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-N040-2013-0106-EA

CASEFILE NUMBER

Federal Leases COC27874, COC36219 and COC58673 (bottomholes)

PROJECT NAME

Lower Kelly Gulch Development – Proposal to Drill 12 Federal Wells from Existing SG 24-22 Pad, Existing 21-27 pad and Proposed SG 23-22 Pad Located on Private Lands Southwest of Parachute, Garfield County, Colorado.

PROJECT LOCATION

Township 7 South (T7S), Range 96 West (R96W), Section 22, Lots 8 and 11, SW¼SE¼, E½SE¼, Section 27, NE¼NW¼, NW¼NE¼, Sixth Principal Meridian. Elevation across the project ranges from 5,150 to 5,680 feet above mean sea level (MSL). The project lies approximately 7 miles southwest of Parachute, Colorado, and is accessed by the field development road north of Interstate 70 (I-70).

APPLICANT

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

PROPOSED ACTION

WPX Energy Rocky Mountain LLC ("WPX") proposes to drill and develop 12 new Federal oil and gas wells from two existing private (fee) locations (SG 24-22 pad and SG 21-27 pad) and from the proposed SG 23-22 fee pad (Figure 1 and Table 1). All of the planned development work would occur on private surface. A total of 27 wells would be drilled on the three pads with 15 wells drilled into fee minerals. The Federal wells would be directionally drilled over a 2- to 3-year period into adjacent Federal minerals.

The two existing pads, both supporting four producing fee wells drilled in 2000 and 2006, would be slightly expanded to provide safe working platforms for the four new wells planned on each pad. One Federal well would be drilled on each of the SG 24-22 and SG 21-27 pads. The roads serving the pads are sufficient to handle the traffic related to the planned development. The existing gas gathering system for the two pads is capable of handling the additional planned wells. Produced water and condensate (oil) generated from the new producing wells would be collected in storage tanks on the individual pad sites. A surface poly pipeline delivering water via the recently-completed Niobrara Dual 14-inch water lines would be laid along the existing pad roads to support the "on pad" frac operations after the drilling is completed (Figure 1).

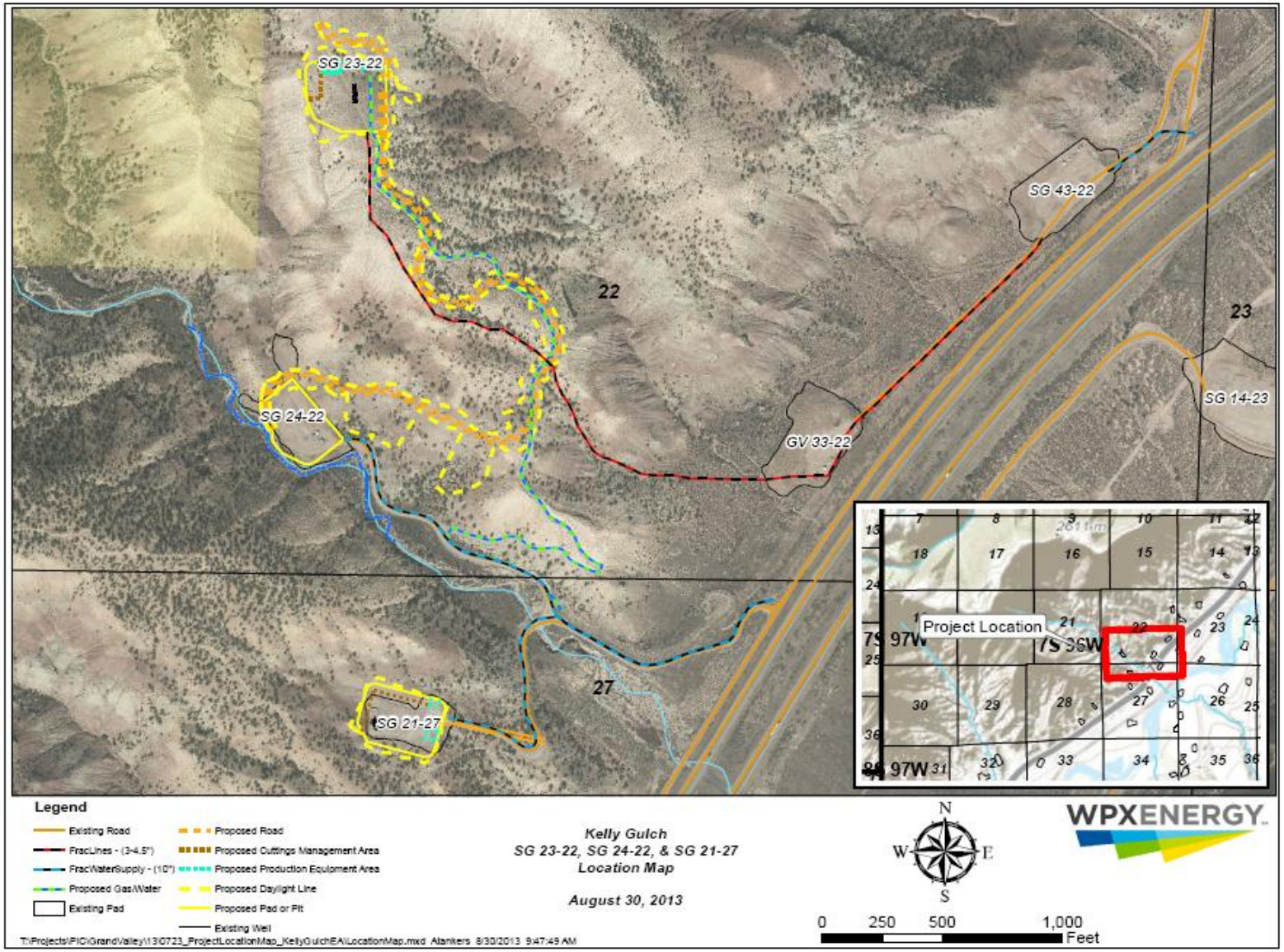

Figure 1. Project Location Map

Table 1. Proposed Well Pads and Wells				
Well Pad	***Surface Ownership***	***Surface Location (T6S, R95W, 6th PM)***	***Existing Wells***	***Proposed Wells***
Drill Pads				
SG 24-22 Pad Expansion	Private	Section 22, Lot 8	4	**4 (1 Fed)**
SG 21-27 Pad Expansion	Private	Section 27, NE¼SE¼	4	**4 (1 Fed)**
SG 23-22 Pad Construction	Private	Section 22, Lots 5, 6	N/A	**19 (10 Fed)**
Support Pad				
SG 43-22 Frac Pad for SG 23-22 Well Completion Work	Private	Section 22, NW¼NE¼	N/A	N/A
Well Totals			8	**27 (12 Fed)**

For the proposed SG 23-22 pad, 19 new wells would be drilled including 10 Federal wells. A new 3,467-foot access road would be constructed from the existing SG 24-22 pad to the new pad. An 8-inch diameter buried natural gas pipeline would be installed along portions of the new access road and within the existing steep road route that served the long-abandoned Mountain Bell telephone phone repeater site. (Figure 1). Produced water and condensate tanks would be staged on the pad to collect fluids generated from the new producing wells.

