

**U.S. Department of the Interior  
Bureau of Land Management  
Colorado River Valley Field Office  
2300 River Frontage Road  
Silt, Colorado 81652**

## **ENVIRONMENTAL ASSESSMENT**

### **NUMBER**

DOI-BLM-CO-N040-2015-0049-EA

### **CASEFILE NUMBER**

Federal Fluid Minerals Lease COC62162 (bottomholes)

### **PROJECT NAME**

Proposal to Drill Two Federal Horizontal Wells from the Existing PA 24-32 Pad Located on Fee Land Northeast of Parachute, Garfield County, Colorado.

### **PROJECT LOCATION**

Township 6 South (T6S), Range 95 West (R95W), Section 32, SESW, Sixth Principal Meridian. The project is located approximately 1.9 miles northeast of Parachute, Garfield County, Colorado, and is accessed by an existing field development road off US Highway 6 (Figure 1). Elevation of the project area is approximately 5,140 feet.

### **APPLICANT**

WPX Energy Rocky Mountain LLC. Contact: Reed Haddock, 1001 Seventeenth Street, Suite 1200, Denver, CO 80202.

### **ALTERNATIVES**

#### **Proposed Action**

WPX proposes to expand the existing PA 24-32 well pad from its original 0.98-acre footprint to 6.51 acres (Figure 2) to provide adequate space for drilling and producing two new Federal horizontal wells and for storing cuttings on the pad. Two new private horizontal wells would also be drilled from the pad. The expanded pad would be reconstructed sometime in 2015, with drilling planned shortly thereafter. No specific leases stipulations would apply to the project.

The PA 24-32 well pad currently supports one producing private oil and gas well drilled in 1996. The pad is located entirely on Fee land (private surface underlain by private minerals). No previous NEPA analysis was completed for the private pad and private well, since these did not involve Federal authorization. The two proposed Federal horizontal wells (732-21-32-HN1 and 732-31-32-HN1) would be drilled vertically into private minerals and enter Federal minerals on the horizontal leg of the well bore. Fresh water from approved sources would be trucked to the site to augment recycled water in well drilling to maintain proper consistency of drilling muds for well control.

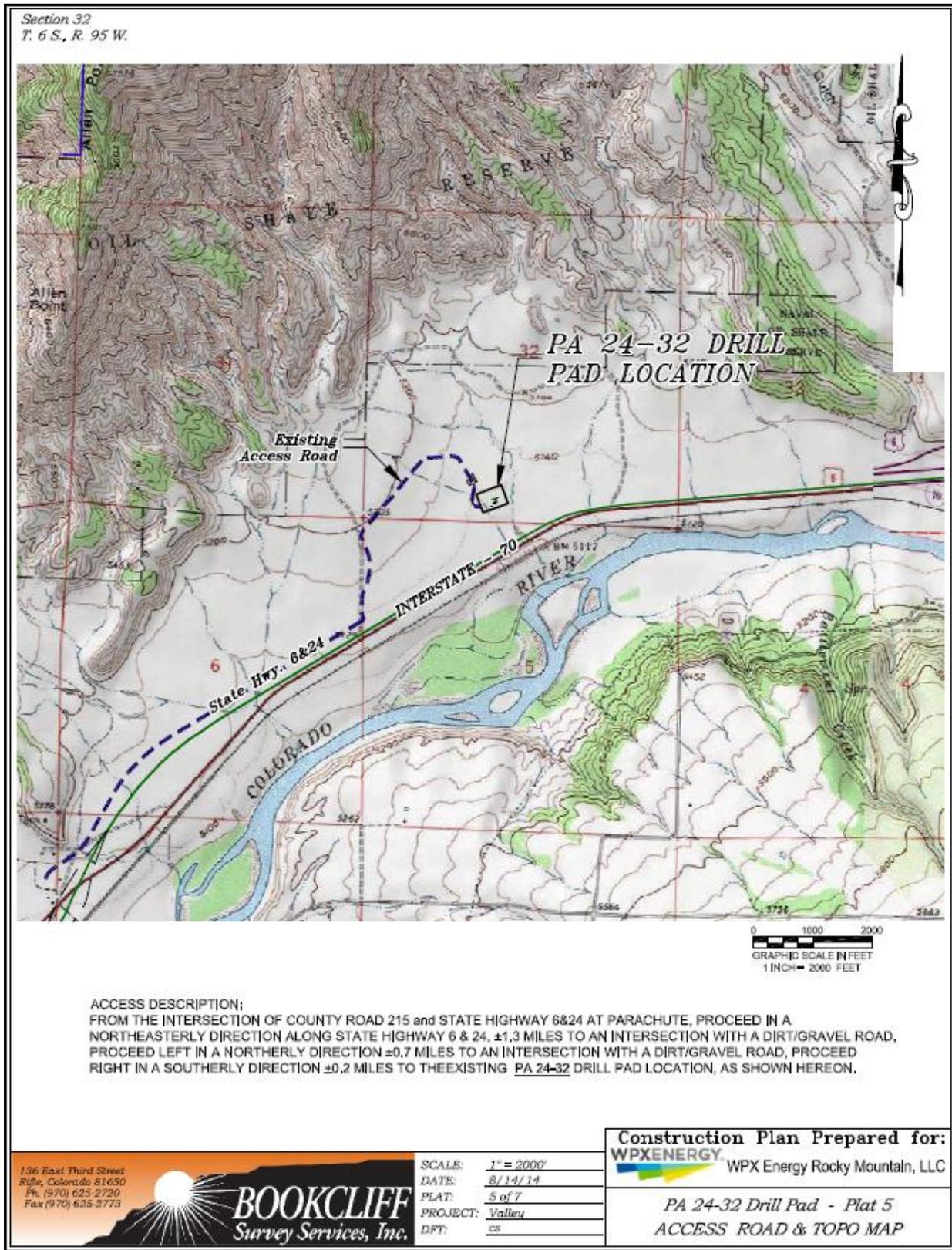


Figure 1. Project Location Map

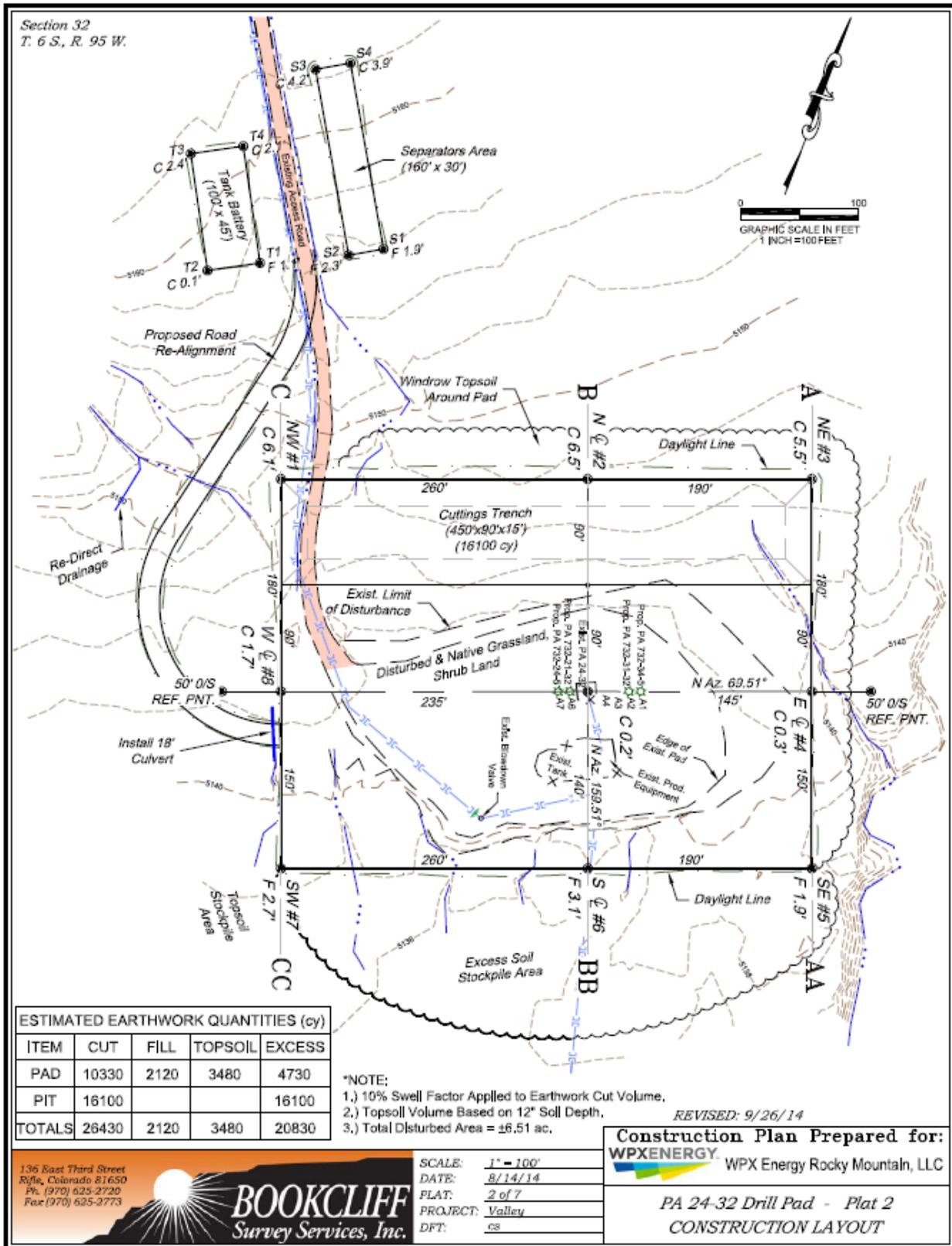


Figure 2. Construction Layout for PA 24-32 Pad.

The PA 24-32 pad expansion would occur as shown in Figure 2. Total cut would be 10,330 cubic yards and total fill would be 2,120 cubic yards. A total of 4,730 cubic yards of topsoil would be stripped during the initial earthwork and windrowed around the pad perimeter to serve as a stormwater structure. A cuttings trench would also be constructed on the north side of the pad. Excess material from this trench would be placed in a soil stockpile area south of the pad as shown in Figure 2.

A closed-loop drilling system would be used during the drilling process, eliminating the need for a fluids-containing reserve pit. Recovered drilling fluid would be stored on location in steel tanks for reuse. Water-based drill cuttings developed from drilling the intermediate string would be collected from the rig's shaker system and placed within a cuttings trench as shown on Figure 2. Synthetic-based drilling mud would be used during the drilling of the horizontal leg of each well. Those cuttings would be hauled from the pad to an approved disposal facility using a documented manifest system for the truck hauling.

Well completions would be staged on the pad after the rig finishes drilling the wells. Two 10-inch temporary surface poly-lines would run along an existing ROW north of the pad for a length of approximately 4,458 feet (Figure 3). These temporary lines would tie into existing infrastructure and supply water for completions.

The existing access road serving the PA 24-32 pad would be rerouted as shown in Figure 2. Production facilities would be staged adjacent to the access road on a production pad. Nine single separators will be placed in a 160-foot by 30-foot area on the east side of the access road. On the west side of the road, four water tanks and one condensate tank will be placed in a 100-foot by 45-foot area (Figure 2).

A variety of pipelines would be installed for the PA 24-32 project. Approximately 1,200 feet of buried 8-inch diameter welded steel gas pipeline would run from the separators, follow the access road and pad edge, then extend south along an existing 3-inch gas line and connect to the William's 16-inch gas line (Figure 3). If this can't be done, the new line would be tied into an existing WPX 8-inch diameter gas line. A new 4-inch produced water line would run along the access road approximately 500 feet from the tank pad and connect to the existing 4-inch line (Figure 3). Maximum disturbance width for all lines would be 50 feet. All new lines would follow existing lines, the pad, or the access road; therefore, no new disturbance would be generated.

Table 1 displays 7.4 total acres of disturbance associated with the PA 24-32 pad expansion and road reroute (6.51 acres attributed to the pad; 0.37 acre to the production pad and 0.52 acre to the access road). All surface disturbance would occur on private property. After interim reclamation, the total disturbance will decrease. The pad will be reclaimed to a 1.12 acre footprint. Additional long-term disturbance acres are displayed in Table 1.

<i>Surface Disturbance</i>	<i>Private</i>		<i>BLM</i>		<i>Total</i>	
	<i>Initial</i>	<i>Long-Term</i>	<i>Initial</i>	<i>Long-Term</i>	<i>Initial</i>	<i>Long-Term</i>
PA 24-32 Pad	6.51 <sup>1</sup>	1.12	0.00	0.00	6.51 <sup>1</sup>	1.12
PA 24-32 Production Pad	0.37 <sup>2</sup>	0.37	0.00	0.00	0.37	0.37
PA 24-32 Access Road	0.52 <sup>3</sup>	0.52	0.00	0.00	0.52	0.52

<sup>1</sup>6.51 acres includes 4.85 acres of new disturbance, 0.98 acre of existing disturbance, and 0.68 acre of redisturbance within the original pad footprint.  
<sup>2</sup>0.37 acre is all new disturbance.  
<sup>3</sup>0.52 acre includes 0.23 acre of new disturbance and 0.29 acre of existing disturbance.

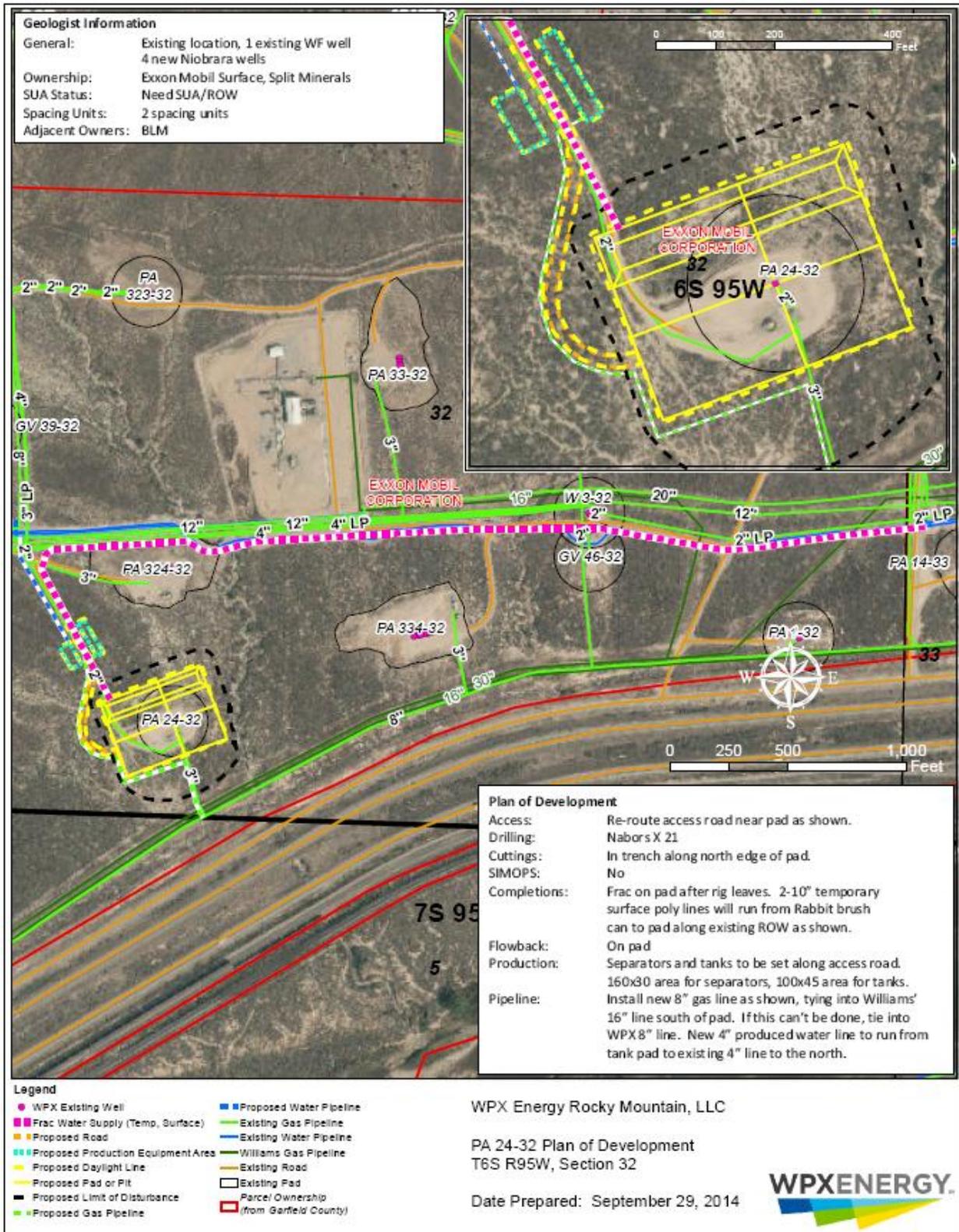


Figure 3. Plan of Development for PA 24-32

Installation of the proposed 8-inch gas line would generate 1.38 acres of disturbance and the proposed 4-inch produced water line would generate 0.57 acre. However, as previously discussed, none of this would be new disturbance.

Construction of the pad and pipeline spur would follow the guidelines established in the BLM Gold Book, *Surface Operating Standards for Oil and Gas Exploration and Development* (USDI and USDA 2007). The existing pad access road would be graveled prior to drilling to ensure all-weather accessibility to the pad site. A road maintenance program would be required during the production phase of the well. This program would include, but not be limited to blading, ditching, culvert installation and cleanout, weed control, and gravel surfacing where excessive rutting or erosion may occur. Roads would be maintained in a safe and usable condition.

The Proposed Action would be implemented consistent with the Federal oil and gas lease, Federal regulations (43 CFR 3100), and the operational measures included in the Applications for Permit to Drill (APDs). Appendix A lists the specific Surface Use Conditions of Approval (COAs) to be implemented as mitigation measures for this project. The operator would be responsible for continuous inspection and maintenance of the access roads, pads, and pipelines.

### **No Action Alternative**

The No Action Alternative would constitute denial of the Federal APDs described in the Proposed Action, meaning that the two proposed Federal horizontal wells would not be drilled or developed. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells.

### **PURPOSE AND NEED FOR THE ACTION**

The purpose of the Proposed Action is to develop oil and gas resources on Federal lease COC62162 consistent with existing Federal lease rights. The action is needed to increase the development of oil and gas resources for commercial marketing to the public.

### **SUMMARY OF LEASE STIPULATIONS**

The Federal wells would be horizontally drilled from the existing pad located on private surface with underlying fee mineral estate. Because the Federal wells are accessing the nearby Federal lease from a private surface/private mineral location, the Federal lease terms are not applicable to the construction, drilling, or completion operations on the pad.

### **PLAN CONFORMANCE REVIEW**

The Proposed Action and No Action Alternative are subject to and have been reviewed for conformance with the following plan (43 CFR 1610.5, BLM 1617.3):

Name of Plan: The current land use plan is the *Glenwood Springs Resource Management Plan* (RMP), approved in 1984 and revised in 1988 (BLM 1984). Relevant amendments include the *Oil and Gas Plan Amendment to the Glenwood Springs Resource Management Plan* (BLM 1991) and the *Oil & Gas Leasing & Development Record of Decision and Resource Management Plan Amendment* (BLM 1999a).

**Decision Language:** The 1991 Oil and Gas Plan Amendment (BLM 1991) included the following at page 3: “697,720 acres of BLM-administered mineral estate within the Glenwood Springs Resource Area are open to oil and gas leasing and development, subject to lease terms and (as applicable) lease stipulations” (BLM 1991, page 3). This decision was carried forward unchanged in the 1999 ROD and RMP amendment at page 15 (BLM 1999b): “In areas being actively developed, the operator must submit a Geographic Area Proposal (GAP) [currently referred to as a Master Development Plan, MDP] that describes a minimum of 2 to 3 years of activity for operator controlled leases within a reasonable geographic area.”

**Discussion:** The Proposed Action is in conformance with the 1991 and 1999 RMP amendments cited above because the Federal mineral estate proposed for development is open to oil and gas leasing and development, and Federal oil and gas lease COC24099 was duly leased pursuant thereto. The current project meets GAP exception criteria in the 1999 RMP Amendments based on its relatively small size, use of an existing well pad, and its location along existing access roads and pipeline corridors. Therefore, the Proposed Action is in conformance with the current land use plan.

