover and nesting habitat for many of the species listed in Table 3.9. Approximately 62% of this disturbance would be reclaimed within five years of initial disturbance resulting in a long-term (LOP) loss of approximately 18.86 acres of habitat.

Considering the relatively small percentage of total surface disturbance proposed within the APE, the actual magnitude of direct habitat loss and subsequent displacement would be minimal. The displacement of bird species to adjacent, undisturbed habitats, while difficult to predict, would be relatively short-term in nature given the overall duration of activities associated with the proposed horizontal drilling project.

4.5.2 The No Action Alternative

Under the No Action Alternative impacts to wildlife populations in the area would continue at existing levels.

4.5.3 Mitigation and Monitoring

In order to minimize the overall impact to wildlife within the Hornbuckle Field which could result from construction and drilling activities associated with the Proposed Action, the following mitigation measures are recommended.

1. To protect important raptor nesting habitat, drilling and/or surface use will not be allowed within one-half mile of occupied raptor nests during the period from February 1 to July 31.

4.6 CUMULATIVE IMPACTS

Cumulative impacts are impacts which are likely to occur due to the proposed action in combination with other ongoing activities in the area, recently constructed projects in the area, and/or projects which would likely be implemented in the area in the near future. Pursuant to NEPA, the BLM must consider the cumulative impacts of the Proposed Action in conjunction with other ongoing oil/gas exploration activities within the general area. In addition, unrelated activities within the overall project area which might have an adverse impact upon existing natural resources in the area and, consequently, which would further contribute to the overall degradation of the human environment must be considered in the analysis of cumulative impacts as well.

4.6.1 Introduction

Nine wells were drilled within the overall project area (Hornbuckle Field) in 2008 including four vertical wells, four horizontal wells and one directional well. These wells are identified in Table 4.4.

Short-term surface disturbance associated with these nine wells is estimated at 51.52 acres, with approximately 34.74 acres of disturbance attributable to pad construction and approximately 16.78 acres of surface disturbance attributable to road construction or reconstruction. These 51.52 acres of short-term surface disturbance would be cumulative to any additional surface disturbance occurring within the overall project area in association with the Proposed Action. Table 4.5 quantifies the 51.52 acres of existing, short-term surface disturbance in the Hornbuckle Field resulting from recent drilling operations conducted therein by Merit Energy Company and SWPC.

Successful interim reclamation of these disturbed areas as described in Section 2.1.5 would result in approximately 24.17 acres of long-term surface disturbance (11.75 acres for the permanent

access roads and 12.42 acres for the well locations), in the overall project area resulting from the recent drilling activity described above and would also be cumulative to any long-term surface disturbance resulting from the Proposed Action.

Table 4.4

Wells Drilled or Approved in the Hornbuckle Field in 2008

Operator	Well Name and Number	Legal (Surface) Location of Well			
		Quarter	Section	Township	Range
Merit Energy Company	Highland Flats #34-2	SW¼SE¼	2	37 North	73 West
Merit Energy Company	Highland Flats #14-34	SW¼SW¼	34	38 North	73 West
Southwestern Production Corp.	HR Fee #11-27V	NW¼NW¼	27	38 North	73 West
Southwestern Production Corp.	HR Federal #31-27H	NW¼NE¼	27	38 North	73 West
Southwestern Production Corp.	HR Federal #44-29H	SE¼SE¼	29	38 North	73 West
Southwestern Production Corp.	HR Fee #21-33H	NE¼NW¼	33	38 North	73 West
Southwestern Production Corp.	Blaylock Fee #42-34V	SE¼NE¼	34	38 North	73 West
Southwestern Production Corp.	Blaylock Federal #13-35A	SE¼NE¼	34	38 North	73 West
Southwestern Production Corp.	BR Fee #11-35V	NW¼NW¼	35	38 North	73 West

Table 4.5

Existing Short-Term Surface Disturbance in the Hornbuckle Field

Well Name and Number	Well Status	Access Road	Well Location	Total Disturbance
Highland Flats #34-2	PGW	3.21 ¹	3.20 ¹	6.41
Highland Flats #14-34	POW	0.92 ¹	2.87 ¹	3.79
HR Fee #11-27V	POW	2.48 ¹	3.24 ¹	5.72
HR Federal #31-27H	POW	1.33 ²	4.80 ²	6.13
HR Federal #44-29H	POW	1.33 ²	4.80 ²	6.13
HR Fee #21-33H	POW	2.76 ¹	4.80 ²	7.56
Blaylock Fee #42-34V	POW	0.34 ¹	3.35 ¹	3.69
Blaylock Federal #13-35A	POW	0.00 ³	2.88 ¹	2.88
BR Fee #11-35V	POW	4.41 ¹	4.80 ²	9.21
TOTALS		16.78	34.74	51.52

- 1 Calculated (actual) surface disturbance
- 2 Estimated surface disturbance (average from Table 2.3)
- 3 Access to the Blaylock Federal #13-35A is included in the BR Fee #11-35V calculations

There are no other projects currently proposed or planned in the reasonably foreseeable future within the general area that would contribute to the cumulative impacts of the eight additional horizontal wells proposed by SWPC in the Hornbuckle Field.

