

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-N040-2013-0062-EA

### CASEFILE NUMBER

Bottomholes for Federal wells are located within Federal Leases COC01523 and COC01524.

### PROJECT NAME

Proposal to Drill 13 Federal Wells from the Proposed PC-22 Well Pad on Private Land in the Parachute Field, Garfield County, Colorado.

### PAD LOCATION

Township 7 South (T7S), Range 95 West (R95W), Section 22, NENW, Sixth Principal Meridian

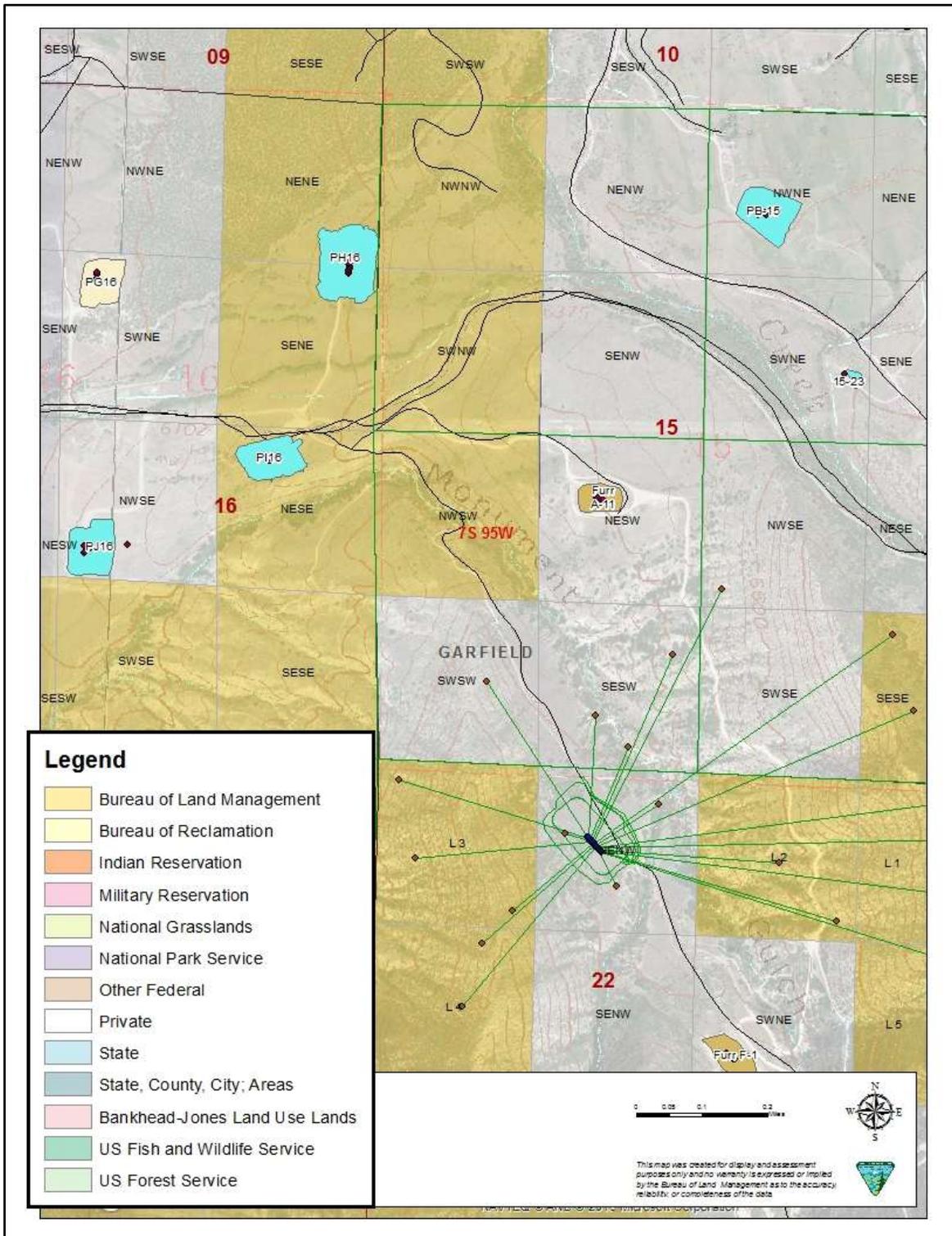
### APPLICANT

Encana Oil & Gas (USA) Inc. Contact: Heather Mitchell, 370 Seventeenth Street, Suite 1700, Denver, Colorado 80202.

### PROPOSED ACTION

Encana Oil & Gas (USA) Inc. (Encana) proposes to drill and develop thirteen Federal gas wells from one proposed pad, the PC-22, located in the Parachute Field, Garfield County, Colorado (Figure 1). The PC-22 pad is located on private land (private surface underlain by fee minerals). The Federal wells would be directionally drilled into Federal leases COC01523 and COC01524. Encana plans to construct the pad in May 2013 and begin drilling the wells in June 2013. The project would result in 12.6 acres of initial surface disturbance (construction of the proposed well pad, access road and pipeline) and 4.5 acres of long-term disturbance through the production phase ( Figures 2 and 3, Table 1). Approximately 2.39 acres of initial surface disturbance and 1.43 acres long-term disturbance would occur on BLM land. Names and locations of the well(s) are presented in Table 2.

The PC-22 well pad (initially called the PB22 pad) was included by Encana as a proposed well pad in the *South Parachute Geographic Area Plan (SPGAP)*, approved on August 28, 2007 (CO-140-2006-050-EA). The proposed PC-22 pad would include all wells initially proposed for the PB22 pad, as well as additional Federal wells. A closed-loop drill system would be used, and no reserve pit would be required. The recovered drilling fluid would be stored on location in steel tanks to allow reuse for drilling operations.



**Figure 1. Location Map showing Proposed PC-22 Pad and Land and Mineral Ownership.**

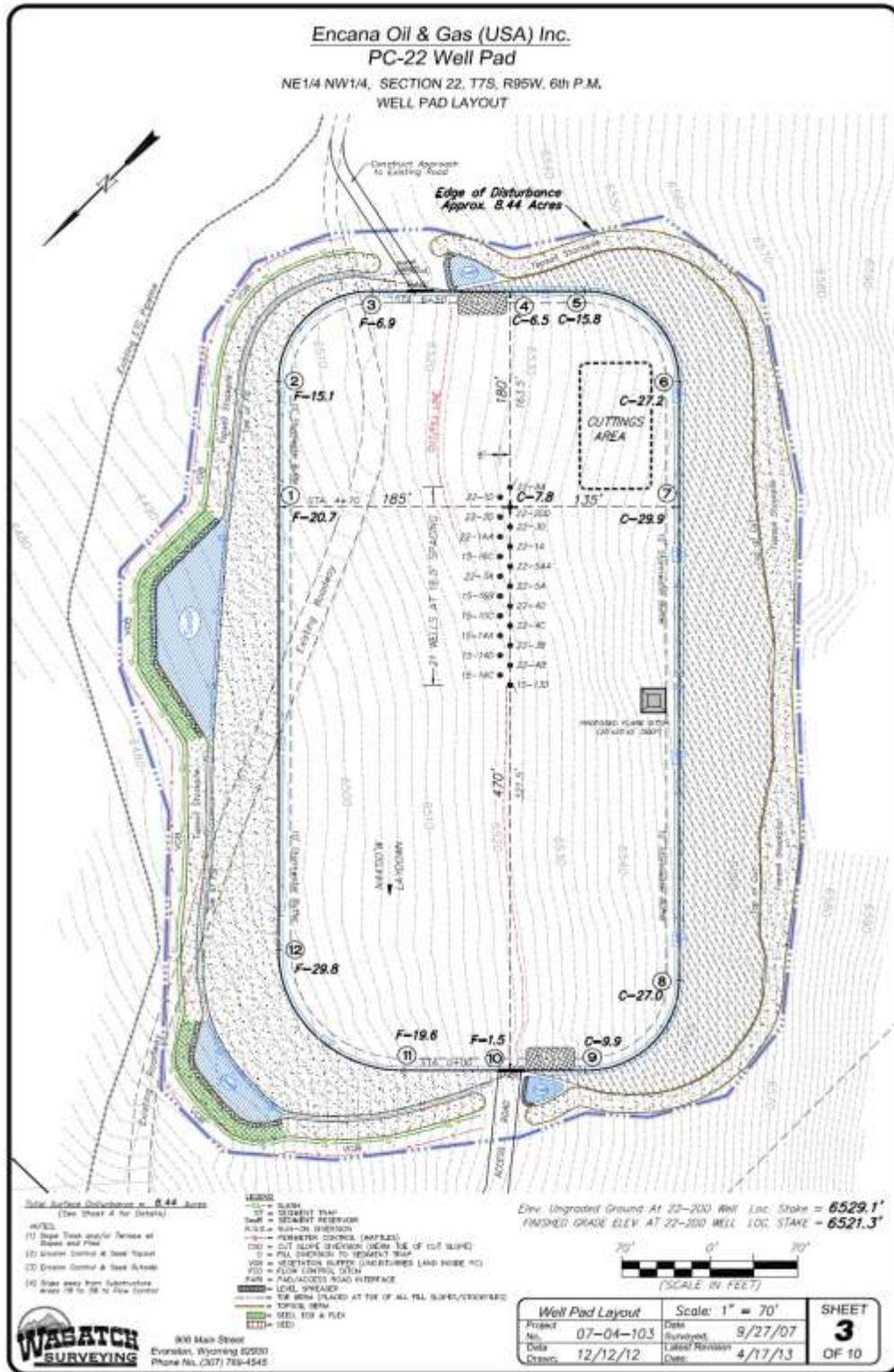


Figure 2. PC-22 Pad Construction Layout



Cuttings generated during drilling would be deposited in a steel cuttings bin (approximately 45 feet by 10 feet by 12 feet) and a cuttings pile. Cuttings deposited in the cuttings bin would be solidified with sawdust. Cuttings would be moved from the steel bin to the cuttings pile. Once drilling is finished the cuttings would be buried on the location and reclaimed.

<b>Table 1. Initial and Long-term Disturbance of Project Components</b>		
<i>Component</i>	<i>Initial Disturbance</i>	<i>Long-term Disturbance</i>
Well Pad	8.4 acres	2.0 acres
Access Road	4.03	2.42
Pipeline	0.18	0.10
<b>Total</b>	<b>12.6 acres</b>	<b>4.5 acres</b>

<b>Table 2. Surface and Bottomhole Locations of Proposed Federal Wells</b>			
<i>Proposed Pad</i>	<i>Proposed Wells</i>	<i>Surface Locations</i>	<i>Bottomhole Locations</i>
PC-22	Hagen Federal 15-16B	T7S R95W, Section 22 NENW, 608 feet FNL 1774 feet FWL	T7S R95W, Section 22 SESE, 1190 feet FSL 1067 feet FEL
PC-22	Hagen Federal 15-16C	T7S R95W, Section 22 NENW, 631 feet FNL 1797 feet FWL	T7S R95W, Section 22 SESE, 576 feet FSL 874 feet FEL
PC-22	Hagen Federal 22-1A	T7S R95W, Section 22 NENW, 642 feet FNL 1797 feet FWL	T7S R95W, Section 22 Lot 1, 133 feet FNL 464 feet FEL
PC-22	Hagen Federal 22-1AA	T7S R95W, Section 22 NENW, 643 feet FNL 1808 feet FWL	T7S R95W, Section 22 Lot 1, 450 feet FNL 522 feet FEL
PC-22	Hagen Federal 22-1D	T7S R95W, Section 22 NENW, 666 feet FNL 1831 feet FWL	T7S R95W, Section 22 Lot 1, 898 feet FNL 558 feet FEL
PC-22	Hagen Federal 22-2D	T7S R95W, Section 22 NENW, 654 feet FNL 1819 feet FWL	T7S R95W, Section 22 Lot 2, 700 feet FNL 1923 feet FEL
PC-22	Hagen Federal 22-2DD	T7S R95W, Section 22 NENW, 666 feet FSL 1819 feet FWL	T7S R95W, Section 22 Lot 2, 1154 feet FNL 1456 feet FEL
PC-22	Hagen Federal 22-4B	T7S R95W, Section 22 NENW, 572 feet FNL 1728 feet FWL	T7S R95W, Section 22 Lot 3, 167 feet FNL 183 feet FWL
PC-22	Hagen Federal 22-4C	T7S R95W, Section 22 NENW, 596 feet FNL 1751 feet FWL	T7S R95W, Section 22 Lot 3, 796 feet FNL 331 feet FWL
PC-22	Hagen Federal 22-4D	T7S R95W, Section 22 NENW, 607 feet FNL 1762 feet FWL	T7S R95W, Section 22 Lot 3, 1187 feet FNL 1123 feet FWL

<b>Table 2. Surface and Bottomhole Locations of Proposed Federal Wells</b>			
<i>Proposed Pad</i>	<i>Proposed Wells</i>	<i>Surface Locations</i>	<i>Bottomhole Locations</i>
PC-22	Hagen Federal 22-5A	T7S R95W, Section 22 NENW, 619 feet FNL 1774 feet FWL	T7S R95W, Section 22 Lot 4, 1463 feet FNL 885 feet FWL
PC-22	Hagen Federal 22-5AA	T7S R95W, Section 22 NENW, 631 feet FNL 1785 feet FWL	T7S R95W, Section 22 Lot 4, 1973 feet FNL 736 feet FWL
PC-22	Hagen Federal 22-8A	T7S R95W, Section 22 NENW, 678 feet FNL 1831 feet FWL	T7S R95W, Section 22 Lot 5, 1435 feet FNL 543 feet FEL

Approximately 6,558 feet of new access road would be required to reach the proposed PC-22 pad, which would consist of 4,024 feet of new access road, and 2,534 feet of improvements to an existing two-track road. The initial disturbance width of the road would be approximately 30 feet, and would be maintained as an 18 foot running surface following completion of construction (Figure 4).

Approximately 140 feet of buried 8-inch-diameter steel, welded, buried natural gas gathering pipeline would be constructed to serve the proposed PC-22 pad. The proposed pipeline would tie into an existing gas line operated by Summit Midstream. The width of the pipeline would be 55 feet during construction and reduced to a permanent width of 30 feet (Figure 5).

The source of water for drilling and completion would be Encana’s High Mesa Water Treatment Facility, recycled flow back water, production water gathered from producing wells, or fresh water from available water rights in the Piceance Basin. Water would be transported to the pad through the High Mesa Water Line and two temporary surface water lines that would connect the High Mesa Water Line to the proposed pad. The two temporary water lines would be 8 inches in diameter. The water lines would be installed approximately 30 days before operations are planned and would be removed 60 days after completions are finished. The temporary surface waterlines would cross BLM and private lands and would be approximately 3,770 feet in length. The temporary water lines would parallel the access road from the PC-22 pad approximately 2,065 feet and then cross approximately 1,705 feet of BLM land to tie in with the High Mesa Water Line in NE/SE Section 16, Township 7 South, Range 95 West.

Pad construction would follow the guidelines established in the BLM Gold Book, *Surface Operating Standards for Oil and Gas Exploration and Development* (USDI and USDA 2007). A road maintenance program would be required during the production phase of the wells which includes, but is not 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 include drilling and completion, production of natural gas and associated liquid condensate, proper handling and disposal of produced water, and interim and final reclamation. The Proposed Action would be implemented consistent with 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) that would 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.