### **AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES**

During its internal scoping process for this Environmental Assessment (EA), pursuant to the National Environmental Policy Act (NEPA), BLM resource specialists identified the following elements of the natural and human environment as present in the project vicinity and potentially affected by the project:

Access and Transportation	Native American Religious	Vegetation
Air Quality	Concerns	Visual Resources
Cultural Resources	Noise	Wastes, Hazardous and Solid
Fossil Resources	Socioeconomics	Water Quality, Surface and Ground
Geology and Minerals	Soils	Wildlife
Invasive Non-Native Plants	Special Status Species	

#### **Access and Transportation**

##### **Affected Environment**

The project is located approximately 1.9 miles northeast of Parachute, Garfield County, Colorado, and is accessed by an existing field development road off US Highway 6 (Figure 1).

##### **Environmental Consequences**

###### *Proposed Action*

The existing road accessing the project area would be used to meet the transportation needs of the Proposed Action. A slight reroute of this access road would occur as shown and discussed in the Proposed Action. Some road resurfacing could be needed depending on the scheduled drilling season. The Proposed Action would result in a substantial increase in truck traffic related to the development of the proposed Federal wells. The largest traffic increase would be during rig-up, drilling, and completion activities.

As shown in Table 2, data for traffic supporting drilling and completion operations have been increased by a factor of three (3X) when compared to a typical directional well to reflect the extended time it takes to drill an exploratory horizontal well. Thus, the overall traffic count for each well included in the

Proposed Action would be estimated at 3,480 vehicles instead of the 1,160 vehicles typically associated with the drilling and completion of a directional well (Table 2).

Once each well is producing, traffic would dramatically decrease to occasional visits in pickups for monitoring or maintenance activities. Produced water generated during the life of each well would be initially stored at the tank facilities staged on the pad and then transferred via piping to WPXs water pipeline systems that delivers water to their water recycling facilities. The volume of condensate collected in a tank would require periodic truck visits to remove the oil from the tanks. The well may have to be recompleted once per year, requiring three to five truck trips per day for approximately 7 days.

Degradation of field development roads may occur due to heavy equipment travel and fugitive dust and noise would be created. Mitigation measures (see Appendix A) would be required as Conditions of Approval (COAs) to ensure adequate dust abatement and road maintenance occur.

<b>Table 2. Traffic Associated with Drilling and Completion Activities</b>		
<i>Vehicle Class</i>	<i>Trips per Well</i>	<i>Portion of Total</i>
18-wheel tractor trailers	264	7.65 %
10-wheel trucks	648	18.6 %
6-wheel trucks	1,356	39.0 %
Pickup trucks	1,212	34.8 %
<b>Total</b>	<b>3,480</b>	<b>100.0%</b>
Initial source for traffic associated with directional well drilling and completion operations: BLM 2006. Note: With the exploratory nature of drilling and completing horizontal wells, accurate traffic analysis has not yet been developed. To better reflect the traffic supporting the longer wellbores and operational drilling and completion periods for such wells, the typical traffic counts associated with a directional well have been increased by a factor of 3 for this analysis.		

### *No Action Alternative*

The No Action Alternative would constitute denial of the Federal APDs described in the Proposed Action, meaning that the two proposed Federal horizontal wells would not be drilled or developed. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would increase with the development of the two fee horizontal wells. Therefore, impacts on access and transportation would be projected to increase under the No Action Alternative.

### **Air Quality**

#### Affected Environment

Colorado Ambient Air Quality Standards (CAAQS) and National Ambient Air Quality Standards (NAAQS) are health-based criteria for the maximum acceptable concentrations of air pollutants in areas of public use. Although specific air quality monitoring has not been conducted within the project area, regional air quality monitoring has been conducted in Rifle and elsewhere in Garfield County. Air pollutants measured in the region for which ambient air quality standards exist include carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter less than 10 microns (µ) in diameter (PM<sub>10</sub>), and particulate matter less than 2.5 µ in diameter (PM<sub>2.5</sub>).

The project area lies within Garfield County, which has been described as an attainment area under CAAQS and NAAQS. An attainment area is an area where ambient air pollution quantities are below (i.e., better than) NAAQS standards. Regional background values are well below established standards, and all areas within the cumulative study area are designated as attainment for all criteria pollutants. The Garfield County Quarterly Monitoring Report summarizing data collected at monitoring sites in Parachute, Silt, Battlement Mesa, and Rifle in January through June 2012 (the most recent posting) confirms continuing attainment of the CAAQS and NAAQS (Garfield County 2012). Federal air quality regulations are enforced by the Colorado Department of Public Health and Environment (CDPHE).

Federal air quality regulations adopted and enforced by CDPHE through the Clean Air Act (CAA) Prevention of Significant Deterioration (PSD) Program limit incremental emissions increases of air pollutants from certain sources to specific levels defined by the classification of air quality in an area. Incremental increases in PSD Class I areas are strictly limited, while increases allowed in Class II areas are less strict.

The project area and surrounding areas are classified as PSD Class II, as is Dinosaur National Monument, located approximately 180 miles to the northwest. PSD Class I areas located within 100 miles of the project area are Flat Tops Wilderness (approximately 25 miles north), Maroon Bells – Snowmass Wilderness (approximately 35 miles south), West Elk Wilderness (approximately 60 miles southeast), Black Canyon of the Gunnison National Park (approximately 65 miles south), and Eagles Nest Wilderness (approximately 60 miles east).

### Environmental Consequences

#### *Proposed Action*

The CDPHE, under delegated authority from the U.S. Environmental Protection Agency (EPA) and in conformance with Colorado's State Implementation Plan (SIP), is the agency with primary responsibility for air quality regulation and enforcement in connection with industrial developments and other air pollution sources in Colorado. Unlike the conceptual "reasonable but conservative" engineering designs used in NEPA analyses, CDPHE air quality preconstruction permitting is based on site-specific, detailed engineering values, which are assessed in CDPHE's review of the permit application.

As discussed, the Proposed Action would involve expanding the existing PA 24-32 pad, drilling two Federal horizontal wells, drilling two Fee wells, and completing and operating each of these new wells. The existing access road would be slightly rerouted and a variety of new pipelines would be installed. The entire Proposed Action would occur on private land.

Each horizontal well would require approximately 60 days to drill and 30 days to complete. Air quality in the project area would decrease during construction of access roads, pads, and pipelines and drilling and completing the wells and would be spread across the 2 year timeframe for the project. Long term air quality benefits of this project include road improvements which would decrease long term dust generation and centralized fluids collection facilities which reduce truck traffic and fugitive emissions.

Pollutants generated during construction activities would include combustion emissions and fugitive dust associated ( $PM_{10}$  and  $PM_{2.5}$ ) with earthwork and construction equipment. Once construction activities are complete, air quality impacts associated with construction would cease and impacts would transition to emissions associated with transportation of drilling and completion equipment. Fugitive dust and vehicle emissions associated with mobilization of equipment necessary for the drilling and completions phase and rigging up the drill rig would occur during the transitions between construction, drilling and completions phases.

During drilling and completions work air quality impacts would be caused by emissions from generators and engines to run equipment, onsite and offsite vehicle traffic, and escaped and flared gasses during drilling and flowback phases. Following the completion of these phases, emissions would be greatly reduced to emissions associated with long-term natural gas and condensate production.

The CRVFO analyzes air quality impacts of oil and gas development projects using results of a regional air model prepared by Tetra Tech, Inc. and its subcontractor, URS Corporation, in October 2011. The modeling addressed the cumulative impacts of incremental oil and gas development in the CRVFO by assuming a range of future Federal (BLM and USFS) and private wells and associated facilities such as compressors, storage tanks, and roads. The modeled scenarios also incorporated different levels of mitigation. The “no action” scenario assumed a total of 5,106 future Federal (BLM plus USFS) wells with mitigation sufficient to meet CDPHE and EPA regulations and emissions standards. Other scenarios included as many as 6,640 Federal wells and associated facilities in a “maximum development” scenario in combination with more stringent mitigation to meet or exceed State and Federal regulations and standards. In all scenarios analyzed, impacts to air quality are estimated to be below applicable NAAQS, CAAQS, PSD increments, and visibility and deposition thresholds.

The modeling also estimated cumulative impacts from future Federal plus private wells in the CRVFO, ranging from a total of 12,072 wells in the “no action” scenario to 15,664 wells in the “maximum development” scenario. During the modeling, estimated future emissions from wells in the CRVFO were added to background air quality levels, major stationary sources, and an additional 28,843 future Federal plus private wells outside the CRVFO but within the modeling domain. These additional wells were based on estimated numbers for three other BLM field offices in the modeling domain—White River Field Office (Meeker, Colorado), Little Snake Field Office (Craig, Colorado), and Vernal Field Office (Vernal, Utah). Methods and results of the modeling are presented in an Air Resources Technical Support Document (ARTSD) (BLM 2011), available for viewing at the CRVFO in Silt, Colorado, and on its website.

The air quality model addressed impacts associated with emissions of greenhouse gases (GHGs), “criteria pollutants” (CO, NO<sub>2</sub>, SO<sub>2</sub>, ozone, PM<sub>10</sub>, and PM<sub>2.5</sub>) and hazardous air pollutants (HAPs) including BTEX (benzene, ethylbenzene, toluene, and xylenes), formaldehyde, and n-hexane. The modeling also addressed potential impacts on visibility due to particulates and “photochemical smog” (caused by chemical reactions in the atmosphere) and on lake chemistry of selected pristine lakes due to modeled deposition rates of sulfur and resultant impacts on acid neutralizing capacity of the lake waters. The visibility analysis predicted a slight impact (1 day per year with a reduction in visibility of 1 deciview or greater) in the Flat Tops Wilderness and no days with 1 deciview or greater reduction in visibility at all other modeled Class I and II receptors. For the remaining pollutants analyzed, modeled levels of future oil and gas development within the CRVFO would have no or negligible long-term adverse impacts on air quality. Since the Proposed Action is within the scope of the future development modeled, no significant adverse impacts on air quality are anticipated.

The air quality model incorporated assumptions about various development and mitigation scenarios either integrated into WPX’s project design or to be applied by the BLM as COAs (Appendix A). These include use of directional drilling to reduce the number of well pads, flaring instead of venting of natural gas during well completions, self-contained flare units to minimize emissions to the atmosphere, and use of closed-loop drilling. Closed-loop drilling minimizes emissions by recycling drilling muds and separating fluids and drill cuttings, thus eliminating open pits containing petroleum fluids. In addition to minimizing emissions associated with drilling and completion activities, these mitigation measures would also significantly reduce fugitive dust and vehicle tailpipe emissions by greatly reducing the volume of truck traffic required to support the operations.

Generation of fugitive dust as a result of construction activities and travel on unpaved access roads would also be reduced by the BLM's requirement that the operator apply gravel to a compacted depth of 6 inches on the access road, apply water to the access road during the development phase, and apply a dust suppressant surfactant approved by the BLM throughout the long-term production phase (Appendix A). In addition, construction activities for the well pad, access road, and pipelines would occur between the hours of 7:00 a.m. and 6:00 p.m. each day, a generally more favorable period for atmospheric dispersion due to warmer temperatures and less stable air. Fugitive dust emissions from vehicular traffic during drilling and completion would be further reduced if, as planned under the Proposed Action, these activities are allowed to occur during the winter season, when roads are frozen, snow-covered, or wet.

Emissions of volatile organic compounds (VOCs) such as the BTEX constituents of condensate vary depending on the characteristics of the condensate, the volume produced, and tank operations. Operators are required to control emissions of VOCs from condensate tanks under CDPHE Regulation 7. If deemed necessary by the State, the operator may be required to install a vapor recovery or thermal destruction system to further reduce VOC concentrations.

Ongoing scientific research has identified the potential impacts of "greenhouse gases" (GHGs) and their effects on global atmospheric conditions. These GHGs include carbon dioxide, methane, nitrous oxide, water vapor, and several trace gases. Through complex interactions on a global scale, these GHG emissions are believed by many experts to cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the Earth back into space.

In 2001, the Intergovernmental Panel on Climate Change (IPCC) predicted that by the year 2100, global average surface temperatures would increase 1.4 to 5.8°C (2.5 to 10.4°F) above 1990 levels. The National Academy of Sciences (NAS) supports these predictions but has acknowledged uncertainties regarding how climate change may affect different regions. In 2007, the IPCC also concluded that "warming of the climate system is unequivocal" and "most of the observed increase in globally average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic (man-made) greenhouse gas concentrations" (NAS 2007). Other theories about the effect of GHGs on global climate change exist.

An inventory and assessment of GHG emissions from oil and gas projects in the CRVFO was included in the air quality modeling completed in October 2011. In all of the modeled development scenarios, annual GHG emissions from Federal wells in the CRVFO would be less than 0.5% of Colorado emissions from natural gas projects in 2008 and 0.0009% of U.S. emissions from natural gas projects in 2005 (USEPA 2013). The lack of scientific tools designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts of climate change on the specific area of the Proposed Action. While any oil and gas development project may contribute GHGs to the atmosphere, these contributions would not have a significant effect on a phenomenon occurring at the global scale believed by some to be due to more than a century of human activities.

Based on the information presented in this section, including results of the air quality model prepared for the BLM in October 2011, the Proposed Action is not expected to have significant adverse impacts on air quality.

#### *No Action Alternative*

The No Action Alternative would constitute denial of the Federal APDs described in the Proposed Action, meaning that the two proposed Federal horizontal wells would not be drilled or developed. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction

would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells. Therefore, air quality impacts would be projected to increase with the development of the two fee horizontal wells.

## **Cultural Resources**

### **Affected Environment**

An intensive (Class III) cultural resource inventory (CRVFO# 1114-12) was performed specifically for this project and conducted of the Area of Potential Effect (APE) around of the Proposed Action. The inventory identified no eligible sites within the project's APE. Therefore, no "historic properties" were identified as being within the area of the Proposed Action. "Historic properties" are cultural resources that are eligible or potentially eligible for inclusion on the National Register of Historic Places (NRHP). Isolated finds are by definition not eligible to the NRHP.

### **Environmental Consequences**

#### *Proposed Action*

The implementation of the Proposed Action would have no direct impacts to known "historic properties," as none has been identified in the project's APE. The APE consists of the physical extent of the proposed PA 24-32 well pad expansion and the ROW for new subsurface gas lines and surface waterlines. The entire APE was included in a 42 acre inventory block. Consequently, the BLM made a determination of "**No Historic Properties Affected.**" This determination was made in accordance with the 2001 revised regulations [36CFR 800.4(d)(1)] for Section 106 of the National Historic Preservation Act (NHPA 16U.S.C 470f), the BLM/State Historic Preservation Officer (SHPO) Programmatic Agreement (2012) and Colorado Protocol (2014)]. Cultural resource types typically found in the surrounding areas include prehistoric open camps, lithic scatters, historic ditches, historic structures, historic trash scatters/dumps and isolated prehistoric and historic finds.

Although no known eligible sites are within the areas of potential effect, indirect, long-term cumulative impacts from increased access and the presence of project personnel could result in a range of impacts to known and undiscovered cultural resources in the vicinity of the project location. These impacts could range from accidental damage or vandalism to illegal collection and excavation.

A Standard Education/Discovery COA for cultural resource protection would be attached to the APDs as a COA (Appendix A). The importance of these COAs would be stressed to the operator and their contractors, including informing them of their responsibilities to protect and report any cultural resources encountered during construction operations.

#### *No Action Alternative*

Under the No Action Alternative, development of the Federal mineral estate would not occur. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Potential impacts to unidentified cultural resources would be reduced but not entirely eliminated.

## **Fossil Resources**

### **Affected Environment**

The surface formation is comprised of alluvial gravel deposits of the Quaternary Holocene age. The predominant bedrock formation beneath the surface deposits is of the Wasatch Formation (including the Fort Union Formation or equivalent at its base) and Ohio Creek Formation. Both formations are overlain by areas of Quaternary gravels and earthflow deposits. Occurring in varying thicknesses, these Quaternary sediments are considered Potential Fossil Yield Classification Class 3, defined as having a moderate probability of fossil occurrence. Class 3 geologic units are units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential. They are often marine in origin with sporadic known occurrences of vertebrate fossils, or have scientifically significant invertebrate or plant fossils known to occur intermittently, or are poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance. Surface-disturbing activities may require field assessment to determine appropriate course of action.

The Wasatch Formation is considered BLM Condition 5 formations, defined as an area that is known to contain vertebrate fossils or noteworthy occurrences of invertebrate fossils. These types of fossils are known to occur or have been documented, but may vary in occurrence and predictability. All members of the Wasatch Formation contain vertebrate fossils in varying abundances (Murphy and Daitch 2007). Rocks of the Wasatch Formation are lithologically similar to one another throughout the Piceance Creek Basin as heterogeneous continental fluvial deposits with interfingering channel sandstone beds and overbank deposits consisting of variegated claystone, mudstone, and siltstone beds (Franczyk et al. 1990). Eocene mammals have been found in the lower part of the Shire member.

Fossils historically identified in the Wasatch are archaic mammals—including marsupials, representatives of two extinct orders of early mammals (pantodonts and creodonts), artiodactyls (deer-like even-toed ungulates), ancestral horses and other perissodactyls (odd-toed ungulates), carnivores, and primates—as well as birds, lizards, turtles, crocodilians, gars and other fishes, freshwater clams, gastropods (snails), and other invertebrates (BLM 1999a).

### **Environmental Consequences**

#### *Proposed Action*

Surface deposits consist of PFYC 3 Quaternary deposits, with moderate potential for fossil yield. Although Tertiary Wasatch Formation is adjacent to the project area, field inspection revealed the Wasatch exposed only in a few outcrops found on cliff faces and landslide exposures. The thickness of the Quaternary sediments cannot be accurately determined, but construction activities have the potential to adversely affect important fossils that may be present in the underlying Wasatch Formation. The greatest potential for impacts is associated with excavation of shallow bedrock that may be unearthed during well pad and facilities (especially pipeline) construction. In general, alluvium, colluvium, and other unconsolidated sediments are much less likely than bedrock to contain well-preserved fossils.

An examination of the BLM paleontology database indicates that there are more than 10 known fossil discovery sites (mostly northwest to northeast in Sections 31 and 32) within a 1-mile radius of the project area. There are no fossil sites listed within 0.5 mile of the project area. Areas covered with vegetation and soil cover do not usually yield fossil resources, but in the event paleontological resources are encountered, BMPs related to the standard paleontological COA would be recommended (Appendix A).

*No Action Alternative*

Under the No Action Alternative, the Federal wells would not be drilled or developed. However, the two proposed Fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new pipelines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells.

**Geology and Minerals**

Affected Environment

The project area is located near the eastern margin of the Colorado Plateau physiographic province (Fenneman 1946), a region characterized by dissected plateaus of strong relief. A broad, asymmetric, southeast-northwest trending structural basin, the Piceance Basin contains stratified sediments ranging in age from Cambrian through middle Tertiary up to 20,000 feet thick. The basin lies between the White River uplift to the northeast, the Gunnison uplift to the south, and the Uncompahgre swell to the west (George 1927, Weiner and Haun 1960). Table 3 lists the geologic formations within the project area.

The predominant bedrock exposures within the proposed development area are the Tertiary Wasatch and Ohio Creek Formation. The Wasatch Formation is underlain unconformably by the Mesaverde Group. The Mesaverde Group is composed of mudstones and sandstones with interlayered coal beds and ranges in thickness from about 3,000 to over 7,000 feet. The Mesaverde Group has also been referred to as the Mesaverde Formation, which includes informal subdivisions based on gas productivity characteristics.

<b>Table 3 Geologic Formations within the Project Area</b>				
<i>Map Symbol</i>	<i>Formation Name</i>	<i>Age</i>	<i>Characteristics</i>	<i>Location</i>
Qa	Alluvial and Floodplain Deposits	Holocene	Mud, silt, sand and gravel.	Mantels topography.
Two	Wasatch Formation and Ohio Creek Formation	Eocene to Paleocene	Variegated claystone, sandstone, and conglomerate.	Steep slopes and outcrops.
Source: Donnell et al. 1986				

The Niobrara Formation is the target zone of the proposed horizontal drilling program. The Niobrara Formation underlies components of the Mesaverde Group and is interfingering with the Mancos Shale. The Mancos Shale is the source for gas that has migrated into the reservoirs in the lower part of the Mesaverde Group as well as the Dakota Sandstone, Corcoran, Cozzette, and Rollins Sandstone Members. These formations are the source of much of the local gas production. The Mancos Shale is a ubiquitous formation of similar age as other regional known shale gas resource plays (BLM 2012). Peak gas generation from coals and carbonaceous rocks occurred about 47 million years ago (Johnson and Roberts 2003).

