

**DECISION RECORD**  
**Resolute Wyoming Incorporated, Turner POD**  
**Environmental Assessment (EA), WY-070-EA15-68**  
**Bureau of Land Management, Buffalo Field Office, Wyoming**

DECISION. The BLM approves Resolute Wyoming Incorporated’s (Resolute), Turner POD gas and oil well applications for permit to drill (APD)s described in Alternative B of the environmental assessment (EA) WY-070-EA-15-68. This approval includes the wells’ support facilities.

**Compliance.** This decision complies with or supports:

- Federal Land Policy and Management Act of 1976 (FLPMA) (43 USC 1701); DOI Order 3310.
- Mineral Leasing Act of 1920 (MLA) (30 U.S.C. 181); including the Onshore Oil and Gas Orders.
- National Environmental Policy Act of 1969 (NEPA) (42 USC 4321).
- National Historic Preservation Act of 1966 (NHPA) (16 USC 470).
- Powder River Basin Oil and Gas Project Final Environmental Impact Statement (FEIS) (2003).
- Buffalo Resource Management Plan (RMP) (1985) Update and Amendments (2001, 2003, 2011).
- Greater Sage-Grouse Habitat Management Policy on Wyoming BLM Administered Public Lands (WY-IM-2012-019) and Greater Sage-Grouse Interim Management Policies and Procedures (WO-IM-2012-043).

BLM summarizes the details of the approval of Alternative B below. The EA includes the project description, including specific changes made at the onsite, and site-specific mitigation measures.

**Well Site.** BLM approves 5 APDs and support facilities at the following locations:

Well Name	TwN	Rng	Sec	Qtr/Qtr	Surface Ownership	Surface Lease	Lateral Lease	Bottom Hole Lease
Castle 1-14TH	44N	71W	2	SESE	Fee	Fed	Mixed	Fee
Castle 11-41TH			11	NENE	Fee	Fed	Mixed	Fee
Castle 1-34TH	44N	71W	1	SESW	Fee	Fed	Mixed	Fee
Castle 12-21TH					Fee	Fed	Fed	Fed
Castle 2-41TH	44N	71W	2	NENE	Fee	Fee	Mixed	Fed

**Limitations.** There are no denials or deferrals. Also see the conditions of approval (COAs).

**THE FINDING OF NO SIGNIFICANT IMPACT (FONSI).** Analysis of Alternative B of EA, WY-070-EA15-68 and the FONSI (incorporated here by reference) found Resolute’s proposal for Turner POD Applications for Permit to Drill will have no significant impacts on the human environment, beyond those described in the PRB FEIS. There is no requirement for an EIS.

**COMMENT OR NEW INFORMATION SUMMARY.** BLM publically posted the APDs for 30 days, received no comments, and then internally scoped them. BLM received no new policy clarifications after receiving these APDs.

**DECISION RATIONALE.** BLM bases the decision authorizing the selected project on:

1. BLM and Resolute included design features and mitigation measures (conditions of approval (COAs)) to reduce environmental impacts while meeting the BLM’s need. For a complete description of all site-specific COAs, see the COAs.
  - a. The impact of this development cumulatively contributes to the potential for local extirpation of the Greater Sage Grouse (GSG) yet its effect is acceptable because it is outside priority habitats

and is within the parameters of the PRB FEIS/ROD and current BLM (WO-IM-2012-043) and Wyoming (WY-IM-2012-019) GSG conservation strategies.

- b. With application of Standard Operating Procedures (SOPs), applied mitigation, Required Design Features, and COAs identified for Greater Sage-Grouse under the proposed action, impacts caused by surface-disturbing and disruptive activities would be minimized.
- c. There are no conflicts anticipated or demonstrated with current uses in the area.
2. The Resource Management Plan (RMP) for the Buffalo Field Office is currently undergoing revision. The Draft RMP and Environmental Impact Statement was released in June 2013.
3. Resolute will conduct operations to minimize adverse effects to surface and subsurface resources, prevent unnecessary surface disturbance, and conform with currently available technology and practice.
4. The selected alternative will help meet the nation's energy needs, and help stimulate local economies by maintaining workforce stability.
5. The operator committed to:
  - Comply with the approved APD, applicable laws, regulations, orders, and notices to lessees.
  - Obtain necessary permits from agencies.
  - Offer water well agreements to the owners of record for permitted wells.
  - Incorporate several measures to alleviate resource impacts into their submitted surface use plan and drilling plan.
6. The operator certified it has a surface access agreement.
7. The project lacks wilderness characteristics. A wilderness characteristics inventory was completed in 2013; no lands with wilderness characteristics were identified outside the Big Horn Mountains. The inventory is available at: <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo/docs.html>.
8. These APDs are pursuant to the Mineral Leasing Act for developing oil or gas and do not satisfy the categorical exclusion directive of the Energy Policy Act of 2005, Section 390.

**ADMINISTRATIVE REVIEW AND APPEAL.** This decision is subject to administrative review according to 43 CFR 3165. Request for administrative review of this decision must include information required under 43 CFR 3165.3(b) (State Director Review), including all supporting documentation. Such a request must be filed in writing with the State Director, Bureau of Land Management, P.O. Box 1828, Cheyenne, Wyoming 82003, no later than 20 business days after this Decision Record is received or considered to have been received. Parties adversely affected by the State Director's decision may appeal that decision to the Interior Board of Land Appeals, as provided in 43 CFR 3165.4.

Field Manager:                     /s/ Duane W. Spencer                    

Date:                     3/6/15

**FINDING OF NO SIGNIFICANT IMPACT**  
**Resolute Wyoming Incorporated, Turner POD**  
**Environmental Assessment (EA), WY-070-EA15-68**  
**Bureau of Land Management, Buffalo Field Office, Wyoming**

**FINDING OF NO SIGNIFICANT IMPACT (FONSI).** Based on the information in the EA, WY-070-EA15-68, which BLM incorporates here by reference; I find that: (1) the implementation of Alternative B will not have significant environmental impacts beyond those addressed in the Powder River Basin (PRB) Oil and Gas Project Final Environmental Impact Statement (FEIS) (2003) (2) Alternative B conforms to the Buffalo Field Office (BFO) Resource Management Plan (RMP) (1985, 2001) and amendments (2003, 2011); and (3) Alternative B does not constitute a major federal action having a significant effect on the human environment. Thus an EIS is not required. I base this finding on consideration of the Council on Environmental Quality's (CEQ) criteria for significance (40 CFR 1508.27), with regard to the context and to the intensity of the impacts described in the EA, and Interior Department Order 3310.

**CONTEXT.** Mineral development is a common PRB land use, sourcing over 42% of the nation's coal. The PRB FEIS foreseeable development analyzed the development of 54,200 oil and gas wells. The additional development analyzed in Alternative B is insignificant in the national, regional, and local context.

**INTENSITY.** The implementation of Alternative B will result in beneficial effects in the forms of energy and revenue production however; there will also be adverse effects to the environment. Design features and mitigation measures included in Alternative B will reduce adverse environmental effects. The preferred alternative does not pose a significant risk to public health and safety. The geographic area of project does not contain unique characteristics as identified in the 1985 RMP, the 2003 PRB FEIS, or other legislative or regulatory processes. BLM used relevant scientific literature and professional expertise in preparing the EA. The scientific community is reasonably consistent with their conclusions on environmental effects relative to oil and gas development. Research findings on the nature of the environmental effects have minor controversy, are not highly uncertain, or do not involve unique or proven risks. The PRB FEIS predicted and analyzed oil development of the nature proposed with this project and similar projects. The selected alternative does not establish a precedent for future actions with significant effects. There are no cultural or historical resources present that will be adversely affected by the selected alternative. No species listed under the Endangered Species Act or their designated critical habitat will be adversely affected. The selected alternative will not have any anticipated effects that would threaten a violation of federal, state, or local law or requirements imposed for the protection of the environment.

Field Manager:                   /s/ Duane W. Spencer                  

Date:                   3/6/15

**ENVIRONMENTAL ASSESSMENT (EA), WY-070-EA15-68**  
**Resolute Wyoming Incorporated, Turner POD**  
**Bureau of Land Management, Buffalo Field Office, Wyoming**

## **1. INTRODUCTION**

BLM provides an EA for Resolute Wyoming Incorporated (Resolute) Turner POD, 5 oil and gas well applications for permit to drill (APD). BLM's jurisdiction for this proposal is mixed, see Table 2.1. This site-specific analysis tiers into and incorporates by reference the information and analysis in the Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (PRB FEIS), WY-070-02-065, 2003 and the PRB FEIS Record of Decision (ROD) per 40 CFR 1508.28 and 1502.21. One may review these documents at the BLM Buffalo Field Office (BFO) and on our website: [http://www.blm.gov/wy/st/en/field\\_offices/Buffalo.html](http://www.blm.gov/wy/st/en/field_offices/Buffalo.html). These APDs are pursuant to the Mineral Leasing Act for the purpose of exploring or developing oil or gas and do not satisfy the categorical exclusion directive of the Energy Policy Act of 2005, Section 390.