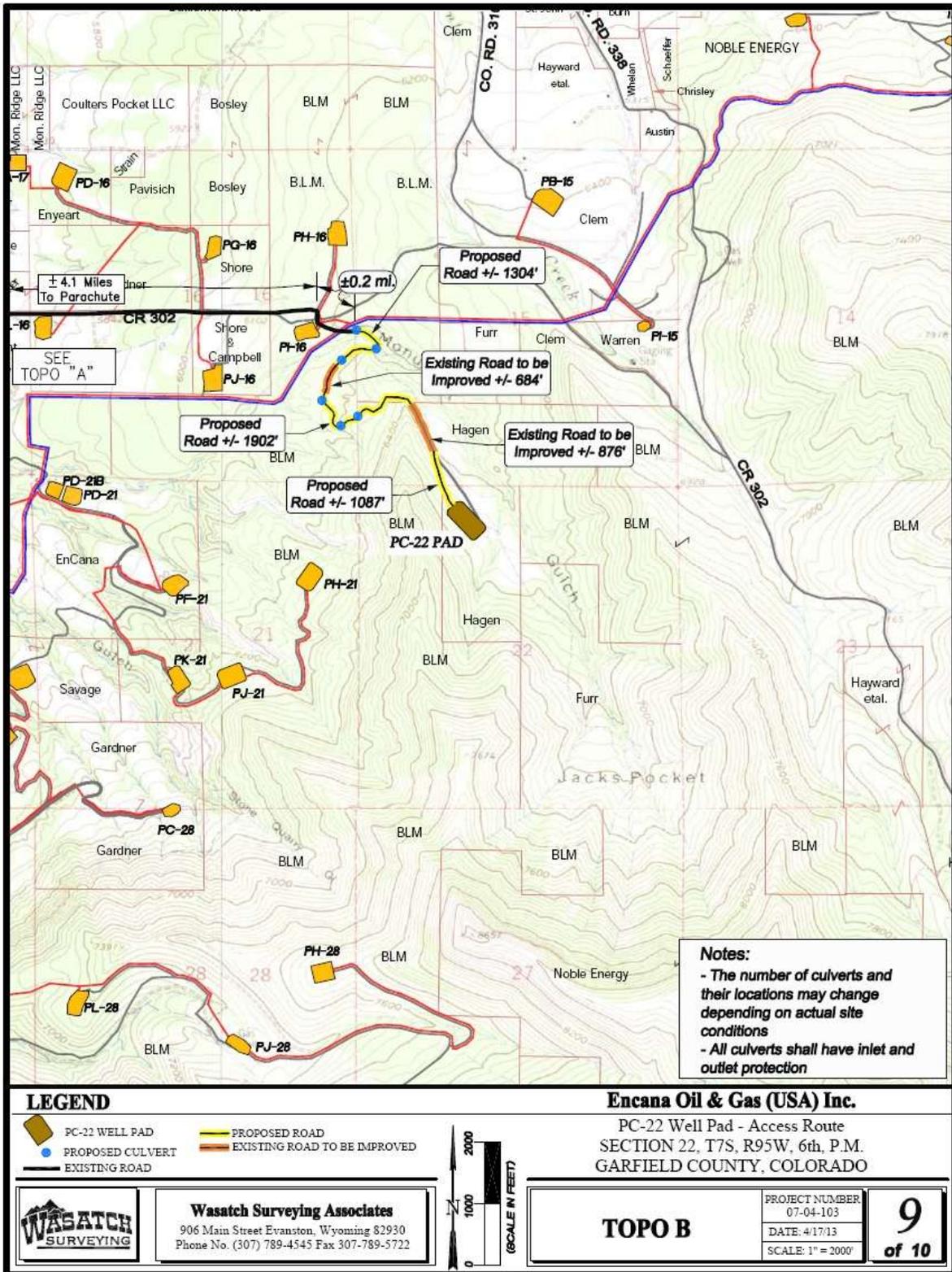


Figure 4. Proposed Access Road to Serve the PC-22 pad.

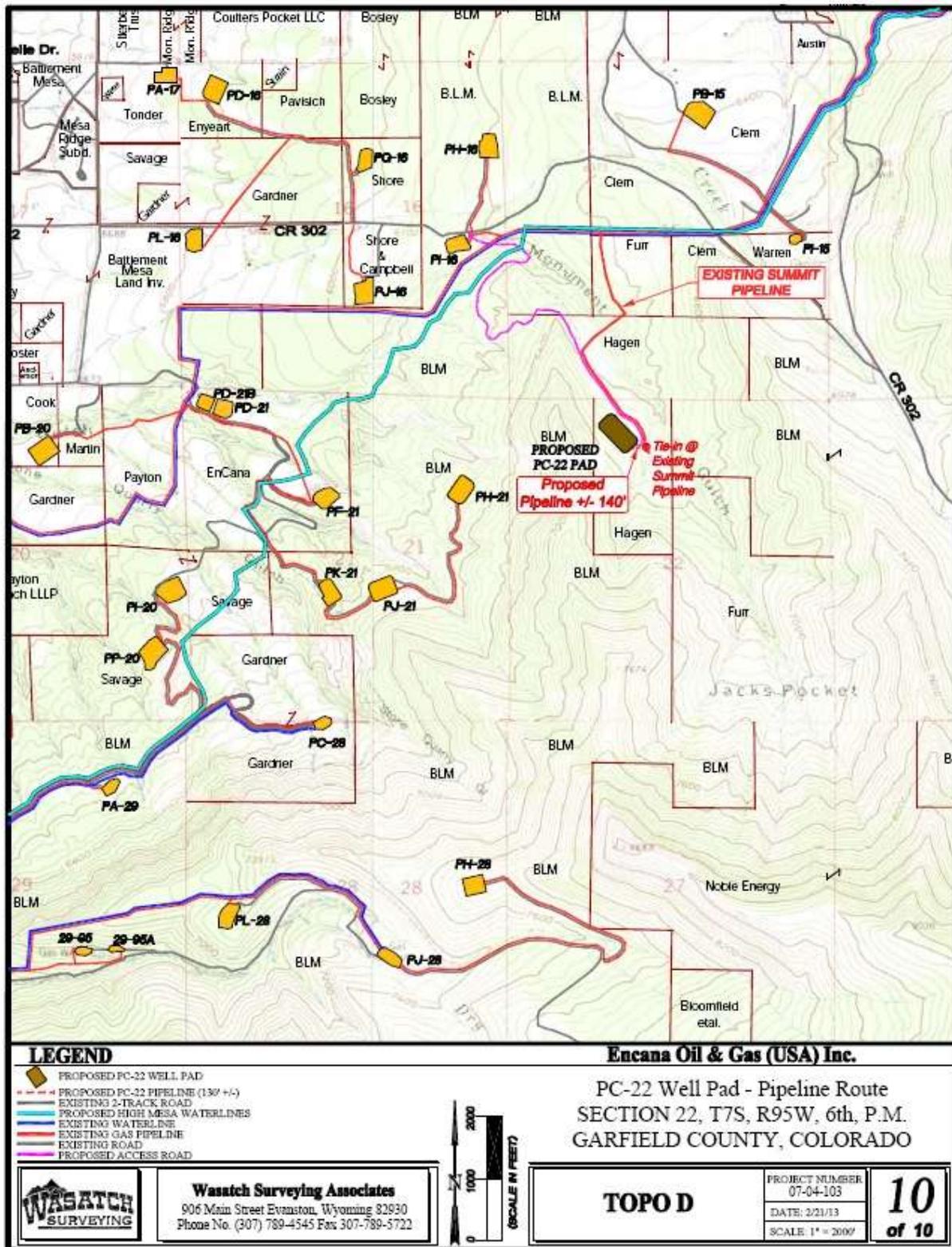


Figure 5. Proposed Buried Natural Gas Pipeline to Serve the PC-22 pad.

## **NO ACTION ALTERNATIVE**

The Proposed Action involves the drilling of up to 13 Federal wells from BLM surface into the subsurface minerals encumbered with Federal oil and gas leases COC01523 and COC01524. Although the Bureau of Land Management (BLM) cannot deny the right to drill and develop the leasehold, individual APDs can be denied to prevent unnecessary and undue degradation. The No Action Alternative constitutes denial of the Federal APD(s) described in the Proposed Action. In so doing, the proposed Federal wells would not be approved.

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

The purpose of the action is to develop oil and gas resources on Federal leases COC01523 and COC01524 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**

No applicable lease stipulations are attached to Federal leases COC01523 and COC01524. However, a general big game winter range Timing Limitation (TL) would be applied as a Condition of Approval (COA) to prohibit construction, drilling, or completion activities during the period January 1 to March 1. Site-specific COAs developed during the APD/Environmental Assessment (EA) review and onsite field consultation would also apply to the PC-22 well pad and would be attached to the Federal APD(s) (Appendix A).

## **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 Record of Decision 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. The 1999 RMP amendment requires multi-year development plans for lease development over a large geographic area. However, the 1999 RMP amendment also provides exceptions to that requirement for individual or small groups of exploratory wells drilled in relatively undrilled areas outside known high production areas. The Proposed Action is therefore in conformance with the exception to the requirement to require operators to submit MDPs, previously known as GAPs.

## **AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES**

During its internal scoping process for this 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	Special Status Plant Species
Air Quality	Special Status Animal Species
Cultural Resources	Vegetation
Fossil Resources	Visual Resources
Geology and Minerals	Wastes - Hazardous and Solid
Invasive Non-Native Plants	Water Quality - Surface and Ground
Native American Religious Concerns	Waters of the U.S.
Noise	Wildlife - Aquatic, Migratory Birds, and
Socioeconomics	Other Terrestrial
Soils	

### **Access and Transportation**

#### **Affected Environment**

The project area would be located approximately 16.4 miles southeast of Parachute, Garfield County, Colorado. The primary vehicle access is as follows: From the town of Parachute proceed south approximately 0.5 mile on CR3F08 to the intersection with CR3F02. Turn left on CR3F02 and travel in an easterly direction approximately 1.2 miles to the intersection of with the existing access road to the PI16 well pad. Turn right onto the existing access road and proceed southeasterly approximately 0.2 mile to the beginning of the proposed PC-22 access road.

Approximately 6,558 feet of new access road would be required to reach the proposed PC-22 pad, which would consist of 4,024 feet of new access road, and 2,534 feet of improvements to an existing two-track road. The initial disturbance width of the road would be approximately 30 feet, and would be maintained as an 18 foot running surface following completion of construction.

Maintenance and reclamation would conform to guidelines established in the BLM Gold Book (USDI and USDA 2007). A road maintenance program would be required during the drilling, completion, and production phases which includes, but is not limited to blading, ditching, culvert installation and cleanout, weed control, and gravel surfacing where excessive rutting or erosion may occur. The access road would be maintained in a safe and usable condition. Surface and subsoil materials within the proposed construction areas would be used. Gravel would be obtained from Federal or Fee lands in conformance with applicable regulations.

#### **Environmental Consequences**

##### *Proposed Action*

The Proposed Action would result in a substantial increase in truck traffic related to the eventual development of the Federal well. The largest increase in truck use would be during rig-up, drilling, and completion activities. Data indicate that approximately 1,160 truck trips over a 30-day period would be required to support the drilling and completion of each well (Table 3). Once the wells are producing,

traffic would decrease to occasional visits for monitoring or maintenance activities. Each 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 (Appendix A) would be required as COAs to ensure that adequate dust abatement and road maintenance occur.

<b>Table 3. Traffic Associated with Drilling and Completion Activities</b>		
<i>Vehicle Class</i>	<i>Trips per Well</i>	<i>Percent of Total</i>
16-wheel tractor trailers	88	7.6%
10-wheel trucks	216	18.6%
6-wheel trucks	452	39.0%
Pickup trucks	404	34.8%
Total	1,160	100.0%
Source: BLM 2006. Note: Trips by different vehicle types are not necessarily distributed evenly during the drilling process. Drilling and completion period is approximately 30 days per well.		

*No Action Alternative*

Under the No Action Alternative, the proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on access and transportation would be less than under the Proposed Action but not eliminated.

**Air Quality**

*Proposed Action*

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 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).

### *Proposed Action*

The CDPHE, under CAA 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.

The Proposed Action includes building the PC-22 pad, access road, and pipeline on private surface and constructing, drilling, completing, and operating 13 new Federal wells. In addition, the pad would total disturbance from construction of a new pad would be 12.6 acres which would be reduced to 4.5 acres upon interim reclamation (Table 1). Each well would require approximately 7 to 10 days to drill and 5 to 15 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.

Pollutants generated during construction activities would include combustion emissions and fugitive dust associated (PM<sub>10</sub> and PM<sub>2.5</sub>) 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 from 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.

A regional air model addressing air quality impacts of current and future oil and gas activities within the CRVFO has recently been completed for the BLM by Tetra Tech, Inc. and its subcontractor, URS Corporation. The model addressed the cumulative impacts of incremental oil and gas development in the modeling domain by assuming a range of BLM wells and associated infrastructure and mitigation scenarios. A total of 2,664 wells were modeled in the "no action" scenario in which no additional mitigation above meeting CDPHE and EPA regulations and emissions standards was modeled. Within the range of alternatives, a total of 4,198 new BLM wells and the associated facilities and infrastructure were modeled, including requiring air quality mitigation measures in addition to the CDPHE and EPA regulations and emissions standards. In all scenarios analyzed in the ARTSD, the air analysis shows that impacts to air quality from the proposed levels of Federal minerals development are estimated to be below applicable NAAQS, CAAQS, PSD increments, and visibility and deposition thresholds. In addition, the cumulative impacts of all oil and gas development in conjunction with other major emissions sources

were evaluated by assuming 15,664 future wells and a cumulative total of over 44,000 Federal and non-Federal wells within the modeling domain over the next 20 years. The methods and results of the modeling are presented in an Air Resources Technical Support Document (ARTSD) (BLM 2011).

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>), 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 (one 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, piping instead of trucking of fluids to a centralized collection facility, 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 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, which is generally a 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 that there are 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.

The recent air modeling for the CRVFO inventoried and assessed GHG emissions associated with various scenarios of future oil and gas development. In all scenarios modeled, the GHG emissions would not increase the total U.S. natural gas sector emissions by more than 0.5%. 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.

#### *No Action Alternative*

Under the No Action Alternative, the proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on air quality would be less than under the Proposed Action but not eliminated.

### **Cultural Resources**

#### Affected Environment

Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to take in to account the effects their actions will have on cultural resources. As a general policy, an agency must consider effects to cultural resources for any undertaking that involves Federal monies, Federal permitting/authorization, or Federal lands.

Four Class III (intensive pedestrian survey) cultural resource inventories (CRVFO# 902, 1202, 1253 and 1106-18) have been conducted previously on portions of the proposed project area for adjacent pads, access roads and/or pipelines. A fifth inventory (CRVFO# 5413-5) was undertaken specifically for this project and covered the remaining un-inventoried portion of the project area. The cultural inventories and pre-field file searches of the Colorado SHPO database and BLM Colorado River Valley Field Office cultural records identified only one cultural resource in the immediate project Area of Potential Effect (APE). This site consists of a portion of the Battlement Ditch (5GF3840.6) and has been determined not eligible for the National Register of Historic Places (NRHP). Eligible or potentially eligible cultural sites are referred to in Section 106 of the National Historic Preservation Act as “historic properties.”

#### Environmental Consequences

##### *Proposed Action*

The only cultural resources identified within the proposed project Area of Potential Effect (APE) is not eligible for the NRHP. Therefore, 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 (16U.S.C 470f), the BLM/State Historic Preservation Officer (SHPO) Programmatic Agreement and Colorado Protocol]. As the BLM has determined that the Proposed Action would have no direct impacts to known “historic properties,” no formal consultation was initiated with the SHPO.

Although unlikely, indirect long-term cumulative damage 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, illegal collection and excavation. A standard Education/Discovery COA for cultural resource protection will be attached to the EA. The importance of this COA would be stressed to the operator and its contractors, including informing them of their responsibilities to protect and report any cultural resources encountered during construction operations.

#### *No Action Alternative*

Although under the No Action Alternative the proposed Federal wells would not be approved, Encana could still construct the PC-22 pad location on fee surface and drill the fee wells. Therefore, the No Action Alternative would most likely reduce though not eliminate the potential for accidental damage, vandalism, illegal collection and excavation on the public lands involved.

### **Fossil Resources**

#### **Affected Environment**

The predominant bedrock formations present at or near the surface within the project area are the Wasatch Formation (including the Fort Union Formation or equivalent at its base) the Green River 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 2, defined as having a low probability of fossil occurrence. Class 2 geologic units are not likely to contain vertebrate or scientifically significant invertebrate fossils.

Both the Wasatch and Green River Formations are considered BLM Condition 4 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. The Wasatch Formation is divided into the early Eocene Shire, and the Paleocene age Molina and Atwell Gulch members; while the Eocene aged Green River Formation is divided into the Parachute Creek, Garden Gulch, Douglas Arch, Cow Ridge, and Anvil Points members.

All members of the Wasatch Formation contain vertebrate fossils in varying abundances (Murphy and Daitch 2007). Rocks of the Wasatch Formation are lithologically very 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).

The Green River Formation consists of fine-grained lacustrine and fluvial-lacustrine rocks that were deposited in the Eocene Lake Uinta. The lake expanded early in its history, during the Long Point transgression (Johnson 1989), to cover much of the Piceance and Uinta Basins. The Green River Formation has yielded hundreds of invertebrate and plant fossils and more than 60 vertebrate taxa have been described from the formation, including crocodiles, boa constrictors, and birds.