Sediments of the Niobrara Formation are predominately marine shales, with minor amounts of sandstones, siltstones, and limestones (Finn and Johnson 2005). These sediments were deposited during the Cretaceous period when rising sea levels created the Western Interior Seaway. Sediments were deposited along the margins of the Interior Seaway in swamps and marshes associated with a deltaic and coastal plain environment.

The depth of the Mancos/Mowry section that contains the Niobrara Formation is over 4000 feet thick in some areas, and source rocks include coal beds and organic-rich carbonaceous shale rocks of the Upper Cretaceous Mesaverde Group, Mancos Formation, and Lower Cretaceous Mowry Formation (BLM 2012). Gas expelled from coals and carbonaceous shale rocks is interpreted as having migrated into nearby low-permeability sandstone beds of the Mesaverde Group, initiating basin-centered gas accumulations (Johnson and Roberts 2003). The trapping mechanism of the gas is both stratigraphic (related to lithology) and diagenetic (related to post-depositional process).

No commercial deposits of coal, oil shale, uranium, precious metals, limestone, sand and gravel, gypsum, or other leasable, locatable, or salable minerals are believed to occur within or beneath the project area.

### Environmental Consequences

#### *Proposed Action*

If the proposed wells are proven feasible, initial production rates would be expected to be highest during the first few years of production, then decline during the remainder of the economic lives of the wells. Substantial reserves have been known to be trapped within the tight sands of these reservoirs since the late 1950s, but only within the last decade, and particularly within the last few years, has the integrated application of new technologies turned the tight gas sands of the Mesaverde Group into a profitable play (Kuuskraa 1997). Natural fracture detection, advanced log analysis, more rigorous well completions and recompletions, and denser spacing have increased the amount of recoverable gas within these reservoirs.

Natural gas production from the proposed wells would contribute to the draining of hydrocarbon-bearing reservoirs within the Mesaverde Group in this area, an action that would be consistent with BLM objectives for mineral production. Hydraulic fracturing would be utilized to create fractures within the formation to allow gas production from the wells. In recent years, public concern has been voiced regard potential impacts of hydraulic fracturing from “micro-earthquakes” and from contamination of freshwater aquifers. Potential impacts of hydraulic fracturing are addressed in the section on Water Quality-Ground.

#### *No Action Alternative*

Under the No Action Alternative, the Federal wells would not be drilled or developed. However, the two proposed Fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new pipelines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells.

### **Invasive Non-Native Plants**

#### Affected Environment

State-listed noxious weeds are designated by the Colorado Department of Agriculture. Management of these weeds is regulated under the Colorado Noxious Weed Act, Title 35, Article 5.5. Botanical surveys conducted in June 2014 identified state-listed noxious weeds occurring within the PA 24-32 project area, as well as other nonnative plant species which can also have detrimental impacts on native plant communities (WWE 2014). The proposed project would expand an existing well pad, add additional facilities areas, buried pipelines, and a short access road reroute on private lands. Because of the previous disturbance in the project area, the area is heavily infested with noxious weeds and other nonnative plant species.

Four State B List noxious weed species are known to occur within the project area. These are jointed goatgrass (*Aegilops cylindrica*), Russian knapweed (*Acroptilon repens*), Scotch thistle (*Onopordum acanthium*), and tamarisk (*Tamarix ramosissima*). Also present are five State C List noxious weed species: bulbous bluegrass (*Poa bulbosa*), cheatgrass (*Bromus tectorum*), field bindweed (*Convolvulus arvensis*), halogeton (*Halogeton glomeratus*), and redstem filaree (*Erodium cicutarium*).

In addition to these noxious weeds, numerous other non-native species that can negatively impacts native plant communities are present in the project area. These include annual wheatgrass (*Eremopyrum triticeum*), clasping pepperweed (*Lepidium perfoliatum*), dandelion (*Taraxacum officinale*), flixweed (*Descurainia sophia*), kochia (*Bassia scoparia*), prickly lettuce (*Lactuca serriola*), prostrate knotweed (*Polygonum aviculare*), purple mustard (*Chorispora tenella*), Russian-thistle (*Salsola kali*), salsify (*Tragopogon dubius*), and tumbled mustard (*Sisymbrium altissimum*). Four other non-native species—crested wheatgrass (*Agropyron cristatum*), smooth brome (*Bromus inermis*), Russian wildrye (*Psathyrostachys junceus*), and yellow sweetclover (*Melilotus officinalis*)—are also present in association with older reclamation seedings. All of these have the potential to become invasive, particularly in disturbed areas, and interfere with the establishment of native species in reclamation areas.

### Environmental Consequences

#### *Proposed Action*

Under the Proposed Action, a total of 7.4 acres would be disturbed, of which 0.68 acres would be redisturbance of previously disturbed and reclaimed areas, and 1.27 acres is existing disturbance. A total of 2.01 acres would remain as long-term disturbance following interim reclamation on all areas not needed for ongoing operations. All of this disturbance would occur on private land.

Surface-disturbing activities, such as those proposed for this project, provide a niche for invasion and establishment of non-native plant species particularly when these species are already present in the surrounding area. The mechanisms for this invasion and establishment are multi-fold. Removal of native vegetation removes the competition from native plants for resources, including water and soil nutrients, opening up niches for invasive species (Parendes and Jones 2000). Linear disturbances, such as roads, provide corridors of connected habitat along which invasive plants can easily spread (Gelbard and Belnap 2003). Well pad construction and subsequent well drilling and operations activities, as well as new road construction and installation of pipelines, require construction equipment and motorized vehicles which often transport invasive plant seeds either alone or in mud clods on the vehicle undercarriage or tires and deposit them in disturbed habitats along access roads and at well pad sites (Schmidt 1989, Zwaenepoel et. al. 2006).

Noxious weeds and other invasive species are well-adapted to colonize and dominate in disturbed ground. They generally do not require well-developed soils, can out-compete native species for resources, produce prodigious quantities of seeds, and have seeds which can survive for many years or even decades within the soil. When weeds establish on a site, they can also significantly alter the composition of the soil microbial community of bacteria and fungi, making it increasingly more difficult over time for native species to reestablish on the site (Hierro et. al. 2006, Reinhart and Callaway 2006, Vinton and Goergen 2006, Vogelsang and Bever 2009). Due to the quantity and longevity of weed seeds and the effects of weeds on the soil, once these invasive species have established on a site they can be extremely difficult to eliminate.

The project area includes a previously disturbed well pad footprint and access road, with existing widely distributed and high densities of noxious weeds and other nonnative species. As a result, the potential for

noxious weeds and other nonnative invasive species is high, and would increase with the new project disturbance. Movement of soil by construction equipment could spread weed seeds throughout the project area, and vehicles and equipment could also transport new noxious weed species to the site, where the new disturbance and already degraded soils would create ideal sites for weed establishment.

To mitigate the invasive species risk, the standard weed control COA would be attached to APDs to require periodic monitoring and weed control practices to ensure that noxious weeds are controlled (Appendix A). Establishment of desirable plant species is also crucial in preventing invasive non-native plant species establishment and spread. Therefore, the standard reclamation COAs would also be attached to APDs to require reclamation seeding and monitoring of seeding results (Appendix A). Because the project would be entirely on private land, the species composition of the seed mix would be at the discretion of the landowner.

#### *No Action Alternative*

Under the No Action Alternative, the two Federal wells would not be drilled or developed, because the APDs would be denied. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells. As a result, the noxious weed and invasive species risk would be the same under the No Action alternative as under the Proposed Action or potentially greater since the weed control and reclamation COAs would not be attached to the project.

### **Native American Religious Concerns**

#### Affected Environment

The proposed PA 24-32 well pad expansion project is located within a larger area identified by the Ute Tribes as part of their ancestral homeland. A cultural resource inventory (see section on Cultural Resources) was conducted to determine if there were any areas that might be culturally sensitive to Native Americans. No cultural resources were identified during the current inventory, and no historic properties are currently known to be located in the area of potential effect within proposed project area.

#### Environmental Consequences

##### *Proposed Action*

At present, no Native American concerns are known within the project area and none were identified during the inventories. The proposed PA 24-32 well pad expansion project is located within a larger area identified by the Ute Tribes as part of their ancestral homeland. A cultural resource inventory (see the section on Cultural Resources) was conducted to determine if there were any areas that might be culturally sensitive to Native Americans. No areas were identified during the inventories and none are currently known by the CRVFO within the proposed PA 24-32 well pad expansion project area. If new data are identified or disclosed, new terms and conditions may have to be negotiated to accommodate their concerns. Although the Proposed Action would have no direct impacts, increased access and personnel at the site could indirectly affect previously unidentified Native American resources ranging from illegal collection to vandalism.

The NHPA requires that if newly discovered cultural resources are identified during project implementation, work in that area must stop and the agency Authorized Officer notified immediately (36

CFR 800.13). The Native American Graves Protection and Repatriation Act (NAGPRA), requires that if inadvertent discovery of Native American Remains or Objects occurs, activity must cease in the area of discovery, a reasonable effort made to protect the item(s) discovered, and immediate notice made to the agency Authorized Officer, as well as the appropriate Native American group(s) (IV.C.2). Notice may be followed by a 30-day delay (NAGPRA Section 3(d)).

Further actions also require compliance under the provisions of NHPA and the Archaeological Resource Protection Act. WPX Energy Rocky Mountain LLC will notify its staff and contractors of the requirement under the NHPA, that work must cease if cultural resources are found during project operations. A standard Education/Discovery COA for the protection of Native American values would be attached to the APDs (Appendix A). The importance of these COAs should be stressed to the operator and its contractors, including informing them of their responsibilities to protect and report any cultural resources encountered. The operator and its contractors would be made aware of the requirements under the NAGPRA.

#### *No Action Alternative*

Under the No Action Alternative, development of the Federal mineral estate would not occur. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Potential impacts to unidentified cultural resources or areas of Native American Religious Concern would be reduced but not entirely eliminated.

### Noise

#### Affected Environment

As discussed, the PA 24-32 pad lies 1.9 miles northeast of Parachute within an existing oil and gas field. The Proposed Action would lie within a rural setting characterized by recent natural gas development activities. Noise levels in the area are presently created by traffic serving existing wells and ongoing drilling and completion, and well production activities.

Noise is generally described as unwanted sound, and noise intensity (or loudness) is measured as sound pressure in decibels (dBAs). The decibel scale is logarithmic, not linear, because the range of sound that can be detected by the human ear is so great that it is convenient to compress the scale to encompass all the sounds that need to be measured. Each 20-unit increase on the decibel scale increases the sound loudness by a factor of 10.

Sound levels have been calculated for areas that exhibit typical land uses and population densities. In rural recreational areas, ambient sound levels are expected to be approximately 30 to 40 dBA (EPA 1974, Harris 1991). As a basis for comparison, the noise level would be 60 dBA during a normal conversation between two people standing 5 feet apart.

#### Environmental Consequences

##### *Proposed Action*

The project would result in increased levels of noise during the construction, drilling, and completion phases. The noise would be most noticeable along the roads used to haul equipment and at the pad location. Drilling activities are subject to noise abatement procedures as defined in the COGCC Rules and Regulations (Aesthetic & Noise Control Regulations). Operations involving pipeline or gas facility

installation or maintenance, compressors, the use of a drilling rig, completion rig, workover rig, or hydraulic stimulation are subject to the maximum permissible noise levels for industrial zones. The 2006 revised COGCC noise control rules call for noise levels from oil and gas operations at any well site and/or gas facility to comply with the maximum permissible levels (Table 4) at a distance of 350 feet. Given the remote locations of the proposed project activities, with no reasonably close occupied structure or designated recreational area, the light industrial standard is applicable. The allowable noise level for periodic impulsive or shrill noises is reduced by 5 dBA from the levels shown (COGCC 2008).

<b>Table 4. Noise Standards for Light industrial, Residential/Agriculture/Rural</b>		
<i>Zone</i>	<i>7:00 A.M. to 7:00 P.M</i>	<i>7:00 P.M. to 7:00 A.M</i>
Light Industrial	70 dBA	65 dBA
Residential/Agricultural/Rural	55 dBA	50 dBA

Short-term (7- to 14-day) increases in nearby noise levels would characterize road and well pad construction while the existing cuttings pit is re-opened. Based on the Inverse Square Law of Noise Propagation (Harris 1991) and an typical noise level for construction sites of 65 dBA at 500 feet (Table 5), project-related noise levels would be approximately 59 dBA at a distance of 1,000 feet, approximating active commercial areas (EPA 1974).

<b>Table 5. Noise Levels at Typical Construction Sites and along Access Roads</b>			
<i>Equipment</i>	<i>Noise Level (dBA)</i>		
	<i>50 feet</i>	<i>500 feet</i>	<i>1,000 feet</i>
Air Compressor, Concrete Pump	82	62	56
Backhoe	85	65	59
Bulldozer	89	69	63
Crane	88	68	62
Front End Loader	83	63	57
Heavy Truck	88	68	62
Motor Grader	85	65	59
Road Scraper	87	67	61
Tractor, Vibrator/Roller	80	60	54

Sources: BLM (1999a), La Plata County (2002)

Traffic noise would also be elevated as a consequence of the Proposed Action. The greatest increase would be along access roads during the drilling and completion phases. Based on the La Plata County data presented in Table 5 approximately 68 dBA of noise (at 500 feet) would be created by each fuel and water truck that travels these roads. Less noise would be created by smaller trucks and passenger vehicles such as pickup trucks and sport utility vehicles. Although the duration of increased noise from this source would be short, it would occur repeatedly during the drilling and completion phases.

Noise impacts would decrease during the production phase but would remain background noise levels. During maintenance and well workover operations, noise levels would temporarily increase above those associated with routine well production.

### *No Action Alternative*

The No Action Alternative would constitute denial of the Federal APDs described in the Proposed Action, meaning that the two proposed Federal horizontal wells would not be drilled or developed. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. With the development of the two new fee horizontal wells, noise impacts would be expected to increase under the No Action Alternative.

## **Socioeconomics**

### **Affected Environment**

The project area is located entirely within Garfield County, Colorado, which has a total area of 2,958 square miles (Garfield County 2013a). The county seat is Glenwood Springs; other towns include Carbondale, New Castle, Silt, Rifle, Battlement Mesa, and Parachute. Interstate 70 transects the county east to west with a network of county and private roads servicing the project area.

The population of the county grew by an average of approximately 2.5% per year from 2000 to 2011 but decreased by 2.6% from 2008 to 2011 due to the national economic downturn, resulting in a net increase of 27% from 44,259 to 56,270 residents (CDOLA 2013a). Population growth in Garfield County is expected to nearly double to 109,887 in 2040 (CDOLA 2012). In July 2011, the Garfield County population was 70% urban and 30% rural, with a population density of approximately 19 people per square mile (City Data 2012).

In February 2013, the total estimated civilian labor force was 34,107 with an unemployment rate of 7.8% (CDLE 2013). In the fourth quarter of 2011, the industry groups with the highest percentage of total employment were construction (14.4%), retail trade (13.7%), and Health Care and Social Assistance (13.5%). Table 6 lists the top 10 industries in Garfield County for the fourth quarter of 2011 (CDLE 2013).

<b>Table 6. Selected Industry Sectors for Garfield County</b>		
<b><i>Rank</i></b>	<b><i>Job Sector</i></b>	<b><i>Employees</i></b>
1	Construction (buildings and engineered projects)	2,901
2	Retail Trade	2,782
3	Health Care and Social Assistance	2,732
4	Education Services	2,484
5	Accommodation and Food Services	2,464
6	Mineral Extraction (including mining and oil and gas)	2,426
7	Public Administration	1,717
8	Professional, Scientific, and Technical Services	1,047
9	Administration, Support, Waste Management, and Remediation	874
10	Transportation and Warehousing	782

Personal income in Garfield County grew by approximately 6% per year from \$1.3 billion in 2000 to \$2.1 billion in 2011. However, personal income dropped by nearly 10% from 2008 to 2011. Annual per capita income grew by 3% from \$29,081 in 2000 to \$37,858 in 2011, but with a drop of nearly 11% during the last 3 years of that period (USDOC 2012).

The communities of Parachute, Rifle, Silt, and New Castle are considered to have the most affordable housing, while the communities of Glenwood Springs and Carbondale have the least affordable housing. In March 2012, the cost of living index in Garfield County was 88.6, below the U.S. average of 100 (City Data 2012). Activities on public land in the vicinity of the project area are primarily ranching/farming, hunting, OHV travel, and the development of oil and gas resources. Hunters contribute to the economy because many require lodging, restaurants, sporting goods, guides and outfitting services, food, fuel, and other associated supplies.

Production of natural gas in Garfield County increased dramatically during the past decade and a half, from approximately 70 billion cubic feet (BCF) in 2000 to 700 BCF in 2012 (COGCC 2013a). Approximately 1,286 drilling permits (Federal and private combined) were approved in Garfield County between April 2, 2012, and March 29, 2013 (COGCC 2013b). However, a drop in U.S. natural gas prices from \$10.79 per thousand cubic feet (MCF) in July 2008 to \$1.89/MCF in April 2012 (USDOE 2013) resulted in fewer drilling rigs and slower drilling rates. Natural gas development activity in Garfield County remains low.

Property tax revenue from oil and gas development is a source of public revenue in Garfield County. In 2012, oil and gas assessed valuation in Garfield County was approximately \$2.8 billion, or about 73% of total property tax assessed value distribution (Garfield County 2013b). The county's largest taxpayers are in the oil and gas industry (Garfield County 2013c). The Federal government makes Payments in Lieu of Taxes (PILT) to local governments to help offset losses in property taxes due to nontaxable Federal lands within their boundaries (USDI NBC 2013). Approximately 60% of all Garfield County lands are Federally owned (Garfield County 2013a). The amount may also be adjusted based on population and as apportioned by Congress. By formula, payments are decreased as other Federal funds, such as mineral royalty payments, increase. PILT amounts to Garfield County have ranged from \$1,732, 974 in 2008 to \$403,176 in 2012 (USDI NBC 2013).

In addition to PILT distributions, Federal mineral royalties are levied on oil and gas production from Federal mineral leases. Oil and gas lessees pay royalties equal to 12.5% of the wellhead value of oil and gas produced from public land (BLM 2007a). Half the royalty receipts received from production are distributed to the state and county governments, which are then allocated to fund county services, schools, and local communities.

The NEPA process requires a review of the environmental justice issues as established by Executive Order 12898 (February 11, 1994). The order established that each Federal agency identify any "disproportionately high and adverse human health or environment effects of its programs, policies, and activities on minority and low-income populations." The Hispanic/Latino community is the only minority population of note in the project vicinity. In 2010, approximately 28% of the residents of Garfield County identified themselves as Hispanic/Latino, compared to 17% in 2000 (CDOLA 2013b). Statewide, the population of Hispanic/Latino residents grew 41.2% during the same 10-year period (CDOLA 2013c). African-American, American Indian, Asian, and Pacific Islander residents accounted for a combined 1.6% of the Garfield County population in 2010, compared to a statewide level of 7% (CDOLA 2013b).

## Environmental Consequences

### *Proposed Action*

The Proposed Action would have minor positive impacts on the local economy of Garfield County through the creation of additional job opportunities in the oil and gas industry and in supporting trades

and services. In addition, Garfield County would receive additional tax and royalty revenues. The Proposed Action could result in negative social impacts including changing the character of the area, reducing scenic quality, increasing dust levels especially during construction, and increasing traffic.

*No Action Alternative*

The No Action Alternative would constitute denial of the Federal APDs described in the Proposed Action, meaning that the two proposed Federal horizontal wells would not be drilled or developed. However, the two proposed fee horizontal wells would drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells. Consequently, new socioeconomic impacts, positive or negative, would likely result under the No Action Alternative.

**Soils**

Affected Environment

The Proposed Action lies approximately 1.9 miles northeast of Parachute, Colorado. The existing PA 24-32 pad lies on relatively flat terrain (10% or less) with elevation at the project site at approximately 5,140 feet. Soils in the project area consist of rock outcroppings and loamy soils derived from mudstone, sandstone, and conglomerate (Table 7) (USDA NRCS 2013).

<b>Table 7. Project Area Soils.25</b>				
<i>Mapping Unit Name</i>	<i>Description</i>	<i>Erosion Hazard</i>	<i>Permeability</i>	<i>Proposed Infrastructure Type</i>
Arvada loam 1-6%	Alluvium derived from sandstone and shale, found on benches, terraces and fans. Soils are deep and well-drained and moderately alkaline. Mainly used for wildlife habitat and limited grazing.	Severe	Very slow	Pad, buried Pipelines

Environmental Consequences

The Proposed Action involves reconstructing the PA 24-32 well pad (with a disturbance footprint of 6.5 acres) to accommodate drilling and completing two Federal horizontal wells, the rerouting of the existing road to support well operations (Figure 2), and installation of new pipelines. Fresh water from approved sources would be trucked to the site to augment recycled water. Two 10-inch temporary surface poly-lines would run along an existing ROW north of the pad for a length of approximately 4,458 feet (Figure 3). These temporary lines would tie into existing infrastructure and supply water for completions.