### **1.1. Background**

Resolute submitted the Turner POD Notices of Staking (NOS) on May 21, 2014 to the BFO to produce oil and gas from federally managed fluid mineral bearing formations of the PRB.

- July 15, 2014-Resolute, BLM BFO resource staff, and other stakeholders conducted a pre-approval onsite inspection for the proposed well locations, roads, utility corridors, and associated infrastructure. The proposal was evaluated and modified to minimize environmental impacts.
- September 18, 2014-BLM received the Applications for Permit to Drill (APD).
- October 3, 2014-BLM sent a post-onsite deficiency letter to Resolute.
- November 7, 2014-BLM received deficiency responses from Resolute.
- February 15, 2015-BLM considered the APD package complete.

### **1.2. Need for the Proposed Project**

BLM's need for this project is to determine whether, how, and under what conditions to support the Buffalo Resource Management Plan's (RMP) goals, objectives, and management actions with allowing the exercise of the operator's conditional lease rights to develop fluid minerals on federal leases. BLM incorporates by reference here, the APD information (40 CFR 1502.21). Conditional fluid mineral development supports the RMP and the Mineral Leasing Act of 1920, the Federal Land Policy Management Act (FLPMA), and other laws and regulations.

### **1.3. Decision to be Made**

The BLM will decide whether or not to approve the proposed development, and if so, under what terms and conditions agreeing with the Bureau's multiple use mandate, environmental protection, and RMP.

### **1.4. Scoping and Issues**

BLM posted the proposed APDs for 30 days and will timely publish the EA, any finding, and decision on the BFO website. This project is similar in scope to other fluid mineral development the BFO analyzed. External scoping is unlikely to identify new issues, as verified with recent fluid mineral EAs that BLM externally scoped. External scoping of the horizontal drilling in Anadarko Petroleum's Crazy Cat East EA, WY-070-EA13-028, 2013, generated 3 comments, and revealed no new issues.

The BFO interdisciplinary team (ID team) conducted internal scoping by reviewing the proposal, its location, and a resource (issue) list (see administrative record, AR, to identify potentially affected resources, land uses, resource issues, regulations, and site-specific circumstances. The APDs and

associated plans as well as the AR are available for review at the BFO. This EA will not discuss resources and land uses that are not present, not affected, or that the PRB FEIS or other analyses adequately addressed. This EA addresses the project’s site-specific impacts to help the decision maker come to a reasoned decision. Project issues include:

- Air quality
- Soils and vegetation: site stability, reclamation potential, invasive species.
- Water: ground water, quality and quantity of produced water.
- Wildlife: raptor productivity, migratory birds, special status species.
- Cultural

BLM analyzed the following issues in the PRB FEIS and they do not present a substantial environmental question of material significance to this proposal:

Geological resources	Recreation	Wilderness characteristics
Cave and karst resources	Heritage & Visual Resources	Livestock & grazing
Wilderness characteristics	Paleontological resources	Wetlands/Riparian Areas
Forest Products	Transportation & Access	Socio-economic resources
Lands & Realty	Tribal Treaty Rights	Environmental justice
Fire, fuels management, and rehabilitation	Areas of critical environmental concern	

## 2. PROPOSED PROJECT AND ALTERNATIVES

### 2.1. Alternative A – No Action

The no action alternative would deny these APDs requiring the operator to resubmit APDs that comply with statutes and the reasonable measures in the PRB FEIS Record of Decision (ROD) in order to lawfully exercise conditional lease rights. Fluid mineral development could continue on state and private leases. The PRB FEIS considered a no action alternative, pp. 2-54 to 2-62.

### 2.2. Alternative B Proposed Action (Proposal)

Resolute requests BLM’s approval for 5 applications for permit to drill (APD). BLM incorporates the APDs here by reference; see the administrative record (AR). Resolute proposes to drill the horizontal oil and gas wells and construct associated infrastructure at the locations in Table 2.1. The wells will be drilled from non-federal surface into underlying fee or federal minerals and laterally into mixed mineral estate. The proposal is to explore for, and possibly develop oil and gas reserves in the Turner Formation at depths range from 8,544 to 8,836 feet Total Vertical Depth (TVD).

The project area is approximately 8 miles northeast of Wright, Campbell County, Wyoming. The proposed surface holes (drill sites) are in Table 2.1. Well elevations range from 4,916 feet to 5,008 feet respectively. The topography has gently sloped draws rising to mixed sagebrush and grassland uplands. Ephemeral tributaries of Coal Creek in the Belle Fourche River drainage drain the area. The climate is semi-arid, averaging 10-14 inches of precipitation annually, about 60% of which occurs between April and September. Mills Brothers Partnership is the surface owner of the project area.

**Table 2.1. Proposed Well Name/Lease/Location:**

Well Name	TwN	Rng	Sec	Qtr/Qtr	Surface Ownership	Surface Lease	Lateral Lease	Bottom Hole Lease
Castle 1-14TH	44N	71W	2	SESE	Fee	Fed	Mixed	Fee
Castle 11-41TH			11	NENE	Fee	Fed	Mixed	Fee
Castle 1-34TH	44N	71W	1	SESW	Fee	Fed	Mixed	Fee
Castle 12-21TH					Fee	Fed	Fed	Fed
*Castle 2-41TH	44N	71W	2	NENE	Fee	Fee	Mixed	Fed

*\*BLM's Instruction Memorandum No. 2009-078 establishes policy and procedures for processing Federal Applications for Permit to Drill (APD) for directional drilling into Federal mineral estate from multiple-well pads on non-Federal locations. The Castle 2-41TH follows IM 2009-78 guidance as the location is on Fee surface, directly over Fee minerals. COAs and Recommended Mitigation Measures (RMMs) are located in Appendix A and B.*

### **Drilling, Construction and Production Design Features Include:**

#### **Access Roads and Utilities**

- Primary access for the proposed wells is provided by WY Highway 59, Breene Road, and Keeline Road.
- A road network will consist of existing improved all-weather roads; engineered roads; and proposed crown and ditch template roads. A road maintenance agreement will be ratified on shared roads to maintain existing roads in a condition the same as or better than before operations began.
- Scoria will be used to surface the access roads.
- Newly constructed access and utility corridors will be built to the approach of the wells; disturbances are listed in Table 2.3a, 2.3b, and 2.3c.
- Resolute plans on installing temporary surface water lines for supply water and removing them after the wells are completed.
- Refer to the SUP for a detailed description of the access roads and utilities.

#### **Well Locations**

- Three well pads are proposed with cuts and fills to be constructed with 1 ½ :1 to 3:1 slopes. The backslope will be reduced to 2:1 and the foreslope to 3:1, during interim reclamation. Initial disturbances are listed in Table 2.3a, 2.3b, and 2.3c.
- There will be reserve pits at the oil well locations during drilling and completion operations.
- The pits will be lined with an impervious synthetic liner.
- Production facilities, i.e. production tanks, water tanks, and a heater treater, will be placed on the well pads. See SUP for a detailed description of design features.
- No other off-site ancillary facilities are planned for this project. No staging areas, man camps/housing facilities are anticipated to be used off-site. Working trailers and sleeping trailers will be placed on the well pad during the drilling and completion of the well.

#### **Drilling and Completion Operations**

For a detailed description of design features, construction practices, and average daily traffic (ADT), associated with the proposed project, refer to the surface use plan (SUP) and drilling plan included with the APDs. Also see the APDs for maps showing the proposed well location and associated facilities described above.

- Hydraulic fracturing (HF) operations are planned as a 'plug and perf' operation done in stages. The process is anticipated to require 14 days. Water used for HF will come from municipal water supplies or from Resolute's Central WSW #5 water supply. Sources and legal locations are outlined in the SUP. All fresh water will be contained in 400-500 bbl rental HF tanks and no surface pits will be used to hold this water. No additional well pad disturbance is anticipated for HF operations. Completion flowback water will be held in tanks on location and trucked offsite to a disposal facility permitted by Wyoming Department of Environmental Quality (WDEQ).
- It is anticipated that 40,000 bbls of water per well will be needed for drilling and completion operations.
- fresh water for drilling operations will be trucked from multiple permitted sources; water sources are listed in the respective SUPs.
- Typically 170 500-bbl fracturing tanks are spotted, taking 2 weeks to fill, prior to pumping the stimulation. All fracturing water, including excess, is present before starting.