The SG 23-22 well completions would be conducted simultaneously and remotely using the existing SG 43-22 pad on private land since this pad also serves as the remote frac (hydraulic fracturing) pad for the SG 42-22 well developments (approved in 2012). As shown in Figure 1, high-pressure steel surface lines would be laid cross-country up the ridge from the SG 43-22 and GV 33-22 pads to the SG 23-22 pad to deliver and gather frac water during the well completion operations. Water would be supplied for the frac operations on the SG 43-22 pad via 10-inch surface poly pipeline connection to the existing Niobrara Dual 14-inch water lines located along the north-side I-70 frontage road (Figure 1).

Fresh water would be delivered for all drilling operations via truck transport. Cuttings generated during the well drilling for these locations would be stored on location against the cutslope where feasible, and any excess cuttings volume would be hauled to the existing state-approved SG Cuttings Trench located on private land in T7S R96W, Section 32 SE¼NW¼.

Since the pad locations supporting the planned Federal wells are located on private land, Federal lease stipulations would not apply to the development operations (i.e., no big game winter timing limitations would be enforced).

Pad Development Plans

***SG 24-22 Pad Expansion*:** The existing SG 24-22 pad would be expanded from 1.87 acres to 2.17 acres to support four new wells. Only an estimated 0.30 acre of the expansion would involve new surface disturbance for the SG 24-22 pad. The existing access road to the pad would remain in its currently serviceable condition. The pad would have a maximum cut of 21.8 feet at the northeast edge and a maximum fill of 9.5 feet at the south edge (Figure 2). Drill cuttings would be stored against the north cutslopes of the pad; any excess cuttings would be hauled and stored at the SG Cuttings Trench. Production facilities (separators and storage tanks) would be staged on the pad at the eastern edge near the road entrance (Table 2 and Figure 3).

Table 2. Project Surface Disturbance (initial & long-term acres)					
New Initial Disturbance	***SG 24-22 Pad***	***SG 21-27 Pad***	***SG 23-22 Pad***		***Total***
New Pad	0.30	1.70	5.13		7.13
New Road	--	--	7.25[1]		7.25
New Gas Pipeline (W/in New Rd Corridor)[2]	--	--	*Inclusive w/in 7.25Acres* [2]		
Existing Initial Redisturbance	***SG 24-22 Pad***	***SG 21-27 Pad***	***SG 23-22 Pad***		***Total***
Existing Pad Area	1.87	1.50	--		3.37
New Gas Pipeline (Within Existing Road)	--	--	2.58		2.58
Initial Disturbance TOTAL	***2.17***	***3.20***	***14.96***		***20.33***
Long-Term Disturbance	***SG 24-22 Pad***	***SG 21-27 Pad***	***SG 23-22 Pad***		***Total***
Working Area of Pad	1.07	1.15	1.35		3.57
Road Running Surface including ditches/turnouts	--	--	2.38		2.38
Long-Term Disturbance TOTAL	***1.07***	***1.15***	***3.73***		***5.95***

[1] Includes estimate of 6.33 acres for main SG 23-22 road and 0.92 acres for 450-foot road connection north of SG 23-22 pad.
[2] Segments of new gas pipeline buried within the new SG 23-22 road corridor are included in new road disturbance estimate.

Conventional frac operations would be conducted on the pad after the drill rig has finished drilling the four new wells. To provide recycled water for the frac operations, approximately 2,352 feet of 10-inch poly surface line would be laid along the access road from a water line connection at the road junction with the I-70 frontage road near the Kelly Gulch access gate. Frac flowback fluids would be contained in steel frac tanks staged on the SG 24-22 pad with the water later collected via 10-inch surface line and returned to the nearby Smith Gulch water storage facility for continued recycled water use (Figures 1 and 3).

For construction, drilling, and completions work on this pad, the short-term (initial) disturbance would amount to 2.17 acres. After interim reclamation, the long-term disturbance footprint of the pad working area would be 1.07 acres (Table 2).

If the SG 24-22 pad is scheduled for drilling prior to the SG 23-22 pad, the new SG 23-22 access road would be constructed in its entirety prior to the rig mobilization on the SG 24-22 pad to avoid safety and logistical issues with ongoing road construction activity during active drilling operations on the SG 24-22 pad (Figure 1). The SG 23-22 road disturbance area would amount to 6.33 acres and is identified in the SG 23-22 disturbance summary.

***SG 21-27 Pad Expansion*:** The existing SG 21-27 pad would be expanded from 1.50 acres to 3.20 acres to support four new wells. An estimated 1.70 acres of the expansion would cause new surface disturbance. The existing access road would remain in its current, serviceable condition. The pad would have a maximum cut of 17.8 feet at the west corner and a maximum fill of 12.6 feet on the south edge (Figure 4). Drill cuttings would be stored against the northern cutslope of the pad; any excess cuttings would be hauled and stored at the SG Cuttings Trench. Production facilities (separators and storage tanks) would be staged on the pad at the eastern edge near the road entrance (Table 2 and Figure 5).