Pad expansion and rerouting the road would equate to 7.4 total acres of disturbance (6.51 acres attributed to the pad; 0.37 acre to the production pad and 0.52 acre to the access road). All surface disturbance would occur on Fee land. After interim reclamation, the total disturbance will decrease to a 1.12-acre pad. The installation of the proposed 8-inch gas line would generate 1.38 acres of disturbance and the proposed 4-inch produced water line would generate 0.57 acre.

The Proposed Action would be located on areas with severe risk of erosion due to the soil characteristics and its location within alluvial fans. Particular care would be taken during construction and reclamation to ensure that proper design and BMPs, including the COAs listed in Appendix, are utilized to prevent erosion and slope movement.

*No Action Alternative*

Under the No Action Alternative, the Federal wells would not be drilled or developed. However, the two proposed Fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new pipelines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells.

**Special Status Species**

***Federally Listed, Proposed, or Candidate Plant Species***

**Affected Environment**

According to the latest species list from the USFWS, four Federally listed plant species may occur within or be impacted by actions occurring in Garfield County. Table 8 lists these species and summarizes information on their habitat associations, potential for occurrence in the project vicinity based on known geographic range and habitats present, and potential for adverse impacts from the Proposed Action.

<b>Table 8. Potential for Occurrence of Threatened or Endangered Plant Species</b>				
<b><i>Species and Status</i></b>	<b><i>Occurrence</i></b>	<b><i>Habitat Association</i></b>	<b><i>Range or Habitat in Vicinity?</i></b>	<b><i>Potentially Affected?</i></b>
Parachute penstemon ( <i>Penstemon debilis</i> ) -- Threatened	Sparsely vegetated, south-facing, steep, white shale talus of the Parachute Creek Member of the Green River Formation; 8,000 to 9,000 feet	Other oil shale endemic species, such as Roan Cliffs blazing-star, Cathedral Bluffs meadow- rue, dragon milkvetch, Piceance bladderpod, and oil shale fescue	No	No
DeBeque phacelia ( <i>Phacelia submutica</i> ) – Threatened	Sparsely vegetated, steep slopes in chocolate-brown, gray, or red clay on Atwell Gulch and Shire Members, Wasatch Formation; 4,700 to 6,200 feet	Desert shrubland with four wing saltbush, shadscale, greasewood, broom snakeweed, bottlebrush squirreltail and Indian ricegrass, grading upward into scattered junipers	Yes	No
Colorado hookless cactus ( <i>Sclerocactus glaucus</i> ) – Threatened	Rocky hills, mesa slopes, and alluvial benches in salt desert shrub communities; often with well-formed microbial crusts; can occur in dense cheatgrass 4,500 to 6000 feet	Desert shrubland with shadscale, galleta grass, black sagebrush, Indian ricegrass grading upward into big sagebrush and sagebrush/pinyon-juniper	Yes	No
Ute lady’s tresses orchid ( <i>Spiranthes diluvialis</i> ) – Threatened	Subirrigated alluvial soils along streams and in open meadows in floodplains; 4,500 to 7,200 feet	Box-elders, cottonwoods, willows, scouring rushes, and riparian grasses, sedges, and forbs	No	No

Two Federally listed plant species have the potential to occur within or adjacent to the project area. These are DeBeque phacelia and Colorado hookless cactus. Rare plant surveys were conducted within

and adjacent to the proposed project area in June 2014 (WWE 2014). The project area is located within the Shire Member of the Wasatch Formation, and there is no Green River Shale substrate, a requirement for Parachute penstemon habitat, in the project vicinity. Ute lady’s-tresses required riparian or subirrigated habitat, which is not present in the project vicinity. Following the latest guidance from USFWS for identifying suitable DeBeque phacelia habitat (USFWS 2013), no suitable habitat for DeBeque phacelia is present within or near the project area. Suitable habitat is present for Colorado hookless cactus adjacent to the project area, but no plants were found during surveys.

Environmental Consequences

*Proposed Action*

Because no occurrences of any Federally listed plants are known within or near the project area, the Proposed Action is not expected to have adverse impacts on any of these species.

**Effects Determinations**

Because there is no suitable habitat for DeBeque phacelia, Parachute penstemon, or Ute lady’s-tresses within 100 meters of the project area, the project would have “**No Effect**” on these species. Because no Colorado hookless cactus occurrences were found during surveys within 100 meters from the project area, the project would have “**No Effect**” on this species.

*No Action Alternative*

Under the No Action Alternative, the two Federal wells would not be drilled or developed, because the APD would be denied. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells. Because no individuals of Colorado hookless cactus or suitable habitat for DeBeque phacelia, Parachute penstemon, or Ute lady’s-tresses is present within 100 meters of the project area, the No Action alternative would have “**No Effect**” on these species.

**BLM Sensitive Plant Species**

Affected Environment

BLM sensitive plant species with habitat and/or occurrence records in Garfield County are listed in Table 9, along with summaries of their habitat requirements, potential for occurrence within the project area, and potential to be impacted by the Proposed Action.

<b>Table 9. Potential for Occurrence of BLM Sensitive Plant Species</b>				
<i>Species and Status</i>	<i>Occurrence</i>	<i>Habitat Association</i>	<i>Range or Habitat in Vicinity?</i>	<i>Potentially Affected?</i>
Cathedral Bluffs meadow-rue ( <i>Thalictrum heliophilum</i> )	Endemic on sparsely vegetated, steep shale talus slopes of the Green River Formation; 6,300-8,800 feet	Pinyon-juniper woodlands and shrublands; often with other oil shale endemics, sometimes with rabbitbrush or snowberry	No	No

<b>Table 9. Potential for Occurrence of BLM Sensitive Plant Species</b>				
<i>Species and Status</i>	<i>Occurrence</i>	<i>Habitat Association</i>	<i>Range or Habitat in Vicinity?</i>	<i>Potentially Affected?</i>
DeBeque milkvetch ( <i>Astragalus debequaeus</i> )	Varicolored, fine-textured, seleniferous or saline soils of Wasatch Formation; 5,100 to 6,400 feet	Pinyon-juniper woodlands and desert shrublands	Yes	No
Harrington's beardtongue ( <i>Penstemon harringtonii</i> )	Flats to hillsides with rocky loam and rocky clay loam soils derived from coarse calcareous parent materials or basalt; 6,200-9,200 feet	Sagebrush shrublands, typically with scattered pinyon-juniper	No	No
Naturita milkvetch ( <i>Astragalus naturitensis</i> )	Sandstone mesas, ledges, crevices and slopes in pinyon/juniper woodlands; 5,000 to 7,000 feet	Pinyon-juniper woodlands	No	No
Piceance bladderpod ( <i>Lesquerella parviflora</i> )	Shale outcrops of the Green River Formation, on ledges and slopes of canyons in open areas; 6,200 to 8,600 feet	Pinyon-juniper woodlands, shrublands; often with other oil shale endemic species	No	No
Roan Cliffs blazing-star ( <i>Mentzelia rhizomata</i> )	Steep, eroding talus slopes of shale, Green River Formation; 5,800-9,000 feet	Pinyon-juniper woodlands, shrublands; often with other oil shale endemic species	No	No

Only one species, DeBeque milkvetch, has the potential to occur in the vicinity of the PA 24-32 project area. Botanical surveys were conducted in June 2014, and no occurrences of any BLM sensitive plant species were found within or adjacent to the project area (WWE 2014).

Environmental Consequences

*Proposed Action*

Because no occurrences of BLM sensitive plants have been identified within or adjacent to the project area, the project would have no impact on any BLM sensitive plant species.

*No Action Alternative*

Under the No Action Alternative, the two Federal wells would not be drilled or developed, because the APD would be denied. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells. Because no occurrences of BLM sensitive plants have been identified within or adjacent to the project area, the No Action alternative would have no impact on any BLM sensitive plant species.

**Federally Listed, Proposed, or Candidate Animal Species**

Affected Environment

Federally listed, proposed, or candidate species potentially occurring within or affected by actions in Garfield County include eight species of vertebrate wildlife. Table 10 lists these species and summarizes information on their distribution, habitat associations, and potential to occur or be adversely affected.

<b>Table 10. Potential for Occurrence of Threatened or Endangered Animal Species</b>				
<i>Species and Status</i>	<i>Distribution in Region</i>	<i>Preferred Habitats</i>	<i>Potentially Present in Vicinity?</i>	<i>Potentially Adversely Affected?</i>
Canada lynx ( <i>Lynx canadensis</i> ) – Threatened	Dispersed use in in upper montane and subalpine zones of Colorado mountains.	Subalpine spruce-fir forests; also lodgepole pine and aspen to as low as upper montane.	No	No
Yellow-billed cuckoo ( <i>Coccyzus americanus</i> ), western distinct population segment – Threatened	Rivers and major tributaries of western, northwestern, and south-central Colorado.	Large cottonwood stands with tall shrub understory along rivers.	No	No
Mexican spotted owl ( <i>Strix occidentalis lucida</i> ) – Threatened	No historic occurrence in area; present in southwestern Colorado and southern Front Range.	Rocky cliffs in canyons with closed-canopy coniferous forests.	No	No
Razorback sucker ( <i>Xyrauchen texanus</i> ) – Endangered	Colorado River and major tributary rivers, including mainstem Colorado River upstream to town of Rifle in CRVFO.	General: Deep, slow runs, pools, and eddies. Spawning: silt to gravel substrates in shallow water and seasonally flooded overbank areas.	Yes	Yes
Colorado pikeminnow ( <i>Ptychocheilus lucius</i> ) – Endangered			Yes	Yes
Humpback chub ( <i>Gila cypha</i> ) -- Endangered	Mainstem Colorado River and major tributaries – upstream to Black Rocks near Utah state line.	Rocky runs, riffles, and rapids in swift, deep rivers.	Yes	Yes
Bonytail chub ( <i>Gila elegans</i> ) – Endangered			Yes	Yes
*Green Lineage Colorado River cutthroat trout ( <i>Oncorhynchus clarki</i> ssp.) – Threatened	Identified in 60 streams in Colorado River basin including CRVFO area.	Clean, cool headwaters streams and ponds isolated from other strains of cutthroat trout.	No	No
*Green Lineage = Relict populations of cutthroat trout indigenous to the Colorado/Gunnison/Dolores River drainages. Currently protected under the ESA pursuant to prior listing of the greenback cutthroat trout ( <i>O. c. stomias</i> ) pending completion of genetic and morphometric studies and taxonomic reassessment of native cutthroat trout in Colorado.				

## Environmental Consequences

### *Proposed Action*

The Canada lynx, Greater sage-grouse, Mexican spotted owl, and western yellow-billed cuckoo have not been observed and are not expected to occur in the project area based on documented occurrences and habitat types present. Therefore, the Proposed Action would have “**No Effect**” on these species.

Razorback Sucker, Colorado Pikeminnow, Humpback Chub, and Bonytail Chub. These four species of Federally listed big-river fishes occur within the Colorado River drainage basin near or downstream from the project area. Designated Critical Habitat for the razorback sucker and Colorado pikeminnow includes the Colorado River and its 100-year floodplain west (downstream) from the town of Rifle. This portion of the Colorado River lies a few miles northeast of the project area. The nearest known habitat for the humpback chub and bonytail is within the Colorado River approximately 70 miles downstream from the project area. Occasionally, the bonytail is in Colorado west of Grand Junction, but its range does not extend east from that point. Only one population of humpback chub, at Black Rocks west of Grand Junction, is known to exist in Colorado.

The endangered Colorado River fishes could potentially be affected by the consumptive use of water taken from the Colorado River basin to support activities associated with the Proposed Action. Depletions in flows in the Colorado River and major tributaries are a major source of impacts to these fishes due to changes in the flow regime that reduce the availability and suitability of spawning sites and habitats needed for survival and growth of the larvae. Principal sources of depletion in the Colorado River basin include withdrawals for agricultural or industrial uses, withdrawals for municipal water supplies, and evaporative losses from reservoirs. On average, approximately 0.77 acre-feet of Colorado River water is consumed during activities related to each oil and gas well. This is equivalent to approximately 0.04 cubic feet per second (cfs) of water throughout the typical 10-day drilling period for an oil and gas well in the CRVFO area.

In 2008, the BLM prepared a Programmatic Biological Assessment (PBA) addressing water-depleting activities associated with the BLM’s fluid minerals program in the Colorado River Basin in Colorado. In response to this PBA, the USFWS issued a Programmatic Biological Opinion (PBO) (ES/GJ-6-CO-08-F-0006) on December 19, 2008. The PBO concurred with the BLM’s effects determination of “**May Affect, Likely to Adversely Affect**” for the Colorado pikeminnow, humpback chub, bonytail chub, or razorback sucker as a result of depletions associated with oil and gas projects. To offset the impacts, the BLM has set up a Recovery Agreement, which includes a one-time fee per well. The estimated depletions from the Proposed Action would be added to the CRVFO tracking log and submitted to the USFWS per the PBA/PBO at the end of the year to account for depletions associated with the BLM’s fluid mineral program. The calculated mitigation fees are used by the USFWS for mitigation projects and contribute to the recovery of these endangered species through restoration of habitat, propagation, and genetics management, instream flow identification and protection, program management, non-native fish management, research, and monitoring, and public education.

Other potential impacts to these species include inflow of sediments from areas of surface disturbance and inflow of chemical pollutants related to oil and gas activities. Construction activities would increase the potential for soil erosion and sedimentation. Although a minor temporary increase in sediment transport to the Colorado River may occur, it is unlikely that the increase would be detectable above current background levels. In any case, the Federally listed, proposed, or candidate fish species associated the Colorado River are adapted to naturally high sediment loads and would not be affected.

In contrast to inflow of sediments, the inflow of chemical pollutants could impact the endangered big-river fishes if concentrations are sufficient to cause acute effects. The potential for adverse impacts would be limited to the Colorado pikeminnow and razorback sucker, the two species known to occur within the CRVFO area. Spills or other releases of chemical pollutants as a result of oil and gas activities are infrequent in the CRVFO area due to the various design requirements imposed by the BLM and the State of Colorado.

In the event of a spill or accidental release into an ephemeral drainage that could flow to the Colorado River, the operator would be required to implement its Spill Prevention, Control, and Countermeasures (SPCC) plan, including such cleanup and mitigation measures as required by the BLM or the State. For these reasons, and because any spills into the Colorado River would be rapidly diluted to levels below that are not deleterious, or even detectable, the potential for adverse impacts from chemical releases is not considered significant.

Based on the above, the BLM has determined that inflow of sediments and chemicals into the Colorado River would have “**No Effect**” on the endangered big river fishes. In the unlikely event of a spill with the potential to affect, or documented occurrence of an effect, the USFWS would initiate discussions with the involved parties to identify appropriate remedies.

*No Action Alternative*

Under the No Action Alternative, the Federal wells would not be drilled or developed. The PA 24-32 pad reconstruction would not occur, and installation of the buried gas pipeline would not be needed. No surface redisturbance on private land would be necessary. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to be the same as at present. Consequently, no new impacts to special status species would result under the No Action Alternative.

***BLM Sensitive Animal Species***

Affected Environment

Table 11 lists BLM sensitive vertebrate wildlife species known to occur in the region and, if present, potentially adversely affected by the Proposed Action. Potential impacts to the species listed are discussed following the table.

<b>Table 11. BLM Sensitive Vertebrate Species Present or Potentially Present in the Project Area</b>		
<i>Common Name</i>	<i>Habitat</i>	<i>Potential for Occurrence</i>
Fringed myotis ( <i>Myotis thysanodes</i> ) Townsend’s big-eared bat ( <i>Corynorhinus townsendii</i> )	Roosting: Caves, trees, mines, and buildings. Foraging: Pinyon-juniper, montane conifers, and semi-desert shrubs.	Possible
White-tailed prairie dog ( <i>Cynomys leucurus</i> )	Semi-desert grasslands, open semi-desert shrublands, and dryland pastures of far western and northwestern Colorado.	Historically present 0.5 mile to west
Bald eagle ( <i>Haliaeetus leucocephalus</i> )	Nesting/Roosting: Mature cottonwood forests along rivers. Foraging: Fish and waterfowl along rivers and lakes; may feed on carrion, rabbits, and other foods in winter.	Nests and roosts along Colorado River

<b>Table 11. BLM Sensitive Vertebrate Species Present or Potentially Present in the Project Area</b>		
<i>Common Name</i>	<i>Habitat</i>	<i>Potential for Occurrence</i>
Peregrine falcon ( <i>Falco peregrinus</i> )	Nesting: Cliffs, usually near a river, large lake, or ocean. Foraging: Waterfowl on rivers and lakes; upland fowl in open grassland or steppe.	Possible
Brewer's sparrow ( <i>Spizella breweri</i> )	Extensive stands of sagebrush, primarily Wyoming sagebrush on level or undulating terrain.	Observed
Midget faded rattlesnake ( <i>Crotalus oreganus concolor</i> )	Cold desert of NW Colorado, SW Wyoming, and NE Utah, primarily in sagebrush with rock outcrops and exposed canyon walls.	Possible
Great Basin spadefoot ( <i>Spea intermontana</i> )	Permanent or seasonal ponds and slow-flowing streams in pinyon-juniper woodlands and semi-desert shrublands.	Unlikely – habitat marginal
Bluehead sucker ( <i>Catostomus latipinnis</i> )	Primarily smaller streams with a rock substrate and mid to fast-moving waters; also shallows of larger rivers.	Possible in Colorado River
Flannelmouth sucker ( <i>Catostomus discobolus</i> )	Runs, riffles, eddies, and backwaters in large rivers.	Present in Colorado River
Roundtail chub ( <i>Gila robusta</i> )	Slow-moving waters adjacent to fast waters in large rivers.	Present in Colorado River

## Environmental Consequences

### *Proposed Action*

Fringed Myotis and Townsend's Big-eared Bat. No caves or other suitable roosting sites occur in the project area. Loss of large trees, potentially also used for roosting, would be negligible. Loss of habitat above which the bats could search for aerial prey would also be minimal, and disturbance due to construction activities would not occur at night when the bats are feeding.

White-tailed Prairie Dog. The project vicinity is near the known eastern limits of this species in the general area. Prairie dogs are known to occur within approximately 0.5 mile of the project area in the past, based both on observations of individuals and the presence of abandoned burrows in some semi-desert grasslands. However, individuals or burrows were not observed during project-specific surveys.

Bald Eagle. Although bald eagles nest and roost along the Colorado River just southeast of the project area, the potential for use of the actual project area is moderate. Any such use would most likely be by an individual hunting across large expanses of open upland habitats during winter. The project area would represent a small portion of such potential winter hunting habitat, and the reclaimed grass-forb community would provide better habitat for prey than the current shrubland types.

Peregrine Falcon. Peregrine falcons nest along cliff bands south and north of the project and hunt for waterfowl along the Colorado River or other birds across open terrain. Use of the project area is unlikely, except for infrequent, transitory overflights while traveling between the Colorado River and the cliff bands to the south.

Brewer's Sparrow. Although the habitat is marginal in the project area, the species was observed during surveys and could nest in the project area. The 60-day TL to prohibit removal of vegetation during the period May 1 to June 30 (Appendix A) would minimize the potential for impacts to nesting Brewer's sparrows. However, long-term operations could displace one or more pairs of Brewer's sparrows that might otherwise nest, potentially resulting in lower survival or reproductive success.

Midget Faded Rattlesnake. This small viper is considered a small, pale-colored subspecies of the common and widespread western rattlesnake, although some authorities consider it and another western subspecies, the Great Basin rattlesnake (*C. v. nuntius*) to be genetically distinct species. Although movement patterns of midget faded rattlesnakes are not well known, they are believed to be limited to a few hundred meters from den sites. The limited distribution and small home range make this snake susceptible to impacts from human disturbance (Parker and Anderson 2007). Threats include direct mortality from vehicles traveling on roads and pads, off-highway vehicle use throughout the landscape, capture by collectors, and livestock grazing. As access increases into previously undeveloped areas, the risk of encounters with humans would increase, resulting in some cases of mortality or collection.

Great Basin Spadefoot. This species is typically found slightly west of the project area, but the area does provide suitable habitat within rocky canyons and broad dry basins. Threats include direct mortality from vehicles traveling on roads within the project area. As more vegetation is cleared predation can increase because of the greater ease of detection by predators.