### Environmental Consequences

#### *Proposed Action*

Although mapped as the predominant surface formation of 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 and Green Formations. 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 no known fossil discovery sites within a mile radius of the project area. Areas covered with vegetation and soil cover do not usually yield fossil resources, but inspections would be conducted for proposed facilities that are located on or within 200 feet of Wasatch or Green River Formation bedrock surface exposures. 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 proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on fossil resources would be less than under the Proposed Action but not eliminated.

### 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 4 lists the geologic formations within the project area.

The predominant bedrock exposures within the proposed development area are the Tertiary Green River and Uinta Formation. The formations are composed of alternating layers of fine grained sandstones and laminated to massive marlstone. The formations overlie the Wasatch Formation, which consists of variegated siltstone, claystone, and sandstones and ranges from 1,000 to 2,500 feet thick. 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 4. Geologic Formations within the SG 43-28 Project Area</b>				
<i>Map Symbol</i>	<i>Formation Name</i>	<i>Age</i>	<i>Characteristics</i>	<i>Location</i>
Tgp	Green River Formation – Parachute Creek Member	Eocene	Gray, black, brown and gray marlstone	Steep slopes and outcrops.
Tga	Green River Formation- Anvil Points Member	Eocene	Red and buff massive sandstone	Steep slopes and outcrops.
Tws	Wasatch Formation – Shire member	Paleocene	Variegated claystone.	Steep slopes and rock outcrops.
Source: Yeend et al. 1988				

The Iles Formation of the Mesaverde Group is the target zone of the proposed drilling program. Comprised of the Williams Fork and Iles Formations, sediments of the Mesaverde Group are marine sandstones transitional to non-marine beds of coal, shale, and sandstone. These sediments were deposited marginal to the great Cretaceous seaway. The oscillating shoreline of this sea, due to the rise and fall of sea level, left behind a complex of transgressive and regressive sedimentary sequences of nearshore and offshore sediments that define the Mesaverde Group.

Production is derived from three reservoir intervals, which include the Wasatch, Williams Fork, and Iles Formations. The latter two make up the Upper Cretaceous Mesaverde Group. The proposed drilling program would target the sandstone sequences of the Upper Williams Fork Formation, which provide most of the natural gas production volumes (Lorenz 1989). The upper portions of the Williams Fork include fluvial point bar, floodplain, and swamp deposits. The Lower Williams Fork Formation includes delta front, distributary channel, strandplain, lacustrine and swamp environments (Hemborg 2000), while the sandstones and coalbeds of the Iles Formation were deposited in a wave-dominated coastal setting (Johnson 1989, Lorenz 1989). The source rocks are interbedded and thermally mature gas-prone shales, mudstones, siltstones, and coals. The reservoir rocks are the fine to medium-grained Williams Fork sandstones, varying in thickness from less than 10 feet to more than 50 feet (Spencer and Wilson 1988), creating an interbedded relationship between source and reservoir. The trapping mechanism of the gas is both stratigraphic and diagenetic.

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 proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on geology and minerals would be less than under the Proposed Action but not eliminated.

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

#### **Affected Environment**

Colorado’s noxious weeds are designated by the Colorado Department of Agriculture, and management of these weeds is regulated under the Colorado Noxious Weed Act, Title 35, Article 5.5. State listed noxious weeds are differentiated into List A species, designated for eradication, List B species, designated for containment to stop continued spread, and List C species, which are too widespread for containment, but whose negative impacts may be reduced by improved integrated weed management.

The project area is located in the Monument Creek drainage, which descends from the north slopes of Battlement Mesa. The well pad site located in an agricultural field within mountain shrub habitat, and the new road located in pinyon-juniper and sagebrush habitat types. The PC-22 well pad would be located at approximately 6,500 feet elevation and the new road and pipeline would range in elevation from approximately 6,200 to 6,500 feet elevation.

Vegetation at the well pad site consists primarily of agricultural grasses surrounded by Gambel oak woodland. The agricultural grassland vegetation is dominated non-native species, including crested wheatgrass (*Agropyron cristatum*), smooth brome (*Bromus inermis*), alfalfa (*Medicago sativa*), and yellow sweetclover (*Melilotus officinalis*). Noxious weeds are also common and widespread within this agricultural vegetation. Three State List B species—houndstongue (*Cynoglossum officinale*), musk thistle (*Carduus nutans*), and plumeless thistle (*Carduus acanthoides*)—occur as several discrete patches in and near the project area. Five State List C species—bulbous bluegrass (*Poa bulbosa*), burdock (*Arctium minus*), cheatgrass (*Bromus tectorum*), common mullein (*Verbascum thapsus*), and field bindweed (*Convolvulus arvensis*)—are also present. Burdock and mullein, two non-native biennial forbs, occur in several discrete occurrences, primarily near an old detention basin and homestead site. The perennial non-natives Bulbous bluegrass and field bindweed and the annual non-native cheatgrass are scattered throughout the area. Common dandelion (*Taraxacum officinale*), another common non-native weed, is also present onsite.

Noxious weeds and other undesirable non-native species are also common along the existing access road, and in the vicinity of the proposed new road and pipeline. The new road route traverses a hillside which burned in 1987, where vegetation is dominated by noxious weeds and invasive non-native species.

Cheatgrass and mullein are the most common noxious weeds, and prevalent non-native species include flixweed (*Descurainia sophia*), salsify (*Tragopogon dubius*), tall tumble-mustard (*Sisymbrium altissimum*), and yellow sweetclover. Discrete occurrences of the State List B noxious weed, diffuse knapweed (*Centaurea diffusa*), are also present along the existing access road.

### Environmental Consequences

#### *Proposed Action*

Under the Proposed Action, a total of 12.6 acres would be disturbed. Of this total, 8.4 acres would be disturbed for the new well pad, 4.03 acres would be disturbed for the new access road, and 0.18 acres would be disturbed for the pipeline. Following construction completion, 8.1 acres would undergo temporary reclamation seeding. A total of 4.5 acres would remain as long-term disturbance areas. The well pad and most of the disturbance would be on private land, but 2.39 acres of the total disturbance would be on BLM land, of which 1.43 acres would remain as long-term disturbance.

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 invasion and establishment are multi-fold. Removal of native vegetation removes the competition from native plants for resources, including sunlight, water and soil nutrients, creating 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 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.

Because of previous disturbance at the pad site, along the new road and pipeline routes, and along the existing access road, several noxious weeds and other invasive, non-native plant species have become established within and surrounding the proposed project area. With new disturbance from the proposed project, the potential for increased establishment of these undesirable plants following construction activities is high. Vehicles and equipment could also transport new noxious weed species to the site, where they would have disturbed habitats in which to establish.

To mitigate the risk of invasive species establishing or spreading, the standard weed control COA would be attached to APDs to require periodic monitoring and weed control practices to ensure that these weedy plants are controlled (Appendix A). Establishment of native plant species is also important in preventing invasive non-native plant species establishment and spread. Therefore, the standard reclamation COAs would also be attached to APDs to require seeding and monitoring of reclamation seeding results, with recommendations for an appropriate native seed mix (Appendix A). However, portions of the pipeline

corridor cross areas of private land ownership. In these areas the reclamation seed mix would be at the landowner's discretion and would not be restricted to native plant species.

#### *No Action Alternative*

Under the No Action Alternative, the proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. The existing concerns with non-native invasive species would continue, as would ongoing treatment of noxious weeds.

### **Native American Religious Concerns**

#### Affected Environment

The Proposed Action is located within an area identified by the Ute Tribes as part of their ancestral homeland. Five Class III cultural resource inventories (see section on Cultural Resources) were conducted in the Proposed Action's vicinity to determine if any areas were known to be culturally sensitive to Native Americans. No sensitive areas were identified or are currently known in the 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 Ute Tribe of the Uintah and Ouray Bands, one of the primary Native American tribes in this area of the CRVFO, have indicated that they do not wish to be consulted for small projects or projects where no Native American areas of concern have been identified either through survey or past consultations. Therefore, formal consultation with Native American Tribes was not undertaken for the current project.

If new data regarding cultural resources 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 in the vicinity of the proposed project could indirectly impact unknown Native American resources ranging from illegal collection to vandalism.

The National Historic Preservation Act (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. Encana Oil & Gas (USA) Inc. 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 would be stressed to the operator and its contractors,

including informing them of their responsibilities to protect and report any cultural resources encountered. The proponent and contractors would also be made aware of requirements under the NAGPRA.

*No Action Alternative*

Although under the No Action Alternative the proposed Federal wells would not be approved, Encana could still construct the PC-22 pad location on fee surface and drill the fee wells. Therefore, the No Action Alternative would most likely reduce though not eliminate the potential for accidental damage, vandalism, illegal collection and excavation on the public lands involved.

**Noise**

**Affected Environment**

The project area would be located approximately 16.4 miles southeast of Parachute, Garfield County, Colorado. The primary vehicle access County Roads 302 and 308. The Proposed Action involves constructing the PC-22 well pad to drill and complete 13 new Federal wells, and installation of a buried water line for water delivery during frac operations. The Proposed Action would lie within a rural setting characterized by oil and gas development activities. Noise levels in the area are presently created by CR3F02 308 and traffic serving existing wells and ongoing drilling and completion activities. The proposed drilling activities would be located more than a mile away from the nearest residence

Noise is generally described as unwanted sound, weighted 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 (US EPA 1974, Harris 1991). As a basis for comparison, the noise level would be 60 dBA during a normal conversation between two people standing five 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 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 5) at a distance of 350 feet.

<b>Table 5. 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

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 2010). 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 6), project-related noise levels would be approximately 59 dBA at a distance of 1,000 feet, approximating active commercial areas (US EPA 1974).

<b>Table 6. 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 6 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*

Under the No Action Alternative, the proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on noise would be lessened, but not eliminated.

**Socioeconomics**

Affected Environment

The project area is located entirely within Garfield County, Colorado, with a total county land 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 7 lists the top 10 industries in Garfield County for the fourth quarter of 2011 (CDLE 2013).

<b>Table 7. Selected Industry Sectors for Garfield County</b>		
<b>Rank</b>	<b>Job Sector</b>	<b>Employees</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 & Technical Services	1,047
9	Administration, Support, Waste Management, and Remediation	874
10	Transportation and Warehousing	782

Personal income in Garfield County has also risen, growing 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 has grown in the same period approximately 3% per year, from \$29,081 to \$37,858, but annual per capita income dropped by nearly 11% from 2008 to 2011 (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 (less than 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 recent years, from approximately 70 billion cubic feet (BCF) in 2000 to 700 BCF in 2012 (COGCC 2013a). Approximately 1,286 drilling permits were approved in Garfield County between April 2, 2012 and March 29, 2013 (COGCC 2013b). However, U.S. natural gas prices have dropped in recent years from \$10.79 per

thousand cubic feet (MCF) in July 2008 to \$1.89/MCF in April 2012 (USDOE 2013). The U.S. price of natural gas has begun to improve, in December 2012 it was \$3.35/MCF, but has not reached the prices of 2008. 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). The PILT distributions are based on acres for all Federal land management agencies. 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 over the last five years 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 2007). 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%.

## Environmental Consequences

### *Proposed Action*

The Proposed Action would have minor positive impacts on the local economies of Garfield County through the creation or retention of job opportunities in the oil and gas industry and in supporting trades and services. In addition, local governments in Garfield County would experience an increase in tax and royalty revenues. The Proposed Action could result in minor negative social impacts, including reduced scenic quality, increased dust levels, and increased traffic. However, these impacts would be minor and limited to the relatively short duration of drilling and completion activities.

### *No Action Alternative*

Under the No Action Alternative, the proposed Federal well would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts to socioeconomics—both negative and positive—would be reduced compared to the Proposed Action but not eliminated.

## **Soils**

### **Affected Environment**

The PC 22 project is covered by the *Soil Survey of Rifle Area, Colorado* (NRCS 2010, USDA 1985) and would include surface-disturbing activities on one soil complex. The entire disturbance area lies within the Bucklon-Inchau loam, a well-drained, moderately sloping (25-50% slopes) soil found on ridges and mountainsides from 7,000 to 9,500 feet. Surface layer is loam 3 to 5 inches thick; upper subsoil, where present, is brown clay loam about 15 inches thick. The permeability is slow to moderate, runoff is rapid and erosion hazard is severe. This soil is generally used for irrigated pasture, hay, and grazing.

### **Environmental Consequences**

The Proposed Action would involve surface disturbance to construct the PC-22 pad on fee surface. The Proposed Action would result in approximately 12.6 acres of short-term vegetation loss and soil compaction and displacement on private lands. After reclamation the long-term surface disturbance would be reduced to 4.5 acres. In general, the area that would be affected by the Proposed Action contains adequate vegetation buffers and moderate slopes that would reduce the potential for sediment transport to the Colorado River. In areas susceptible to erosion or possible slope instability issues proper erosion control and construction techniques and geotechnical analysis may be required in the site specific COAs.

Additionally, construction activities would cause mixing of soil horizons, slight to moderate increases in local soil loss, loss of soil productivity, and sediment available for transport to surface waters. Noxious weed infestation resulting from disturbance would impact soil productivity. Potential for such soil loss and transport would increase as a function of slope, feature (pad, road, or pipeline route) to be constructed, and proximity to streams.

Throughout the affected area, the potential would also exist for accidental spills or leaks of petroleum products and hazardous materials during construction, drilling activities and long term operations for the life of the wells. These events would cause soil contamination and may decrease the soil fertility and revegetation potential.

### **No Action Alternative**

Under the No Action Alternative, the proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on soils would be similar or slightly less than under the Proposed Action.

## **Special Status Plant Species**

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

### **Affected Environment**

According to 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 presents information relative to the project. The project area is between approximately 6,200 and 6,500 feet in elevation, within the Monument Creek drainage basin. Only two of the four listed plant species have the potential to occur within the project area, Colorado hookless cactus and Ute lady's tresses orchid.

<b>Table 8. Potential for Occurrence of Threatened or Endangered 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>
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 endemics 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	No	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 microbiotic crusts; can occur in dense cheatgrass 4,500 to 6,000 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	Yes	No

Botanical surveys were conducted in June 2012 by Western Ecological Resource, Inc. (WER 2012). The lower areas through which the new road would be constructed are within the general habitat types of sagebrush and juniper where Colorado hookless cactus could potentially occur. However, this area burned in 1987 and is now dominated by common mullein, tumbled mustard, and cheatgrass. The remaining juniper skeletons suggest that the site was moderately dense juniper woodland prior to the 1987 fire. Basalt rocks also cover much of the ground surface, and this factor combined with the vegetation and fire history makes the project area unsuitable for Colorado hookless cactus. Although Monument Creek is a perennial stream, it is a deeply incised, steep gradient stream lacking any suitable habitat for Ute lady's tresses. The minor side drainages adjacent to the well pad site lack perennial water flow in areas of lower stream gradient. Therefore, there is no suitable habitat for Ute lady's tresses. The project area geology and soil types are unsuitable for DeBeque phacelia and Parachute penstemon, which require bare Wasatch formation soils and Green River shale respectively. Therefore, there is no suitable habitat for any Federally listed plant species within or adjacent to the project area.

Environmental Consequences

*Proposed Action*

Because the habitat types in and around the project area are unsuitable for any Federally listed plant species, the No Action Alternative would have “**No Effect**” on these species.

*No Action Alternative*

Because the habitat types in and around the project area are unsuitable for any of the Federally listed plant species with the potential to occur in Garfield County, 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 occurrences in Garfield County are listed in Table 9 along with information on typical occurrences, habitat associations, potential for occurrence in the project area based on known geographic range and habitat requirements, and potential for being affected by the Proposed Action.

<b>Table 9. Potential for Occurrence of BLM Sensitive Plant Species</b>				
<i>Species</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 shrub.	Yes	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
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 to 9,200 feet	Sagebrush shrublands, typically with scattered pinyon-juniper	Yes	No
Cathedral Bluffs meadow-rue <i>(Thalictrum heliophilum)</i>	Endemic on sparsely vegetated, steep shale talus slopes of the Green River Formation; 6,300 to 8,800 feet	Pinyon-juniper woodlands and shrublands; often with other oil shale endemics, sometimes with rabbitbrush or snowberry	No	No

Only two sensitive plant species, DeBeque milkvetch and Harrington’s penstemon, could potentially occur within the project area and its vicinity. Botany surveys were conducted by Western Ecological Resource, Inc. in June 2012, and no sensitive plant occurrences or suitable habitat were found (WER 2012). Appropriate soil conditions are not present for DeBeque milkvetch, and the sagebrush shrublands which provide habitat for Harrington’s penstemon were burned in 1987 and converted to noxious weeds and other invasive species in addition to dense bunchgrasses. Therefore, no suitable habitat for any BLM sensitive plant species exists within or near the project area.