- Produced water during the production phase will be stored in a permanent storage tank. A third party will haul the flowback water, produced water, and oil from the reserve pit (if any) to permitted disposal facilities; outlined in the SUP.
- Truck traffic to fill HF tanks during completion operations is estimated to be approximately 700 roundtrips per well.

BLM incorporated and analyzed the implementation of committed mitigation measures in the SUP and drilling plan, in addition to the COAs in the PRB FEIS ROD, as well as changes made at the onsite.

**Table 2.2. Anticipated Drilling and Completion Sequence and Timing (per well)**

<b>Drilling and Completion Step</b>	<b>Approximate Duration</b>
Build location (roads, pad, and other initial infrastructure)	14 days
Mobilize rig	4 days
Drilling (24/7)	30 days
Schedule Logistics	14 days
Completion (Schedule, setup, completion, demobilization)	14 days

Additionally, the operator, in their APDs, committed to:

- Comply with the approved APDs, applicable laws, regulations, orders, and notices to lessees.
- Obtain necessary permits from agencies.
- Offer water well agreements to the owners of record for permitted wells.
- Incorporate measures to alleviate resource impacts in their submitted surface use and drilling plans.
- Certify it has a surface access agreement with the landowners.

**Table 2.3a. Disturbance Summary for Castle 1-14 TH and 11-41 TH wells:**

<b>Facility</b>	<b>Number or Miles</b>	<b>Factor</b>	<b>Initial Disturbance</b>	<b>Interim Disturbance</b>
Engineered Pads (including cuts/fills and topsoil/spoil piles)	1	Varies	3.47 acres	1.07 acres
Improved Roads with utility corridor	155 ft x 50ft	7,750 ft <sup>2</sup>	0.18 acres	0.09 acres
<b>Total Surface Disturbance</b>			<b>3.65 acres</b>	<b>1.16 acres</b>

**Table 2.3b. Disturbance Summary for Castle 1-34TH and 12-21TH TH wells:**

<b>Facility</b>	<b>Number or Miles</b>	<b>Factor</b>	<b>Initial Disturbance</b>	<b>Interim Disturbance</b>
Engineered Pads (including cuts/fills and topsoil/spoil piles)	1	Varies	3.52 acres	1.08 acres
Improved Roads with utility corridor	3,310 ft x 50ft	165,500 ft <sup>2</sup>	3.80 acres	1.82 acres
<b>Total Surface Disturbance</b>			<b>7.32 acres</b>	<b>2.90 acres</b>

**Table 2.3c. Disturbance Summary for Castle 2-41TH well:**

<b>Facility</b>	<b>Number or Miles</b>	<b>Factor</b>	<b>Initial Disturbance</b>	<b>Interim Disturbance</b>
Engineered Pads (including cuts/fills and topsoil/spoil piles)	1	Varies	3.40 acres	0.72 acres
Improved Roads with utility corridor	992 ft x 50ft	49,600 ft <sup>2</sup>	1.14 acres	0.55 acres
<b>Total Surface Disturbance</b>			<b>4.54 acres</b>	<b>1.27 acres</b>

**Reasonably Foreseeable Activity.**

The reasonably foreseeable activity (RFA) for this analysis, includes the area within 4 miles of these proposed wells. BFO, as of April 2014, has in-house 2 Notices of Staking (NOSs) or APDs in this 4-mile analysis area. The RFA for this analysis area includes oil/gas exploration on 640 acre spacing and possible 320 acre spacing for horizontal wells and 40 acre spacing for vertical wells. (This does not preclude the spacing analysis in the PRB FEIS or applying to drill multiple wells from this pad further reducing the surface disturbance per well.) RFA may use existing well pads and infrastructure put in place for fee and/or federal mineral development. The RFA in the analysis area does not include the 5 approved APDs (AAPD) within the 4-mile analysis area. Potential RFA included in this analysis could consist of multiple wells on an existing pad or tie into existing supporting infrastructure; tank batteries, pipelines, power lines, and transportation networks.

**2.3. Conformance to the Land Use Plan and Other Environmental Assessments**

This proposal does not diverge from the goals and objectives in the Buffalo Resource Management Plan (RMP) (1985), and generally conforms to the terms and conditions of that land use plan, and its amendments (2001, 2003, 2011), and laws including the Clean Air Act, 42 USC 7401-7671q (2006), the Clean Water Act, 33 USC 1251 et seq. (1972), etc.

**3. AFFECTED ENVIRONMENT**

This section briefly describes the physical and regulatory environment that may be affected by the alternatives in Section 2, or where changes in circumstances or regulations occurred since adoption of analyses to which the EA tiers or incorporates by reference. The PRB FEIS considered a no action alternative (pp. 2-54 to 2-62) in evaluating a development of up to 54,200 fluid mineral wells.

There are 15,121 producing oil and gas wells in the Powder River Basin, Wyoming Oil and Gas Conservation Commission (WOGCC) December, 2014. The total number of conventional wells in the Buffalo planning area is 2,855 which includes 845 horizontal wells (federal, fee, and state) (as of December 2014). This represents 89% of the projected 3,200 in the 2003 PRB ROD. (See Tables 2.3a, 2.3b, and 2.3c for an approximation of the disturbance in the current situation.) This agrees with the PRB FEIS which analyzed the reasonably foreseeable development of 51,000 CBNG and 3,200 natural gas and oil wells. The State of Wyoming and BLM have also approved 946 of wells that operators may develop in the near future. In addition, Resolute and other operators are likely to continue seeking permits to develop unconnected leases within or near the project area.

**Table 3.1. NEPA Analyses Which BLM Incorporates by Reference either as similar drilling analyses or as substantially similar analyses.**

#	Project Name	Operator	NEPA Analysis #	# / Type Wells	Approved Mo/Yr/Update
1 <sup>a</sup>	Mufasa Fed 11-31H	Lance	WY-070-EA12-062	1 Oil	3/2012
2 <sup>b</sup>	Crazy Cat East	Anadarko	WY-070-EA13-028	24+/- Oil Pads	2/2013
3	Sahara POD	Lance	WY-070-EA13-72	21Oil	3/2013

See also: SDR WY-2013-005, particularly noting pp. 2-3, incorporating the entirety here by reference.

- a. While not overlapping, incorporate those sections describing and analyzing hydraulic fracturing, its supporting analysis, and the Greater Sage-grouse Section 3.7.12 and 4.8.2.
- b. While not overlapping, incorporate those sections describing and analyzing hydraulic fracturing and its supporting analysis to include but not limited to traffic, water, and air quality.

### 3.1. Air Quality

Refer to the PRB FEIS pp. 3-291 to 3-299, for a 2003-era description of the air quality conditions. BLM incorporates by reference, Update of Task 3A Report for the Powder River Basin Coal Review Cumulative Air Quality Effects for 2020, BLM (AECOM), 2009, (Cumulative Air Quality Effects, 2009) (available at [http://www.blm.gov/wy/st/en/programs/energy/Coal\\_Resources/PRB\\_Coal/prbdocs.html](http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html)) as it captures the cumulative air quality effects of present and projected PRB fluid and solid mineral development. Existing air quality in the PRB is “unclassified/attainment” with all ambient air quality standards. It is also in an area that is in prevention of significant deterioration zone. PRB air quality is a rising concern due to PRB-area air quality alerts issued in 2011-2014 for particulate matter (PM), attributed to coal dust.

Four sites monitor the air quality in the PRB: Cloud Peak in the Bighorn Mountains, Thunder Basin northeast of Gillette, Campbell County south of Gillette, and Gillette. In addition, the Wyoming Air Resource Monitoring System (WARMS) measures meteorological parameters from 9 sites throughout the State, and particulate concentrations from 5 of those sites, monitors speciated aerosol (3 locations), and evapotranspiration rates (1 location). The sites monitoring air quality for the Powder River Basin are located at Sheridan, South Coal Reservoir, Buffalo, Fortification Creek, and Newcastle. The northeast Wyoming visibility study is ongoing by the Wyoming Department of Environmental Quality (WDEQ). Sites adjacent to the Wyoming PRB-area are at Birney on the Tongue River 24 miles north of the Wyoming-Montana border, Broadus on the Powder River in Montana, and Devils Tower.