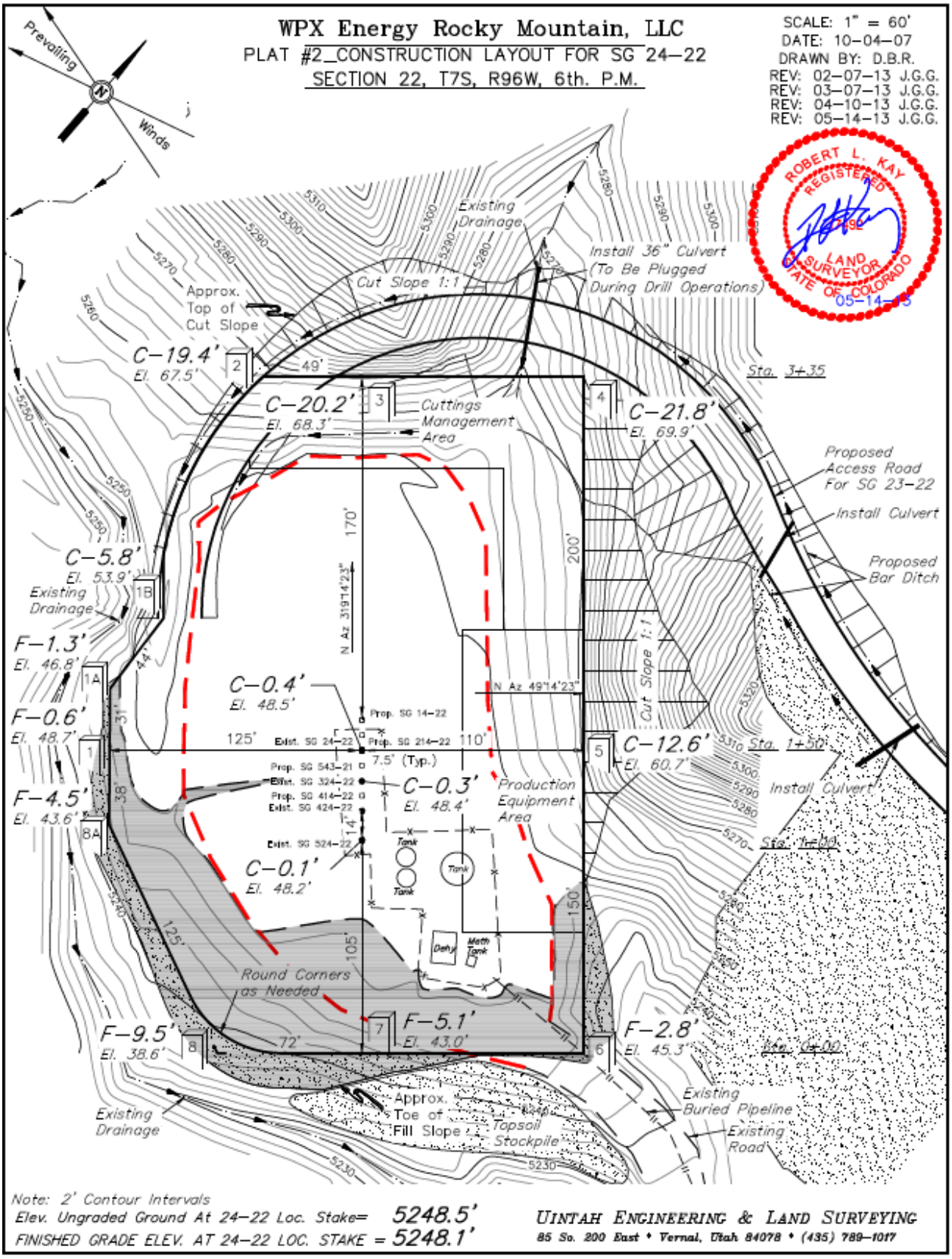

Figure 2. SG 24-22 Pad Expansion Layout.

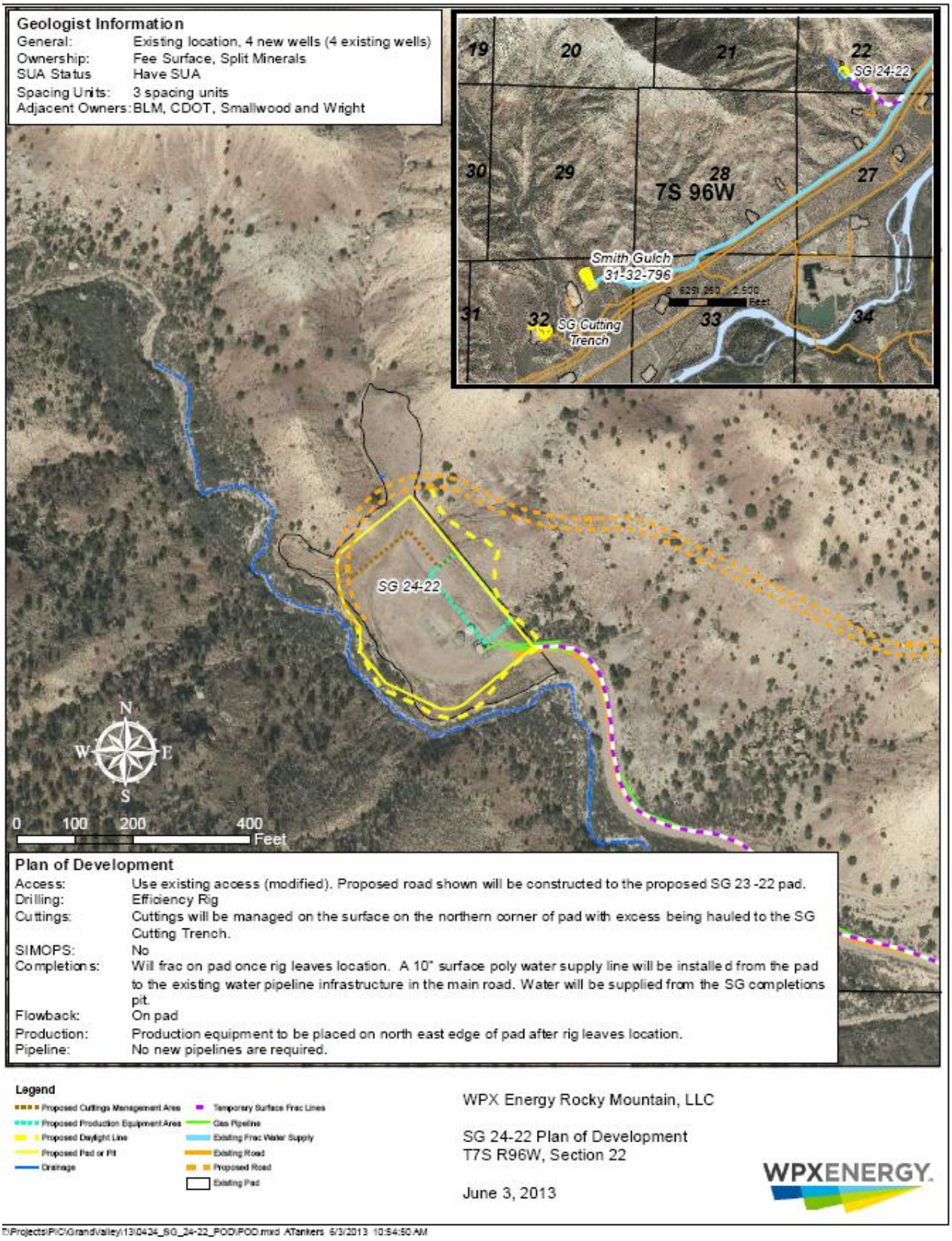

Figure 3. SG 24-22 Plan of Development.