**Environmental Consequences**

*Proposed Action*

No occurrences of BLM sensitive plants or potential habitat are known or anticipated in locations within or adjacent to the project area. Therefore, the project would have no impact on BLM sensitive plants.

*No Action Alternative*

Under the No Action Alternative, the proposed Federal well would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. However, no BLM sensitive plant species are known to occur within or near the project area. Therefore, the No Action Alternative would have no adverse impacts on any BLM sensitive plant species.

**Special Status Animal Species**

*Federally Listed, Proposed, or Candidate Animal Species*

Affected Environment

Eight species of Federally listed, proposed, or candidate threatened or endangered vertebrate species occur within Garfield County or may be affected by projects within the County. These species, their status, and their distributions and habitat associations in the region are listed in Table 10.

<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?</i>	<i>Potentially 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> ) –Candidate	Major rivers and 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	Mainstem Colorado River and major tributary rivers – 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.	No	Yes
Colorado pikeminnow ( <i>Ptychocheilus lucius</i> ) – Endangered			No	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.	No	Yes
Bonytail chub ( <i>Gila elegans</i> ) – Endangered			No	Yes
“Lineage GB” 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

Razorback Sucker (*Xyrauchen texanus*), Colorado Pikeminnow (*Ptychocheilus lucius*), Humpback Chub (*Gila cypha*), and Bonytail Chub (*G. elegans*). Federally listed as endangered. 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. The nearest known habitat for the humpback chub and bonytail is within the Colorado River approximately 50 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 on the Colorado River west of Grand Junction, is known to exist in Colorado.

Environmental Consequences

*Proposed Action*

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

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 0.7 acre-feet of Colorado River water is consumed during activities related to each oil and gas well.

In 2008, the BLM prepared a Programmatic Biological Assessment (PBA) addressing water-depleting activities associated with 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 BLM’s effects determination of “**May Affect, Likely to Adversely Affect**” 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 will 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 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 on the well pads, associated with ancillary surface facilities, or resulting from an accident involving a haul truck in proximity to a stream. Stormwater controls required for the protection of surface water quality would also provide protection of aquatic organisms (see COAs in Appendix A). Even if sediment inflow were to occur, including incidental aerial deposition of fugitive dust from roadways and construction areas, these fishes are adapted to the naturally high sediment loads that characterize the Colorado River and its tributaries.

In contrast to inflow of sediments, the inflow of chemical pollutants could impact the endangered big-river fishes if concentrations were 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 BLM and the State of Colorado. In the event of a spill or accidental release, the operator is required to implement its Spill Prevention, Control, and Countermeasures (SPCC) plan, including such cleanup and mitigation measures as required by BLM or the State. In addition, the stormwater controls (see COAs in Appendix A) would reduce the risk of transport of these substances as well as sediments to surface waters, including the Colorado River. For these reasons, and because any spills making their way 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.

*No Action Alternative*

Under the No Action Alternative, the proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on Federally listed, proposed, or candidate animal species would be less than under the Proposed Action but not eliminated.

***BLM Sensitive Animal Species***

Affected Environment

BLM sensitive animal species with habitat and/or occurrence records in the portion of the CRVFO that includes the project area and vicinity are listed in Table 11. Species indicated in the table as present or possibly present in the project vicinity are described more fully 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> )	Roosting: Caves, trees, mines, and buildings.	Possible
Townsend’s big-eared bat ( <i>Corynorhinus townsendii</i> )	Foraging: Pinyon-juniper, montane conifers, and semi-desert shrubs.	

<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>
<i>Northern goshawk (Accipiter gentilis)</i>	Montane and subalpine coniferous forests and aspen forests; may move to lower elevation pinyon/juniper woodland in search of prey during winter.	Possible in winter
<i>Bald eagle (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
<i>Peregrine falcon (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.	Unlikely
<i>Brewer's sparrow (Spizella breweri)</i>	Extensive stands of sagebrush, primarily Wyoming sagebrush on level or undulating terrain.	Possible – habitat marginal
<i>Midget faded rattlesnake (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 – habitat marginal
<i>Great Basin spadefoot (Spea intermontana)</i>	Permanent or seasonal ponds and slow-flowing streams in pinyon-juniper woodlands and semi-desert shrublands.	No suitable habitat
<i>Northern leopard frog (Lithobates pipiens)</i>	Clean, perennial waters in slow-flowing streams, wet meadows, marshes, and shallows of clean ponds and lakes.	Possible – habitat marginal
<i>Bluehead sucker (Catostomus latipinnis)</i>	Primarily smaller streams with a rock substrate and mid to fast-moving waters; also shallows of larger rivers.	Not present
<i>Flannelmouth sucker (Catostomus discobolus)</i>	Runs, riffles, eddies, and backwaters in large rivers.	Present in Colorado River
<i>Roundtail chub (Gila robusta)</i>	Slow-moving waters adjacent to fast waters in large rivers.	
<i>“Lineage CR” cutthroat trout (Oncorhynchus clarki ssp.)</i>	Headwaters streams and ponds with cool, clear waters isolated from populations of non-native cutthroats and rainbow trout.	Present in Battlement Creek

Environmental Consequences

*Proposed Action*

Fringed Myotis (*Myotis thysanodes* and Townsend’s Big-eared Bat (*Corynorhinus townsendii*) – No caves or other suitable roosting sites occur in the project area. Loss of large trees, potentially also used for roosting, would be negligible. No new loss of habitat above which the bats could search for aerial prey would occur, and the area they might avoid during nighttime drilling and completion activities would represent a small portion of their total feeding range, if present.

Northern Goshawk (*Accipiter gentilis*) – This species is mostly limited to spruce/fir or aspen forests, such as atop the Roan Plateau, Battlement Mesa, and other areas that reach subalpine elevations. However, goshawks may migrate to lower elevation pinyon/juniper or Douglas-fir habitats during winter and therefore could make occasional, transitory use of the project area for winter foraging. Goshawks feed primarily on small birds but also on diurnal small mammals (rabbits, chipmunks, etc.).

Bald Eagle (*Haliaeetus leucocephalus*) – Formerly listed as endangered, then downlisted to threatened and subsequently removed from the list of threatened or endangered species, the bald eagle remains protected by the Bald and Golden Eagle Protection Act (BGEPA) as well as the MBTA. Bald eagles nest

and roost along the Colorado and most likely occasionally venture into the Parachute Creek drainage for hunting activities. Bald eagles hunt primarily for fish and waterfowl but secondarily for rabbits, ground squirrels, or other upland prey, especially in winter. Any use of the West Fork Parachute Creek canyon by this species would be expected to be infrequent and transitory.

Peregrine Falcon (*Falco peregrinus*) – Also formerly listed as endangered, then downlisted to threatened and subsequently removed from the list of threatened or endangered species, the peregrine falcon nests along the Roan Cliffs in the general project vicinity and hunts primarily for waterfowl along the Colorado River or upland fowl and other birds on nearby sagebrush-covered plateaus. No peregrine nests are known near the project area, and Mamm Creek is not suitable hunting habitat due to its small sizes and dense tree cover. Peregrines may hunt for birds on the sagebrush slopes of the canyon sides.

Brewer's Sparrow (*Spizella breweri*) – This species is a near-obligate on sagebrush and is common in expansive stands, especially those dominated by Wyoming big sagebrush on level to rolling or undulating terrain. Smaller stands or those on steep mountainsides may also be used, and the species occasionally nests in stands of short willows near timberline. The sagebrush habitat on the sideslopes of the project area is marginally suitable for nesting by this Neotropical migrant.

Midget Faded Rattlesnake (*Crotalus oreganus concolor*) – This species is mostly limited to areas with rock outcrops that provide escape cover, thermal cover, and especially hibernacula. These are crucial components for reproduction and survival and are uncommon in the project vicinity. Though the midget faded rattlesnake is known to occur in northwestern Colorado in a variety of habitats, including pinyon and juniper woodlands, it is not expected to occur in the project area.

Northern Leopard Frog (*Lithobates pipiens*) – The northern leopard frog is limited to perennial waters, including ponds and slow-flowing perennial streams or persistent portions of intermittent streams. It requires good water quality and abundant aquatic or shoreline vegetation. The habitat along Mamm Creek appears marginally suitable for the species, but no leopard frogs have been reported during fish surveys or other surveys of the stream. Because the project would not involve habitat disturbance near water sources, impacts to this species are not expected.

Flannelmouth Sucker (*Catostomus latipinnis*) – As with the endangered Colorado River fishes described previously, the flannelmouth sucker is vulnerable to alterations in flow regimes in the Colorado River that affect the availability and suitability of spawning sites and habitats needed for development of the larvae. The amount of consumptive water use associated with the Proposed Action would not be expected to cause discernible impacts to flows in the Colorado River. Similar to the endangered big-river fishes, this species is adapted to naturally high sediment loads and therefore would not be affected by increased sediment transport to the Colorado River. However, it is vulnerable to inflow of sediments into smaller streams, smothering the eggs.

The potential for adverse impacts from inflow of chemical pollutants is also greater in small streams due less dilution and the presence of larval or juvenile fishes, which are more susceptible to mortality from acute toxicity. COAs for the protection of water quality (Appendix A) would minimize the potential for impacts from inflow of sediments or toxicants. Prompt implementation of the SPCC plan following any spill or other release of hydrocarbons, saline waters, or other contaminants would further reduce the risk of significant adverse impacts to these species and other aquatic life in affected waters.

### *No Action Alternative*

Under the No Action Alternative, the proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on BLM sensitive animal species would be less than under the Proposed Action but not eliminated.

## **Vegetation**

### **Affected Environment**

The well pad site lies within an agricultural grassland surrounded by Gambel oak (*Quercus gambelii*) woodland. The new access road begins at approximately 6,200 feet elevation within sagebrush and pinyon-juniper woodland grading upwards into Gambel oak woodland at approximately 6,500 feet elevation. Within the agricultural grassland, the vegetation is dominated by non-native grasses and forbs, particularly crested wheatgrass, smooth brome, alfalfa, and yellow sweetclover. A few native plant species are also present within this meadow, although they are more common on its periphery. These species include arrowleaf balsamroot (*Balsamorhiza sagittata*), death-camas (*Zigadenus elegans*), orange globemallow (*Sphaeralcea coccinea*), Osterhout's penstemon (*Penstemon osterhoutii*), pale bastard toadflax (*Comandra umbellata* ssp. *pallida*), rayless tansyaster (*Machaeranthera grindelioides*), big sagebrush (*Artemisia tridentata* ssp. *tridentata*), broom snakeweed (*Gutierrezia sarothrae*), and rubber rabbitbrush (*Ericameria nauseosus*). Within the stream drainage, which crosses south of the well pad site and drops into Monument Creek, Gambel oak dominates the vegetation, with mountain-mahogany (*Cercocarpus montanus*) and Woods' rose (*Rosa woodsii*) also present. A few Douglas-fir (*Pseudotsuga menziesii*) trees grow along the creek upstream from the pad site.

The new access road route crosses an area once dominated by sagebrush and pinyon-juniper woodland, but which burned in 1987. The current vegetation includes a few remnant plants of big sagebrush, Utah juniper (*Juniperus osteosperma*), and pinyon pine (*Pinus edulis*). However, noxious weeds and non-native invasive species currently dominate the vegetation, particularly cheatgrass, common mullein, and tumbled mustard. Several native species are also present here, including Mormon-tea (*Ephedra viridis*), Indian ricegrass (*Achnatherum hymenoides*), needle-and-thread grass (*Hesperostipa comata*), slender wheatgrass (*Elymus trachycaulus*), western wheatgrass (*Pascopyrum smithii*), buckwheat (*Eriogonum* sp.), Hood's phlox (*Phlox hoodii*), mountain pepperweed (*Lepidium montanum*), prickly pear cactus (*Opuntia polyacantha*), and spring parsley (*Cymopterus* sp.).

As noted above, the project area has experienced extensive past and continuing disturbance. In addition to the existing access road and the 1987 fire, the area continues to be grazed by livestock, particularly within the agricultural grassland area.

### **Environmental Consequences**

#### *Proposed Action*

Under the Proposed Action, a total of 12.6 acres would be disturbed, of which approximately 4.5 acres would remain as long-term disturbance. Of the 12.6 acres of total disturbance, approximately acres of agricultural field vegetation would be removed at the well pad site, and 4.21 acres of Gambel oak woodland, pinyon-juniper woodland, sagebrush, and post-fire weed-infested vegetation would be removed along the access road and pipeline corridor. All of the well pad disturbance and new pipeline would occur on private land. Most of the new access road would occur on BLM land. On the BLM portions, reclamation seedings would consist of native plant species, while on the private land areas the reclamation seed mix would be at the discretion of the landowner.

Native vegetation surrounding the project area would not be directly impacted, but could be indirectly impacted by dust. Dust can negatively impact plants by clogging stomatal openings in the leaves, impeding gas exchange in the leaves and reducing the ability of plants to take in carbon dioxide (Sharifi et. al. 1997). Dust on the leaf surface can also effectively reduce light availability at the leaf surface (Thompson et. al. 1984). Light and carbon dioxide are both 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 (Wijayratne et. al. 2009). Dust levels could be expected to increase above ambient levels in the short term from pad and road construction, pipeline installation, and drilling. Dust levels would increase in the long term from the exposed bare ground surface of the working pad and vehicle traffic associated with well operation. Increased dust could reduce growth rates and seed production in neighboring plants.

Neighboring vegetation would also become more vulnerable to invasion by noxious weeds and other non-native invasive plant species. Ground disturbance provides excellent habitat for noxious weeds and other invasive species, particularly when these species are already present on the site as is the case for this project. Construction equipment and vehicles entering the site from elsewhere also provide potential vectors for introducing new invasive species. Because of the previous disturbance history, noxious weed presence, and non-native invasive species establishment in the surrounding vegetation, it would be particularly vulnerable to new noxious weed infestations. Implementation of standard COAs for noxious weeds and temporary reclamation (Appendix A) would reduce the risk of noxious weed and invasive species establishment and spread, but non-native species could be expected to persist on this site due to their current widespread establishment here combined with the new disturbance to the existing vegetation. In this case, they could move beyond the disturbance area to neighboring undisturbed vegetation where bare ground habitat is available.

#### *No Action Alternative*

Under the No Action Alternative, the proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on vegetation would be less but not eliminated.

### **Visual Resources**

#### Affected Environment

The Proposed Action occurs on private land and BLM land approximately 4 air-miles southeast of Parachute (Figure 6). The portion of the Proposed Action that is located on BLM land is classified as visual resource management (VRM) Class IV as identified by the 1984 Glenwood Springs Resource Management Plan. The objective of VRM Class IV, as defined in the BLM's Manual H-8410-1-Visual Resource Inventory (BLM 1986), is described below.

- The objective of VRM Class IV is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of the viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

The Proposed Action that is located on BLM land is within visual resource inventory (VRI) class 3 and 4, scenic quality B and C, sensitivity medium and high, and is within the foreground/middle ground and background distance zones.