Existing air pollutant emission sources in the region include:

- Exhaust emissions (primarily CO and nitrogen oxides (NOx)) from existing natural gas fired compressor engines used in production of natural gas and CBNG; and, gasoline and diesel vehicle tailpipe emissions of combustion pollutants;
- PM (dust) generated by vehicle travel on unpaved roads, windblown dust from neighboring areas, road sanding during the winter months, coal mines, and trains;
- Transport of air pollutants from emission sources located outside the region;
- NOx, PM, and other emissions from diesel trains and,
- SO<sub>2</sub> and NOx from power plants.

### 3.2. Soils, Ecological Sites, and Vegetation

Soil baseline characterization for the project area is based on SSURGO database review and analyses and site specific onsite investigations. SSURGO is the most detailed level of soil mapping done by the USDA NRCS. Soils in the project area were identified from the South Campbell County Survey Area, Wyoming (WY605). The NRCS performed the survey using National Cooperative Soil Survey standards. The BLM uses SSURGO soil survey information to predict soil behavior, limitations, and suitability for a given action. The BLM’s long term goal for soil resource management is to maintain, improve, or restore soil

health and productivity, and to prevent or minimize soil erosion and compaction. Soil management objectives are to ensure that adequate soil protection is consistent with the resource capabilities. Table 3.2 presents a tabulated summary of the soil map units impacted by the proposed well and infrastructure, ecological site, and predicted acres disturbed. The predominant ecological sites occurring in the area are found to be Loamy.

The primary soil limitations in the project area are depth to bedrock, low organic matter content, low water holding capacity, and high water/water erosion potential.

Other important though less visible soil characteristics were identified in the project area using SSURGO Data, onsite investigation, and project design review, these are listed below.

- Predicted disturbance would impact soils by exposing material deep within the soil material, which may have chemical and physical properties contributing to limited reclamation potential (LRP) properties.
- Amount of bareground, physical and chemical properties, and site conditions create soils classified as highly erosive to wind and water erosion.

NRCS SSURGO data and onsite investigations identify site specific ecological sites and vegetation present. Ecological site descriptions provide site and vegetation information needed for resource identification, management, and reclamation recommendations. BLM staff identified the dominant vegetation community types in the project area as a mixed grass prairie and sagebrush shrubland. Species typical of the mixed-grass prairie community type are western wheatgrass (*Pascopyrum smithii*), blue grama (*Bouteloua gracilis*), needle-and-thread (*Hesperostipa comata*), and Wyoming big sagebrush (*Artemisia tridentata* var. *wyomingensis*), while species typical of the sagebrush shrubland include *Artemisia* spp., rabbitbrush (*Chrysothamnus* spp.), western wheatgrass, prairie junegrass (*Koeleria macrantha*), and plains pricklypear (*Opuntia* spp.).

In addition, bluebunch wheatgrass (*Pseudoroegneria spicata*) and green needlegrass (*Nassella viridula*) were identified in the project area. Additional forb and shrub species observed during the site visit included scarlet globemallow (*Sphaeralcea coccinea*), common yarrow (*Achillea millefolium*), penstemons (*Penstemon* spp.), American vetch (*Vicia americana*), and milkvetch (*Astragalus* spp.). Non-native graminoids present included cheatgrass (*Bromus tectorum*), which can be extensive in the project area. Sagebrush canopy cover ranges from 0-5% with an average height of 10-20 inches. The Castle 2-41TH is proposed in an agricultural field, with no native plant species.

**Table 3.2. Dominant Soils and Ecological Sites in the Proposal Area**

<b>SYM</b>	<b>Map Unit Name</b>	<b>Ecological Site</b>	<b>Acres</b>	<b>Percent</b>
154	Heldt clay loam, 0 to 6 percent slopes	Clayey	105.1435	
200	Renohill-Savageton clay loams, 6 to 15 percent slopes		9.762213	
202	Renohill-Worfka clay loams, 3 to 15 percent slopes		969.1987	
209	Savageton-Silhouette clay loams, 6 to 15 percent slopes		760.3845	
227	Ulm clay loam, 0 to 6 percent slopes		136.5855	
228	Ulm-Renohill clay loams, 0 to 6 percent slopes		1998.466	
229	Ulm-Renohill clay loams, 6 to 15 percent slopes		2253.497	
143	Felix clay, ponded, 0 to 2 percent slopes		Clayey Overflow	247.6612
<b>Total Clayey</b>			<b>6480.7</b>	<b>56.1892</b>
102	Arvada, thick surface-Arvada-Slickspots complex, 0 to 6 percent slopes	Loamy	41.50738	
109	Bidman loam, 0 to 6 percent slopes		101.1891	
110	Bidman loam, loamy substratum, 0 to 6 percent slopes		174.8019	
111	Bidman-Parmleed loams, 0 to 6 percent slopes		17.95752	
112	Bidman-Parmleed loams, 6 to 15 percent slopes		459.8284	
113	Bidman-Ulm loams, 0 to 6 percent slopes		50.18705	
144	Forkwood loam, 0 to 6 percent slopes		128.442	
145	Forkwood-Cambria loams, 0 to 6 percent slopes		79.07456	
146	Forkwood-Cushman loams, 0 to 6 percent slopes		590.3164	
147	Forkwood-Cushman loams, 6 to 15 percent slopes		306.0939	
148	Forkwood-Ulm loams, 0 to 6 percent slopes		183.1754	
215	Theedle-Kishona loams, 6 to 20 percent slopes		54.33037	
217	Theedle-Shingle loams, 3 to 30 percent slopes		26.56492	
<b>Total Loamy</b>			<b>2213.47</b>	<b>19.1913</b>
139	Embry-Orpha complex, 3 to 15 percent slopes	Sandy	145.8559	
129	Decolney-Hiland fine sandy loams, 0 to 6 percent slopes		413.8117	
130	Decolney-Hiland fine sandy loams, 6 to 15 percent slopes		196.567	
157	Hiland-Bowbac fine sandy loams, 0 to 6 percent slopes		42.75957	
158	Hiland-Bowbac fine sandy loams, 6 to 15 percent slopes		203.8223	
159	Hiland-Vonalee fine sandy loams, 0 to 6 percent slopes		41.02844	
160	Hiland-Vonalee fine sandy loams, 6 to 15 percent slopes		14.00052	
170	Keeline-Tulloch loamy sands, 6 to 30 percent slopes		83.37203	
177	Maysdorf fine sandy loam, 0 to 6 percent slopes		92.71619	
179	Maysdorf-Pugsley sandy loams, 0 to 6 percent slopes		137.7685	
180	Maysdorf-Pugsley sandy loams, 6 to 15 percent slopes		249.123	
193	Pugsley-Decolney sandy loams, 0 to 6 percent slopes		24.04407	
194	Pugsley-Decolney sandy loams, 6 to 15 percent slopes		396.9617	
222	Turnercrest-Wibaux, thin solum-Taluce complex, 6 to 40 percent slopes		46.69932	
236	Vonalee-Terro fine sandy loams, 2 to 10 percent slopes	217.8553		
<b>Total Sandy</b>			<b>2306.39</b>	<b>19.9969</b>
206	Samday-Shingle-Badland complex, 10 to 45 percent slopes	Shallow Clayey	149.3997	
240	Wibaux-Wibaux, thin solum complex, 6 to 40 percent slopes	Shallow Loamy	383.7639	
<b>Total Shallow Clayey/Loamy</b>			<b>533.164</b>	<b>4.62265</b>
<b>Total Project Area</b>			<b>11533.7</b>	<b>100</b>

Table 3.2 is based on a project boundary that is an arbitrary area outlining; access roads, well pads, and utilities. Only 15.51 acres, of the soils and ecological sites listed in Table 3.1, will be disturbed. The soils and ecological sites that will be disturbed, from construction activities, are primarily Loamy.

The primary soil limitations in the project area are depth to bedrock, low organic matter content, low water holding capacity, and high water/water erosion potential.

### 3.3. Water Resources

WDEQ regulates Wyoming’s water quality with EPA oversight. The Wyoming State Engineer’s Office

(WSEO) has authority for regulating water rights issues and permitting impoundments for the containment of the State's surface waters. The WOGCC has authority for permitting and bonding off channel pits located over state and fee minerals.

### **3.3.1. Groundwater**

The areas historical use of groundwater was for stock or domestic water. There are 83 oil and gas wells, 2 water injection wells (WIW), and 2 water supply wells within 4 miles of the project area. A search of the WSEO Ground Water Rights Database showed 8 registered stock and domestic water wells within 1 mile of the proposed well(s) with depths from 60 to 585 feet. Refer to the PRB FEIS for additional information on groundwater, pp. 3-1 to 3-36.