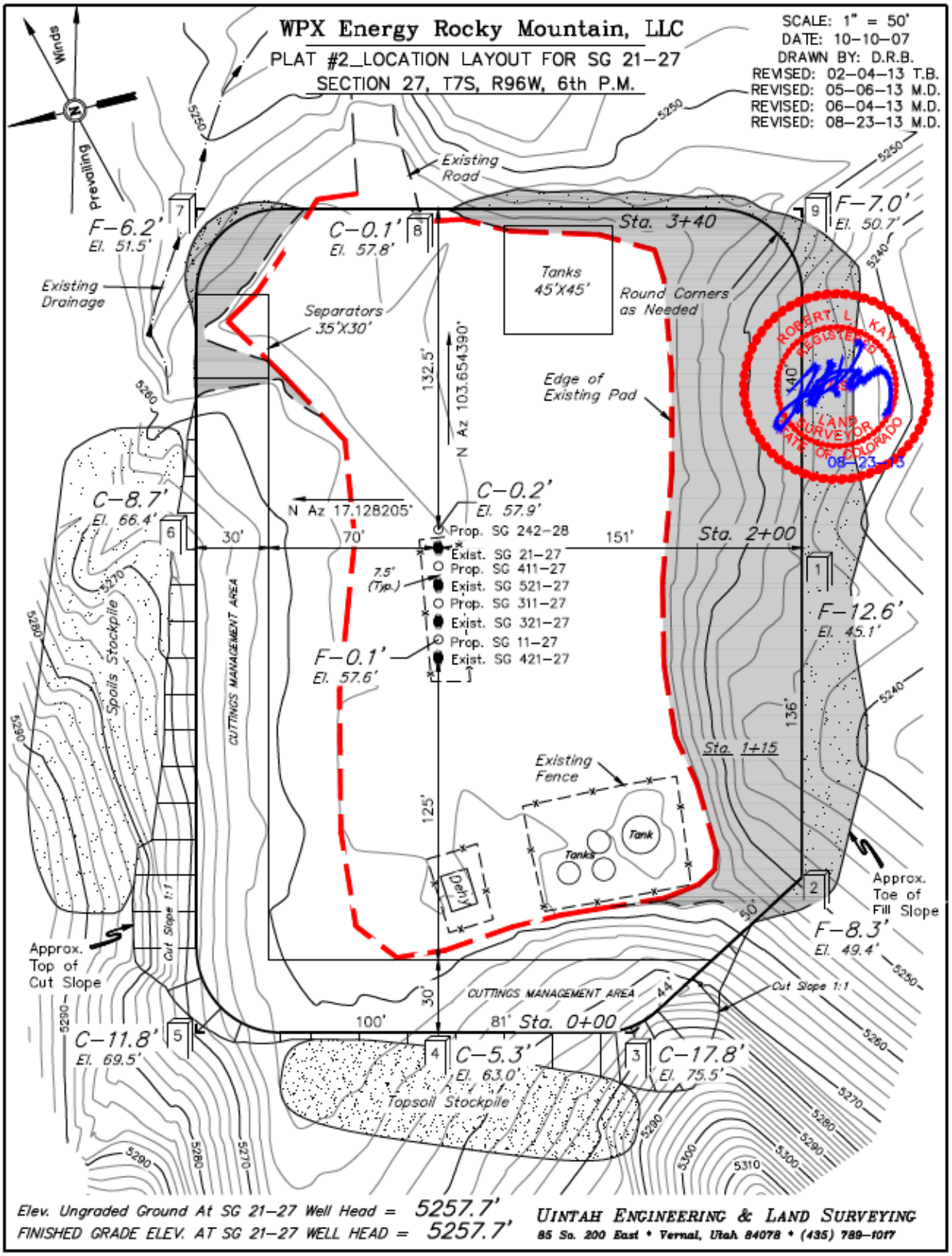

Figure 4. SG 21-27 Pad Expansion Layout.