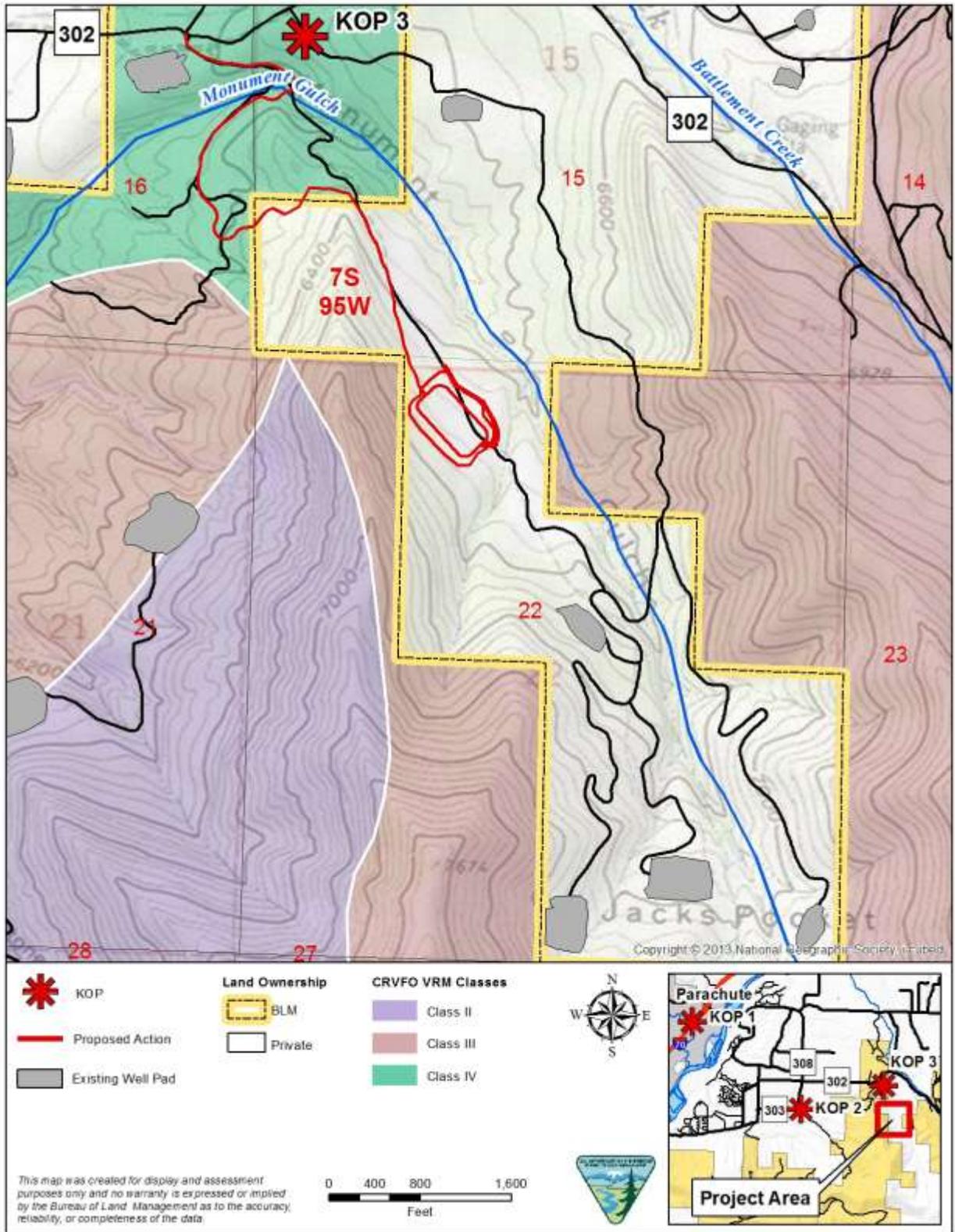


Figure 6. Proposed Action in Relationship to Land Status and VRM Class Designations

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.

The project area consists of long steep finger-like ridges extending north from Battlement Mesa. The Proposed Action would occur in between two of these ridges within Monument Gulch near an area known as Jacks Pocket. These two ridges form a long horseshoe shape enclosing the project area to west, south, and east. The ridges terminated just to the north of the Proposed Action where the topography begins to gently roll into Morrisania Mesa. The Proposed Action would occur in area that burned in 1987 and now consists of agricultural grassland surrounded by Gamble oak woodland.

The visual resource analysis area includes the town of Parachute, Community of Battlement Mesa, and County Road 302 (Underwood Lane). This viewshed is viewed by people who live, work, or commute in the area and constitute the typical casual observer. The visual impact analysis for the project is based on 3 key observation points (KOPs) representing 3 linear and stationary viewing locations representing the viewing angle and direction with the highest frequency of viewers (Figure 6).

**KOP 1** (Figure 7) is located in the town of Parachute at the rest area along East 1<sup>st</sup> Street. KOP 1 represents the contextual view of the project area.

**KOP 2** (Figure 8) is located near the corner of County Road 303 (Gardner Lane) and County Road 308 (4 Corners Road). KOP 2 represents the typical view that a casual observer would have from the Community of Battlement Mesa. The viewer would be lower than the Proposed Action from this location and the Proposed Action would be visually screened by the ridgeline descending from Battlement Mesa.

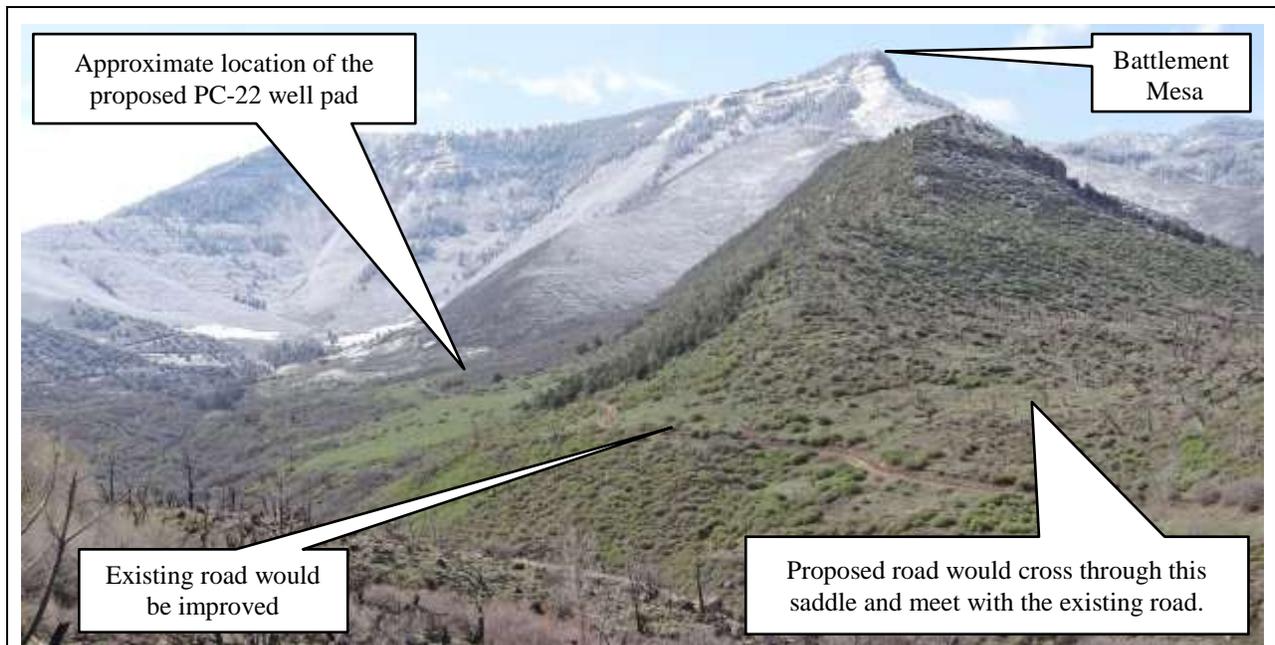
**KOP 3** (Figure 9) is located near the junction of the PC-22 access road and County Road 302 (Underwood Lane). KOP 3 represents the view of the project area from the north near where the two ridgelines enclose the Proposed Action. Figure 10 is located at the beginning of the PC-22 access road.



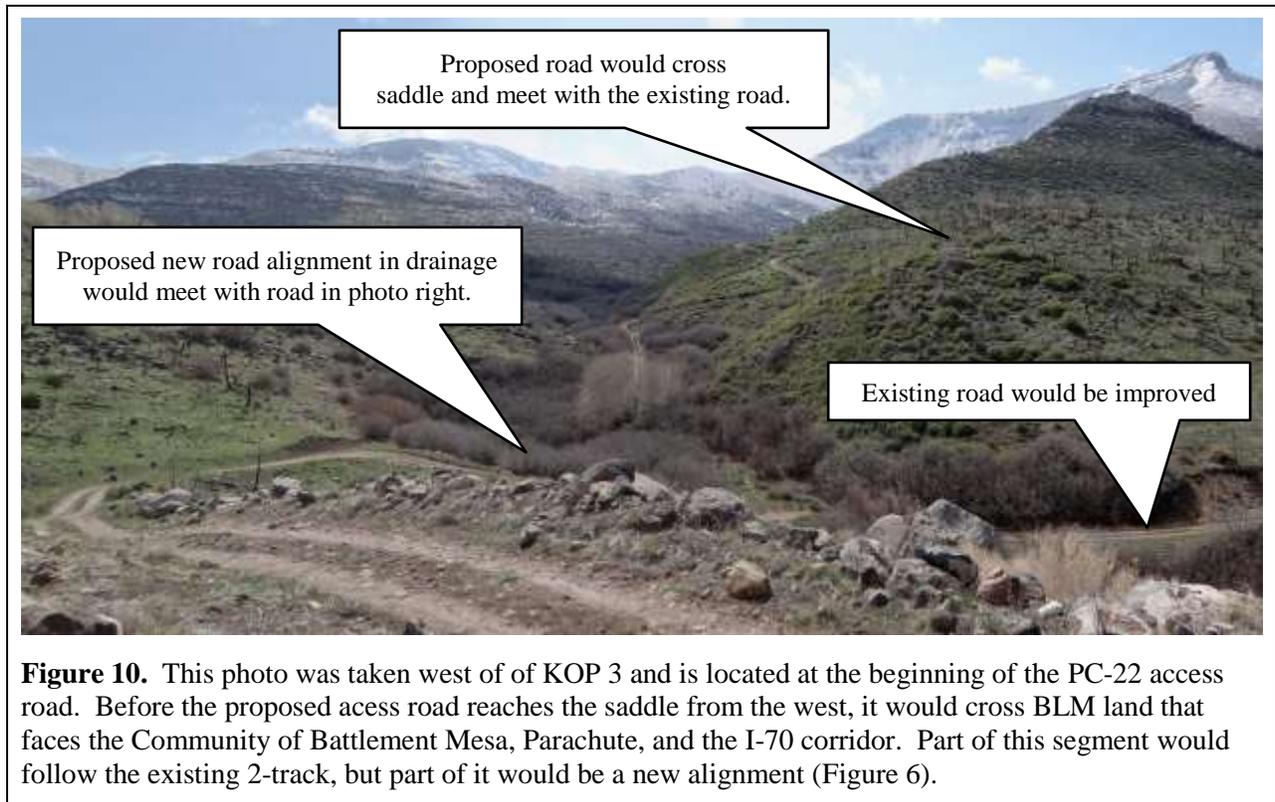
**Figure 7.** KOP 1 – View southeast from the Parachute Rest Area (East 1<sup>st</sup> Street). The viewer would be lower than the Proposed Action. Views into the project location from this KOP would be screened by one of the ridgelines descending north from Battlement Mesa.



**Figure 8.** KOP 2 – View southeast near the corner of CR3F03 and CR3F08. The viewer would be lower than the Proposed Action from this location, and the Proposed Action would be visually screened by the ridgeline descending left (north) off Battlement Mesa.



**Figure 9.** KOP 3 – View south near the junction of the PC-22 access road and CR302. The viewer would be slightly lower to equal to the Proposed Action from this location. Views into the project area from CR302 are limited because the topography in between CR3F02, and the project area would block the field of view.



### Environmental Consequences

#### *Proposed Action*

Short-term visual impacts due to pad, access road construction, pipeline installation, drilling and completion activities would occur within the project area. Construction of the Proposed Action would create contrast within the landscape by removing the existing vegetation, exposing bare ground, and creating distinct lines and forms within the landscape. The new pad, surface facilities, access road, and pipeline would increase the presence of drilling rigs, heavy equipment (e.g., dozers, graders, trackhoes), and vehicular traffic with an associated increase in dust and light pollution.

Long-term impacts of the Proposed Action would consist of an increase in the departure from the native characteristics of the visual character within the landscape where the new pad, facilities, access road, and pipeline are constructed. The visibility of new areas of surface disturbance and production equipment would increase the existing visual contrasts associated with human modification already present in the area.

The proposed PC-22 well pad and pipeline are located entirely on private land. The pad would be located on terrain that gradually slopes upward from the northeast to the southwest. Because the terrain is not flat it would require steeper cut-and-fill slopes. The fill-slope would range from 1.5 feet to 30 feet (north corner of pad) and the cut-slope would range from 6.5 feet to 30 feet (south corner of pad). The cut-and-fill slopes would be the most visible during construction and drilling activities. Once the pad is put into production and the pad is recontoured and vegetation is reestablished, the pad would be expected to blend with the surroundings. The proposed pipeline would tie into an existing pipeline and would require minimal surface disturbance compared to other components of the Proposed Action. Since the well pad and pipeline occur entirely on private land and are located in an area with limited visibility, the standard

best management practices (BMPs) related to reclamation, facility paint colors, and screening the well pad and pipeline alignment from view would mitigate the visual impacts of the project (Standard COAs Appendix A).

There is an existing two-track road that accesses the Proposed Action location (Figures 9 and 10), which is located on both private land and BLM land. The portion of the access road (approximately 4,016 feet) that is located on BLM land is classified as VRM Class IV. Segments of the road would need to be improved or realigned to accommodate the safety requirements for large vehicular traffic accessing the proposed PC-22 well pad. Although a segment of the access road is located on BLM VRM Class IV land and it can dominate the view and be the major focus of the viewer's attention, every attempt should be made to minimize the visual impact of the Proposed Action on Interstate 70 and nearby community viewsheds. The standard best management practices (BMPs) related to reclamation and screening the access road alignment from view would mitigate the visual impacts of the project (Standard COAs Appendix A). However, after construction, the segment of the access road that faces Parachute and the Interstate 70 corridor should be reviewed to determine if the road surface color detracts from the viewshed (as viewed from the KOPs). If it is determined that the road surface color contrasts with the surrounding landscape, dust abatement measures should be implemented (Site-Specific COAs Appendix A).

The total short-term surface disturbance associated with the well pad, access road, and pipeline would be 12.6 acres. After drilling and well completion work, the pad, access road, and pipeline corridor, would be reshaped and seeded reducing the long-term surface disturbance to 4.5 acres.

#### *No Action Alternative*

Under this alternative, none of the proposed 13 Federal wells would be drilled, completed or developed. However, the construction of the PC-22 well pad, access road, and pipeline would still occur on Fee surface, and the proposed Fee wells would be drilled. Consequently, the No Action Alternative would reduce but not eliminate new impacts to visual resources.

### **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 NEPA 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 commonly used for oil and gas projects and a description of common industry practices for use of these materials and disposal of waste products. These practices are dictated by various Federal and State laws and regulations, and BLM standard lease terms and stipulations that would accompany any authorization resulting from this analysis. The most pertinent of Federal laws dealing with hazardous materials are:

- The Oil Pollution Act (Public Law 101-380, August 18, 1990) prohibits discharge of pollutants into Waters of the US, which by definition would 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, ROW 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. BLM would have access to regional resources if justified by the nature of an incident.

#### Environmental Consequences

##### *Proposed Action*

Possible pollutants that could be released during the construction phase of this project would include diesel fuel, hydraulic fluid, and lubricants. These materials would be used during construction of the pads, roads, and pipelines, and for refueling and maintaining equipment and vehicles. 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 would include those associated with well production, transmission of natural gas through gathering lines, and 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 that would be used in construction meet the criteria for an acutely hazardous material/substance, or meet the quantities criteria per BLM Instruction Memorandum No. 93-344. In addition, no extremely hazardous substance, as defined in 40 CFR 355, in amounts above threshold planning quantities would be produced, used, stored, transported, or disposed of during construction or operation of the facilities.

Solid waste (human waste, garbage, etc.) would be generated during construction activities and, to a limited extent, during project operations. These would be removed to a landfill or water treatment facility as needed, and all would be removed prior to interim reclamation.

Surface water or groundwater could be affected under the Proposed Action. Pollutants that might be released during the operational phase of the project could include condensate, produced water (if the wells in the area produce water) and glycol (carried to the site and used as antifreeze). While uncommon, an accident could occur that could result in a release of any of these materials. A release could result in contamination of surface water or soil. Improper casing and cementing procedures could result in the contamination of groundwater resources. In the case of any release, emergency or otherwise, the responsible party would be liable for cleanup and any 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 adequately mitigate any potential hazardous or solid waste issues associated with the Proposed Action.

#### *No Action Alternative*

Under the No Action Alternative, the proposed Federal well would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts to wastes would be lessened, but not eliminated.

### **Water Quality, Surface and Ground**

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

##### Affected Environment

The proposed activities for PC-22 well pad would occur within Monument unit which drains the Colorado River approximately 2 miles to the northwest of the project. According to the *Stream Classifications and Water Quality Standards* (CDPHE, Water Quality Control Commission [WQCC] Regulation No. 37) (CDPHE 2007), unnamed ephemeral drainages that drain most of the project vicinity are within segment 4a, which is the mainstem of Dry Creek including all tributaries and wetlands from the source to immediately above last chance ditch. Following is a brief description of segment 4a.