The Fox Hills, the deepest penetrated fresh water zone in the PRB lies well above the target formation. Adherence to the drilling COAs, the setting of casing at appropriate depths, following safe remedial procedures in the event of casing failure, and using proper cementing procedures should protect any fresh water aquifers above the target zone. The depth of the Fox Hills formation at the proposed well locations ranges from 4,866 feet to 5,003 feet respectively.

### **3.3.2. Surface Water**

The project area is in the Coal Creek drainage which is a tributary to the Belle Fourche River. Most of the area drainages are ephemeral (flowing only in response to a precipitation event or snow melt) to intermittent (flowing only at certain times of the year when it receives water from alluvial groundwater, springs, or other surface source – PRB FEIS, Glossary). The channels are primarily well vegetated grassy swales, without defined bed and bank. See the PRB FEIS for a surface water quality discussion, pp. 3-48 to 3-49.

### **3.4. Invasive or Noxious Species**

The BLM's weed database showed the presence of dalmation toadflax and skeleton leaf bursage in areas around this project. No state-listed noxious weeds and/or invasive/exotic plant infestations were observed during BLM onsite inspection investigation, or by the operator. Cheatgrass (*Bromus tectorum*) and to a lesser extent, Japanese brome (*B. japonicus*) exist in the affected environment. These species are found in high densities and numerous locations throughout NE Wyoming. Balch (2013) linked the proliferation of cheatgrass in semi-arid environments to the increased frequency and severity of wildfire.

### **3.5. Fish and Wildlife**

The PRB FEIS identified wildlife species occurring in the PRB, pp. 3-113 to 3-206. The BLM wildlife biologist consulted databases compiled and managed by BLM BFO wildlife staff, the PRB FEIS, WY Game and Fish Department (WGFD) datasets, and the Wyoming Natural Diversity Database (WYNDD) to evaluate the affected environment for wildlife species that may occur in the area. The BLM wildlife biologist made a field visit to the project area on February 24, 2015. Site specific information is described below for known species suspected to occur and become impacted beyond the analysis of the PRD EIS 2003. Rationale for species not discussed in detail below can be referenced in the administrative record (Table 4.1 Summary of Threatened and Endangered Species Habitat and Project Effects Summary of Sensitive Species Habitat).

Land uses and other disturbances occurring within the proposed project area include, coal mining, livestock grazing, ranching operations, overhead power lines, conventional oil and gas, and improved and unimproved roads. Habitats within the proposal are comprised of grassland and agriculture. The dominant vegetation is needle and thread, prairie junegrass, prickly pear and annual forbs.

### 3.5.1. Migratory Birds

The PRB FEIS discussed the affected environment for migratory birds, pp. 3-150 to 3-153. A wide variety of migratory birds may occur in the proposal area at some point during the year. Migratory birds are birds that migrate for breeding and foraging at some point in the year. The BLM-Fish and Wildlife Service (FWS) Memorandum of Understanding (MOU) (2010) promotes the conservation of migratory birds, complying with Executive Order 13186 (Federal Register V. 66, No. 11). BLM must include migratory birds in every NEPA analysis of actions that have potential to affect migratory bird species of concern to fulfill obligations under the Migratory Bird Treaty Act (MBTA). The MBTA (and Bald and Golden Eagle Protection Act) are strict liability statutes so require no intent to harm migratory birds through prosecuting a taking. Recent prosecutions or settlements in Wyoming, and the west, cost companies millions of dollars in fines and restitution (which was usually retrofitting power lines to discourage perching to minimize electrocution or shielding ponds holding toxic substances). BLM encourages voluntary design features and conservation measures supporting migratory bird conservation, in addition to appropriate restrictions.

Habitats occurring near the proposed well locations include agriculture and grass prairie. Nationally, grassland and shrubland birds declined more consistently than any other ecological association of birds over the last 30 years (WGFD 2009). The FWS's Birds of Conservation Concern (BCC 2008) report identifies species of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act. Species in this list that have the potential to occur in the project area are: loggerhead shrike, short-eared owl, and grasshopper sparrow. Of these, the loggerhead shrike is a BLM WY Sensitive Species (PRB FEIS WY-070-02-065, pp 3-189).

### 3.5.2. Raptors

Resolute did not provide BLM with a wildlife survey and the area is not within any CBNG POD that would have been surveyed for raptors. The area has had raptor surveys for coal mining and is within the Wright Area Coal Lease Application study area. According to the Final Environmental Impact Statement for the Wright Area Coal Applications (BLM 2010), there is one ferruginous hawk nest in the POD area approximately 0.36 miles to the south of the 1-14/11-41 location. During the 2/24/2015 field visit the BLM biologist noted that the terrain offered suitable habitat for ferruginous hawk nesting and foraging but there is a high degree of existing disturbance in the area in the form of oil and gas wells, pipelines and scoria quarrying. The surrounding terrain from each proposed location was scanned with binoculars and no nests were apparent. The PRB FEIS discussed the affected environment for raptors present in the project area in pp. 3-145-146, and for ferruginous hawk on 3-183.

### 3.6. Cultural Resources

In accordance with section 106 of the National Historic Preservation Act, BLM must consider impacts to historic properties (sites that are eligible for or listed on the National Register of Historic Places (NRHP)). For an overview of cultural resources that are generally found within BFO the reader is referred to the *Draft Cultural Class I Regional Overview, Buffalo Field Office* (BLM, 2010). A Class III (intensive) cultural resource inventory (BFO project no. 70150015) was performed in order to locate specific historic properties which may be impacted by the proposed project. A previously accepted Class III inventory (#70010124) covered the remainder of the proposed project area. The following resources are located in or near the proposed project area.

#### Cultural Resources Located In or Near the Project Area

Site Number	Site Type	NRHP Eligibility
48CA3858	Historic	NE

## 4. ENVIRONMENTAL EFFECTS

**No Action Alternative.** BLM analyzed the no action alternative as Alternative 3 in the PRB FEIS. The project area has approximately 15.51 acres of surface disturbance from existing roads, well pads, and oil and gas facilities. Under the no action alternative, on-going well field operations would continue as would the development of single and multi-well pads. The production and the drilling and completion of these new wells would result in noise and human presence that could affect resources in the project area; these effects could include the disruption of wildlife, the dispersal of noxious and invasive weed species, and dust effects from traffic on unpaved roads. Present fluid mineral development in the PRB is under half of that envisioned and analyzed in the PRB FEIS. There is only a remote potential for effects above those identified in the PRB FEIS as a result of implementing the no action alternative.

### **Alternative B, Proposed Action (Proposal)**

#### **4.1. Air Quality**

In the project area, air quality impacts would occur during construction (due to surface disturbance by earth-moving equipment, vehicle traffic fugitive dust, well testing, as well as drilling rig and vehicle engine exhaust) and production (including well production equipment, booster and pipeline compression engine exhaust). The amount of air pollutant emissions during construction would be controlled by watering disturbed soils, and by air pollutant emission limitations imposed by applicable air quality regulatory agencies. BLM incorporates by reference the analysis found in the August 2012 High Plains District Oil and Gas Lease Sale EA, WY-070-EA12-44, pp. 45-51 (air quality, greenhouse gas emissions, and visibility). Air quality impacts modeled in the PRB FEIS and Cumulative Air Quality Effects (2009) concluded that PRB projected fluid and solid development would not violate state, tribal, or federal air quality standards and this project is well within the projected development parameters. Adgate, et al.(2014) advanced a hypothesis that air and water quality effects from HF may negatively impact human health but concluded that “major uncertainties” and a “paucity of baseline data” after drilling 153,260 wells since 2004. They called for more research funding.

#### **4.2. Soils, Ecological Sites, and Vegetation**

##### **4.2.1. Direct and Indirect Effects**

The PRB FEIS discusses direct and indirect effects to ecological sites and vegetation (p. 4-153 to 4-164) and soils associated with fluid mineral development (p. 4-134 to 149). The proposed action would impact the existing plant communities, species richness, diversity, and structure that occur on the site and the transition between the communities. Direct effects to ecological sites would occur from ground disturbance caused by construction practices. Short term effects would occur where vegetated areas are disturbed but later reclaimed within 1 to 3 years of initial disturbance. Long-term effects would occur where well pads, roads, and other semi-permanent facilities, resulting in loss of vegetation and prevent reclamation for the life of the project. Other impacts include a reduction in the utility of interim reclaimed areas because of reduced species and landscape diversity on reclaimed sites, increased soil erosion, and habitat loss for wildlife and livestock.