Flannelmouth Sucker and Roundtail Chub. As with the ecologically similar Colorado River endangered fishes described above, the flannelmouth sucker and roundtail chub are adapted to naturally high sediment loads and therefore would not be affected by increased sediment transport to the Colorado River. Furthermore, protective COAs for water quality would minimize this potential (Appendix A). However, these species are vulnerable to alterations in flow regimes in the Colorado River (including evaporative losses from dams and depletions from withdrawal of water for irrigation or municipal water supplies) that affect the presence of sandbars and seasonally flooded overbank areas needed for reproduction. The amount of depletion in flows associated with this project is not expected to have a significant adverse impact on the survival or reproductive success of these species.

#### *No Action Alternative*

Under the No Action Alternative, the Federal wells would not be drilled or developed, because the APD would be denied. The PA 24-32 pad reconstruction would not occur, and installation of the buried gas pipeline would not be needed. No surface redisturbance on private land would be necessary. However, the four producing fee wells would continue to be maintained and operated on the PA 24-32 pad. Future levels of activity at the pad would be projected to be the same as they are at present. Consequently, no new impacts to special status species would result under the No Action Alternative.

### Vegetation

#### Affected Environment

The project area is located along the I-70 and Colorado River corridor, approximately 2 miles northeast of Parachute, Colorado, at an elevation of approximately 5,140 feet. Vegetation in this area is primarily of the salt desert shrub plant community type, dominated by basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and greasewood (*Sarcobatus vermiculatus*). Annual wheatgrass and cheatgrass, both invasive non-native species, dominate the understory, indicating past disturbance associated with livestock grazing.

A variety of native species are also associated with the pinyon-juniper and sagebrush habitat types in the area. These include basin wild rye (*Leymus cinereus*), broom snakeweed (*Gutierrezia sarothrae*), claret cup cactus (*Echinocereus triglochidiatus*), evening primrose (*Oenothera caespitosa*), fourwing saltbush (*Atriplex canescens*), galletagrass (*Pleuraphis jamesii*), Gardner's saltbush (*Atriplex gardneri*), Indian ricegrass (*Achnatherum hymenoides*), longleaf phlox (*Phlox longifolia*), mountain pepperweed (*Lepidium*

*montanum*), prickly-pear cactus (*Opuntia polyacantha*), rough Indian paintbrush (*Castilleja scabrida*), rubber rabbitbrush (*Ericameria nauseosus*), saline wildrye (*Leymus salinus*), scarlet globemallow (*Sphaeralcea coccinea*), shadscale (*Atriplex confertifolia*), spiny horsebrush (*Tetradymia spinosa*), Utah juniper (*Juniperus osteosperma*), and wild onion (*Allium* sp.).

In addition to the native plant species is an abundance of noxious weeds and other invasive species, particularly in and near the existing well pad, reclamation area, and access road where these species dominate the vegetation. These include bulbous bluegrass, field bindweed, flaxweed, halogeton, jointed goatgrass, kochia, prostrate knotweed, redstem filaree, Russian knapweed, Russian-thistle, Scotch thistle, and tumbled mustard. A native early successional species, gumweed (*Grindelia squarrosa*), is also common in these areas, as well as lambsquarters (*Chenopodium album*), an early successional species of murky nativity with both native and non-native genotypes in Colorado.

### Environmental Consequences

#### *Proposed Action*

Under the Proposed Action, a total of 5.45 acres of sagebrush-salt desert shrub vegetation would be removed. An additional 0.68 acre of previously disturbed and reclaimed vegetation would also be removed. Combined with the existing disturbance, there would be a total of 7.4 acres of disturbance. All of the disturbance would occur on private land. Following project completion, 5.39 acres would undergo interim reclamation, and 2.01 acres would remain as long-term disturbance. Interim reclamation would consist of seeding in accordance with the reclamation COAs presented in the Appendix. Although the BLM encourages use of a native seed mix for reclamation, the private landowner would have jurisdiction over the seed mix composition.

Adjacent native vegetation would not be directly impacted, but could be indirectly impacted by increased dust deposition on leaves. Dust levels could be expected to increase above ambient levels in the short term from pad expansion, well drilling, new road construction, and new pipeline installation. Increased dust levels can negatively impact plants by clogging stomatal openings in the leaves, impeding gas exchange and reducing the ability of plants to take in carbon dioxide. Dust on the leaf surface can also effectively reduce light availability at the leaf surface. Light and carbon dioxide are critical for plants to conduct photosynthesis, and reductions in either can reduce the quantity of carbohydrates plants can produce through photosynthesis, and thereby reduce plant growth and seed production. Dust on leaf surfaces can also facilitate plant tissue uptake of toxic pollutants (Thompson et. al. 1984, Farmer 1993, Sharifi et. al. 1997). Dust can also affect snowmelt patterns and resulting hydrology and soil moisture availability, alter soil pH and nutrient availability, and result in plant community composition changes (Angold 1997, Auerbach et. al. 1997, Johnston and Johnston 2004, Field et. al. 2010, Gieselman 2010).

Additional indirect impacts to adjacent vegetation could occur from noxious weeds and other non-native plants associated with project area disturbances. The proposed removal of native vegetation would increase the site vulnerability to invasion and establishment of noxious weeds and other non-native invasive plant species, particularly with the existing widespread establishment of noxious weeds and other non-native species. Neighboring vegetation would also become more vulnerable to invasion by noxious weeds and other non-native species. Ground disturbance combined with vehicle traffic and construction equipment provides both excellent habitat and vectors for invasive species, particularly when these species are already present within the soil seed bank (Schmidt 1989, Parendes and Jones 2000, Gelbard and Belnap 2003, Larson 2003, Zaenepoel et. al. 2006).

These non-native species can negatively impact native plant communities, both directly through competition for resources, and indirectly through alteration of soil microbial communities (Klironomos 2002, Hierro et. al. 2006, Reinhart and Callaway 2006, Vogelsang and Bever 2009). Herbicide treatments of noxious weeds can also result in negative effects or mortality to native plants if they are co-occurring or located nearby (BLM 2007b). Implementation of COAs for noxious weeds and temporary reclamation (Appendix A) would reduce the risk of noxious weed and invasive species establishment and spread through the combination of chemically treating noxious weeds while also reestablishing desirable vegetation through interim reclamation.

#### *No Action Alternative*

Under the No Action Alternative, the two Federal wells would not be drilled or developed, because the APD would be denied. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells. As a result, the effects on vegetation would be the same under the No Action alternative as under the Proposed Action or potentially greater, since the COAs for noxious weeds and reclamation would not be attached to the project under the No Action alternative.

### **Visual Resources**

#### Affected Environment

The Proposed Action would occur on private land in an existing field of development approximately 1.9 miles northeast of the town of Parachute. Federal lease terms regarding visual concerns are not applicable on private land. BLM visual resource management (VRM) objectives do not apply to non-BLM lands and visual values for those lands are only protected by landowner discretion. The BLM can only make recommendations to mitigate impacts to scenic values on non-BLM lands.

#### Environmental Consequences

##### *Proposed Action*

Short-term visual impacts due to the pad expansion and well drilling and completion activities would occur within in the project area. Reconstruction of the well pad would create contrast within the landscape by removing existing vegetation, exposing bare ground, and creating distinct lines and forms in the landscape. There would also be an increase in the presence of drilling rigs, heavy equipment (e.g., dozers, graders, trackhoes), and vehicular traffic with an increase in dust and light pollution. Long-term impacts associated with the Proposed Action include additional production equipment, which would increase the existing visual contrast associated with human modification already present in the area.

##### *No Action Alternative*

The No Action Alternative would constitute denial of the Federal APDs described in the Proposed Action, meaning that the two proposed Federal horizontal wells would not be drilled or developed. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells. Therefore, visual impacts would be projected to increase under the No Action Alternative.

## **Wastes, Hazardous or Solid**

### Affected Environment

The affected environment for hazardous materials includes air, water, soil, and biological resources that may potentially be affected by an accidental release of hazardous materials during transportation to and from the project area, storage, and use in construction and operations. Sensitive areas for hazardous materials releases include areas adjacent to water bodies, above aquifers, and areas where humans or wildlife would be directly impacted.

BLM Instruction Memoranda numbers WO-93-344 and CO-97-023 require that all National Environmental Policy Act documents list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a proposed project. The Glenwood Springs Resource Area, Oil & Gas Leasing & Development, Draft Supplemental Environmental Impact Statement (June 1998), Appendix L, Hazardous Substance Management Plan, contains a comprehensive list of materials that are commonly used for oil and gas projects. It also includes a description of the common industry practices for use of these materials and disposal of the waste products. These practices are dictated by various Federal and State laws and regulations, and the BLM standard lease terms and stipulations that would accompany any authorization resulting from this analysis. The most pertinent of the Federal laws dealing with hazardous materials are as follows:

- The Oil Pollution Act (Public Law 101-380, August 18, 1990) prohibits discharge of pollutants into Waters of the U.S., which by definition include any tributary, including any dry wash that eventually connects with the Colorado River.
- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Public Law 96-510 of 1980) provides for liability, compensation, cleanup, and emergency response for hazardous substances released into the environment. It also provides national, regional, and local contingency plans. Applicable emergency operations plans in place include the National Contingency Plan (40 CFR 300, required by section 105 of CERCLA), the Region VIII Regional Contingency Plan, the Colorado River Sub-Area Contingency Plan (these three are Environmental Protection Agency produced plans), the Mesa County Emergency Operations Plan (developed by the Mesa County Office of Emergency Management), and the BLM Grand Junction Field Office Hazardous Materials Contingency Plan.
- The Resource Conservation and Recovery Act (RCRA) (Public Law 94-580, October 21, 1976) regulates the use of hazardous substances and disposal of hazardous wastes. Note: While oil and gas lessees are exempt from RCRA, right-of-way holders are not. RCRA strictly regulates the management and disposal of hazardous wastes.

Emergency response to hazardous materials or petroleum products on BLM lands are handled through the BLM Grand Junction Field Office contingency plan. The BLM would have access to regional resources if justified by the nature of an incident.

### Environmental Consequences

#### *Proposed Action*

Pollutants potentially spilled or otherwise accidentally released during the construction phase of the project would include diesel fuel, hydraulic fluid, and lubricants associated with the operation of heavy equipment. These materials would be used during construction of the pads, roads, and pipelines and for refueling and maintaining the vehicles and equipment. Potentially harmful substances used in the

construction and operation phases would be kept onsite in limited quantities and trucked to and from the site as required. No hazardous substance, as defined by 40 CFR 355 would be used, produced, stored, transported, or disposed of in amounts above threshold quantities. Waste generated by construction activities would not be exempt from hazardous waste regulations under the oil and gas exploration and production exemption of RCRA. Exempt wastes include those associated with well production and transmission of natural gas through the gathering lines and the natural gas itself.

With the exception of produced hydrocarbons, ethylene glycol (antifreeze), lubricants, and amine compounds, chemicals subject to reporting under Title III of the Superfund Amendments and Reauthorization Act in quantities of 10,000 pounds or more would not be used, produced, stored, transported, or disposed of during construction or operation of the facilities. None of the chemicals used in construction meets the criteria for an acutely hazardous material/substance or the quantities criteria per BLM Instruction Memorandum No. 93-344. In addition, no extremely hazardous substance, as defined in 40 CFR 355, would be produced, used, stored, transported, or disposed of during construction or operation of the facilities in amounts above threshold permissible quantities.

Solid waste (human waste, garbage, etc.) would be generated during construction activities and, to a larger extent, during drilling and completion operations since the workforce would increase during those activities. Trailers housing workers would be outfitted with self-contained sewage collection system; regular trash collection would occur throughout the drilling and well completion process.

Because of the use or production of solid and hazardous wastes, the potential exists for accidental contamination of surface water or groundwater. While uncommon, an accident could occur that would result in a release of one or more of these materials directly or indirectly into surface waters or in a way that poses a potential for transport to groundwater. For example, improper casing and cementing of the boreholes could result in the contamination of groundwater resources. Releases are also possible from tanks used for storage on the pads, from haul trucks used to transport materials to and from the pads, or from pipelines. Storage tanks on the pad are required to be placed within an area of secondary containment equal to 110% of the volume of the enclosed tanks.

In the event of any release of a hazardous substance to the environment in reportable quantities, the responsible party is required to implement a Spill Prevention, Control, and Countermeasures (SPCC) Plan and is liable for cleanup and monetary damages. Depending on the scope of the accident, any of the above referenced contingency plans would be activated to provide emergency response. At a minimum, the BLM Grand Junction Field Office contingency plan would apply. These laws, regulations, standard lease stipulations, and contingency plans and emergency response resources are expected to mitigate any potential hazardous or solid waste issues associated with the Proposed Action.

#### *No Action Alternative*

The No Action Alternative would constitute denial of the Federal APDs described in the Proposed Action, meaning that the two proposed Federal horizontal wells would not be drilled or developed. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells. Therefore, new impacts to wastes, hazardous or solid, are possible under the No Action Alternative.

**Water Quality – Surface and Ground**

*Surface Water and Waters of the U.S.*

Affected Environment

The PA 24-32 pad lies within the “Colorado River below Battlement Creek 6<sup>th</sup>-code watershed unit” and is located about 0.3 mile north of the Colorado River. Two unnamed ephemeral drainages flow through or adjacent to the proposed pad site. These drainages are not currently on the State of Colorado’s *Stream Classifications and Water Quality Standards List* (CDPHE, WQCC Regulation No. 37) (CDPHE 2007), the State of Colorado’s *303(d) List of Water Quality Limited Segments Requiring TMDLS* (CDPHE, WQCC Regulation No. 93) (CDPHE 2006a), or the State of Colorado’s *Monitoring and Evaluation List* (CDPHE, WQCC Regulation No. 94) (CDPHE 2006b).

The larger of the two unnamed ephemeral drainages, which flows just east of the pad footprint, is conveyed beneath I-70 and the north and south frontage roads to the Colorado River, which it enters approximately 0.3 mile to the southeast. This drainage, with a distinct bed and bank, appears to be a jurisdictional Waters of the U.S. as defined by 33 CFR Part 328. The smaller ephemeral drainage to the west of the pad footprint appears to convey lesser and less frequent flows, mostly limited to stormflows following summer thunderstorms. The more minor ephemeral drainage, currently truncated by previous road construction, was also identified as potentially jurisdictional during project-specific surveys because flow events appear to join the larger drainage, to which the lesser drainage was probably tributary before historic road construction.

The closest downstream sediment measuring station on the Colorado River is near DeBeque, Colorado. A summary of the 2 years of data collected at this station is presented in Table 12 (USGS 2007).

<b>Table 12. Sediment Yields – USGS Station 9093700 (Colorado River near DeBeque, CO)</b>				
<i>Maximum (tons/day)</i>	<i>Minimum (tons/day)</i>	<i>Mean (tons/day)</i>	<i>Median (tons/day)</i>	<i>Period of Record</i>
41,300	8.4	1,817.6	267	1974 – 1976
Source: USGS 2007a.				

Environmental Consequences

*Proposed Action*

Any potential direct impacts to the unnamed ephemeral drainages or the Colorado River, would be minimized by many design features of the pad expansion, access road maintenance, cuttings storage placements, and the buried pipeline installation. All road sections would be maintained and graveled, as needed. The pad expansion would be designed and positioned in the optimal location to take advantage of the topography and avoid impacts to the larger of two ephemeral drainages described above. A site-specific COA in Appendix A describes the requirement for a deflection berm to direct runoff from the north and northwest around the proposed pad. This would impact the smaller ephemeral drainage.

Impacts to waters of the U.S. from the planned features of the Proposed Action would be addressed by the U.S. Army Corps of Engineers through the agency’s permitting system. A COA listed in Appendix A

requires that the operator obtain a formal jurisdictional determination by USACE prior to any construction that could affect waters of the U.S. and verification that the impacts do not require a permit or are covered by a Nationwide Permit pursuant to Section 404 of the Clean Water Act.

Potential impacts to surface water quality associated with the Proposed Action would result from surface-disturbing activities, traffic, waste management, and the use, storage and transportation of fluids (i.e., chemicals, condensate, and produced water). Surface-disturbing activities associated with well and facility pads, roads, and pipelines cause loss of vegetation cover, soil compaction and displacement, increased volume and velocity of runoff, and increased sedimentation and salinity in surface waters. Impacts would be minimized by implementing stormwater management BMPs, stockpiling topsoil, controlling erosion, and rehabilitating disturbed surfaces quickly. Long-term soil protection could be achieved by continued road and pad maintenance to reduce erosion, remediation of contaminated soils, and minimizing the size of the long-term pad footprints through interim reclamation measures. As proposed, these measures would include limiting cutslope steepness, step-cutting, crowning road surfaces, installing culverts and drainage systems, and applying gravel to all upgraded roads in the project area to a compacted thickness of 6 inches (Appendix A).

Oil and gas waste management practices have the potential to contaminate soils and surface water. Contamination of soils could cause long-term reduction in site productivity resulting in increased erosion and potential sediment and contaminant delivery to nearby waterways during runoff. Use, storage, and transportation of fluids such as produced water, hydraulic fracturing fluids, and condensate have the possibility of spills that could migrate to surface or groundwater. Elements of the Proposed Action are designed to mitigate risks to surface waters associated with the release and migration of drilling fluids, produced water, and condensate. A closed-loop drilling system would recycle drilling fluids. Cuttings would be dried with a shaker system, decontaminated to COGCC standards and be stacked against the cutslope on the pad. A traditional reserve pit would not be constructed. Completions would be conducted either onsite or remotely and fluids may be stored in secured, lined surface containment or a pit.

In addition to individual containment measures, the entire pad would be bermed to contain an accidental release on the pad. In the event of an accidental release, produced water and condensate would be confined for cleanup in a containment area and would not migrate to surrounding soils or surface waters. Pipelines associated with the transport of these liquids would be pressure tested to detect leakage prior to use. Implementation of the COAs for mitigating impacts to surface waters (Appendix A) would minimize risks of adverse impacts associated with construction and ongoing production activities.

### *No Action Alternative*

The No Action Alternative would constitute denial of the Federal APDs described in the Proposed Action, meaning that the two proposed Federal horizontal wells would not be drilled or developed. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells. Therefore, impacts to waters of the U.S. would be projected to increase under the No Action Alternative.

### ***Groundwater***

#### Affected Environment

The Lower Piceance Basin contains both alluvial and bedrock aquifers (CGS 2003). Unconsolidated alluvial aquifers are the most productive aquifers in the region (USEPA 2004) and are defined as narrow,

thin deposits of sand and gravel formed primarily along stream courses, in this case, along the Colorado River and its tributaries. Alluvial wells are generally less than 200 feet deep and typically range from 100 to 150 feet. Well yield is dependent upon the intended use of the well, well construction design, sediment type and saturated thickness. Domestic wells are limited to 15 gallons per minute (gpm) administratively, while municipal wells are designed and constructed for maximum potential yield.

The principal bedrock aquifers of the Piceance Basin are the Uinta Formation and the Parachute Creek Member of the Green River Formation, and are defined as the upper and lower Piceance Basin aquifer systems. The Uinta Formation consists of discontinuous layers of sandstone, siltstone, and marlstone and is less permeable than the hydrologically connected upper Parachute Creek Member (Robson and Saulnier 1981). The uppermost Uinta Formation also contains a shallow, perched aquifer that is separate from the upper aquifer unit (Cole et al. 1995). The upper Piceance Basin aquifer is underlain by the Mahogany confining unit, and correlates with the Mahogany Zone, the principal oil shale unit of the Piceance Basin. The Mahogany Zone separates the upper aquifer from the lower. The lower aquifer consists of the fractured marlstone of the lower part of the Parachute Creek Member.

The thickness of the upper and lower aquifer units average 700 and 900 feet, respectively (CGS 2003). Both upper and lower aquifer systems are found within the surrounding cliffs of the project area, but no water wells are completed within either the upper or lower bedrock aquifers units as described above. Beneath these two aquifer systems is a confining unit consisting of the Wasatch Formation and the lower two members of the overlying Green River Formation. Some fresh-water wells are completed in localized water-bearing intervals within this unit. Below the Wasatch Formation is the Cretaceous-aged Mesaverde aquifer. At a depth of more than 5,000 feet below ground surface (bgs), this aquifer is far too deep for economic development. The Mesaverde aquifer is of regional importance, but does not provide recharge into the fresh water system within the shallower groundwater system of the area.