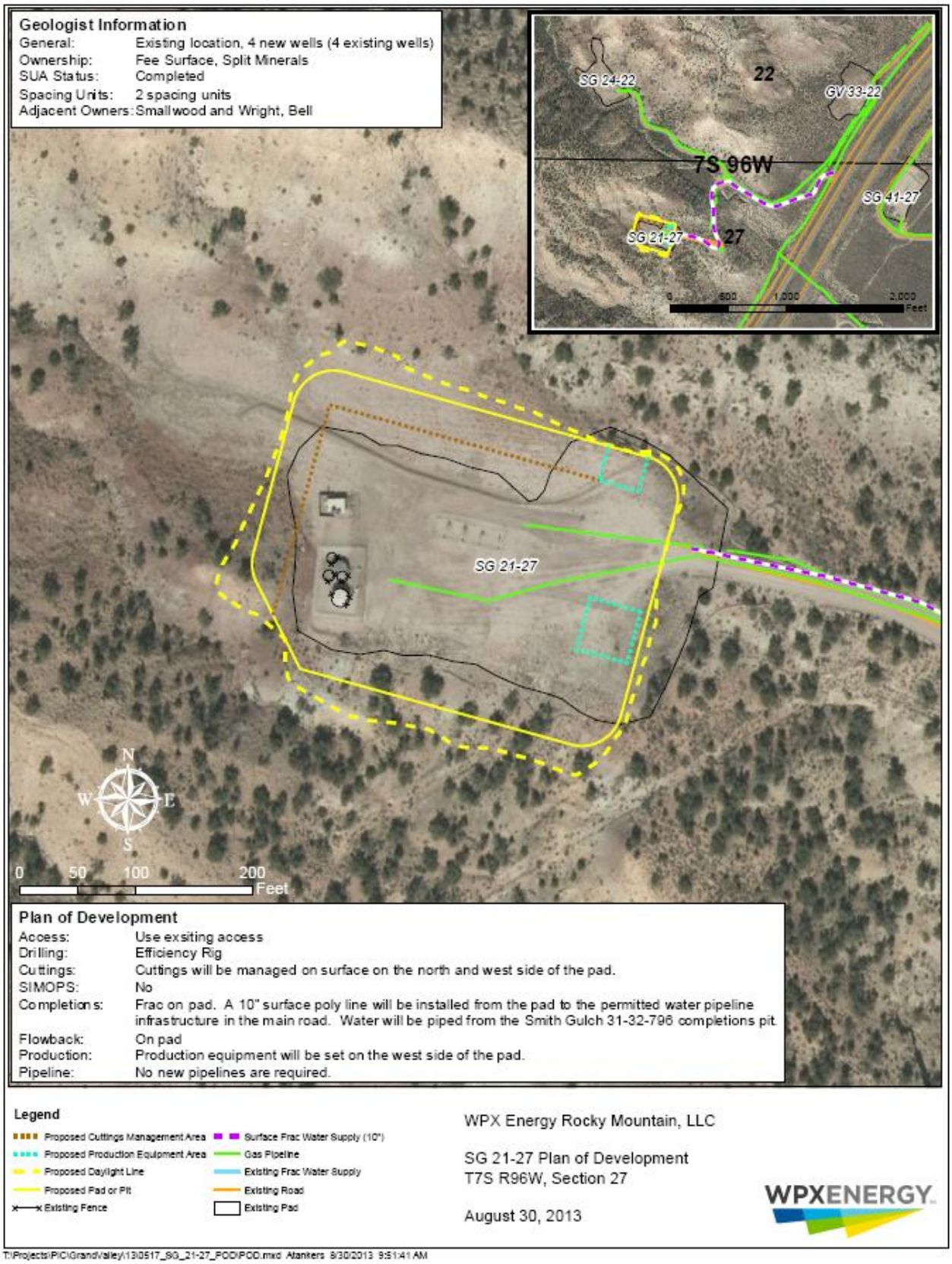

Figure 5. SG 21-27 Plan of Development

Conventional frac operations would be conducted on the pad after the drill rig has finished drilling the four new wells. To provide recycled water for frac operations, approximately 2,117 feet of 10-inch poly surface line would be laid along the pad access road from a water line connection at the road junction with the I-70 frontage road near the Kelly Gulch access gate. Frac flowback fluids would be contained in steel frac tanks staged on the SG 21-27 pad with the water later collected via 10-inch surface line and returned to the nearby Smith Gulch water storage facility for continued recycled use (Figures 1 and 5).

For construction, drilling, and completions work on this pad, the short-term disturbance would amount to 3.20 acres. After reclamation of the planned work, the long-term disturbance footprint of the pad working area would be 1.15 acres (Table 2).

***SG 23-22 Pad, Road, and Pipeline Construction*:** The proposed SG 23-22 pad, supporting 19 new wells with 10 Federal bottomholes, would be constructed on a ridge east of the SG 24-22 pad overlooking the Kelly Gulch drainage, I-70, and the Colorado River. The pad is located directly south of the site of a Mountain Bell telephone phone repeater abandoned in the 1990s and accessed by a steep, winding road.

Building the SG 23-22 pad would create a new disturbance footprint of 5.13 acres with a maximum cut of 23.8 feet at the northwest corner and a maximum fill of 22.4 feet at the southwest corner (Figure 6). Drill cuttings would be managed and stored against the northwest corner cutslope of the pad; any excess cuttings would be hauled and stored at the SG Cuttings Trench. Production facilities (separators and storage tanks) would be staged along the northern side of the pad.

The new access road serving the SG 23-22 pad would be constructed with a length of 3,467 feet and a finished roadway width of 25 feet (which includes two 4-foot ditches on either side) creating 6.33 acres of new disturbance and 2.12 acres of long-term disturbance. The running surface (covering 1.48 acres) would be graveled for its entire length with minimum 6-inch depth of surfacing. A road design package would be incorporated by reference into the project APDs. As mentioned in the SG 24-22 pad summary, the new SG 23-22 access road would be constructed in its entirety including necessary culvert and storm water structures prior to any rig mobilization on the nearby SG 24-22 pad. An additional 450-foot segment of new road (disturbing 0.92 acres of which 0.26 acres would remain long-term) would also be built from the northeast pad corner west across the SG 23-22 pad cutslope to connect with the existing old road north of the pad that served the phone repeater. Total interim disturbance related to SG 23-22 road construction would amount to 7.25 acres with long-term allotment of 2.38 acres (Table 2 and Figure 7).

The proposed 8-inch diameter welded steel gas gathering pipeline serving the SG 23-22 pad would be buried within the old repeater access road for the majority of its run. Of the total pipeline length of 3,806 feet, about 3,207 feet would be installed within the old roadway and about 599 feet would be buried across or within the new access road. The disturbance associated with the placement of the gas line along the existing repeater access road would amount to 2.58 acres of existing disturbance using an average 35-foot swath of disturbance to bury the line and reclaim the old road. The short segments of the gas line buried across or within the new road corridor would be considered new disturbance and are include within the disturbance estimate for the new road work. After the pipeline installation is complete, the reclamation earthwork would essentially obliterate the cuts and fills related to the old roadway (Figures 1 and 7).

Completions for the SG 23-22 wells would be conducted remotely from the SG 43-22 pad, which also serves as the remote frac base for the ongoing drilling operations on the SG 42-22 pad. Three 4½-inch diameter welded steel surface lines would be temporarily laid in a cross-country alignment from the GV 33-22 pad north up the ridge line to the SG 23-22 pad. The lines would be laid along the existing road between the SG 43-22 and GV 33-22 pads. The total length of the steel high-pressure lines would be 4,200 feet. These remote operations would eliminate the need for completions equipment and traffic to

negotiate the new road to the SG 23-22 pad. A 10-inch poly surface water supply line (with length of 415 feet) would provide recycled water for the frac operations on the SG 43-22 pad and return frac flowback fluids via the existing dual 14-inch water line system to the Smith Gulch water storage facility (Figures 1 and 7).

For the construction, drilling and completion work on this pad, the short-term disturbance would amount to 14.96 acres. After reclamation of the planned work, the long-term disturbance footprint would be 1.35 acres for the pad working area and 2.38 acres for the access roads below and above the SG 23-22 pad (including ditches and turnouts) for a total long-term impact of 3.73 acres (Table 2).

***Surface Disturbance Summary*.** All of the planned surface disturbance related to the Lower Kelly Gulch Project would occur on private land. Table 2 illustrates the total initial (short-term) disturbance including redisturbance of the existing pads which amounts to 20.33 acres related to the construction work for the project and the long-term disturbance which amounts to 5.95 acres that comprises the working areas of the pads and the maintainable portions of the roads for the life of the producing wells. Areas noted as "Existing Initial Redisturbance" in Table 2 include the existing working area of the pad as well as any areas within previously disturbed footprints that have not been acceptably reclaimed.

The SG Cuttings Trench, the Smith Gulch 31-32-796 Water Storage Facility and the ancillary dual 14-inch buried poly water lines along the north-side I-70 frontage road are facilities constructed and operated on private land by WPX and permitted by the Colorado Oil and Gas Conservation Commission (COGCC). The primary intent of these facilities is to support WPX's ongoing Niobrara well development program involving surrounding fee leases. Since these facilities exist and would be in operation during the drilling period for the Lower Kelly Gulch wells, WPX would use them to support the Lower Kelly Gulch developments.