The proposed action would impact the common plant communities that occur on the site and the transition between the communities. Anticipated impacts to soils and vegetation from well pad, road, and utility construction include:

- Soil rutting and mixing, compaction, increased erosion potential, and loss of soil productivity.
- Construction activities mix the soil profiles with a corresponding loss of soil structure. Mixing may result in removal, dilution, or relocation of organic matter and nutrients to depths where it would be unavailable for vegetative use. Less desirable inorganic compounds such as carbonates, salts, or weathered materials could be relocated and have a negative impact on re-vegetation.
- Construction will result in slopes of 1 ½:1 to 3:1. The operator has not committed to a specific plan for stabilization and interim reclamation.

- Soils compaction results from the construction of wells and associated facilities, continued vehicle and foot traffic as well as operational activities. Factors affecting compaction include soil texture, moisture, organic matter, clay content and type, pressure exerted, and the number of passes by vehicle traffic or machinery. Compaction leads to a loss of soil structure; decreased infiltration, permeability, and soil aeration; as well as increased runoff and erosion.
- Increased erosion can lead to a decrease in soil fertility and an increase in sedimentation. The duration and intensity of these impacts would vary according to the type of construction activity to be completed and the inherent characteristics of the soils to be impacted.
- The potential for erosion would increase through the loss of vegetation cover and soil structure as compared to an undisturbed state. Soil productivity would decrease, primarily as a result of profile mixing and compaction along with the loss in vegetative cover. These impacts would begin immediately as the soils would be subjected to grading and construction activities and impacts would continue for the term of operations. The impacts on soils would move to a steady state as construction activities were completed and well production/maintenance operations begin.
- Loss of soil vegetation cover, biologic crusts, organic matter and productivity. With expedient reclamation, productivity and stability should be regained in the shortest time frame.

The BLM will evaluate reclamation success using the BLM State Wide Reclamation Policy found at: <http://www.blm.gov/wy/st/en/programs/reclamation>, incorporated here by reference.

#### **4.2.2. Cumulative Effects**

For details on expected cumulative impacts, refer to the PRB FEIS, pp. 4-151. The PRB FEIS defines the designation of the duration of disturbance (pp. 4-1 and 4-151). Most soil disturbances would be short term impacts with expedient interim reclamation and site stabilization. These impacts, singly or in combination, could increase the potential for valuable soil loss due to increased water and wind erosion, invasive/noxious/poisonous plant spread, invasion and establishment, and increased sedimentation and salt loads to the watershed system, if applicable mitigation measures are not used. The PRB FEIS discusses the cumulative effects to ecological sites (pp. 4-153 to 4-172). Cumulative effects to ecological sites include the further alteration of disturbance regimes from the increased disturbance, increase in noxious weeds, and alterations in vegetation community's diversity and cover.

#### **4.2.3. Mitigation Measures**

The following site specific COAs will be added as mitigation.

1. The entire access road must be fully built (including all water control structures such as wing ditches, culverts, relief ditches, turnouts, surfacing, etc.) and functional to BLM standards prior mobilizing the drilling equipment to the well location.
2. Re-contouring and interim reclamation will be initiated as soon as is practicable but not more than 6 months from the date of the well completion incorporating stored soil material into that portion of the well pad not needed for well production; exception(s) may be granted with sufficient justification.
3. Soil compaction will be remediated on all compacted surfaces and prior to the redistribution of topsoil on disturbed surfaces to the depth of compaction by methods that prevent mixing of the soil horizons. BLM's recommended methods are subsoiling, paraplowing, or ripping with a winged shank. Scarification is acceptable on areas identified as very shallow or shallow soils.
4. A 30 day stabilization requirement from initial disturbance is applied to all wells and access/pipelines for the entire project. Stabilization BMPs include, but are not limited to; straw waddles, rock check dams, surface roughening, ditch and berms, erosion matting/blankets, seeding and mulching, and spraying tackifier on cut/fill slopes and topsoil/spoil piles.
5. If the well is a producer, the location shall be put into interim reclamation as soon as possible after completing well. Resolute shall locate the facilities in a way that will facilitate maximum interim reclamation; all areas not needed for production shall be put into interim reclamation.

#### **4.2.4. Residual Effects**

The PRB FEIS identified residual effects (p. 4-408). Residual effects across the project area would include a long-term loss of soil productivity associated with well pad and roads and a loss of vegetative cover, despite expedient reclamation, for several years until reclamation is successfully established. The alteration of biodiversity of ecological sites could result from disturbance, alterations in vegetation in reclaimed areas, and the spread and establishment of weed species. Due to the presence of erosive soils and the topography of the project area erosion will occur. Rilling and gullying of cut and fill slopes on, access/utility corridors, will take place. Impacts from livestock to stabilized cut and fill slopes will limit soils becoming stable and getting vegetation establish.

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. This practice results in less surface disturbance and overall environmental impacts. See Section 2.2 for a summary of the disturbance. All disturbances associated with the proposed action are long term. With the reclamation status of the project area being rated as fair and field observations showing areas of reclamation success expedient reclamation of disturbed land with stockpiled topsoil, proper seedbed preparation techniques, and appropriate seed mixes, along with utilization of erosion control measures (e.g., waterbars, water wings, culverts, rip-rap, etc.) would ensure land productivity/stability is regained and maximized. The BLM considers these residual effects from Alternative B with the proposed wells are within the parameters for acceptable surface disturbance and surface disturbance reclamation in PRB FEIS ROD and Onshore Oil and Gas Order Number 1.

### **4.3. Water Resources**

#### **4.3.1. Groundwater**

##### **4.3.1.1. Direct and Indirect Effects**

Resolute's drilling program provides protection for the Fox Hills formation. The casing design and cement program includes centralizers on every joint of casing through the Fox Hills to facilitate adequate cement covering. The volume of cement pumped is calculated to provide cement across the Fox Hills from at a minimum, 100 feet above to 100 feet below the aquifer. Adherence to the drilling COAs, the setting of casing at appropriate depths, following safe remedial procedures in the event of casing failure, and using proper cementing procedures should protect fresh water aquifers above the drilling target zone. The operator will set surface casing at a depth of 1,700 feet to provide additional protection for shallow groundwater aquifers and coal zones. Compliance with the drilling and completion plans and Onshore Oil and Gas Orders Nos. 2 and 7 minimize an adverse impact on ground water. The volume of water produced by this federal mineral development is unknown at the time of permitting.

##### **4.3.1.2. Cumulative Effects**

Resolute will have to produce the wells for a time to be able to estimate the volume and quantity of water production. To comply with Onshore Order Oil and Gas Order No. 7, Disposal of Produced Water, Resolute will submit a Sundry to the BLM within 90 days of first production which includes a representative water analysis and the final proposal for water management. The quality of water produced in association with conventional oil and gas historically was such that surface discharge would not be possible without treatment. Initial water production is quite low in most cases. There are 3 common alternatives for water management: re-injection, deep disposal, or disposal into pits. All alternatives would be protective of groundwater resources when performed in compliance with state and federal regulations.

##### **4.3.1.3. Mitigation Measures**

Adherence to the Turner POD Drilling Plans, standard drilling COAs, the setting of casing at appropriate depths, following safe remedial procedures in the event of casing failure, and using proper cementing procedures should protect any fresh water aquifers above the target coal zone. Adherence to WDEQ

permits and regulations will also mitigate impacts from produced water. This will ensure that groundwater will not be adversely impacted by well drilling and completion operations.

#### **4.3.1.4. Residual Effects**

Conformance with the identified mitigation measures will ensure that ground water will not be adversely impacted by well drilling and completion operations. No residual effects are anticipated.

### **4.3.2. Surface Water**

#### **4.3.2.1. Direct and Indirect Effects**

Potential effects to surface water resources may include: (1) changes in surface water quality and suitability to meet designated uses; (2) changes in the quantity and distribution of surface flows; (3) erosion and degradation of the drainage network; and (4) increased sedimentation.

#### **4.3.2.2. Cumulative Effects**

Refer to the PRB FEIS, p. 4-115 to 4-122 and Table 4-13 for cumulative effects relative to the watershed and p. 117 for cumulative effects common to all sub-watersheds. The designation of the duration of disturbance is defined in the PRB FEIS (pp. 4-1 and 4-151). Most soil disturbances would be short term impacts with expedient interim reclamation and site stabilization.

#### **4.3.2.3. Mitigation Measures**

A WYPDES permit for construction activities would address potential surface water impacts from storm water runoff. The wells will be incorporated into Resolute's stormwater pollution prevention plan (SWPPP) associated with large construction activities as required by WDEQ. Also, refer to the SUPs for operator committed BMPs for the project areas.