- Segment 4a – This segment has been classified aquatic life cold 2, recreation N, water supply, and agriculture. Aquatic life cold 2 indicates that this water course is not capable of sustaining a wide variety of cold or warm water biota due to habitat, flows, or uncorrectable water quality conditions. Recreation class N refers to waters that are not suitable or intended to become suitable for primary contact recreation. This segment is suitable or intended to become suitable for potable water supplies and agricultural purposes that include irrigation and livestock use.

The segment of the Colorado River which Monument Gulch drains is on the State of Colorado's *303(d) List of Impaired Waters and Monitoring and Evaluation List* (CDPHE, WQCC Regulation No. 93) (CDPHE 2010) for naturally high levels of selenium; however no streams within segment 4e are on this list. *Colorado's Monitoring and Evaluation List* identifies water bodies where there is reason to suspect water quality problems, but uncertainty also exists regarding one or more factors. The USGS has not collected surface water data at sites along Monument Gulch near the project area (USGS 2007). Data were collected from the Colorado River below the project area near Rulison in 1977 and 1978 (Table 12).

<b>Table 12. Selected Water Quality Data for Two Sampling Locations near the Project Area</b>		
<i>Parameter</i>	<i>Colorado River below Rulison CO, USGS Site #09092570 01/18/1978</i>	<i>Colorado River below Rulison CO, USGS Site #09092570 4/8/1977</i>
Instantaneous discharge (cfs)	1,500	1,560
Temperature, water (°C)	2.5	11
Field pH (standard units)	7.9	8.1
Specific conductance (µS/cm/cm at 25°C)	1,320	1,200
Total Dissolved Solids (mg/L)	756	733
Hardness as CaCO <sub>3</sub> (mg/L)	280	250
Chloride (mg/L)	230	230
Selenium (µg/L)	2	1
Dissolved oxygen (mg/L)	11.2	10
NA = data not available Source: USGS 2007.		

No sediment measuring stations are present on the Colorado River or its tributaries near the pad location. The closest downstream station on the Colorado River is near DeBeque, Colorado. A summary of USGS data collected at this station indicates that the mean sediment load was 1,817 tons per day during the period of 1974 to 1976. The maximum and minimum for this location during the same period was 41,300 and 8 tons/day respectively (USGS 2007).

### Environmental Consequences

#### *Proposed Action*

The proposed action would result in 12.6 acres of surface disturbance of which approximately 4.5 acres would not be reclaimed during the life of the wells. Potential impacts to surface water associated with the Proposed Action occur 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 can be minimized by stormwater management, stockpiling topsoil, controlling erosion, rehabilitation of 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 footprint through interim reclamation measures. As proposed, these measures would include limiting cut slope steepness, step-cutting, crowning road surfaces, installing culverts and drainage systems, and applying gravel to all upgraded BLM 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 be implemented which recycles

drilling fluids; cuttings would be dried through the use of 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 may be conducted either onsite or remotely and fluids may be stored in surface containment or a pit. An on or offsite engineered completions pit may be constructed to store water for hydraulic fracturing and recycle flowback water. These pits are engineered with double lining and leak detection systems. To achieve successful closure of the pit the soils below the lining must pass COGCC standards and the hole must be backfilled with decontaminated cuttings and/ or clean fill.

In addition to individual containment measures, the entire pad is 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 standard 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*

Under the No Action Alternative, the proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on surface waters would be similar or slightly less than under the Proposed Action.

#### ***Waters of the U.S.***

##### Affected Environment

Waters of the U.S. located in the project vicinity include the mainstem and tributaries of Monument Gulch. Section 404 of the Clean Water Act requires a Department of the Army permit from the U.S. Army Corps of Engineers (USACE) prior to discharging dredged or fill material into waters of the U.S. as defined by 33 CFR Part 328. A permit is required for both permanent and temporary discharges into waters of the United States; larger discharges require an individual permit, while smaller discharges may be granted a nationwide permit (NWP).

##### Environmental Consequences

No new crossings of waters of the U.S. are included in the Proposed Action, nor is pad construction proposed that could discharge fill into Waters of the U.S.

Any upgrades to the road and pipeline crossings of drainages within the PC-22 would be authorized by the USACE. Appendix A includes a COA requiring 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.

Improperly designed or improperly installed crossings of small ephemeral drainages, in particular any undersized or poorly aligned culverts, could result in soil degradation, including erosion at culvert outlets. This could potentially supply sediment to the Colorado River approximately 2 miles to the northwest. However, standard and site-specific surface-use COAs listed in Appendix A would be implemented to protect Monument Gulch, the Colorado River, and any other waters of the U.S. potentially impacted by long-distance stormflow transport.

### *No Action Alternative*

The No Action alternative would constitute denial of the Federal wells as proposed. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on surface waters would be similar or slightly less than under the Proposed Action.

### ***Groundwater***

#### Affected Environment

The Lower Piceance Basin contains both alluvial and bedrock aquifers (Colorado Geological Survey 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 well depths are generally less than 200 feet and water levels typically range between 100 to 150 feet. Well yield is dependent upon the intended use of the well, well construction design, sediment type and saturated thickness. Domestic use 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. The depth to the top of this aquifer beneath the project area is more than 5,000 feet below ground surface (bgs), 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 CDWR database, there are no domestic water wells located within a 1-mile radius of the proposed well site.

### 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. Typical proppants 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 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 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 (National Academy of Sciences 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. 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. BLM petroleum engineers review 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 fracture jobs are 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 chemicals 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 is as a proppant, or propping agent, to help keep the newly formed fractures from closing.

**Table 13. Constituents of Typical Hydraulic Fracturing Operation in Tight Gas Formations**

<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 the 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	Used in hair coloring, as a disinfectant, and in manufacture of household plastics
Clay stabilizer	Potassium chloride	0.060	Creates a brine carrier fluid that prohibits fluid interaction with formation clays	Used in low-sodium table salt substitutes, medicines, and IV fluids
Corrosion inhibitor	Formic acid	0.002	Prevents corrosion of the well casing	Used as preservative in livestock feed; used as lime remover in toilet bowl cleaners
Crosslinker	Borate salts	0.007	Maintains fluid viscosity as temperature increases	Used in laundry detergents, hand soaps, and cosmetics
Friction reducer	Polyacrylamide	0.088	“Slicks” the water to minimize friction	Used as a flocculant in water treatment and manufacture of paper
Gelling agent	Guar gum	0.056	Thickens the water to help suspend the sand propping agent	Used as a thickener, binder, or stabilizer in foods
Iron control	Citric acid	0.004	Prevents precipitation of metal oxides	Used as flavoring agent or preservative in foods
Surfactant	Lauryl sulfate	0.085	Increases the viscosity of the fluid	Used in soaps, shampoos, detergents, and as foaming agents
pH adjusting agent	Sodium hydroxide, acetic acid	0.011	Adjusts pH of fluid to maintain the effectiveness of other components	Sodium hydroxide used in soaps, drain cleaners; acetic acid used as chemical reagent, main ingredient of vinegar
Scale inhibitor	Sodium polycarboxylate	0.043	Prevents scale deposits in the pipe	Used in 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>				
**DOE 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, the COGCC published an analysis of hydraulic fracturing technology use in the state 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 proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on groundwater resources would be less than under the Proposed Action but not eliminated.

### **Wildlife – Aquatic Species**

#### **Affected Environment**

Aquatic habitat is limited in the project area given the intermittent nature of the streams. Battlement Creek lies approximately 1.5 miles east of the PC-22 pad. Battlement Creek is a perennial stream and is a tributary to the Colorado River. A native trout subspecies, the Colorado River cutthroat trout, Lineage CR, is known to occur in Battlement Creek. This subspecies is listed as sensitive by the BLM; see the section on Special Status Species for detailed information. Fish surveys by CDOW and USFS have documented the presence of greenback cutthroat trout—a Federally listed threatened subspecies—in upper reaches of Cache Creek, located two drainages to the east.

Aquatic macroinvertebrates living in perennial streams such as Battlement Creek during a portion of their lifecycles include larvae of stoneflies, mayflies, and some caddisflies in fast-flowing reaches with rocky or detrital substrates. Both the aquatic larvae and winged adults of stoneflies, mayflies, and caddisflies are probably the main prey for trout in Battlement Creek, along with terrestrial invertebrates that land or fall onto the surface or are carried into the stream in runoff from adjacent uplands. In slow-flowing portions of Battlement Creek with fine substrates, aquatic macroinvertebrates probably include the larvae of midges, mosquitoes, and some caddisflies. These species are able to tolerate relatively warm, turbid, and poorly oxygenated waters, and their more abbreviated larval stages allow them to reproduce in intermittent streams and in seasonally inundated overbank areas.

## Environmental Consequences

### *Proposed Action*

Habitat for the present fish population would remain adequate by maintaining the present condition of the aquatic and riparian environment of Battlement Creek. Runoff from the well pads is adequately buffered given the distance to the creek and the topography of the project area. Additionally, protective COAs for water quality would minimize potential impacts from the development. (Appendix A)

### *No Action Alternative*

Under the No Action Alternative, the proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on terrestrial wildlife would be less the Proposed Action but not eliminated.

## **Wildlife - Migratory Birds**

### Affected Environment

The Migratory Bird Treaty Act (MBTA) includes native passerines (flycatchers and songbirds) as well as birds of prey, migratory waterbirds (waterfowl, wading birds, and shorebirds), and other species such as doves, hummingbirds, swifts, and woodpeckers. Within the context of the MBTA, “migratory” birds include non-migratory “resident” species as well as true migrants, essentially encompassing virtually all native bird species. For most bird species, nesting habitat is of special importance because it is critical for supporting reproduction in terms of nesting and foraging sites. Because birds are generally territorial during the nesting season, their ability to access and utilize sufficient food is limited by the quality of the territory occupied. During non-breeding seasons, birds are generally non-territorial and able to feed across a larger area and wider range of habitats.

Emphasizing the need to conserve declining migratory bird species, the U.S. Fish and Wildlife Service (USFWS 2008) has published a list of Birds of Conservation Concern (BCC). This section focuses on BCC species, non-BCC species that are Neotropical (long-distance) migrants, and raptors—three groups especially vulnerable to habitat loss or modification on their breeding grounds. Species protected under the Endangered Species Act or classified by the BLM as sensitive species are addressed in the section on Special Status Species.

The current BCC list includes 10 species potentially present in or near the project area: the bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), prairie falcon (*Falco mexicanus*), flammulated owl (*Otus flammeolus*), yellow-billed cuckoo (*Coccyzus americanus*), Lewis’s woodpecker (*Melanerpes lewis*), willow flycatcher (*Empidonax traillii*), gray vireo (*Vireo vicinior*), pinyon jay (*Gymnorhinus cyanocephalus*), juniper titmouse (*Baeolophus griseus*), Brewer’s sparrow (*Spizella breweri*), and Cassin’s finch (*Haemorhous cassinii*). The flammulated owl and Brewer’s sparrow are also listed as BLM sensitive species and addressed in the section on Special Status Species.

Although oakbrush and mixed mountain shrub habitats such as occur in the area do not support BCC species, they are suitable for other migrants such as common poorwill (*Phalaenoptilus nuttallii*), dusky flycatcher (*Empidonax oberholseri*), western scrub-jay (*Aphelocoma californica*), Virginia’s warbler (*Oreothlypis virginiae*), MacGillivray’s warbler (*Oreothlypis tolmiei*), spotted towhee (*Pipilo maculatus*), green-tailed towhee (*P. chlorurus*), black-headed grosbeak (*Pheucticus melanocephalus*), blue grosbeak (*Passerina caerulea*), and lazuli bunting (*Passerina amoena*).

Pinyon-juniper habitat provides potential nesting sites for the three BCC species: pinyon jay, juniper titmouse, and (less likely based on range) the gray vireo. Another BCC species, Cassin's finch, nests at higher elevations in montane and subalpine conifers but may move into pinyon-juniper in winter. Non-BCC species potentially nesting in pinyon-juniper in the project area include migrants such as the black-chinned hummingbird (*Archilochus alexandri*), western kingbird (*Tyrannus verticalis*), Say's phoebe (*Sayornis saya*), dusky flycatcher, mountain bluebird (*Sialis currucoides*), western bluebird (*S. mexicana*), blue-gray gnatcatcher (*Polioptila caerulea*), plumbeous vireo (*Vireo plumbeus*), black-throated gray warbler (*Dendroica nigrescens*), and chipping sparrow (*Spizella passerina*).

Sagebrush shrublands in the project area provide marginal habitat for the Brewer's sparrow, a near-obligate in sagebrush shrublands. Non-BCC species associated with sagebrush shrublands include the western meadowlark (*Sturnella neglecta*) and three species of Neotropical migrants: western kingbird, vesper sparrow (*Pooecetes gramineus*), and lark sparrow (*Chondestes grammacus*). Additionally, two active golden eagle nests were found in the cliff bands north of the proposed well pads.

Raptors most likely to nest in the project vicinity and forage in or near the project area include two BCC species—the golden eagle and prairie falcon. Non-BCC species such as the American kestrel (*Falco sparverius*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*A. striatus*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), great horned owl (*Bubo virginiana*), and long-eared owl (*Asio otus*) are more likely to occur in the project area. Three sticknest structures besides those attributable to black-billed magpies (*Pica hudsonia*) were documented during surveys conducted in April 2013. These include one cliff nest occupied by common ravens (*Corvus corax*) and two arboreal sticknests unoccupied at the time of the survey. Appendix A includes a COA specific to protection of nesting raptors in conjunction with the Proposed Action.

## Environmental Consequences

### *Proposed Action*

Under the Proposed Action, 12.6 acres of new disturbance would occur on private land as a result of pad, road, and pipeline construction. Following successful interim reclamation, the disturbance would be reduced to 4.5 acres. Removal of pinyon-juniper, sagebrush, and mixed shrub species would result in loss of existing and potential nesting sites for perching birds. While habitat loss and fragmentation may affect individual birds, it is not expected to adversely impact a species as a whole. If construction, drilling, or completion activities occur during the nesting season, visual and noise disturbance near active nests could cause nest abandonment and failure, reducing the productivity of affected species. Construction activity during the nesting season could also result in the destruction of clutches and/or mortality of nestlings.

To minimize the potential for adverse impacts to nesting migratory birds, and especially BCC species, a COA would be applied to prohibit removal of vegetation and initiation of surface-disturbing activities ruction, drilling, or completion activities, or use of project-specific access roads to support during the period from May 1 to July 1. The BLM would grant an exception to this TL if a nesting survey during the breeding season for BCC species potentially present indicates no active nests within 30 meters (100 feet) of the pad, road, or other area proposed for surface disturbance (see Appendix A.)

Because an inactive nest was found within 0.25 mile of the pad, Appendix A includes a COA precluding the initiation of construction, drilling, or completion activities during a 60-day Timing Limitation (TL) period from May 1 to July 1 unless a survey during the breeding season in which activities are proposed documents that the nest is also inactive in that year. The MBTA prohibits "take," which includes harassing, injuring, or killing a covered species and actions that result in mortality of eggs or nestlings.

### *No Action Alternative*

Under the No Action Alternative, the proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on migratory birds would be less the Proposed Action but not eliminated.

## **Wildlife – Other Terrestrial Species**

### Affected Environment

#### MAMMALS

The site is located within winter range for mule deer (*Odocoileus hemionus*) as well as winter range and winter concentration areas for American elk (*Cervus elaphus*) as mapped by CPW (2011). Winter range is that part of the overall range of a species where 90% of the individuals are located during the average five winters out of ten from the first heavy snowfall to spring green-up, or during a site-specific period of winter as defined for each data analysis unit (DAU) (CPW 2011). Winter Concentration areas are that part of the winter range where densities are at least 200% greater than the surrounding winter range density during the same period used to define winter range in the average five winters out of ten (CPW 2011). Field surveys indicate that the project area is winter range for elk and year-round habitat for mule deer.

Large carnivores present in the project vicinity include the mountain lion (*Puma concolor*) and black bear (*Ursus americanus*). Mountain lions move seasonally to follow migrations of their preferred prey, mule deer. Two medium-sized 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. Smaller carnivores in habitats similar to the project area include the ringtail (*Bassariscus astutus*) and western spotted skunk (*Spilogale gracilis*).