The road, pipeline, and pad construction work would follow the guidelines established in the BLM Gold Book, *Surface Operating Standards for Oil and Gas Exploration and Development* (USDI and USDA 2007). The pad access roads would be graveled, as needed, prior to drilling to ensure all-weather accessibility to the pad sites. A road maintenance program would be required during the production phase of the well 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 well drilling and well 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 the Federal oil and gas lease, Federal regulations (43 CFR 3100), and the operational measures included in the Applications for Permit to Drill (APDs). Appendix A lists the specific Surface Use Conditions of Approval (COAs) to be implemented as mitigation measures for this project. The operator would be responsible for continuous inspection and maintenance of the access roads, pads and pipelines.

NO ACTION ALTERNATIVE

The No Action Alternative would constitute denial of the Federal APDs related to the development plans for these three pads. However, since 15 fee wells are planned on the three pads, the pad construction work would occur for the three pads, the SG 23-22 road construction would be necessary, the SG 43-22 frac pad expansion would be needed for completion work on the SG 23-22 fee wells, and the installation of the buried and surface pipelines would occur to support the fee wells.

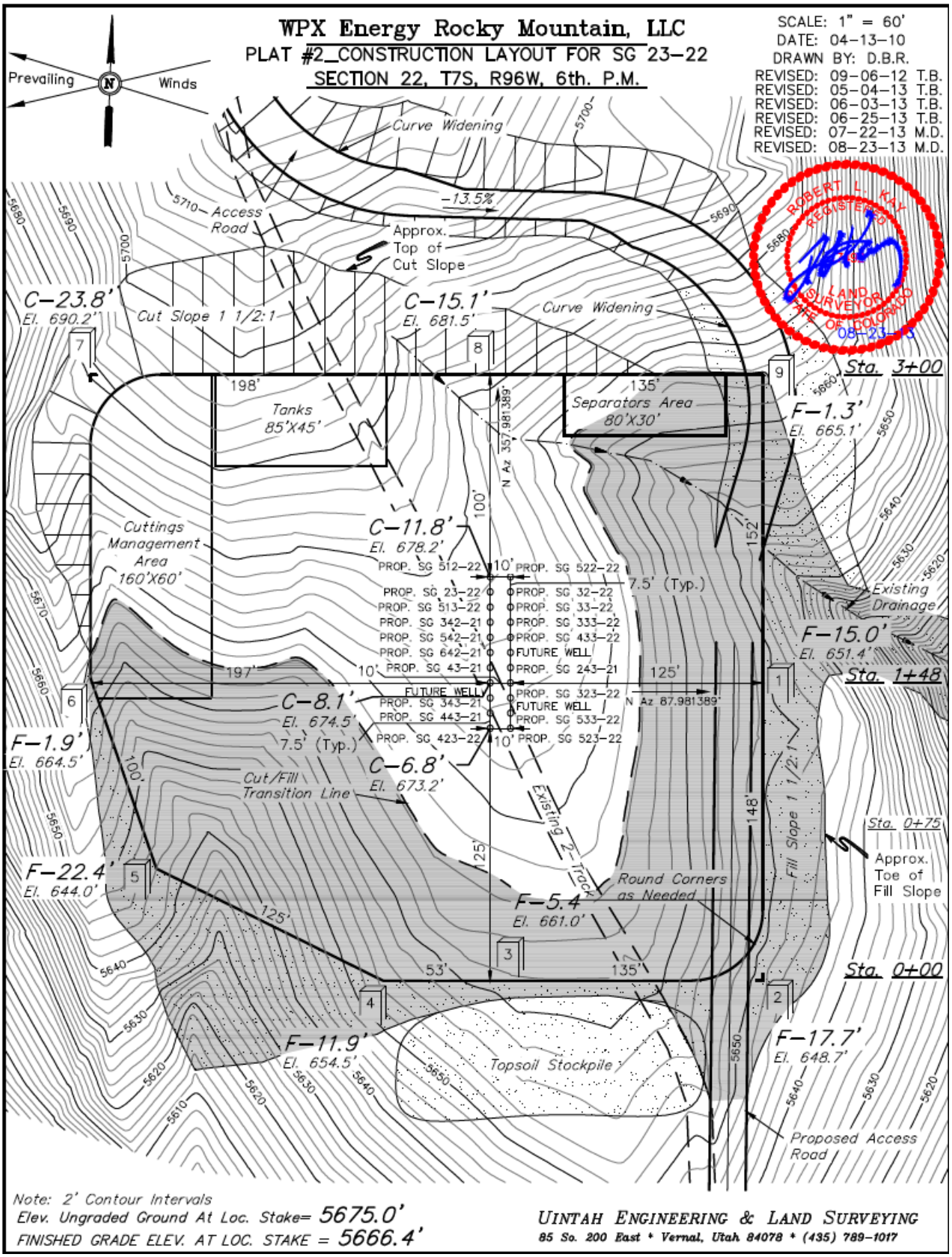

Figure 6. SG 23-22 Pad Construction Layout.