Water quality of the upper Piceance Basin aquifer unit is relatively good, ranging in Total Dissolved Solid (TDS) levels from 500 to 1,000 milligrams per liter (mg/L). In the lower unit, TDS concentrations increase from 1,000 to 10,000 mg/L along basin flow paths. Waters with TDS values in excess of 1,000 mg/L are generally unsuitable for potable supply. Water suitable for drinking has a Federal secondary standard set at 500 mg/L or less (USEPA 2006). The quality of the water in the Mesaverde aquifer is highly variable, with concentrations of dissolved solids ranging from less than 1,000 mg/L in many of the basin-margin areas to more than 10,000 mg/L in the central part of the Piceance Basin (USEPA 2004). In general, areas of the aquifer that are recharged by infiltration from precipitation or surface water sources contain relatively fresh water. However, water quality in the Piceance Basin is generally poor overall due to the presence of nahcolite deposits and salt beds throughout the basin. Only very shallow waters such as those from the surficial Wasatch Formation are used for drinking water (USEPA 2004).

According to the COGCC database, 10 permitted fresh-water wells are located within 1 mile of the location, including two geothermal wells, three monitoring wells, and five domestic wells. The wells vary in depths from 84 feet to 150 feet, with static water levels ranging from 55 feet to 145 feet and flow rates ranging from 3 gallons per minute (gpm) to 20 gpm. Surface casing would be set at approximately 2,100 feet TVD, and all potentially useable water zones would be protected.

## Environmental Consequences

### *Proposed Action*

Potential impacts to groundwater resources from the proposed development would include contamination of the groundwater with produced water, drilling mud, and petroleum constituents. Hydraulic fracturing

would be incorporated to create additional pathways to facilitate gas production. Agents called “proppants” used to prop open the fractures are mixed with both fresh water and produced water. These typically include sand, aluminum, glass, or plastic beads, with less than 1% of other compounds such as corrosion-, friction-, and scale-inhibitors (EnerMax Inc. 2007). Fracing techniques are used to create secondary porosity fractures, held open by proppants, allowing the otherwise trapped gas to migrate up the borehole for production.

Hydraulic fracturing would be conducted at 5,000 feet or more bgs. Drilling scenarios are developed to prevent fluids and produced hydrocarbons from migrating upward into fresh water zones. Also see the discussion of hydraulic fracturing on groundwater resources in the section of this EA on Geology and Minerals. Geologic and engineering reviews are conducted to ensure that the cementing and casing programs are adequate to protect all downhole resources. With proper construction practices, drilling practices, and BMPs, no significant adverse impact to groundwater aquifers is anticipated to result from the project (see Downhole COAs in Appendix A).

#### Potential Impacts of Hydraulic Fracturing During Oil and Gas Well Completions

For decades, oil and gas companies and independent geophysicists have used state of the art equipment to monitor microseismic activity—defined as a “faint” or “very slight” tremor—during hydraulic fracturing to optimize well completions and to gather information about fracture dimensions and propagation (Warpinski 2009). These data give an indication about the magnitude of seismic activity associated with hydraulic fracturing, dimensions of resultant fractures in geologic formations, and probability for induced fractures to extend into nearby aquifers, if present. Research indicates that microseismic activity created by hydraulic fracturing occurs at Richter magnitude 1.0 or less (Warpinski and Zimmer 2012). In comparison, a magnitude 3 earthquake is the threshold that can be felt at the ground surface. The Richter magnitude scale is base-10 logarithmic, meaning that a magnitude 1.0 tremor is 1/100th the amplitude of a magnitude 3 tremor. The National Academy of Sciences reviewed more than 100,000 oil and gas wells and waste water disposal wells around the world and concluded that “incidences of felt induced seismicity appear to be very rare,” with only one such documented occurrence (NAS 2012).

The dimensions of induced fractures have been measured with field monitoring equipment (including microseismic “listeners”) and in laboratory tests and have been compared to three-dimensional (3D) hydraulic fracture models. Researchers have successfully validated these models for fracturing in “tight gas” reservoirs including those in the Piceance Basin. Results of the analyses show that fractures resulting from completions of oil and gas wells can be predicted (Zhai and Sharma 2005, Green et al. 2009, Palisch et al. 2012) and that the length of fractures in relation to depth of the well can be estimated.

Hydraulically induced fracture orientation in relation to the wellbore depends upon the downhole environment (i.e., rock mechanics, minimum and maximum principle stress directions, rock physical properties, etc.) and the wellbore trajectory. In vertical or normal directional wells such as in the Mesaverde formation—the predominant hydrocarbon-producing formation in the CRVFO area—fracture growth is primarily lateral or outward from the wellbore, with minimal secondary fractures extending at some angle away from the lateral fractures. In horizontal wells such as being used to develop deep marine shales, fracture growth from the wellbore is mainly determined by the orientation of the wellbore in relation to the principal stresses of the rock.

Fracture growth toward the surface is limited by barriers such as variations in stress and lithology, as is also the case in vertical and normal directional wells. In some horizontal wells, fracture growth is similar to that in vertical or normal directional wells due to wellbore trajectory along the maximum principal

stress direction. Analysis of data from thousands of wells indicates fracture extent (length) of less than 350 feet in the vast majority of cases, with outliers of 1,000 to 2,000 feet (Maxwell 2011, Davies et al. 2012). The extreme outlier lengths are associated with fractures in thick deposits of lithologically uniform marine shales.

The potential height of hydraulically induced fractures in horizontal drilling is reduced in layered sediments in which a propagating fracture encounters a change in rock type or a bedding plane within a formation or a contact between formations. When these features are encountered, the fracture either terminates or to a lesser extent reorients along the generally horizontal bedding plane or formation contact instead of continuing upward across it. In the CRVFO area, natural gas production is primarily from vertically stacked, lenticular tight sands of the Mesaverde formation using vertical and directional wells. These tight-sand lenses are a few tens of feet thick or less. More recently, advances in horizontal drilling technology have allowed enhanced development of deeper marine shales such as the Niobrara formation. These tight-shale deposits are a few hundreds to thousands of feet thick in the CRVFO area compared to many hundreds or thousands of feet in some other gas-producing regions. The thickness of hydrocarbon-bearing strata in this area limits the vertical growth of primary and secondary fractures resulting from hydraulic stimulation.

Based on a review of available information on microseismic monitoring and fracture dimensions, Fisher and Warpinski (2011) concluded that fractures from deep horizontal wells are not a threat to propagate across the long distances (thousands of feet) needed to reach fresh-water aquifers much closer to the surface. This conclusion applies to the CRVFO area, and is also applicable to much shallower potable groundwater sources consisting of unconsolidated alluvium (streambed deposits) associated with the Colorado River and major tributaries. In general, alluvial water wells in the CRVFO extend to depths of less than 200 feet, with few in the range of 400 feet. Typical water levels in these wells range from 50 to 100 feet deep. Impacts to water quality of these shallow fresh-water wells is highly improbable as a result of hydraulic fracturing, which occurs at depths of 5,000 to 11,000 feet below ground surface.

In addition to vertical separation of several thousand feet between the upper extent of fractures and fresh-water aquifers are requirements by the BLM and COGCC for proper casing and cementing of wellbores to isolate the aquifers penetrated by a wellbore. The BLM requires that surface casing be set from 800 to 1,500 feet deep, based on a geological review of the formations, aquifers, and groundwater. Cement is then pumped into the space between the casing and surrounding rock to prevent fluids from moving up the wellbore and casing annulus and coming in contact with shallow rock layers, including fresh-water aquifers. The BLM petroleum engineer reviews well and cement design and final drilling and cementing logs to ensure that the cement has been properly placed. When penetration of groundwater and freshwater aquifers is anticipated, BLM inspectors may witness the cementing of surface casing and subsequent pressure testing to ensure that the annular space between the casing and borehole wall is properly sealed.

No single list of chemicals currently used in hydraulic fracturing exists for western Colorado, and the exact combinations and ratios used by operators are considered proprietary. However, the general types of compounds and relative amounts used are well known and relatively consistent (Table 13). Since hydraulic fracturing is tailored to the downhole environment and companies are aware of the concerns involving hydraulic fracturing, the chemicals listed in Table 13 may or may not be used, and the information is provided solely as general information.

Although a variety of chemical additives are used in hydraulic fracturing—the examples in Table 13 being drawn from a total of 59 listed on the FracFocus website—the vast bulk of fluid injected into the formation during the process is water mixed with sand, representing 99.51% of the total by volume in the

typical mixture shown in Table 13. The sand listed in the table is used as a proppant to help keep the newly formed fractures from closing.

<b>Table 13. Constituents of Typical Hydraulic Fracturing Operations in Tight Gas Formations</b>				
<i>Additive Type*</i>	<i>Typical Example*</i>	<i>Percent by Volume**</i>	<i>Function*</i>	<i>Common Use of Example Compound</i>
Acid	Hydrochloric acid	0.123	Dissolves mineral cement in rocks and initiates cracks	Swimming pool chemical and cleaner
Biocide	Glutaraldehyde	0.001	Eliminates bacteria in water that produce corrosive or poisonous by-products	Disinfectant; sterilizer for medical and dental equipment
Breaker	Ammonium persulfate	0.010	Allows delayed breakdown of the gel	Hair coloring, disinfectant, manufacture of plastics
Clay stabilizer	Potassium chloride	0.060	Creates a brine carrier fluid that prohibits fluid interaction with formation clays	Low-sodium table salt substitutes, medicines, IV fluids
Corrosion inhibitor	Formic acid	0.002	Prevents corrosion of well casing	Preservative in livestock feed; lime remover in toilet bowl cleaner
Crosslinker	Borate salts	0.007	Maintains fluid viscosity as temperature increases	Laundry detergents, hand soaps, and cosmetics
Friction reducer	Polyacrylamide	0.088	“Slicks” water to minimize friction	Flocculant in water treatment and manufacture of paper
Gelling agent	Guar gum	0.056	Thickens water to help suspend sand propping agent	Thickener, binder, or stabilizer in food
Iron control	Citric acid	0.004	Prevents precipitation of metal oxides	Flavoring agent or preservative in food
Surfactant	Lauryl sulfate	0.085	Increases fluid viscosity	Soaps, shampoos, detergents, and foaming agents
pH adjusting agent	Sodium hydroxide, acetic acid	0.011	Adjusts pH of fluid to maintain effectiveness of other components	Sodium hydroxide in soaps, drain cleaners; acetic acid as chemical reagent, main ingredient of vinegar
Scale inhibitor	Sodium polycarboxylate	0.043	Prevents scale deposits in pipes	Dishwashing liquids and other cleaners
Winterizing agent	Ethanol, isopropyl alcohol, methanol	--	Added as necessary as stabilizer, drier, and anti-freezing agent	Various cosmetic, medicinal, and industrial uses
<b>Total Additives</b>		<b>0.49</b>		
<b>Total Water and Sand</b>		<b>99.51</b>		
*FracFocus Chemical Disclosure Registry, <a href="http://fracfocus.org/chemical-use/what-chemicals-are-used">fracfocus.org/chemical-use/what-chemicals-are-used</a>				
**USDOE 2009				

Following completion of fracturing activities, the pressure differential between the formation—a result of several thousand feet of overlying bedrock—and the borehole that connects with the surface causes most of the injected fluids to flow toward the borehole and then upward to the surface along with the hydrocarbon fluids released from the formation. The composition of this mixture, called flowback water, gradually shifts over a period of several days to a few months as injected fluids that have not yet migrated back to the wellbore or reacted with the native rock are carried out of the formation. In 2011, COGCC

published an analysis of hydraulic fracturing technology and potential risks to human health and the environment. The introduction to that report included the following paragraph:

“Hydraulic fracturing has occurred in Colorado since 1947. Nearly all active wells in Colorado have been hydraulically fractured. The COGCC serves as first responder to incidents and complaints concerning oil and gas wells, including those related to hydraulic fracturing. To date, the COGCC has not verified any instances of groundwater contaminated by hydraulic fracturing.”

Based on the information summarized above, the CRVFO has concluded that properly implemented hydraulic fracturing of oil and gas wells drilled within its boundaries for the purpose of accessing Federal fluid minerals or for accessing private fluid minerals from BLM surface lands does not represent a significant adverse impact to human health and the environment.

#### *No Action Alternative*

Under the No Action Alternative, the Federal wells would not be drilled or developed. However, the two proposed Fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new pipelines would take place. Future levels of activity at the pad would be projected to increase with the development of the two fee horizontal wells.

### **Wildlife**

#### AQUATIC ORGANISMS

##### Affected Environment

The Colorado River flows within approximately 0.3 mile of the proposed well pad. The river supports some species of native nongame fishes, non-native nongame fishes, and non-native sportfishes in addition to aquatic macroinvertebrates that provide food sources for these species. In general, the Colorado River in the project vicinity is characterized by naturally high sediment loads and dissolved solid concentrations. See the section on Surface Water and Waters of the U.S. Among the native nongame species known to occur or potentially present in the project vicinity are species Federally listed as endangered and species classified by the BLM as sensitive. See the section on Special Status Wildlife.

##### Environmental Consequences

###### *Proposed Action*

Implementation of the Proposed Action has the potential to result in increases in erosion and sedimentation into nearby drainages and eventually the Colorado River. Because the Proposed Action includes summer use of the project areas, it is likely that roads and pads would not be muddy for extended periods of time. Roads are generally drier and in better condition during the non-winter months and consequently are less prone to erosion. Vehicular use during muddy road conditions could contribute to increased erosion of sediments into nearby ephemeral washes and eventually the Colorado River.

The potential increase of sediment transport to the Colorado River would probably be nominal given background sediment loads currently carried by the river. Sediment-intolerant aquatic wildlife could be negatively affected, as increased erosion potential would persist and impair water and habitat quality. Measures to minimize erosion and sedimentation of aquatic environments are included in the COAs (Appendix A).

### *No Action Alternative*

Under the No Action Alternative, the Federal wells would not be drilled or developed. The PA 24-32 pad reconstruction would not occur, and installation of the buried gas pipeline would not be needed. No surface redisturbance on private land would be necessary. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to be the same as they are at present. Consequently, no new impacts to aquatic wildlife would result under the No Action Alternative.

## MIGRATORY BIRDS

### Affected Environment

The project area consists of sagebrush, saltbush, and rabbitbrush shrublands on the valley floor, rimmed with Utah juniper and scattered pinyon pine along nearby slopes and ridgelines. Associated species on the adjacent slopes include mountain-mahogany (*Cercocarpus montanus*), Utah serviceberry (*Amelanchier utahensis*), black sagebrush (*Artemisia nova*), and a variety of native grasses and forbs. A weedy non-native annual grass, cheatgrass, is scattered and widespread throughout the project area.

Species on the U.S. Fish and Wildlife Service list of Birds of Conservation Concern (BCC) (USFWS 2008) for the project region include two species associated with pinyon-juniper woodlands—the pinyon jay (*Gymnorhinus cyanocephalus*) and juniper titmouse (*Baeolophus griseus*). Another BCC species, Cassin's finch (*Haemorhous cassinii*), nests in higher elevation montane and subalpine conifer forests but commonly moves into pinyon-juniper woodlands following nesting and throughout winter. None of these species was observed during the most recent survey (WWE 2013).

Non-BCC migratory species associated with pinyon-juniper habitats include the broad-tailed hummingbird (*Selasphorus platycercus*), black-chinned hummingbird (*Archilochus alexandri*), western kingbird (*Tyrannus verticalis*), Say's phoebe (*Sayornis saya*), cliff swallow (*Petrochelidon pyrrhonota*), Townsend's solitaire (*Myadestes townsendii*), American robin (*Turdus migratorius*), mountain bluebird (*Sialia sialis*), plumbeous vireo (*Vireo plumbeus*), gray vireo (*V. vicinior*), blue-gray gnatcatcher (*Poliophtila caerulea*), black-throated gray warbler (*Dendroica nigrescens*), chipping sparrow (*Spizella passerina*), lark sparrow (*Chondestes grammacus*), and lesser goldfinch (*Spinus psaltria*).

Areas of mountain shrubs such as mountain-mahogany and serviceberry, although limited, have the potential to attract additional non-BCC species such as the black-headed grosbeak (*Pheucticus melanocephalus*) and spotted towhee (*Pipilo maculata*).

Sagebrush-saltbush habitats may support nesting by one BCC species associated primarily with sagebrush steppe, the Brewer's sparrow, also a BLM sensitive species (see the section on Special Status Species). This habitat type may also support other migrants such as the western meadowlark (*Sturnella neglecta*), vesper sparrow (*Poocetes gramineus*), and lark sparrow.

### Environmental Consequences

#### *Proposed Action*

The Proposed Action would result in a loss of nesting, roosting, perching, and foraging habitat for migratory birds on disturbed areas and reduce habitat effectiveness adjacent to areas where disturbance-related effects could be expected. Expansion of the PA 24-32 pad would redisturb an area that initially

involved the removal of pinyon-juniper woodlands and sagebrush vegetation during the early 1990s. In addition to the associated small-scale physical loss of habitat and habitat fragmentation, it is possible that during construction activities, individual birds could be displaced to adjacent habitats due to noise and human presence. Effects of displacement could include increased risk of predation or failure to reproduce if adjacent habitat is at carrying capacity.

Native bird species are protected by the Migratory Bird Treaty Act (MBTA), which makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. In addition to the MBTA, Executive Order 13186 sets forth the responsibilities of Federal agencies to implement further the provisions of the MBTA by integrating bird conservation principles and practices into agency activities and by ensuring that Federal actions evaluate the effects of actions and agency plans on migratory birds.

Consistent with Executive Order 13186 and BLM Colorado guidelines, CRVFO has established TL (Appendix A) prohibiting initiation of vegetation removal or ground-disturbing activities during the period **May 1 to June 30**, during the peak period for incubation and brood rearing among migratory birds in the project vicinity. The BLM may grant an exception to this COA if surveys by a qualified biologist during the nesting season of BCC species potentially present indicates no active nests within 30 meters (100 feet) of the disturbance area.

Also for the protection of migratory birds is a COA specifying that any pits containing fluids must be fitted with one or more devices to avoid or minimize exposure to the fluids by migratory birds (Appendix A). Such exposures could result in acute toxicity or compromised insulation or buoyancy due to dissolution of protective oil on the feathers.

#### *No Action Alternative*

Under the No Action Alternative, the Federal wells would not be drilled or developed, because the APD would be denied. The PA 24-32 pad reconstruction would not occur, and installation of the buried gas pipeline would not be needed. No surface redisturbance on private land would be necessary. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur, and installation of the new lines would take place. Future levels of activity at the pad would be projected to be the same as they are at present. Consequently, no new impacts to migratory birds would result under the No Action Alternative.

## OTHER TERRESTRIAL SPECIES

### Affected Environment

The project area would be located in medium density pinyon-juniper woodlands with openings of sagebrush, saltbush, and greasewood. Understory vegetation consists of mostly native grasses and forbs with some cheatgrass. Given these vegetation types, the area provides cover, forage, breeding, and nesting habitat for a variety of big game and small game species as well as nongame species.

## MAMMALS

The project area is within overall ranges of mule deer (*Odocoileus hemionus*) and Rocky Mountain elk (*Cervus elaphus nelsoni*). Because of its low elevation the project area is primarily winter range which means deer and elk populations increase during the winter months when animals migrate to lower elevations from the Battlements to the south. Winter densities of big game animals in a given area are

dependent on the type of habitat present and the severity of the winter. Deeper snows and colder temperatures result in increase in the number of big game animals using the area.

The project area contains winter range and severe winter range for mule deer (*Odocoileus hemionus*) and a smaller amount of winter range for Rocky Mountain elk (*Cervus elaphus nelsoni*) as mapped by Colorado Parks and Wildlife (CPW 2011). The mule deer is a recreationally important species that is common throughout suitable habitats in the region. Although most of the area is mapped as mule deer winter range, the project area also receives use by deer during the summer. Rocky Mountain elk are also recreationally important, but the project area contains relatively little suitable habitat for this species. Most winter use by elk north of I-70 in the project vicinity is along Parachute Creek and tributary canyons or along Piceance Creek, which the elk access by moving northward from summer range on the Roan Plateau.

Large carnivores potentially present in the project vicinity include the mountain lion (*Felis concolor*), which moves seasonally with its preferred prey, the mule deer, and the black bear (*Ursus americanus*). Black bears are uncommon in the lowlands north of I-70 due to the scarcity of sufficient forest cover and suitable foods (including acorns and berries). Two smaller carnivores, the coyote (*Canis latrans*) and bobcat (*Lynx rufus*), are also present throughout the region in open habitats and broken or wooded terrain, respectively, where they hunt for small mammals, reptiles, and ground-dwelling birds. Other small carnivores potentially present are the raccoon (*Procyon lotor*) and striped skunk (*Mephitis mephitis*) primarily along Parachute Creek and their respective relatives, the ringtail (*Bassariscus astutus*) and spotted skunk (*Spilogale gracilis*) the drier and more rugged, higher terrain on the valley sideslopes and along tributary drainages.