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

#### BIRDS

In addition to the species mentioned above in the section on Migratory Birds are a variety of residents or short-distance migrants such as the northern flicker (*Colaptes auratus*), common raven (*Corvus corax*), black-billed magpie (*Pica hudsonia*), and house finch (*Haemorhous mexicanus*).

The wild turkey (*Meleagris gallopavo*) is native to North America and the largest member of the upland fowl. Wild turkeys are omnivorous, foraging on the ground or climbing shrubs and small trees to feed. They prefer hard mast such as acorns and pine nuts but also relish berries, seeds, and large insects. Wild turkeys may move from cover into open areas such as woodland clearings and the margins of grasslands and pastures dusk and dawn. This site is located in an area mapped by the CPW as wild turkey overall range and approximately 1 mile from an area mapped as a turkey production area. See the sections on Migratory Birds and Special-Status Species for discussions of other birds in the area.

## REPTILES AND AMPHIBIANS

Species most likely to occur include the western fence lizard (*Sceloporus undulatus*) and gopher snake (bullsnake) (*Pituophis catenifer*) in xeric shrublands or grassy clearings and the western terrestrial garter snake (*Thamnophis elegans*) along creeks. Other reptiles potentially present along creeks, although more commonly found at lower elevations than the site, are the milk snake (*Lampropeltis triangulum*) and smooth green snake (*Opheodrys vernalis*).

Although the project area does not contain any suitable habitat, the surrounding area provides potentially suitable habitat for the northern leopard frog (see the section on Special Status Species) and two additional amphibians, the Woodhouse's toad (*Anaxyrus woodhousii*), and western chorus frog (*Pseudacris triseriata*). Within the CRVFO and vicinity, the spadefoot toad and Woodhouse's 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 Consequences

#### *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 the 12.6 acres of 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.

The greatest impact on wildlife, especially big game and raptors, would be the disturbance caused by increased human activity, equipment operation, vehicle traffic, harassment by any dogs brought to the site by contractors, and noise related to drilling and completion activities. Most species of wildlife are relatively secretive and distance themselves from these types of disturbance or move to different areas screened by vegetation screening or topographic features. This avoidance, referred to as displacement, results in underuse of habitat near the disturbance. Avoidance of forage and cover resources adjacent to disturbance reduces habitat utility and the capacity of the affected acreage to support wildlife populations.

#### *No Action Alternative*

Under the No Action Alternative, the proposed Federal wells would not be approved. However, Encana would construct the pad on fee surface and drill the fee wells. Therefore, impacts on terrestrial wildlife would be less the Proposed Action but not eliminated.

## **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, nonetheless past, present, and reasonably foreseeable future actions have had and would continue to have adverse effects on various elements of the human and natural 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.

Based on the above, 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, native vegetation, migratory birds, terrestrial wildlife, and other resources.

**PERSONS AND AGENCIES CONSULTED**

Heather Mitchell, Encana Oil & Gas (USA) Inc.

**INTERDISCIPLINARY REVIEW**

BLM staff who participated in the preparation of this EA are listed in Table 14.

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Christine Cimiluca	Natural Resource Specialist	EA Project Lead, Access & Transportation, Socioeconomics, Wastes-Hazardous or Solid.
D. J. Beaupeurt	Realty Specialist	Lands and Realty
John Brogan	Archaeologist	Cultural Resources, Native American Religious Concerns
Peter Cowan	Petroleum Engineer	Downhole COAs
Allen Crockett, Ph.D., J.D.	Supervisory Natural Resource Specialist	NEPA Review, General Technical Review

**Table 14. BLM Interdisciplinary Team Authors and Reviewers**

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Sylvia Ringer	Wildlife Biologist	Migratory Birds, Special-status Species (Animals), Wildlife, Aquatic and Terrestrial
Todd Sieber	Geologist	Geology and Minerals, Groundwater

**REFERENCES CITED**

Bureau of Land Management (BLM). 1984. Glenwood Springs Resource Management Plan. Glenwood Springs Field Office, Colorado.

\_\_\_\_\_. 1991. Record of Decision, Oil and Gas Plan Amendment. Glenwood Springs Field Office, Colorado.

\_\_\_\_\_. 1999a. Oil & Gas Leasing & Development – Final Supplemental Environmental Impact Statement. Glenwood Spring Field Office, Colorado.

\_\_\_\_\_. 1999b. Oil & Gas Leasing & Development – Record of Decision and Resource Management Plan Amendment. Glenwood Spring Field Office, Colorado.

\_\_\_\_\_. 2006. Final Roan Plateau Resource Management Plan Amendment & Environmental Impact Statement, Volume III, Appendix C. Glenwood Springs Field Office, Colorado.

\_\_\_\_\_. 2007. Federal Mineral Leasing Act of 1920 as Amended. Oil and Gas Royalty Permittee Fees Page. 6. [www.blm.gov/pgdata/...minerals.../MineralLeasingAct1920.pdf](http://www.blm.gov/pgdata/...minerals.../MineralLeasingAct1920.pdf)

\_\_\_\_\_. 2011. Air Resources Technical Support Document. Colorado River Valley Field Office, Silt, CO. <http://www.blm.gov/co/st/en/fo/crvfo.html>

City Data. 2012. Garfield County, Colorado. [http://www.city-data.com/county/Garfield\\_County-CO.html](http://www.city-data.com/county/Garfield_County-CO.html).

Colorado Department of Labor and Employment (CDLE). 2013. Colorado LMI Gateway. Summary area Profile for Garfield County, Colorado. <http://www.colmigateway.com/vosnet/lmi/area/areasummary.aspx?session=areadetail&geo=0804000045>

Colorado Department of Local Affairs (CDOLA). 2012. Population forecasts – years 2000 to 2040. Table III –C-1. Preliminary population forecasts for Colorado counties, 2000-2040. <http://www.colorado.gov/cs/Satellite?c=Page&childpagename=DOLA-Main%2FCBONLayout&cid=1251593346867&pagename=CBONWrapper>

Colorado Department of Local Affairs (CDOLA). 2013a. State Demography Office, Profile System, Colorado County Profile System, Results Garfield County 2000 – 2011. [https://dola.colorado.gov/demog\\_webapps/psc\\_parameters.jsf](https://dola.colorado.gov/demog_webapps/psc_parameters.jsf).

\_\_\_\_\_. 2013b. 2010 Census Data for Colorado, Race & Ethnicity (including 18+, % and Absolute Change from 2000 to 2010) by County. <http://dola.colorado.gov/dlg/demog/2010censusdata.html>

\_\_\_\_\_. 2013c. 2010 Census Data for Colorado, 2010 Hispanic or Latino (of any race) Population and Percent Change Colorado Counties – Total Population <http://dola.colorado.gov/dlg/demog/2010censusdata.html>.

Colorado Department of Public Health and Environment (CDPHE). 2007. Water Quality Control Commission (WQCC), Regulation No. 37, Classifications and numeric standards for Lower Colorado River basin and tables. Amended February 8, 2010; effective June 3, 2010. Available online.

\_\_\_\_\_. 2010. Water Quality Control Commission (WQCC), Regulation No. 93, Section 303(d) List of Impaired Waters and Monitoring and Evaluation List. Effective April 30, 2010. Available online.

Colorado Parks and Wildlife (CPW). 2008. Recommended buffer zones and seasonal restrictions for Colorado raptors. February. Available online.

\_\_\_\_\_. 2011. National Diversity Information Source (CPW-NDIS). Elk and mule deer habitat GIS data.

Colorado Geological Survey (CGS). 2003. Ground Water Atlas of Colorado, Special Publication 53, pgs. 97-106.

Colorado Oil and Gas Commission (COGCC). 2010. Colorado Oil and Gas Information System (COGIS) Production. <http://cogcc.state.co.us/>. Available online.

Colorado Oil and Gas Commission (COGCC). 2013a. Colorado Oil and Gas Information System (COGIS) Production. <http://cogcc.state.co.us/cogis/ProductionSearch.asp>.

Colorado Oil and Gas Commission (COGCC) 2013b. Colorado Oil and Gas Drilling Permits. <http://cogcc.state.co.us/>.

Davies, R. J., S. Mathias, J. Moss, S. Hustoft, and L Newport. 2012. Hydraulic fractures: How far can they go? *Marine and Petroleum Geology* 37(1):1-6. November.

EnerMax, Inc. 2007. Hydraulic fracturing. <http://www.enermaxinc.com/hydraulic-fracturing>.

Fenneman, N. M. 1946, Physical subdivisions of the United States (Map): U.S. Geological Survey, 1:700,000, 1 sheet.

Garfield County. 2013a. About Garfield County. <http://www.garfield-county.com/about-garfield-county/index.aspx>.

\_\_\_\_\_. 2013b. Garfield County Administration, 2012 Abstract of Assessment. [www.garfield-county.com/assessor/documents/2012-Abstract-brochure.pdf](http://www.garfield-county.com/assessor/documents/2012-Abstract-brochure.pdf)

\_\_\_\_\_. 2013c. Garfield County Administration, Impacts of Oil and Gas Industry on Garfield County. [www.garfield-county.com/.../Economic-Impacts-of-Oil-and-Gas-Industry-on -Garfield-County.pdf](http://www.garfield-county.com/.../Economic-Impacts-of-Oil-and-Gas-Industry-on-Garfield-County.pdf)

Gelbard, J.L. and J. Belnap. 2003. Roads as conduits for exotic plant invasions in a semiarid landscape. *Conservation Biology*, 17(2):420-432.

George, R.D. 1927. *Geology and Natural Resources of Colorado*. University of Colorado, Boulder, CO.

Green, C.A., R.D. Barree, and J.L. Miskimins. 2009. Hydraulic-fracture-model sensitivity analysis of a massively stacked, lenticular, tight gas reservoir. *SPE Production & Operations Journal* 24(1):66-73. SPE 106270-PA. February.

Harris, C.M. 1991. *Handbook of acoustical measurements and noise control*, McGraw-Hill, Inc., New York.

Hierro, J.L., D. Villarreal, O. Eren, J.M. Graham, and R.M. Callaway. 2006. Disturbance facilitates invasion: the effects are stronger abroad than at home. *The American Naturalist*, 168(2):144-156.

Hemborg, T.H. 2000. Gas production characteristics of the Rulison, Grand Valley, Mamm Creek, and Parachute Fields, Garfield County, Colorado: Turning marginally economic basin-centered tight-gas sands into profitable reservoirs in the Southern Piceance Basin. *Colorado Geological Survey, Resource Series 39*. Denver.

Johnson, R.C. 1989. Geologic history and hydrocarbon potential of late Cretaceous-age, low-permeability reservoirs, Piceance Basin, western Colorado: U.S. Geological Survey Bulletin 1787, *Evolution of sedimentary basins-Uinta and Piceance Basins*, chapter E, 51 p.

Kuuskraa, V.A. 1997. Producing massively stacked lenticular sands of Colorado's Piceance Basin: Gas Tips – A Publication of Gas Research Institute GRI-97/0206:4-11.

La Plata County, Colorado. 2002. *Final La Plata County Impact Report*. October.

Lorenz, J.C. 1989. Reservoir sedimentology of rocks of the Mesaverde Group, multiwall experiment site and east-central Piceance Basin, northwest Colorado. *In* B.E. Law and C.W. Spencer, C.W. (Eds.), *Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the multiwall experiment site, Colorado*: U.S. Geological Survey Bulletin 1886:K1-K24.

Maxwell, S.C. 2011. Hydraulic fracture height growth. *Canadian Society of Exploration Geophysicists (CSEG) Recorder*. November.

National Academy of Sciences. 2007. *Weather and climate extremes in a changing climate*. National Academies Press. <http://dels.nas.edu/globalchange/reportDetail.php?id=4288&c=clim&t=pubs>.

\_\_\_\_\_. 2012. *Induced seismicity potential in energy technologies*. National Academy Press, Washington, DC.

Palisch, T.T. M.A. Chapman, and J. Godwin. 2012. Hydraulic fracture design optimization in Unconventional Reservoirs: A Case History. Paper SPE 160206 presented at the Annual Technical Conference and Exhibition, San Antonio, TX. October 8-10.

- Parendes, L.A. and J.A. Jones. 2000. Role of light availability and dispersal in exotic plant invasion along roads and streams in the H.J. Andrews Experimental Forest, Oregon. *Conservation Biology*, 14(1):64-75.
- Reinhart, K.O. and R.M. Callaway. 2006. Soil biota and invasive plants. *New Phytologist*, 170:445-447.
- Schmidt, W. 1989. Plant dispersal by motor cars. *Vegetatio* 80:147-152.
- Sharifi, M.R., A.C. Gibson, and P.W. Rundel. 1997. Surface dust impacts on gas exchange in Mojave Desert shrubs. *Journal of Applied Ecology*, 34(4):837-846.
- Spencer, C.W., and Wilson, R.J. 1988. Petroleum geology and principal exploration plays in the Uinta-Piceance-Eagle Basins Province, Utah and Colorado: U.S. Geological Survey Open-File Report 88-450-G, 35 p.
- Thompson, J.R., P.W. Mueller, W. Fluckiger, and A.J. Rutter. 1984. The effect of dust on photosynthesis and its significance for roadside plants. *Environmental Pollution (Series A)*, 34:171-190.
- U.S. Department of Agriculture (USDA). 1985. Soil survey of Rifle area, Colorado: parts of Garfield and Mesa Counties. Soil Conservation Service [Natural Resources Conservation Service].
- U.S. Department of Commerce (USDOC). 2012. Regional Economic Information System, Bureau of Economic Analysis (BEA). Table CA 1-3 Personal Income Summary. <http://www.bea.gov/iTable/iTable.cfm?ReqID=70&step=1.#reqid=70&step=30&isuri=1&7028=-1&7040=-1&7083=Levels&7031=08000&7022=20&7023=7&7024=Non-Industry&7025=4&7026=08045&7027=2011,2010,2009,2008,2007,2006,2005,2004,2003,2002,2001,2000&7001=720&7029=20&7090=70&7033=-1>
- U.S. Department of Energy (USDOE ). 2013. U.S. Energy Information Administration U.S. Natural Gas Wellhead Price. <http://www.eia.gov/dnav/ng/hist/n9190us3a.htm>.
- U.S. Department of the Interior National Business Center (USDI NBC). 2013. Payments in Lieu of Taxes (PILT) County Payments and Acres. USDI National Business Center <http://www.doi.gov/pilt/index.cfm>.
- USDI Bureau of Land Management and USDA Forest Service (USDI and USDA). 2007. The Gold Book – Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, 4th Edition, Revised BLM/WO/ST-06/021+3071/REV07. BLM. Denver, CO. 84pp.
- U.S. Environmental Protection Agency (US EPA). 1974. Information on noise levels identified as requisite to protect public health and welfare with an adequate margin of safety. EPA-550/9-74-004, Arlington, VA.
- \_\_\_\_\_. 2004. Environmental Protection Agency. Evaluation of impacts to underground sources of drinking water by hydraulic fracturing of coalbed methane reservoirs. EPA 816-R-04-003, Attachment 3, The Piceance Basin, June 2004.
- \_\_\_\_\_. 2006. Drinking water standards and health advisories, EPA 822-R-06-013, August 2006. Available online.

U.S. Fish and Wildlife Service (USFWS). 2008. Birds of conservation concern. Division of Migratory Bird Management, Arlington, Virginia. 93 pp. Available online.

\_\_\_\_\_. 2013. DRAFT Guidance for Section 7 Consultations that Include Plants within the State of Colorado. Grand Junction, CO.

U.S. Geological Survey (USGS). 2007. Water Resources of the United States, NWISWeb. Water quality samples for the nation, Colorado River near DeBeque. Available online.

Vinton, M.A. and E.M. Goergen. 2006. Plant-soil feedbacks contribute to the persistence of *Bromus inermis* in tallgrass prairie. *Ecosystems*, 9:967-976.

Vogelsgang, K.M. and J.D. Bever. 2009. Mycorrhizal densities decline in association with non-native plants and contribute to plant invasion. *Ecology*, 90 (2):399-407.

Warpinski, N.R. 2011. Fracture growth in layered and discontinuous media. Proceedings of the Technical Workshops for the Hydraulic Fracturing Study: Fate and Transport. U.S. Environmental Protection Agency, Washington, DC. May.

Warpinski, N.R., J. Du, and U. Zimmer. 2012. Measurements of hydraulic-fracture induced seismicity in gas shales. Paper SPE 151597 presented at the SPE Hydraulic Fracture Technology Conference, The Woodlands, TX. February 6-8.

Weiner, R.J., and J.D. Haun. 1960. Guide to the Geology of Colorado. Geological Society of America.