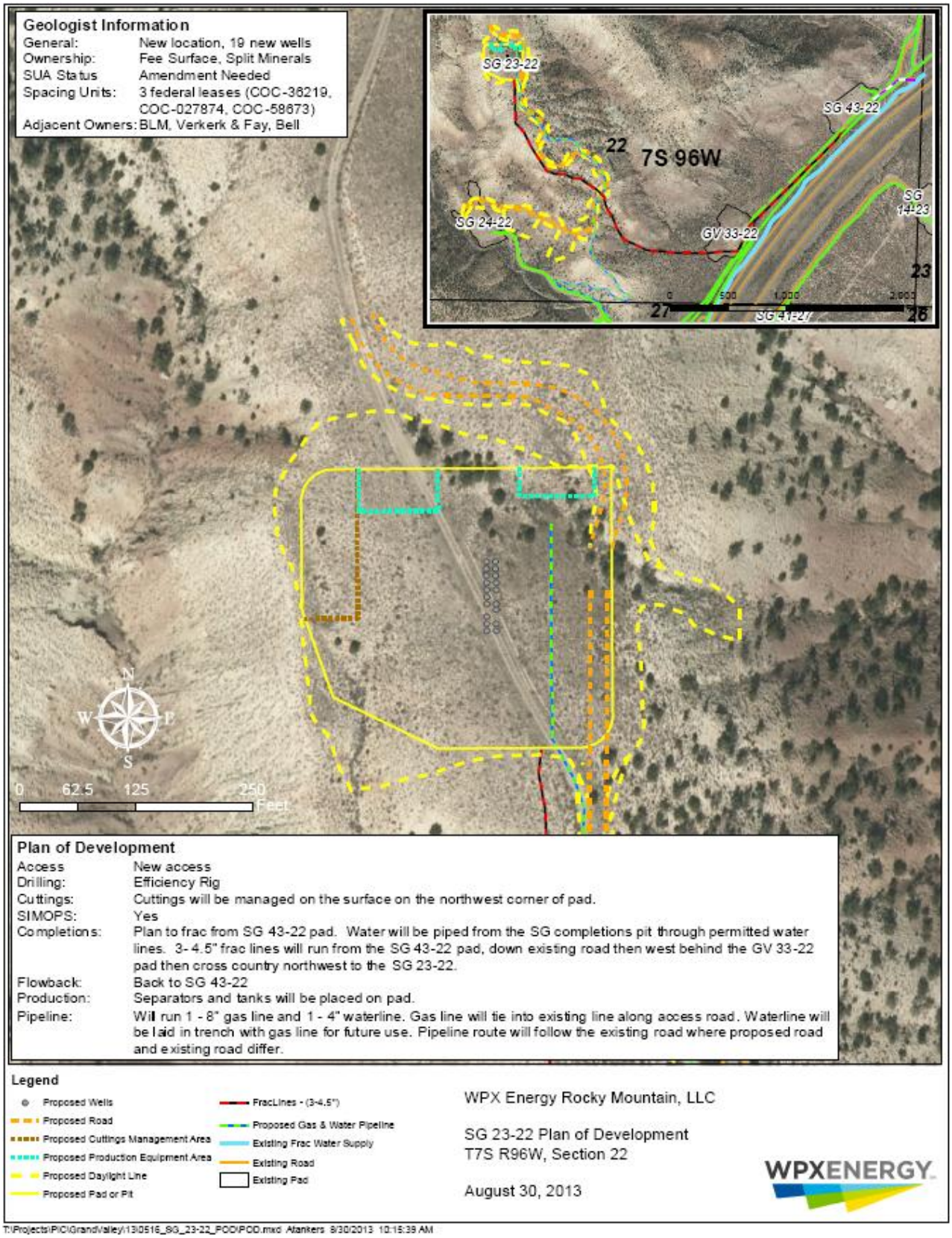

Figure 7. SG 23-22 Plan of Development

Impacts under the No Action Alternative would be similar to the Proposed Action but reduced in the sense that the developments would support only 15 fee wells instead of 27 wells described in the Proposed Action. The surface disturbance estimates presented in the Proposed Action remain unchanged since the pad, road, and pipeline improvements would be implemented.

PURPOSE AND NEED FOR THE ACTION

The purpose of the Proposed Action is to develop oil and gas resources on Federal leases COC27874, COC36219 and COC58673 consistent with existing Federal lease rights. The action is needed to increase the development of oil and gas resources for commercial marketing to the public.

SUMMARY OF LEASE STIPULATIONS

The Federal wells would be directionally drilled from existing and planned pads located on private surface with underlying fee mineral estate. Because the Federal wells are accessing the nearby Federal leases from a private surface/private mineral location, the Federal lease terms are not applicable to the construction, drilling, completion, gas gathering or well production operations on the pad.

PLAN CONFORMANCE REVIEW

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

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

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

Discussion: The Proposed Action is in conformance with the 1991 and 1999 RMP amendments cited above because the Federal mineral estate proposed for development is open to oil and gas leasing and development, and Federal oil and gas leases COC27874, COC36219 and COC58673 were duly leased pursuant thereto. The current project meets GAP exception criteria in the 1999 RMP Amendments based on its location entirely on private land, use of existing pads, and its location along existing access roads and pipeline corridors. Therefore, the Proposed Action is in conformance with the current land use plan.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

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

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

Access and Transportation

Affected Environment

The Proposed Action area is accessible from Parachute, Colorado, by traveling west on I-70 to the West Parachute Exit, then west along the I-70 frontage road for approximately 4.4 miles to the field development road approximately 0.5 mile west of the Una Bridge, Garfield County Road 300 (CR 300) junction, turning right onto the field development road, and traveling north and east under the I-70 overpass for approximately 1.9 miles to the existing Kelly Gulch access road. A locked gate at the junction of the private field development road and the Kelly Gulch road precludes public access to the project area.

Environmental Consequences

Proposed Action

The existing development road accessing the project area would adequately serve the transportation needs of the Proposed Action. Since there are adequate pad access roads serving the SG 24-22 and SG 21-27 pads, the road construction work related to the Proposed Action would focus on the new 3,467-foot-long SG 23-222 access road and a short 450-foot connection road directly north of the SG 23-22 pad. A road design package was prepared for the SG 23-22 road which would guide the construction work and identify the construction limits, road drainage structures, road grades and turnouts. A unique feature of this project would be the completion of the road pioneering for the SG 23-22 access road prior to any rig mobilization on the SG 24-22 pad to avoid rolling debris and construction hazards during any planned work on the SG 24-22 pad.

The road construction work planned for the SG 23-22 pad would follow the guidelines established in the BLM Gold Book, *Surface Operating Standards for Oil and Gas Exploration and Development* (USDI and USDA 2007). The access roads serving the three pads would be graveled, as needed, before drilling commences to ensure all-weather accessibility to the pad sites.

The Proposed Action would result in a substantial increase in truck traffic related to the development of the 12 proposed Federal wells. The largest traffic increase 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 dramatically decrease to periodic truck transport visits to haul produced water and condensate collected from the storage tanks at each pad site. Occasional visits in pickups for monitoring or maintenance activities would occur throughout the productive life of the wells. Each well may have to be recompleted once per year, requiring three to five truck trips per day for approximately 7 days. Fluids would be stored at the tank facilities on each pad for the producing life of the wells.

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 Conditions of Approval (COAs) to ensure adequate dust abatement and road maintenance occur.

Table 3. Traffic Associated with Drilling and Completion Activities		
Vehicle Class	***Trips per Well***	***Percent of Total***
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 this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed. This would require implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Access or transportation impacts would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

Air Quality

Affected Environment

Colorado Ambient Air Quality Standards (CAAQS) and National Ambient Air Quality Standards (NAAQS) are health-based criteria for the maximum acceptable concentrations of air pollutants in areas of public use. Although specific air quality monitoring has not been conducted within the project area, regional air quality monitoring has been conducted in Rifle and elsewhere in Garfield County. Air pollutants measured in the region for which ambient air quality standards exist include carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), particulate matter less than 10 microns (µ) in diameter (PM_{10}), and particulate matter less than 2.5 µ in diameter ($PM_{2.5}$).

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).