Small mammals present within the planning area include rodents such as the rock squirrel (*Otospermophilus variegatus*), golden-mantled ground squirrel (*Callospermophilus lateralis*), least chipmunk (*Tamias minimus*), and packrat (bushy-tailed woodrat) (*Neotoma cinerea*) and lagomorphs such as the desert cottontail (*Sylvilagus audubonii*) and black-tailed jackrabbit (*Lepus californicus*). Rodents and, to a lesser extent, lagomorphs are the primary prey for a variety of avian and mammalian predators.

## BIRDS

Raptors potentially nesting in the area include the red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*B. swainsoni*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*A. striatus*), American kestrel (*Falco sparverius*), great horned owl (*Bubo virginiana*), and long-eared owl (*Asio otus*), the latter uncommonly. The carrion-feeding turkey vulture (*Cathartes aura*) is also likely to forage in the area. Two BCC birds of prey—the golden eagle and prairie falcon—are known to nest on cliffs in the general project region and could occasionally use the project area for foraging, although the area would represent a tiny percentage of a typical home range for either species. Two other BCC birds of prey that nest in the general project region but are not expected to forage within or near the site are the bald eagle and peregrine falcon (see the section on Special Status Species).

A raptor survey completed in August 2014 did not identify occupied or unoccupied potential raptor nests within the 0.25-mile project survey buffer.

Passerine (perching) birds commonly found in the area include year-round residents such as the common raven (*Corvus corax*), American crow (*C. brachyrhynchos*), black-billed magpie (*Pica hudsonia*), western scrub-jay (*Aphelocoma californica*), mountain chickadee (*Poecile gambeli*), and house finch (*Haemorhous mexicanus*) in addition to the migratory species and raptors described above under Migratory Birds and previously under Special Status Species.

A non-native gallinaceous species widely introduced as a gamebird, the chukar (*Alectoris chukar*), is present in relatively low numbers on nearby slopes supporting grasses and low shrubs.

## REPTILES AND AMPHIBIANS

The project area is within elevational range of most reptile species known to occur in Garfield County. Species most likely to occur include the short-horned lizard, (*Phrynosoma hernandesi*), plateau lizard (*Sceloporus undulatus*), tree lizard (*Urosaurus ornatus*), plateau whiptail (*Cnemidophorus velox*), and gopher snake (bullsnake) (*Pituophis catenifer*) in pinyon-juniper woodlands, sagebrush shrublands, or grassy clearings. Other reptiles potentially present along riparian areas are the milk snake (*Lampropeltis triangulum*), western terrestrial garter snake (*Thamnophis elegans*), and smooth green snake (*Liochlorophis vernalis*).

The area is also within the known range of the Great Basin spadefoot [toad] (*Spea intermontana*) (see the section on Special Status Species), Woodhouse's toad (*Anaxyrus woodhousii*), and western chorus frog (*Pseudacris triseriata*). Within the CRVFO and vicinity, the spadefoot toad and the true toad occur primarily along ephemeral washes that do not support fish and contain pools of water for a period of at least a few weeks every spring. The chorus frog occurs primarily in cattail and bulrush wetlands and along the vegetated margins of seasonal or perennial ponds and slow-flowing streams.

### Environmental Consequence

#### *Proposed Action*

Direct impacts to terrestrial wildlife from the Proposed Action may include mortality, disturbance, nest abandonment/nesting attempt failure, or site avoidance/displacement from otherwise suitable habitats. These effects could result from habitat loss or modification, increased noise from vehicles and operation of equipment, increased human presence, and collisions between wildlife and vehicles. Impacts would be more substantial during critical seasons such as winter (deer and elk) or the spring/summer breeding season (raptors, songbirds, amphibians).

Deer and elk are often restricted to smaller areas during the winter months and may expend high amounts of energy to move through snow, locate food, and maintain body temperature. Disturbance during the winter can displace wildlife, depleting much-needed energy reserves and may lead to decreased over winter survival. Additional, indirect habitat loss may occur if increased human activity (e.g., traffic, noise) associated with infrastructure causes intolerant species to be displaced or alter their habitat use patterns. The extent of indirect habitat loss varies by species, the type and duration of the disturbance, and the amount of screening provided by vegetation and topography. In general, disturbance-related impacts are temporary, with patterns of distribution and habitat use returning to predisturbance conditions rather quickly when disturbance stops.

Because no raptor nests were identified during the August 2014 project-specific survey, no raptor nesting TL will be applied as a COA (Appendix A).

#### *No Action Alternative*

Under the No Action Alternative, the Federal wells would not be drilled or developed, because the APD would be denied. The PA 24-32 pad reconstruction would not occur, and installation of the buried gas pipeline would not be needed. No surface redisturbance on private land would be necessary. However, the two proposed fee horizontal wells would be drilled and developed, pad reconstruction would occur,

and installation of the new lines would take place. Future levels of activity at the pad would be projected to be the same as they are at present. Consequently, no new impacts to terrestrial wildlife would result under the No Action Alternative.

### **SUMMARY OF CUMULATIVE IMPACTS**

Historically, habitat loss or modification in the CRVFO areas was characteristic of agricultural, ranching lands, rural residential, with localized industrial impacts associated with the railroad and I-70 corridors and the small communities. More recently, the growth of residential and commercial uses, utility corridors, oil and gas developments, and other rural industrial uses (e.g., gravel mining along the Colorado River) has accelerated the accumulation of impacts in the area. Cumulative impacts have included (1) direct habitat loss, habitat fragmentation, and decreased habitat effectiveness; (2) increased potential for runoff, erosion, and sedimentation; (3) expansion of noxious weeds and other invasive species; (4) increased fugitive dust from construction of oil and gas pads, roads, and pipelines and associated truck travel; (5) increased noise, especially along access and haul roads; (6) increased potential for spills and other releases of chemical pollutants; and (7) decreased scenic quality.

Although none of the cumulative impacts was described in the 1999 FSEIS (BLM 1999a) as significant, and while new technologies and regulatory requirements have reduced the impacts of some land uses, it is clear that past, present, and reasonably foreseeable future actions have had and would continue to have adverse effects on various elements of the human environment. Anticipated impacts for existing and future actions range from negligible to locally major, and primarily negative, for specific resources.

The primary bases for this assessment are twofold. First, although the rate of development, including oil and gas development, has slowed in recent years due to the general economic downturn and depressed natural gas prices, some development continues to occur, adding to the previous residential, commercial, and industrial growth, the previous habitat loss, modification, and fragmentation, and the amount of vehicular traffic and equipment operations associated with long-term production and maintenance. Second, most of the oil and gas development has occurred on private lands where mitigation measures designed to protect and conserve resources may not be in effect to the same extent as on BLM lands. However, COGCC regulations enacted in recent years have closed considerably the former gap between the potential environmental impacts associated with development of private versus Federal fluid mineral resources.

It is clear that the Proposed Action would contribute to the collective adverse impact for some resources. Although the contribution would be minor, the Proposed Action would contribute incrementally to the collective impact to air quality, vegetation, migratory birds, terrestrial wildlife, and other resources. The 2011 air quality modeling that provided the basis for the assessment of impacts from oil and gas projects within the CRVFO specifically addressed cumulative effects by including present and reasonably foreseeable future emission sources and air quality receptors within the field office area and a much larger modeling domain. This cumulative analysis included not only Federal wells but also the much more numerous private wells (see the section on [Air Quality](#)).

### **PERSONS AND AGENCIES CONSULTED**

WPX Energy: April Mestas, Adam Tankersley, Mike Reynolds, Heather Hancock, Kris Meil, Traci Van Loan, Wayne Gallahan, Porter Cooley, Justin Hall

Colorado Oil and Gas Conservation Commission: Dave Kubecko

**INTERDISCIPLINARY REVIEW**

The BLM staff from the CRVFO who participated in the preparation of this EA, including review of survey results submitted by the operator’s consultants, evaluation of impacts likely to occur from implementation of the Proposed Action, and identification of appropriate COAs to be attached and enforced by the BLM, are listed in Table 14.

<b>Table 14. BLM Interdisciplinary Team Authors and Reviewers</b>		
<i>Name</i>	<i>Title</i>	<i>Areas of Participation</i>
John Brogan	Archaeologist	Cultural Resources, Native American Religious Concerns
Bob Hartman	Petroleum Engineer	Downhole COAs
Vanessa Caranese	Geologist	Geology and Minerals, Groundwater, Paleontology, Soils
Allen Crockett, Ph.D., J.D.	Supervisory Natural Resource Specialist	Technical Review, NEPA Review
Christina O’Connell	Natural Resource Specialist	EA Project Lead, Access & Transportation, Socioeconomics, Wastes-Hazardous or Solid, Air Quality, Noise, Surface Waters, Waters of the U.S.
Judy Perkins, Ph.D.	Botanist	Invasive Non-native Species, Special Status Plants, Vegetation
Sylvia Ringer	Wildlife Biologist	Migratory Birds, Special Status Species Animals, Aquatic and Terrestrial Wildlife

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**APPENDIX A**

**Surface-Use and Downhole Conditions of Approval  
for the PA 24-32 Pad**

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**SURFACE-USE CONDITIONS OF APPROVAL  
DOI-BLM-CO-N040-2015-0049-EA**

**General COAs Applicable to All Surface Disturbance Associated with the Project**

1. Administrative Notification. The operator shall notify the BLM representative at least 48 hours prior to initiation of construction. If requested by the BLM representative, the operator shall schedule a preconstruction meeting, including key operator and contractor personnel, to ensure that any unresolved issues are fully addressed prior to initiation of surface-disturbing activities or placement of production facilities. No construction activities shall commence without staking of pad construction limits, pad corners, and road/pipeline centerlines and disturbance corridors.
2. Road Maintenance. Roads shall be crowned, ditched, surfaced, drained with culverts and/or water dips, and constructed to BLM Gold Book standards. Initial gravel application shall be a minimum of 6 inches. The operator shall provide timely year-round road maintenance and cleanup on the access roads. A regular schedule for maintenance shall include, but not be limited to, blading, ditch and culvert cleaning, road surface replacement, and dust abatement. When rutting within the traveled way becomes greater than 6 inches, blading and/or gravelling shall be conducted as approved by the BLM.
3. Drill Cuttings Management. Cuttings generated from the numerous planned well bores shall be worked through a shaker system on the drill rig, mixed with a drying agent, if necessary, and deposited in the planned cuttings trench or piled on location against the cut slope for later burial during the interim reclamation earthwork. The cuttings shall be remediated per COGCC regulations (Table 910-1 standards) prior to earthwork reshaping related to well pad interim reclamation.
4. Dust Abatement. The operator shall implement dust abatement measures as needed to prevent fugitive dust from vehicular traffic, equipment operations, or wind events. The BLM may direct the operator to change the level and type of treatment (watering or application of various dust agents, surfactants, and road surfacing material) if dust abatement measures are observed to be insufficient to prevent fugitive dust.
5. Air Emissions. Pursuant to BLM Instruction Memorandum No. CO-2015-009 issued on February 9, 2015, the operator shall either voluntarily submit an emissions inventory to the BLM using the online Emissions Tool or provide the necessary data for the BLM to complete an emissions inventory. The BLM may direct the operator to implement appropriate mitigation measure(s) if the emissions inventory results indicate a threshold exceedance of any single criteria pollutant (PM<sub>10</sub>, PM<sub>2.5</sub>, CO, NO<sub>x</sub>, SO<sub>x</sub>). **NOTE: If the operator chooses to enter emissions inventory data directly into the BLM worksheet, the operator shall await notification from the BLM that worksheet revisions currently underway by the BLM Colorado State Office have been completed and are in place (estimated timeframe April 2015).**
6. Drainage Crossings and Culverts. Construction activities at perennial, intermittent, and ephemeral drainage crossings (e.g., burying pipelines, installing culverts) shall be timed to avoid high flow conditions. Construction that disturbs any flowing stream shall utilize either a piped stream diversion or a cofferdam and pump to divert flow around the disturbed area.

Culverts at drainage crossings shall be designed and installed to pass a 25-year or greater storm event. On perennial and intermittent streams, culverts shall be designed to allow for passage of aquatic biota. The minimum culvert diameter in any installation for a drainage crossing or road drainage shall be 24 inches. Crossings of drainages deemed to be jurisdictional Waters of the U.S. pursuant to Section 404 of the Clean Water Act may require additional culvert design capacity. Due to the flashy nature of

area drainages and anticipated culvert maintenance, the U.S. Army Corps of Engineers (USACE) recommends designing drainage crossings for the 100-year event. Contact the USACE Colorado West Regulatory Branch at 970-243-1199 ext. 17.

Pipelines installed beneath stream crossings shall be buried at a minimum depth of 4 feet below the channel substrate to avoid exposure by channel scour and degradation. Following burial, the channel grade and substrate composition shall be returned to preconstruction conditions.

7. Jurisdictional Waters of the U.S. The operator shall obtain appropriate permits from the U.S. Army Corps of Engineers (USACE) prior to discharging fill material into Waters of the U.S. in accordance with Section 404 of the Clean Water Act. Waters of the U.S. are defined in 33 CFR Section 328.3 and may include wetlands as well as perennial, intermittent, and ephemeral streams. Permanent impacts to Waters of the U.S. may require mitigation. Contact the USACE Colorado West Regulatory Branch at 970-243-1199 ext. 17. Copies of any printed or emailed approved USACE permits or verification letters shall be forwarded to the BLM.
8. Reclamation. The goals, objectives, timelines, measures, and monitoring methods for final reclamation of oil and gas disturbances are described in Appendix I (Surface Reclamation) of the 1998 Draft Supplemental EIS (DSEIS). Specific measures to follow during interim reclamation are described below.
  - a. Reclamation Plans. In areas that have low reclamation potential or are especially challenging to restore, reclamation plans will be required prior to APD approval. The plan shall contain the following components: detailed reclamation plans, which include contours and indicate irregular rather than smooth contours as appropriate for visual and ecological benefit; timeline for drilling completion, interim reclamation earthwork, and seeding; soil test results and/or a soil profile description; amendments to be used; soil treatment techniques such as roughening, pocking, and terracing; erosion control techniques such as hydromulch, blankets/matting, and wattles; and visual mitigations if in a sensitive VRM area.
  - b. Deadline for Interim Reclamation Earthwork and Seeding. Interim reclamation to reduce a well pad to the maximum size needed for production, including earthwork and seeding of the interim reclaimed areas, shall be completed within 6 months following completion of the last well planned to be drilled on that pad as part of a continuous operation. If a period of greater than one year is expected to occur between drilling episodes, the BLM may require implementation of all or part of the interim reclamation program.

Reclamation, including seeding, of temporarily disturbed areas along roads and pipelines, and of topsoil piles and berms, shall be completed within 30 days following completion of construction. Any such area on which construction is completed prior to December 1 shall be seeded during the remainder of the early winter season instead of during the following spring, unless the BLM approves otherwise based on weather. If road or pipeline construction occurs discontinuously (e.g., new segments installed as new pads are built) or continuously but with a total duration greater than 30 days, reclamation, including seeding, shall be phased such that no portion of the temporarily disturbed area remains in an unreclaimed condition for longer than 30 days. The BLM may authorize deviation from this requirement based on the season and the amount of work remaining on the entirety of the road or pipeline when the 30-day period has expired.

If requested by the project lead NRS for a specific pad or group of pads, the operator shall contact the NRS by telephone or email approximately 72 hours before reclamation and reseeding begin.

This will allow the NRS to schedule a pre-reclamation field visit if needed to ensure that all parties are in agreement and provide time for adjustments to the plan before work is initiated.

The deadlines for seeding described above are subject to extension upon approval of the BLM based on season, timing limitations, or other constraints on a case-by-case basis. If the BLM approves an extension for seeding, the operator may be required to stabilize the reclaimed surfaces using hydromulch, erosion matting, or other method until seeding is implemented.

- c. Topsoil Stripping, Storage, and Replacement. All topsoil shall be stripped following removal of vegetation during construction of well pads, pipelines, roads, or other surface facilities. In areas of thin soil, a minimum of the upper 6 inches of surficial material shall be stripped. The BLM may specify a stripping depth during the onsite visit or based on subsequent information regarding soil thickness and suitability. The stripped topsoil shall be stored separately from subsoil or other excavated material and replaced prior to final seedbed preparation. The BLM best management practice (BMP) for the Windrowing of Topsoil shall be implemented for well pad construction whenever topography allows.
- d. Seedbed Preparation. For cut-and-fill slopes, initial seedbed preparation shall consist of backfilling and recontouring to achieve the configuration specified in the reclamation plan. For compacted areas, initial seedbed preparation shall include ripping to a minimum depth of 18 inches, with a maximum furrow spacing of 2 feet. Where practicable, ripping shall be conducted in two passes at perpendicular directions. Following final contouring, the backfilled or ripped surfaces shall be covered evenly with topsoil.

Final seedbed preparation shall consist of scarifying (raking or harrowing) the spread topsoil prior to seeding. If more than one season has elapsed between final seedbed preparation and seeding, and if the area is to be broadcast-seeded or hydroseeded, this step shall be repeated no more than 1 day prior to seeding to break up any crust that has formed.

If directed by the BLM, the operator shall implement measures following seedbed preparation (when broadcast-seeding or hydroseeding is to be used) to create small depressions to enhance capture of moisture and establishment of seeded species. Depressions shall be no deeper than 1 to 2 inches and shall not result in piles or mounds of displaced soil. Excavated depressions shall not be used unless approved by the BLM for the purpose of erosion control on slopes. Where excavated depressions are approved by the BLM, the excavated soil shall be placed only on the downslope side of the depression.

If directed by the BLM, the operator shall conduct soil testing prior to reseeding to identify if and what type of soil amendments may be required to enhance revegetation success. At a minimum, the soil tests shall include texture, pH, organic matter, sodium adsorption ratio (SAR), cation exchange capacity (CEC), alkalinity/salinity, and basic nutrients (nitrogen, phosphorus, potassium [NPK]). Depending on the outcome of the soil testing, the BLM may require the operator to submit a plan for soil amendment. Any requests to use soil amendments not directed by the BLM shall be submitted to the CRVFO for approval.

- e. Seed Mixes. A seed mix consistent with BLM standards in terms of species and seeding rate for the Low-Elevation Salt-Desert Scrub/Basin Big Sagebrush habitat type shall be used on all BLM lands affected by the project (see Attachment 1 of the letter provided to operators dated October 24, 2014).

For private surfaces the operator shall use a BLM-approved native seed mix unless specified otherwise by the private landowner.

The seed shall contain no prohibited or restricted noxious weed seeds and shall contain no more than 0.5 percent by weight of other weed seeds. Seed may contain up to 2.0 percent of “other crop” seed by weight, including the seed of other agronomic crops and native plants; however, a lower percentage of other crop seed is recommended. Seed tags or other official documentation shall be submitted to the BLM at least 14 days before the date of proposed seeding for acceptance. Seed that does not meet the above criteria shall not be applied to public lands.

- f. Seeding Procedures. Seeding shall be conducted no more than 24 hours following completion of final seedbed preparation.

Where practicable, seed shall be installed by drill-seeding to a depth of 0.25 to 0.5 inch. Where drill-seeding is impracticable, seed may be installed by broadcast-seeding at twice the drill-seeding rate, followed by raking or harrowing to provide 0.25 to 0.5 inch of soil cover or by hydroseeding and hydromulching. Hydroseeding and hydromulching shall be conducted in two separate applications to ensure adequate contact of seeds with the soil.

An exception to these seeding requirements shall be made for seeding of sagebrush. Sagebrush seeding shall occur prior to winter snowfall, or on top of snow. Sagebrush may be sown either by broadcast seeding, or, if not on snowpack, by placing the seed in the fluffy seed box of a seed drill, with the drop tube left open to allow seed to fall out on the ground surface.

If interim revegetation is unsuccessful, the operator shall implement subsequent reseeding until interim reclamation standards are met.

- g. Mulch. Mulch shall be applied within 24 hours following completion of seeding in project areas within pinyon-juniper, sagebrush shrubland, and/or salt desert shrub habitat types. Mulch may consist of either hydromulch or of certified weed-free straw or certified weed-free native grass hay crimped into the soil. Mulch shall not be used within mountain shrub or spruce-fir forest habitat types, unless requested or approved by the BLM.

NOTE: Mulch is not required in areas where erosion potential mandates use of a biodegradable erosion-control blanket (straw matting).