#### **4.3.2.4. Residual Effects**

Turbidity and sediment loading in the streams would possibly increase due to erosion of project disturbed areas and sediment transport to the associated drainages due to storm water runoff. These impacts are mitigated by expediently stabilizing the disturbance and reducing the sediment reaching the streams.

### **4.4. Invasive Species**

#### **4.4.1. Direct and Indirect Effects**

Surface disturbance associated with construction of proposed access roads, pipelines, and related facilities would present opportunities for weed invasion and spread. The activities related to the performance of the proposed project would create a favorable environment for the establishment and spread of noxious weeds/invasive plants such as salt cedar, Canada thistle, and perennial pepperweed. Gelbhard, 2003 and Duniway 2010, showed that surface disturbances increase the proliferation of invasive or noxious species out to 0.5 miles or more from the disturbance while correspondingly compromising native communities in the same footprint. However, applicant committed measures will reduce potential impacts from noxious weeds and invasive plants. The operator committed to the control of noxious weeds and species of concern using the following measures identified in their Integrated Pest Management Plan (IPMP): 1) Cultural; 2) Physical; 3) Biological; and 4) Chemical control methods. See the IPMP for a detailed description of control methods.

#### **4.4.2. Cumulative Effects**

Cumulative effects resulting from invasive species are discussed in the PRB FEIS, p. 4-171.

#### **4.4.3. Mitigation Measures**

The proponents operated committed measures and design features are sufficient to not warrant the application of site specific conditions of approval (COAs).

#### **4.4.4. Residual Effects**

Cheatgrass (*Bromus tectorum*) and to a lesser extent, Japanese brome (*B. japonicus*) exist in the affected environment. Required control efforts by the Operator would be limited to the surface disturbance associated with the construction and operation of the project. Cheatgrass and other weed species that are present within non-physically disturbed areas of the project area are anticipated to continue to spread unless control efforts are expanded. Efforts are being made by BLM, USDA, WGFD and other partners to treat infestations beyond physically disturbed areas.

#### **4.5. Fish and Wildlife**

##### **4.5.1. Greater Sage-Grouse**

Effects (Direct and indirect, Cumulative, Mitigation, and Residual) to GSG from surface disturbing and disruptive activities associated with development of horizontal oil wells were analyzed in the Lance Oil and Gas Sahara POD EA, WY-070-EA13-72, 2013, Section 4.6.4.1, pp. 34-37, incorporated here by reference. Activities associated with development of this project are anticipated to have minimal impact to GSG as their habitat is not present.

##### **4.5.2. Migratory Birds**

###### **4.5.2.1. Direct and Indirect Effects**

The PRB FEIS discussed direct and indirect effects to migratory birds on pp. 4-231 to 4-235. Construction of the well pad and associated infrastructure will cause fragmentation of grassland and result in the direct loss of an estimated 15.51 acres of migratory bird habitat. BLM analyzed the effects to migratory birds from surface disturbing and disruptive activities associated with development of horizontal oil wells in the Sahara POD EA, WY-070-EA13-72, 2013, Section 4.6.2.2, pp. 31-33, incorporated here by reference. Effects and mitigation associated with this project are similar in nature, but will not affect sagebrush obligate BLM sensitive species.

Heater treaters, and similar facilities with vertical open-topped stacks or pipes, can attract birds. Facilities without exclusionary devices pose a mortality risk. Once birds crawl into the stack, escape is difficult and the bird may become trapped (U.S. v. Apollo Energies Inc., 611 F.3d 679 (10th Cir. 2010); see also Colorado Oil and Gas Commission, Migratory Bird Policy, accessed February 13, 2012). To minimize these effects, the operator will equip all open-top pits, tanks, and pipes containing hydrocarbons with nets, screens, or other avian exclusion devices to prevent injury or death to migratory birds.

###### **4.5.2.2. Cumulative Effects**

The cumulative effects associated with alternative B are within the analysis parameters and impacts described in the PRB FEIS, p. 4-235.

###### **4.5.2.3. Mitigation Measures**

No mitigation beyond the exclusion devices above are necessary for this project.

###### **4.5.2.4. Residual Effects**

No residual impacts are expected.

##### **4.5.3. Raptors**

###### **4.5.3.1. Direct and Indirect Effects**

The PRB FEIS discussed impacts to raptors, pp.4-216 – 4 -220, and ferruginous hawks on p. 4-262. All raptors using nests in the vicinity of the project will likely be impacted to some extent by the human disturbance associated with operation and maintenance. The presence of human activity may preclude nesting and reduce raptor foraging in the area.

#### **4.5.3.2. Cumulative Effects**

The cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS, Volume 2, Chapter 4, p. 4-221. Existing and reasonably foreseeable conventional oil development in the PBR would affect raptor populations due to increased human activity and fragmentation of foraging habitat.

#### **4.5.3.3. Mitigation Measures**

BLM will apply timing restrictions on the 1-14/11-41 and 1-34/12-21 locations during the nesting season (February 1 – July 31) unless a survey indicates that no raptors are actively nesting.

#### **4.5.3.4. Residual Impacts**

Even with a timing limitation, ferruginous hawks may abandon nests due to alterations in foraging habitats associated with development or because of sensitivity to well or infrastructure placement. Even with timing limitations on surface-disturbing activities, ferruginous hawks may be displaced by other development activities. Traffic and construction activities that are not prohibited by the timing limitations may degrade habitat quality sufficiently to render the area unsuitable for some ferruginous hawks. Timing limitations do nothing to mitigate habitat loss, therefore drilling and construction that takes place outside of nesting season will still result in net habitat loss for this species. The timing limitation would result in some decrease in direct mortalities that would occur with increased drilling/production traffic during the breeding season. Mortalities associated with maintenance and non-surface-disturbing activities will still occur. Collisions with or electrocutions from power lines will still occur. Harassment or displacement of nesting individuals will still occur during the production and abandonment phases of the project.

### **4.6. Cultural Resources**

#### **4.6.1. Direct and Indirect Effects**

BLM policy states that a decision maker's first choice should be avoidance of historic properties (BLM Manual 8140.06(C)). If historic properties cannot be avoided, mitigation measures must be applied to resolve the adverse effect. Non eligible site 48CA3858 will be impacted by the proposed project. No historic properties will be impacted by the proposed project. Following the State Protocol Between the *Wyoming Bureau of Land Management State Director and The Wyoming State Historic Preservation Officer*, Section V(E)(iv) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 03/02/2015 that no historic properties exist within the area of potential effect (APE). If any cultural values (sites, features or artifacts) are observed during operation, they will be left intact and the Buffalo Field Manager notified. If human remains are noted, the procedures described in Appendix L of the PRB FEIS must be followed. Further discovery procedures are explained in Standard COA (General)(A)(1) and Appendix K of the Wyoming Protocol.

#### **4.6.2. Cumulative Effects**

Construction and development of oil and gas resources impacts cultural resources through ground disturbance, unauthorized collection, and visual intrusion of the setting of historic properties. This results in fewer archaeological resources available for study of past human life-ways, changes in human behavior through time, and interpreting the past to the public. Additionally, these impacts may compromise the aspects of integrity that make a historic property eligible for the National Register of Historic Places. Recording and archiving basic information about archaeological sites and the potential for subsurface cultural materials in the proposed project area serve to partially mitigate potential cumulative effects to cultural resources.

Fee actions constructed in support of federal actions can result in impacts to historic properties. Construction of oil and gas developments on split estate often include associated infrastructure that is not permitted through BLM. Project applicants may connect wells draining fee minerals, or previously constructed pipelines on fee surface with a federal plan of development. BLM has no authority over such

development which can impact historic properties. BLM has the authority to modify or deny approval of federal undertakings on private surface, but that authority is limited to the extent of the federal approval. Historic properties on private surface belong to the surface owner and they are not obligated to preserve or protect them. The BLM may go to great lengths to protect a site on private surface from a federal undertaking, but the same site can be legally impacted by the landowner at any time. The cumulative effect of numerous federal approvals can result in impacts to historic properties. Archeological inventories reveal the location of sites and although the BLM goes to great lengths to protect site location data, information can potentially get into the wrong hands. BLM authorizations that result in new access can inadvertently lead to impacts to sites from increased visitation by the public.

#### 4.6.3. Mitigation Measures

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

#### 4.6.4. Residual Effects

During the construction phase, there will be numerous crews working across the project area using heavy construction equipment without the presence of archaeological monitors. Due to the extent of work and the surface disturbance caused by large vehicles, it is possible that unidentified cultural resources can be damaged by construction activities. The increased human presence associated with the construction phase can also lead to unauthorized collection of artifacts or vandalism of historic properties.