4.6.2 Cultural Resources

Those surface disturbing activities subject to federal jurisdiction proposed within the Hornbuckle Field including those associated with the Proposed Action have all been inventoried to determine their potential impact upon cultural resources. Any cultural sites identified in conjunction with these inventories have added to our cumulative understanding of past human habitation within the overall project area and any sites identified in conjunction with these surveys that were deemed to be potentially eligible for nomination to the National Register of Historic Places (NRHP) have either been avoided or the potential impacts thereto mitigated in accordance with BLM/SHPO recommendations. Considering that potentially eligible cultural sites identified within the overall WCPA have been and would continue to be avoided, combined with the fact that no eligible cultural sites were identified in conjunction with the Proposed Action, we would not anticipate any adverse cumulative impacts to cultural resources within the overall project area as a result of surface disturbing activities proposed in conjunction therewith.

4.6.3 Invasive Non-Native Species

Considering that invasive, non-native plant species would be controlled by SWPC within the overall project area, it is unlikely that the Proposed Action would have any adverse cumulative impacts on native plant communities arising from the invasion of and replacement with non-native species. However, any area(s) within the overall project area subjected to new surface disturbance would represent an opportunity for the establishment of these invasive, non-native species.

4.6.4 Soils

Some very small amount of soils would move off disturbed areas; however, such movement would likely cease once the soils reach undisturbed areas. Cumulative impacts to soils would be negligible based on the use of Best Management Practices (BMPs) in construction and the timely reclamation of those areas disturbed in conjunction with the construction of the roads and well pads proposed herein.

As indicated in Table 2.4, surface disturbances associated with the Proposed Action would result in the short-term disturbance of approximately 49.04 acres of the soil resource within the Hornbuckle Field and would result in approximately 100.56 acres of cumulative short-term disturbance.

Addition of the 49.04 acres of surface disturbance attributable to the Proposed Action would almost double the overall, short-term surface disturbance within the Hornbuckle Field resulting

from recent/proposed drilling activities. However, implementation of BMP for reclamation and erosion control would result in a commensurate reduction in overall erosion rates as discussed in Section 4.4.1. The successful reclamation of surface disturbance within the overall project area combined with routine monitoring of reclamation success and implementation of remedial measures as necessary to correct any identified deficiencies would reduce the cumulative impacts to the soil resource to negligible levels.

4.6.5 Wildlife

The 49.04 acres of short-term and 18.86 acres of long-term disturbance associated with the Proposed Action would add to the pre-existing surface disturbance within the Hornbuckle Field as discussed above. Overall, the generally small amounts of cumulative habitat loss would have minimal impacts on wildlife populations. Once the initial construction and drilling phases of the proposed project have been completed, the project area should return to a pre-project level of human disturbance. Moreover, once the wells in the Hornbuckle Field have been depleted, the subsequent abandonment and successful reclamation of existing facilities within the field would return the area to a pre-disturbance state.

Some small mammals could be killed during construction or by collisions with vehicles during production, and a small amount of wildlife habitat would be removed for the life of the project.

4.7 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable commitment of resources resulting from the Proposed Action would include any soils lost through wind and water erosion; the inadvertent or accidental destruction of previously unrecorded or potentially eligible cultural resources; the loss of animals due to earthmoving activities or by collisions with vehicles; and energy expended during project activities.

4.8 SHORT-TERM USE OF THE ENVIRONMENT VERSUS LONG-TERM PRODUCTIVITY

Short-term use of the environment during the life of the project would not detract from long-term productivity of the area. Even during the life of the project, only the small areas from which vegetation is removed would be unavailable for grazing and wildlife habitat. Once the project is completed and disturbed areas are reclaimed the same resources that were available prior to the project would be available again, except for the hydrocarbons that were extracted from the Sussex Fm. While it may ultimately take up to 25 years to regenerate a mature, climax stand of vegetation (particularly shrubs such as sagebrush) comparable to those population(s) present prior to project implementation, successful and ongoing reclamation of surface disturbance within the overall project area would introduce vegetative communities which would support wildlife and livestock grazing, stabilize the soil, and reduce the potential for erosion and sedimentation.

5.0 REFERENCES

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6.0 ABBREVIATIONS

APD	Application for Permit to Drill
APE	Area of Potential Affect
BBS	Breeding Bird Survey
BLM	Bureau of Land Management
BMP	Best Management Practices
BO	Barrels of Oil
BOPD	Barrels of Oil per Day
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFO	Casper Field Office
COA	Condition of Approval
DR	Decision Record
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy Management Act
FONSI	Finding of No Significant Impact
FOOGRLA	Federal Onshore Oil and Gas Leasing Reform Act
FOOGRMA	Federal Onshore Oil and Gas Royalty Management Act
Fm	Formation
FR	Federal Register
LOP	Life of Project
MCF	Thousand Cubic Feet
MD	Measured Depth
MLA	Mineral Leasing Act
MSLE	Modified Soil Loss Equation
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
NTL	Notice to Lessees
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OBM	Oil Based Mud
PGW	Producing Gas Well
POW	Producing Oil Well
PSD	Prevention of Significant Deterioration
RMP	Resource Management Plan
ROW	Right-of-Way
SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Officer
SLAMS	State and Local Air Monitoring Site

SMU	Soil Mapping Unit
SUP	Multi-Point Surface Use and Operations Plan
SWPC	Southwestern Production Corporation
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USC	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VRM	Visual Resource Management
WDEQ	Wyoming Department of Environmental Quality
WGFD	Wyoming Game and Fish Department
WOGCC	Wyoming Oil and Gas Conservation Commission
WSE	Wyoming State Engineer
WYNDD	Wyoming Natural Diversity Database