- h. Erosion Control. Cut-and-fill slopes shall be protected against erosion with the use of water bars, lateral furrows, or other BMPs approved by the BLM. Additional BMPs such as biodegradable wattles, weed-free straw bales, or silt fences shall have be employed as necessary to reduce transport of sediments into the drainages. The BLM may, in areas with high erosion potential, require use of hydromulch or biodegradable blankets/matting to ensure adequate protection from slope erosion and offsite transport of sediments and to improve reclamation success.
- i. Site Protection. The pad shall be fenced to BLM standards to exclude livestock grazing for the first two growing seasons or until seeded species are firmly established, whichever comes later. The seeded species will be considered firmly established when at least 50 percent of the new plants are producing seed. The BLM will approve the type of fencing.
- j. Monitoring. The operator shall conduct annual monitoring surveys of all sites categorized as “operator reclamation in progress” and shall submit an annual monitoring report of these sites,

including a description of the monitoring methods used, to the BLM by **December 31** of each year. The monitoring program shall use the four Reclamation Categories defined in Appendix I of the 1998 DSEIS to assess progress toward reclamation objectives. The annual report shall document whether attainment of reclamation objectives appears likely. If one or more objectives appear unlikely to be achieved, the report shall identify appropriate corrective actions. Upon review and approval of the report by the BLM, the operator shall be responsible for implementing the corrective actions or other measures specified by the BLM.

9. Weed Control. The operator shall regularly monitor and promptly control noxious weeds or other undesirable plant species as set forth in the Glenwood Springs Field Office *Noxious and Invasive Weed Management Plan for Oil and Gas Operators*, dated March 2007. A Pesticide Use Proposal (PUP) must be approved by the BLM prior to the use of herbicides. Annual weed monitoring reports and Pesticide Application Records (PARs), including GPS data in accordance with the February 27, 2014, letter to operators, shall be submitted to BLM by **December 1**.
10. Bald and Golden Eagles. It shall be the responsibility of the operator to comply with the Bald and Golden Eagle Protection Act (Eagle Act) with respect to “take” of either eagle species. Under the Eagle Act, “take” includes to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest and disturb. “Disturb” means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle; (2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior. Avoidance of eagle nest sites, particularly during the nesting season, is the primary and preferred method to avoid a take. Any oil or gas construction, drilling, or completion activities planned within 0.5 mile of a bald or golden eagle nest, or other associated activities greater than 0.5 miles from a nest that may disturb eagles, shall be coordinated with the BLM project lead, the BLM wildlife biologist, and the USFWS representative to the BLM Field Office (970-876-9051).
11. Raptor Nesting. To protect nesting raptors, a survey shall be conducted prior to construction, drilling, or completion activities that are to begin during the raptor nesting season (February 1 to August 15) shall be surveyed for active or inactive but potential nests within 0.25 mile of a well pad or 0.125 mile of an access road, pipeline, or other surface facility. Results of the survey shall be submitted to the BLM. If a raptor nest is located within the buffer widths specified above, a 60-day raptor nesting TL will be applied by the BLM to preclude initiation of construction, drilling, and completion activities during the period **April 1 to May 30**. The operator is responsible for complying with the MBTA, which prohibits the “take” of birds or of active nests (those containing eggs or young), including nest failure caused by human activity (see COA for Migratory Birds). If project-related activities are initiated within the specified buffer distance of any active nest, even if outside the 60-day TL period specified in this COA, the operator remains responsible for compliance with the MBTA with respect to a “take” of birds or of active nests (those containing eggs or young), including nest failure caused by human activity (see COA for Migratory Birds).
12. Migratory Birds – Birds of Conservation Concern. Pursuant to BLM Instruction Memorandum 2008-050, all vegetation removal or surface disturbances in previously undisturbed lands providing potential nesting habitat for Birds of Conservation Concern (BCC) is prohibited from **May 1 to June 30**. An exception to this TL may be granted if nesting surveys conducted no more than one week prior to surface-disturbing activities indicate that no BCC species are nesting within 30 meters (100 feet) of the area to be disturbed. Nesting shall be deemed to be occurring if a territorial (singing) male is present within the distance specified above. Nesting surveys shall include an aural survey for diagnostic vocalizations in conjunction with a visual survey for adults and nests. Surveys shall be

conducted by a qualified breeding bird surveyor between sunrise and 10:00 AM under favorable conditions for detecting and identifying a BCC species. This provision does not apply to ongoing construction, drilling, or completion activities that are initiated prior to May 1 and continue into the 60-day period at the same location.

13. Migratory Birds – General. It shall be the responsibility of the operator to comply with the Migratory Bird Treaty Act (MBTA) with respect to “take” of migratory bird species, which includes injury and direct mortality resulting from human actions not intended to have such result. To minimize the potential for the take of a migratory bird, the operator shall take reasonable steps to prevent use by birds of fluid-containing pits associated with oil or gas operations, including but not limited to reserve pits, produced-water pits, hydraulic fracturing flowback pits, evaporation pits, and cuttings trenches. Liquids in these pits—whether placed or accumulating from precipitation—may pose a risk to birds as a result of ingestion, absorption through the skin, or interference with buoyancy and temperature regulation.

Based on low effectiveness of brightly colored flagging or spheres suspended over a pit, the operator shall install netting with a mesh size of 1 to 1.5 inches, and suspended at least 4 feet above the fluid surface, on all pits into which fluids are placed, except for storage of fresh water in a pit that contains no other material. The netting shall be installed within 24 hours of placement of fluids into a pit. The requirement for netting does not apply to pits during periods of continuous, intensive human activity at the pad, such as drilling and hydraulic fracturing phases or, as pertains to cuttings trenches, during periods of active manipulation for cuttings management, remediation of contaminated materials, or other purposes.

14. Fossil Resources. All persons associated with operations under this authorization shall be informed that any objects or sites of paleontological or scientific value, such as vertebrate or scientifically important invertebrate fossils, shall not be damaged, destroyed, removed, moved, or disturbed. If in connection with operations under this authorization any of the above resources are encountered the operator shall immediately suspend all activities in the immediate vicinity of the discovery that might further disturb such materials and notify the BLM of the findings. The discovery shall be protected until notified to proceed by the BLM.

Where feasible, the operator shall suspend ground-disturbing activities at the discovery site and immediately notify the BLM of any finds. The BLM would, as soon as feasible, have a BLM-permitted paleontologist check out the find and record and collect it if warranted. If ground-disturbing activities cannot be immediately suspended, the operator shall work around or set the discovery aside in a safe place to be accessed by the BLM-permitted paleontologist.

15. Cultural Education/Discovery. All persons in the area who are associated with this project shall be informed that if anyone is found disturbing historic, archaeological, or scientific resources, including collecting artifacts, the person or persons would be subject to prosecution.

If subsurface cultural values are uncovered during operations, all work in the vicinity of the resource will cease and the Authorized Officer with the BLM notified immediately. The operator shall take any additional measures requested by the BLM to protect discoveries until they can be adequately evaluated by the permitted archaeologist. Within 48 hours of the discovery, the SHPO and consulting parties will be notified of the discovery and consultation will begin to determine an appropriate mitigation measure. BLM in cooperation with the operator will ensure that the discovery is protected from further disturbance until mitigation is completed. Operations may resume at the discovery site upon receipt of written instructions and authorization by the authorized officer.

Pursuant to 43 CFR 10.4(g), the holder must notify the authorized officer, by telephone, with written confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony on Federal land. Further, pursuant to 43 CFR 10.4 (c) and (d), the holder must stop activities in the vicinity of the discovery that could adversely affect the discovery. The holder shall make a reasonable effort to protect the human remains, funerary items, sacred objects, or objects of cultural patrimony for a period of thirty days after written notice is provided to the authorized officer, or until the authorized officer has issued a written notice to proceed, whichever occurs first.

Antiquities, historic ruins, prehistoric ruins, and other cultural or paleontological objects of scientific interest that are outside the authorization boundaries but potentially affected, either directly or indirectly, by the Proposed Action shall also be included in this evaluation or mitigation. Impacts that occur to such resources as a result of the authorized activities shall be mitigated at the operator's cost, including the cost of consultation with Native American groups.

Any person who, without a permit, injures, destroys, excavates, appropriates or removes any historic or prehistoric ruin, artifact, object of antiquity, Native American remains, Native American cultural item, or archaeological resources on public lands is subject to arrest and penalty of law (16 USC 433, 16 USC 470, 18 USC 641, 18 USC 1170, and 18 USC 1361).

16. Interim Reclamation Related to Drilling Phases. Within 1 year of completion of all exploratory wells proposed on a pad or within one year of completion of all development wells on a pad (whichever the situation may be), the operator would stabilize the disturbed area by recontouring, mulching, providing run-off and erosion control, replacing topsoil as directed, and seeding with BLM-prescribed native seed mixes (or landowner requested seed mix on Fee surface), and conducting weed control, as necessary. In cases where the exploratory drilling and development drilling on a single pad occur more than 1 year apart, slopes shall be recontoured to the extent necessary to accommodate seeding, and seed mixes required by the BLM or requested by the private landowner shall be applied to stabilize the soil between visits per direction of the BLM.
17. Windrowing of Topsoil. Topsoil shall be windrowed around the pad perimeter to create a berm that limits and redirects stormwater runoff and extends the viability of the topsoil per BLM Topsoil Best Management Practices (BLM 2009 PowerPoint presentation available upon request from Glenwood Springs Field Office). Topsoil shall also be windrowed, segregated, and stored along pipelines and roads for later spreading across the disturbed corridor during final reclamation. Topsoil berms shall be promptly seeded to maintain soil microbial activity, reduce erosion, and minimize weed establishment.
18. Range Management. Range improvements (fences, gates, reservoirs, pipelines, etc.) shall be avoided during development of natural gas resources to the maximum extent possible. If range improvements are damaged during exploration and development, the operator will be responsible for repairing or replacing the damaged range improvements. If a new or improved access road bisects an existing livestock fence, steel frame gate(s) or a cattleguard with associated bypass gate shall be installed across the roadway to control grazing livestock.
19. Visual Resources. Production facilities shall be placed to avoid or minimize visibility from travel corridors, residential areas, and other sensitive observation points – unless directed otherwise by the BLM due to other resource concerns – and shall be placed to maximize reshaping of cut-and-fill slopes and interim reclamation of the pad.

Above-ground facilities shall be painted with BLM Standard Environmental Color **Shadow Gray** to minimize contrast with adjacent vegetation or rock outcrops.

To the extent practicable, existing vegetation shall be preserved when clearing and grading for pads, roads, and pipelines. The BLM may direct that cleared trees and rocks be salvaged and redistributed over reshaped cut-and-fill slopes or along linear features.

**SITE-SPECIFIC COAS APPLICABLE TO THE FOLLOWING PROJECT COMPONENTS**

1. In addition to windrowing top soil around pad perimeter, WPX shall use the topsoil to establish stormwater controls on the pad. A deflection berm as shown on Plat 2 shall be installed along the west side of the new access road and pipelines to redirect overland drainage into the existing ephemeral draw that flows to west and south. Any overland drainage from north of the pad shall be diverted to the east by the windrowed topsoil pile.
2. A minimum 18-inch diameter culvert shall be installed at the pad entrance.

## BUREAU OF LAND MANAGEMENT

Colorado River Valley Field Office  
2300 River Frontage Road  
Silt, CO 81652

### CONDITIONS OF APPROVAL Synthetic-Based Drilling Fluid

Operator: WPX Energy Rocky Mountain LLC  
Case Number: COC62162  
Well(s): PA 732-21-32 HN1, PA 732-31-32-HN1 (PA 24-32 Pad)  
Surface Location: Garfield County; SE SW, Sec. 32, T6S, R95W

The use of synthetic-based drilling mud (SBM) to drill the horizontal leg of the Niobrara wells (PA 732-21-32 HN1, PA 732-31-32-HN1) on the PA 24-32 pad shall be conducted consistent with the protocols outlined in the APDs and these COAs. Such approval for the use of SBM is expressly limited to the curve and lateral portion of the wells after the setting and cementing of the intermediate casing.

#### Cuttings Management

1. All cuttings developed during the use of SBM shall be collected in the cuttings tray or box set under the centrifuge system on the Pace X rig. Care shall be taken to keep the cuttings tray area as tidy as possible to avoid ground contamination from the SBM use – the centrifuge outlets shall be closed off during the switching out of cuttings trays. When the cuttings tray is filled to capacity, with a contingency for safe hauling on roads and highways, the tray shall be removed from under the rig's centrifuge system on the PA 24-32 pad and either (a) hauled directly to Greenleaf with a manifest for disposal.
2. Cuttings shall be tested periodically during the drilling process for the constituents and contamination levels addressed in the COGCC Table 910-1 and testing results shall be submitted to BLM for review upon request. All cuttings that fail to satisfy the contamination levels identified in COGCC's Table 910-1 shall be hauled to and disposed at the Greenleaf facility identified in the APDs.

#### Synthetic-Based Mud (SBM) Operations

3. Mud hoses shall be new or like new with hydraulically crimped-on hose ends. King nipples or hose clamps shall not be used.
4. The drilling system shall be equipped with appropriate drip pans, liners, and catchments under reasonably anticipated leak sources as needed to prevent the SBM and cuttings from the contaminating ground surface of the drill pad.
5. Any cuttings dropped or mud spilled shall be immediately cleaned up and placed in the approved containment device.
6. All spills in excess of one barrel outside the containment devices shall be reported to the BLM within 24 hours. A spill kit specific to SBM use shall be staged onsite.
7. Prior to skidding or moving the drill rig to another well or well pad, the pumps, pump lines and tanks shall be cleaned to ensure that no SBM is in the system during surface drilling operations of the new well.

8. The BLM shall be notified 24 hours prior to the use of SBM by calling the PET notification phone number (970) 876-9064. For work to commence on a Monday, notice shall be provided to the BLM no later than close of business (COB) on the previous Thursday.

Post-Assessment Review

9. WPX and representatives shall participate in a post-assessment meeting with the BLM to discuss and review the drilling process for the PA 24-32 Niobrara wells. The meeting will focus on information sharing, remedies for problems, approaches for future use, etc. If the situation warrants during the drilling process, WPX may request, and the BLM may require, a meeting to discuss methods to remedy unforeseen circumstances or events related to the use of SBM.

## BUREAU OF LAND MANAGEMENT

Colorado River Valley Field Office  
2300 River Frontage Road  
Silt, CO 81652

### DOWNHOLE CONDITIONS OF APPROVAL Applications for Permit to Drill

Operator: WPX Energy Rocky Mountain LLC  
Case Number: COC62162  
Surface Location: Garfield County; SE SW, Sec. 32, T6S, R95W

See list of wells following the COAs.

- 1. The proposed horizontal wellbore crosses lease lines. Therefore, a communitization agreement (CA) must be created prior to completion or production operations. Please contact Jennifer Robinson at 970-876-9055 with any questions related to CAs.**
2. Twenty-four hours *prior* to (a) spudding, (b) conducting BOPE tests, (c) cementing/running casing strings, and (d) within 24 hours *after* spudding, the CRVFO shall be notified. One of the following CRVFO inspectors shall be notified by phone. The contact number for all notifications is: 970-876-9064. The BLM CRVFO inspectors are; David Giboo, PET; Greg Rios, PET; Tim Barrett, PET; Alex Provstgaard, PET; Brandon Jamison, PET.
3. A CRVFO petroleum engineer shall be contacted for a verbal approval prior to commencing remedial work, plugging operations on newly drilled boreholes, changes within the drilling plan, sidetracks, changes or variances to the BOPE, deviating from conditions of approval, and conducting other operations not specified within the APD. Contact the petroleum engineer for verbal approvals (contact information below).
4. If a well control issue or failed test (e.g. kick, blowout, water flow, casing failure, or a bradenhead pressure increase) arises during drilling or completions operations, the petroleum engineer shall be notified within 24 hours from the time of the event. IADC/Driller's Logs and Pason Logs (mud logs) shall be forwarded to CRVFO – Petroleum Engineer, 2300 River Frontage Road, Silt, CO 81652 within 24 hours of a well control event.
5. The BOPE shall be tested and conform to Onshore Order No. 2 for a **10M** system and recorded in the IADC/Driller's log.
6. Flexible choke lines shall meet or exceed the API SPEC 16C requirements. Flexible choke lines shall have flanged connections and configured to the manufacturer's specifications. The flexible choke lines shall be anchored in a safe and workmanlike manner. At minimum, all connections shall be effectively anchored in place for safety of the personal on location. Manufacturer specifications shall be kept with the drilling rig at all times and immediately supplied to the authorized officer/inspector upon request. Specifications at a minimum shall include acceptable bend radius, heat range, anchoring, and the working pressure. All flexible choke lines shall be free of gouges, deformations, and as straight/short as possible.

7. Prior to drilling out the surface casing shoe, gas detecting equipment shall be installed in the mud return system. The mud system shall be monitored for hydrocarbon gas/pore pressure changes, rate of penetration, and fluid loss.
8. After the surface/intermediate casing is cemented, a Pressure Integrity Test/Mud Equivalency Test/FIT shall be performed on the first well drilled in accordance with OOGO No. 2; Sec. III, B.1.i. to ensure that the surface/intermediate casing is set in a competent formation. This is not a Leak-off Test, but a formation competency test, insuring the formation at the shoe is tested to the highest anticipated mud weight equivalent necessary to control the formation pressure to the next casing shoe depth or TD. Submit the results from the test via email to the petroleum engineer on the first well drilled on the pad or any horizontal well and record results in the IADC log. A failed pressure integrity test is more than 10% pressure bleed off in 15 minutes. Report failed test to the petroleum engineer.
9. On the first well drilled on this pad, a triple combo open-hole log shall be run from the base of the surface borehole to surface and from TD to bottom of surface casing shoe. This log shall be in submitted within 48 hours in .las and .pdf format to: CRVFO – Petroleum Engineer, 2300 River Frontage Road, Silt, CO 81652. Contact 970-876-9000 for clarification.
10. Submit the (a) mud/drilling log (e.g. Pason disc), (b) driller’s event log/operations summary report, (c) production test volumes, (d) directional survey, and (e) Pressure Integrity Test results within 30 days of completed operations (i.e. landing tubing) per 43 CRF 3160-9 (a).
11. During hydraulic frac operations, monitor the bradenhead/casing head pressures throughout the frac job. Frac operations shall be terminated upon any sharp rise in annular pressure (+/- 40 psi or greater) in order to determine well/wellbore integrity.

**Contact Information**

Justin Barmore  
 Petroleum Engineer

Bob Hartman  
 Petroleum Engineer

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<i>Proposed Pad</i>	<i>Proposed Well</i>	<i>Surface Location</i>	<i>Bottom Hole Location</i>
PA 24-32	PA 732-21-32 HN1	T6S R95W, Sect. 32, SE SW	Section 32, NE NW
	PA 732-31-32 HN1		Section 32, NW NE

**FONSI**  
**DOI-BLM-CO-N040-2015-0049-EA**

The Environmental Assessment (EA) analyzing the environmental effects of the Proposed Action has been reviewed. The project design and approved mitigation measures result in a Finding of No Significant Impact (FONSI) on the human environment. Therefore, an Environmental Impact Statement (EIS) is not necessary to analyze further the environmental effects of the Proposed Action.

**DECISION RECORD**

DECISION: It is my decision to approve the Proposed Action as described and analyzed in this EA. This decision would provide for the orderly, economical, and environmentally sound exploration and development of oil and gas resources on a valid Federal oil and gas lease.

RATIONALE: The bases for this decision are as follows:

1. Approval of the Proposed Action is validating the rights granted with Federal oil and gas lease COC62162 to develop the leasehold to provide commercial commodities of oil and gas.
2. The environmental impacts would be avoided, minimized, or offset with the mitigation measures incorporated into the Proposed Action or attached and enforced by the BLM as Conditions of Approval (COAs).
3. This Decision does not authorize the initiation of surface-disturbing activities on private lands or of drilling activities associated with any Federal oil and gas well. Initiation of activities related to the new Federal oil and gas well to be drilled from the fee surface PA 24-32 well pad may commence only upon approval by the BLM of the Application for Permit to Drill (APD).

MITIGATION MEASURES: Mitigation measures presented in the Appendix of the EA would be incorporated as COAs for both surface and drilling operations and attached to the APD for the Federal well drilled on the PA 24-32 pad.

NAME OF PREPARER: Christina O'Connell, Natural Resource Specialist

SIGNATURE OF AUTHORIZED OFFICIAL:



Allen B. Crockett, Ph.D., J.D.  
Supervisory Natural Resource Specialist

DATE: 3/27/15