### 5. CONSULTATION/COORDINATION:

#### List of Preparers (BFO unless otherwise noted)

Position/Organization	Name	Position/Organization	Name
NRS/Team Lead	Dustin Hill	Archaeologist	Seth Lambert
Supr NRS	Casey Freise	Wildlife Biologist	Don Brewer
Petroleum Engineer	William Robbie	Geologist	Warren Garrett
LIE	Sharon Soule	Supr NRS	Kathy Brus
Assistant Field Manager	Chris Durham	Assistant Field Manager	Clark Bennett
NEPA Coordinator	Thomas Bills		

### 6. References and Authorities

- Adgate, J.L., Goldstein, B.D., and McKenzie, L.M., Potential Public Health Hazards, Exposures and Health Effects from Unconventional Natural Gas Development, Environ, Sci. and Tech., Am. Chem. Soc., 2014.
- AHPIS, Animal and Plant Health Inspection Service. 2002. General information available online at <http://www.aphis.usda.gov/lpa/issues/wnv/wnv.html>.
- American Water Works Association. 2013. Water and Hydraulic Fracturing, a White Paper. [www.awwa.org/fracturing](http://www.awwa.org/fracturing). Denver, CO. 17pp.
- Balch, J.K., B.A. Bradley C.M D'Antonio, and J. Gomez-Dans. 2013. Introduced Annual Grass Increases Annual Fire Activity Across the Arid West (1980-2009). Global Change Biology. 19-1, pp. 173-183. <http://onlinelibrary.wiley.com/doi/10.1111/gcb.12046/abstract>.
- Bradley, B. A., J. F. Mustard. 2006. Characterizing the Landscape Dynamics of an Invasive Plant and Risk of Invasion Using Remote Sensing. Ecological Applications, 16(3), pp. 1132-1147.
- Chapman, S.S., Bryce, S.A., Omernik, J.M., Despain, D.G., ZumBerge, J., and Conrad, M. 2004. Ecoregions of Wyoming (color poster with map, descriptive text, summary tables, and photographs). Reston, Virginia, U.S. Geological Survey (map scale 1:1,400,000).
- Curtis, Jan and K. Grimes. 2004. Wyoming Climate Atlas. Wyoming Water Research Program, University of Wyoming; the U.S. Geological Survey; and the Wyoming Water Development Commission. 328 pp. <http://www.wrds.uwyo.edu/sco/climateatlas/toc.html>.

- Duniway, M.C. J. E. Herrick, D. A. Pyke, and D. P. Toledo. 2010. Assessing Transportation Infrastructure Impacts on Rangelands: Test of a Standard Rangeland Assessment Protocol. *Rangeland Ecol Manage* 63:524-536.
- Ebert, James I., and Timothy A. Kohler. 1988. The Theoretical Basis of Archaeological Predictive Modeling and a Consideration of Appropriate Data-Collection Methods, in *Quantifying the Present and Predicting the Past: Theory, Method, and Application of Archaeological Predictive Modeling* edited by W. James Judge and Lynne Sebastian, pp. 97-171. U.S. Department of the Interior, BLM Service Center, Denver, CO.
- Eckerle, William. 2005. Experimental: Archaeological Burial Model for Powder River and Tongue River Hydrological Basins, Wyoming. In *Adaptive Management and Planning Models for Cultural Resource in Oil and Gas Fields in New Mexico and Wyoming*, by Eric Ingbar, Lynne Sebastian, Jeffrey Altschul, Mary Hopkins, William Eckerle, Peggy Robinson, Judson Finley, Stephen A. Hall, William E. Hayden, Chris M. Rohe, Tim Seaman, Sasha Taddie, and Scott Thompson, pp. 39-102. Prepared for the Department of Energy, National Energy Technology Laboratory by Gnomon, Inc. Electronic Document, <http://www.gnomon.com/DOEPumpIII/FinalCombinedReport.pdf>, accessed August and September 2010.
- Gelbard J. L., and J. Belnap. 2003. Roads as conduits for exotic plant invasions in a semiarid landscape. *Conservation Biology*. 17:420–432.
- Goolsby, J. 2012. Evolution & Revolution of Drilling Technologies & the Impact on Wyoming. Goolsby, Finley, and Associates, LLC. Presentation.
- Ken Kreckel. 2007. Direction Drilling: The Key to Smart Growth of Oil and Gas Development in the Rocky Mountain Region. The Wilderness Society, <http://wilderness.org/files/Directional-Drilling.pdf> .
- North Dakota Industrial Commission Oil and Gas Research Program. 2011. Investigation of Methodologies to Control Dust on County Roads in Western North Dakota. Grant Applicants: Dunn and Mckenzie County.
- Pendery, Bruce M. 2010, BLM's Retained Rights: How Requiring Environmental Protection Fulfills Oil and Gas Lease Obligations, 40 *Environmental Law*, 599-685.
- Saab, V., and T. Rich. 1997. Large-scale conservation assessment for neotropical migratory landbirds in the Interior Columbia River Basin. USDA Forest Service General Technical Report PNW-GTR-399, Portland, Oregon.
- US National Academy of Sciences, 2012. Induced Seismicity Potential in Energy Technologies. Washington, D.C.
- US Department of Agriculture, 2006, Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin, Handbook 296, Washington, DC.
- US Environmental Protection Agency, 2012, Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews, 77 FR 49490.
- US Department of the Interior 2009, Bureau of Land Management, Instruction Memorandum 2009-078. Processing Oil and Gas Applications for Permit to Drill for Directional Drilling into Federal Mineral Estate from Multiple-Well Pads on Non-Federal Surface and Mineral Estate Locations.
- US Department of the Interior 2009, Bureau of Land Management, High Plains District, Update of Task 3A Report for the Powder River Basin Coal Review Cumulative Air Quality Effects for 2020, (AECOM).
- US Department of the Interior 2010 Bureau of Land Management, Final Environmental Impact Statement for the Wright Area Coal Lease Applications.
- US Department of the Interior 2011, Bureau of Land Management. State Director Review, SDR WY-2011-010.
- US Department of the Interior, Geological Survey. 2007. Organic Compounds in Produced Waters from Coalbed Natural Gas Wells in the Powder River Basin, Wyoming. *Applied Geochemistry* 22, 2240–2256.
- US Department of the Interior, Geological Survey. 2010. Assessment of Potential Effects of Water Produced from Coalbed Methane Natural Gas Development on Macroinvertebrate and Algal Communities in the Powder River and Tongue River, Wyoming and Montana.
- US Department of the Interior, Geological Survey. 2012. Hydraulic Fracturing – The State of the Science. Induced Seismicity. Leith, B. [http://www.usgs.gov/solutions/ppt/2012june08\\_leith.pptx](http://www.usgs.gov/solutions/ppt/2012june08_leith.pptx). Congressional Briefing hosted by the Honorable Gerry Connelly (D-VA). June 8, 2012. View at: <http://www.youtube.com/watch?v=XnRH9i8hpbo&feature=youtu.be> See, Earthquakes Induced by Fluid Injection. <http://www.usgs.gov/faq/index.php?sid=54684&lang=en&action=show&cat=125>
- US Department of the Interior, Geological Survey. 2012. Kresse, T.M., Warner, N.R., Hays, P.D., Down, A., Vengosh, A., and Jackson, R.B., 2012, Shallow groundwater quality and geochemistry in the Fayetteville Shale gas-production area, north-central Arkansas, 2011: Investigations Report 2012–5273, 31 p.
- US Environmental Protection Agency. 2004. Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs Study, EPA 816-R-04-003, <http://water.epa.gov/type/groundwater/uic/upload/completestudy.zip> .
- University of Wyoming, Norton, J., Strom, C., Reclamation Considerations for Oil and Gas Lease Contracts on Private Lands, Bulletin B-1242, Apr. 2013.

Warner, N.R., Jackson, R.B., Darraha, T.H., Osborn, S.G., Down, A., Zhaob, K., White, A. and Vengosha, A., 2012, Geochemical evidence for possible natural migration of Marcellus Formation brine to shallow aquifers in Pennsylvania, Proceedings Natl Acad Sciences

Wyoming Department of Environmental Quality, June 14, 2004. Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments

WGFD. 2009. Minimum Recommendations for Development of Oil and Gas Resources within Crucial and Important Wildlife Habitats on BLM Lands. WGFD. Cheyenne, WY

Wyoming Oil and Gas Conservation Commission. 2013. Well Files, <http://wogcc.state.wy.us/> .