Western Ecological Resource, Inc. (WER). 2012. Special Status Plants, Plant Communities & Noxious Weed Inventory, PA29, PB22, PC-22, PJ21, PL33NE & PL31SW Well Pads.

Wijayratne, U.C., S.J. Scoles-Sciulla, and L.A. Defalco. 2009. Dust deposition effects on growth and physiology of the endangered *Astragalus jaegerianus* (Fabaceae). *Madrono* 56(2):81-88.

Zhai, Z. and M.M. Sharma. 2005. A new approach to modeling hydraulic fractures in unconsolidated sands. Paper SPE 96246 presented at the SPE Annual Technical Conference and Exhibition, Dallas, TX. October 9-12.

Zwaenepoel, A., P. Roovers, and M. Hermy. 2006. Motor vehicles as vectors of plant species from road verges in a suburban environment. *Basic and Applied Ecology*, 7:83-93.

## **APPENDIX A**

### **Surface-Use and Downhole Conditions of Approval**

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## **SURFACE-USE CONDITIONS OF APPROVAL**

### **GENERAL COAS APPLICABLE TO ALL ACTIVITIES FOR EA #DOI-BLM-CO-N040-2013-0062**

The following surface-use COAs are in addition to all stipulations attached to the respective Federal leases and to any site-specific COAs for individual well pads, presented following these general COAs. Wording and numbering of these COAs may differ from those included in [CO-140-2006-050-EA]. In cases of discrepancies, the following COAs supersede earlier versions.

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 pre-construction 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.
2. Road Construction and 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. 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.
4. 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. 15 or mark.a.gilfillan@usace.army.mil.

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 pre-construction conditions.

5. 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 jurisdictional waters may require mitigation. Contact the USACE Colorado West Regulatory Branch at 970-243-1199 ext. 17 or mark.a.gilfillan@usace.army.mil. Copies of any printed or emailed approved USACE permits or verification letters shall be forwarded to the BLM.

6. Wetlands and Riparian Zones. The operator shall restore temporarily disturbed wetlands or riparian areas. The operator shall consult with the BLM Colorado River Valley Field Office to determine appropriate mitigation, including verification of native plant species to be used in restoration.
7. 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, 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 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. 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 (COA number 19) 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 specific habitat type shall be used on all BLM lands affected by the project (see Attachments 1 and 2 of the letter provided to operators dated April 6, 2012).

For private surfaces, the menu-based seed mixes are recommended, but the surface landowner has ultimate authority over the seed mix to be used in reclamation. The seed shall contain no noxious, prohibited, or restricted 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 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.

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

- g. Mulch. Mulch shall be applied within 24 hours following completion of seeding. Mulch may consist of either hydromulch or of certified weed-free straw or certified weed-free native grass hay crimped into the soil.

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 measures approved by the BLM. Cut-and-fill slopes along drainages or in areas with high erosion potential shall also be protected from erosion using hydromulch designed specifically for erosion control or biodegradable blankets/matting, bales, or wattles of weed-free straw or weed-free native grass hay. A well-anchored fabric silt fence shall also be placed at the toe of cut-and-fill slopes along drainages or to protect other sensitive areas from deposition of soils eroded off the slopes. Additional BMPs shall be employed as necessary to reduce soil erosion and offsite transport of sediments.
- 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 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.
8. 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 shall be submitted to BLM by **December 1**.

9. Big Game Winter Range Timing Limitation. To minimize impacts to wintering big game, no construction, drilling or completion activities shall occur during a Timing Limitation (TL) period from **January 1 to March 1 annually.**
  
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, should be coordinated with the BLM project lead and BLM wildlife biologist and the USFWS representative to the BLM Field Office (970-876-9051).
  
11. Raptor Nesting. Raptor nest surveys in the project vicinity resulted in the location of one or more potential raptor nest structures within 0.25 mile of a well pad or 0.125 mile of an access road, pipeline, or other surface facility. The nests were not occupied by raptors during the nesting season surveyed. However, to protect nesting raptors, a 60-day Timing Limitation (TL) shall be applied to construction, drilling, or completion activities within the buffer widths specified above to prohibit initiation of construction, drilling, or completion activities while the nest is occupied. Specific dates of the 60-day TL are **May 1 to June 30.** The 60-day TL shall also apply to prohibit initiation of construction, drilling, or completion activities during subsequent nesting seasons unless subsequent surveys determine that the sticknests are no longer present or unoccupied during the normal breeding period for the associated species. The BLM may grant an exception to the TL in subsequent nesting seasons without requiring a follow-up survey if the nest was severely dilapidated when identified, indicating protracted disuse and low likelihood of reuse.

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 disturbance in previously undisturbed lands providing potential nesting habitat for Birds of Conservation Concern (BCC) is prohibited from **May 1 to July 1.** 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 auidial 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.

In addition to netting of pits, oil slicks and oil sheens shall be promptly skimmed off the fluid surface. The requirement for prompt skimming of oil slicks and oil sheens also applies to cuttings trenches in which precipitation has accumulated. All mortality or injury to birds shall be reported immediately to the BLM project lead and to the USFWS representative to the BLM Field Office at 970-243-2778 x28 and visit <http://www.fws.gov/mountain-prairie/contaminants/oilpits.htm>.

14. 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.
15. Ips Beetle. To minimize the potential for triggering or expanding an outbreak of the *Ips* beetle, the BLM may require any pinyon trees inadvertently damaged or intentionally trimmed during road, pad, or pipeline construction to be cut to the ground or grubbed from the ground and either chipped and buried in the toe of the fill slope or removed within 24 hours to a location approved by the Colorado State Forest Service. Prior to authorizing use of any slash from pinyon pines for purposes of visual mitigation, erosion control, as a coarse mulch, or to impede travel along a pipeline route by off-highway vehicles, the BLM will inspect the affected stand for signs of *Ips* beetle infestation. No slash or pruned material from an infected stand shall be used for such purposes.
16. Paleontological 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 must 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 will, 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.

17. 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 will be subject to prosecution.

Pursuant to 43 CFR 10.4(g), the BLM shall be notified by telephone, with written confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony. Further, pursuant to 43 CFR 10.4 (c) and (d), activities shall stop in the vicinity of the discovery, and the discovery shall be protected for 30 days or until notified by the BLM to proceed.

If in connection with operations under this contract, the operator, its contractors, their subcontractors, or the employees of any of them discovers, encounters, or becomes aware of any objects or sites of cultural value or scientific interest such as historic ruins or prehistoric ruins, graves or grave markers, fossils, or artifacts, the operator shall immediately suspend all operations in the vicinity of the cultural resource and shall notify the BLM of the findings (16 USC 470h-3, 36 CFR 800.112). Operations may resume at the discovery site upon receipt of written instructions and authorization by the BLM. Approval to proceed will be based upon evaluation of the resource. Evaluation shall be by a qualified professional selected by the BLM from a Federal agency insofar as practicable. When not practicable, the operator shall bear the cost of the services of a non-Federal professional.

Within five working days, the BLM will inform the operator as to:

- whether the materials appear eligible for the National Register of Historic Places
- what mitigation measures the holder will likely have to undertake before the site can be used (assuming that *in-situ* preservation is not necessary)
- the timeframe for the BLM to complete an expedited review under 36 CFR 800.11, or any agreements in lieu thereof, to confirm through the SHPO State Historic Preservation Officer that the findings of the BLM are correct and that mitigation is appropriate

The operator may relocate activities to avoid the expense of mitigation and delays associated with this process, as long as the new area has been appropriately cleared of resources and the exposed materials are recorded and stabilized. Otherwise, the operator shall be responsible for mitigation costs. The BLM will provide technical and procedural guidelines for relocation and/or to conduct mitigation. Upon verification from the BLM that the required mitigation has been completed, the operator will be allowed to resume construction.

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).

18. 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.

All woody vegetation (live and dead) shall remain standing at the toe of the well pad and production facility staging areas to provide visual screening. All woody vegetation left standing shall be protected and remain standing and undamaged when fill material is pulled back to recontour the well pad.

Above-ground facilities shall be painted **Shadow Gray** to minimize contrast with existing surrounding vegetation or rock outcrops.

19. 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.
20. Reserve Pit. A minimum of 2 feet of freeboard shall be maintained in the reserve pit. Freeboard is measured from the highest level of drilling fluids and cuttings in the reserve pit to the lowest surface elevation of ground at the reserve pit perimeter.
21. Soils. Cuts and fills shall be minimized when working on erosive soils and slopes in excess of 30 percent. Cut-and-fill slopes shall be stabilized through revegetation practices with an approved seed mix shortly following construction activities to minimize the potential for slope failures and excessive erosion. Fill slopes adjacent to drainages shall be protected with well-anchored silt fences, straw wattles, or other acceptable BMPs designed to minimize the potential for sediment transport. On slopes greater than 50 percent, BLM personnel may request a professional geotechnical analysis prior to construction.

#### **SITE-SPECIFIC COAS APPLICABLE TO PC-22 WELL PAD**

The following site-specific surface use COAs are in addition to the standard COAs applicable to all wells within the PC-22 well pad and all stipulations attached to the respective Federal leases.

1. Visual Resources. After construction, the segment of the access road that faces Parachute, the Community of Battlement Mesa, and the I-70 viewshed shall be reviewed to determine if the road surface color detracts from the viewshed (as viewed from the KOPs). If it is determined that the road surface color contrasts with the surrounding landscape, gravel surfacing with a similar color to adjacent dominant soil colors and/or dust abatement measures with Magnesium Chloride or other dust abatement measure, as approved by the BLM authorized officer, shall be required.

## BUREAU OF LAND MANAGEMENT

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

### DOWNHOLE CONDITIONS OF APPROVAL

#### Applications for Permit to Drill

Operator:	Encana Oil & Gas (USA) Inc.
Lease number:	COC01523 & COC01524
Surface Location:	Garfield County; NENW, Sec. 22 T7S R95W
Pad(s):	PC-22
Engineer:	Peter Cowan

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See list of wells following the COAs.

1. 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 Julie King, Lead PET; David Giboo, PET; Greg Rios, PET; Tim Barrett, PET; Alex Provstgaard, PET; Brandon Jamison, PET.
2. 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 Shauna Kocman or Peter Cowan for verbal approvals (contact information below).
3. 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, Shauna Kocman or Peter Cowan 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.
4. The BOPE shall be tested and conform to Onshore Order No. 2 for a **5M** system and recorded in the IADC/Driller's log. A casing head rated to 5,000 psi or greater shall be utilized.
5. Flexible choke lines shall meet or exceed the API SPEC 16C requirements. Flexible choke lines shall be effectively anchored, have flanged connections, and configured to the manufacturer's specifications. 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.
6. An electrical/mechanical mud monitoring equipment shall be function tested prior to drilling out the surface casing shoe. As a minimum, this equipment shall include a pit volume totalizer, stroke counter, and flow sensor.
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. A gas buster shall be functional and all flare lines effectively anchored in place, prior to drilling out the surface casing shoe. The discharge of the flare lines shall be a minimum of 100 feet from the wellhead and targeted at bends. The panic line shall be a separate line (not open inside the buffer tank) and effectively anchored. All lines shall be downwind of the prevailing wind direction and directed into a flare pit, which cannot be the reserve pit. The flare system shall use an automatic ignition. Where noncombustible gas is likely or expected to be vented, the system shall be provided supplemental fuel for ignition and maintain a continuous flare.
9. 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 ([picowan@blm.gov](mailto:picowan@blm.gov)) on the first well drilled on the pad or any horizontal well and record results in the IADC log. Report failed test to Shauna Kocman or Peter Cowan. A failed pressure integrity test is more than 10% pressure bleed off in 15 minutes.
10. As a minimum, cement shall be brought to 200 feet above the Mesaverde. After WOC for the production casing, a CBL shall be run to verify the TOC and an electronic copy in .las and .pdf format shall be submitted to CRVFO – Petroleum Engineer, 2300 River Frontage Road, Silt, CO 81652 within 48 hours. If the TOC is lower than required or the cement sheath of poor quality, a CRVFO petroleum engineer shall be notified for remedial operations within 48 hours from running the CBL and prior to commencing fracturing operations,  
  
A greater volume of cement may be required to meet the 200-foot cement coverage requirement for the Williams Fork Formation /Mesaverde Group. Evaluate the top of cement on the first cement job on the pad (Temperature Log). If cement is below 200-foot cement coverage requirement, adjust cement volume to compensate for low TOC/cement coverage.
11. 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 – Todd Sieber, 2300 River Frontage Road, Silt, CO 81652. Contact Todd Sieber at 970-876-9000 or [asieber@blm.gov](mailto:asieber@blm.gov) for clarification.
12. 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 CFR 3160-9 (a).
13. Prior to commencing fracturing operations, the production casing shall be tested to the maximum anticipated surface treating/fracture pressure and held for 15 minutes without a 2% leak-off. If leak-off is found, Shauna Kocman or Peter Cowan shall be notified within 24 hours of the failed test, but prior to proceeding with fracturing operations. The test shall be charted and set to a time increment as to take up no less than a quarter of the chart per test. The chart shall be submitted with the well completion report.
14. 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. Notify Shauna Kocman or Peter Cowan immediately.
15. Per 43 CFR 3162.4-1(c), no later than the 5<sup>th</sup> business day after any well begins production on which royalty is due anywhere on a lease site or allocated to a lease site, or resumes production in a case of a well which has been off production for more than 90 days, the operator shall notify the authorized

officer by letter or sundry notice, Form 3160-5, or orally to be followed by a letter or sundry notice, of the date on which such production has begun or resumed.

16. After drilling and setting the surface casing for all wells, email Julie King, [jjking@blm.gov](mailto:jjking@blm.gov), the casing tally and cementing report.

**Contact Information**

**Shauna Kocman, PhD, PE**  
Petroleum/ Environmental Engineer

Office: (970) 876-9061  
Cell: (970) 456-5602  
[skocman@blm.gov](mailto:skocman@blm.gov)

**Peter Cowan**  
Petroleum Engineer

Office: (970) 876-9049  
Cell: (970) 309-8548  
[picowan@blm.gov](mailto:picowan@blm.gov)

<b>List of Wells</b>			
<i>Proposed Pads</i>	<i>Proposed Wells</i>	<i>Surface Locations</i>	<i>Bottom Hole Locations</i>
PC-22 Pad (Fee Surface)	Hagen Federal 15-16B	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 15 SESE
	Hagen Federal 15-16C	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 15 SESE
	Hagen Federal 22-1A	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 22 Lot 1
	Hagen Federal 22-1AA	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 22 Lot 1
	Hagen Federal 22-1D	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 22 Lot 1
	Hagen Federal 22-2D	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 22 Lot 2
	Hagen Federal 22-2DD	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 22 Lot 2
	Hagen Federal 22-4B	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 22 Lot 3
	Hagen Federal 22-4C	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 22 Lot 3
	Hagen Federal 22-4D	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 22 Lot 3
	Hagen Federal 22-5A	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 22 Lot 4
	Hagen Federal 22-5AA	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 22 Lot 4
	Hagen Federal 22-8A	T7S R95W, Sect. 22 NENW	T7S R95W, Sect. 22 Lot 5

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# FONSI

## DOI-BLM-CO-N040-2013-0062-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 further analyze 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.

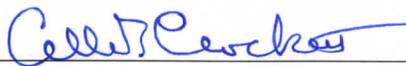
RATIONALE: The bases for this decision are as follows:

1. This decision will provide for the orderly, economical, and environmentally sound exploration and development of oil and gas resources on Federal oil and gas leases.
2. Approval of the Proposed Action validates the rights granted with the Federal oil and gas leases to develop the leasehold to provide commercial commodities of oil and gas.
3. Environmental impacts will be avoided or minimized through protective lease stipulations and by the best management practices and mitigation measures included in the Proposed Action or otherwise applied and enforced by BLM as Conditions of Approval (COAs).
4. This decision does not authorize the initiation of surface-disturbing activities on BLM lands or the development of new Federal oil and gas wells on new or existing well pads. Surface-disturbing activities on BLM lands and development of Federal wells will not commence until approval by BLM of Applications for Permits to Drill (APDs) or issuance by BLM of right-of-way grants pursuant to this EA.

MITIGATION MEASURES: Mitigation measures presented in Appendix A of the EA will be incorporated as COAs for both surface and drilling operations and attached to APDs for the Federal wells drilled on the proposed well pads.

NAME OF PREPARER: Christine Cimiluca, Natural Resource Specialist

SIGNATURE OF AUTHORIZED OFFICIAL:



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

DATE: May 20, 2013