Environmental Consequences

Proposed Action

The CDPHE, under CAA delegated authority from the U.S. Environmental Protection Agency (USEPA) and in conformance with the Colorado 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 would involve expanding the existing SG 24-22 and SG 21-27 pads and constructing the new SG 23-22 pad to drill, complete, and operate 12 new Federal wells and 15 fee wells. A new access road and buried 8-inch gas pipeline would be constructed to serve the planned wells on the SG 23-22 pad. The existing SG 43-22 pad, presently serving as remote frac pad for wells being drilled on the SG 42-22 pad (analyzed in EA #DOI-BLM-CO-N040-2013-0001), would also be used to stage well completions operations for the SG 23-22 wells. Well completion work for the existing pad locations would occur on each respective pad site. The total project short-term disturbance would be 20.33 acres and the long-term disturbance after reclamation would be 5.95 acres (Table 1). All of the Lower Kelly Gulch project components would occur on private land.

The wells 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 and would be spread across the 2 year timeframe for the project. Long term air quality benefits of this project include road improvements which would decrease long term dust generation and centralized fluids collection facilities which reduce truck traffic and fugitive emissions.

Pollutants generated during construction activities would include combustion emissions and fugitive dust associated (PM_{10} and $PM_{2.5}$) with earthwork and construction equipment. Once construction activities are complete, air quality impacts associated with construction would cease and impacts would transition to emissions associated with transportation of drilling and completion equipment. Fugitive dust and vehicle emissions 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.

The CRVFO analyzes air quality impacts of oil and gas development projects using results of a regional air model prepared by Tetra Tech, Inc. and its subcontractor, URS Corporation, in October 2011. The modeling addressed the cumulative impacts of incremental oil and gas development in the CRVFO by assuming a range of future Federal (BLM and USFS) and private wells and associated facilities such as compressors, storage tanks, and roads. The modeled scenarios also incorporated different levels of mitigation. The "no action" scenario assumed a total of 5,106 future Federal (BLM plus USFS) wells

with mitigation sufficient to meet CDPHE and EPA regulations and emissions standards. Other scenarios included as many as 6,640 Federal wells and associated facilities in a "maximum development" scenario in combination with more stringent mitigation to meet or exceed State and Federal regulations and standards. In all scenarios analyzed, impacts to air quality are estimated to be below applicable NAAQS, CAAQS, PSD increments, and visibility and deposition thresholds.

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

The air quality model addressed impacts associated with emissions of greenhouse gases (GHGs), "criteria pollutants" (CO, NO_2, SO_2, ozone, PM_{10}, and $PM_{2.5}$) and hazardous air pollutants (HAPs) including BTEX (benzene, ethylbenzene, toluene, and xylenes), formaldehyde, and n-hexane. The modeling also addressed potential impacts on visibility due to particulates and "photochemical smog" (caused by chemical reactions in the atmosphere) and on lake chemistry of selected pristine lakes due to modeled deposition rates of sulfur and resultant impacts on acid neutralizing capacity of the lake waters. The visibility analysis predicted a slight impact (1 day per year with a reduction in visibility of 1deciview or greater) in the Flat Tops Wilderness and no days with 1 deciview or greater reduction in visibility at all other modeled Class I and II receptors. For the remaining pollutants analyzed, modeled levels of future oil and gas development within the CRVFO would have no or negligible long-term adverse impacts on air quality. Since the Proposed Action is within the scope of the future development modeled, no significant adverse impacts on air quality are anticipated.

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

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

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

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

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

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

Table 4 presents the As of October 30, 2013, a total of 1,724 Federal oil and gas wells have been approved by the CRVFO and allocated against the number analyzed in the October 2011 air quality model. This total includes 1,328 Applications for Permit to Drill (APDs) approved and not subsequently expired or withdrawn during the "baseline" period of January 1, 2007, through September 30, 2011, prior to publication of the air model. It also includes 226 APDs approved in Fiscal Year 2012 (October 1, 2011, through September 30, 2012), 155 APDs approved in Fiscal Year 2013 (October 1, 2012, through September 30, 2013) and 15 APDs approved to date in Fiscal Year 2014.

Table 4. Number of Federal Oil and Gas Wells Approved and Allocated against the Number Analyzed in the October 2011 Air Quality Model

Number APDs Approved[1]	***1/1/07 – 9/30/11***	***10/1/11 – 9/30/12***	***10/1/12 – 9/30/13***	***10/1/13 – 10/30/13***
1,724	1,328	226	155	15

[1] Does not include APDs approved but subsequently expired or withdrawn.

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

No Action Alternative

Under this alternative, none of the Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to air quality would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

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.

Two Class III (intensive pedestrian survey) cultural resource inventories (CRVFO# 1111-4 and 1105-21) have been conducted within the project area for adjacent pads, access roads, and/or pipelines. The larger of the two inventories (1111-4) was conducted by the Grand River Institute for the Kelly Gulch Block Area (2450 acres) in 2011. The cultural inventories and pre-field file searches of the Colorado SHPO database and BLM Colorado River Valley Field Office cultural records did not identify any eligible cultural resources within the current project area. Eligible or sites potentially eligible for the National Register of Historic Places (NRHP) are referred to in Section 106 of the National Historic Preservation Act as "historic properties." Therefore, no historic properties are located in the immediate project Area of Potential Effect (APE).

Environmental Consequences

Proposed Action

No cultural resources within the Project Area were identified as eligible or potentially 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

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to cultural resources would be only slightly reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

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 member and the Paleocene Molina and Atwell Gulch members. The Eocene 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 deposited in the Eocene-age Lake Uinta. The lake expanded early in its history, during the Long Point transgression (Johnson 1985), to cover much of the Piceance and Uinta Basins. The Green River Formation has yielded numerous 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 for adverse impacts on fossils that may be present in the underlying Wasatch and Green River 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 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 are required for proposed facilities 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 are recommended (Appendix A).

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to fossil resources would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

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 5 lists the geologic formations within the project area.

Table 5. Geologic Formations within the Lower Kelly Gulch Project Area

Map Symbol	***Formation Name***	***Age***	***Characteristics***	***Location***
Qal	Alluvial and Floodplain Deposits	Holocene	Mud, silt, sand and gravel.	Mantles topography.
Qp	Pediment Gravel Deposits	Pleistocene	Pebbles and cobbles	Mantles topography
Tws	Wasatch Formation – Shire member	Paleocene	Variegated claystone.	Steep slopes and outcrops.
Source: Donnell et al. 1986				

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.

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 this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for

the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to geologic resources would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

Invasive Non-Native Plants

Affected Environment

Colorado's listed 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. The Colorado noxious weed list is broken down into tiered levels based on existing infestation levels and a tiered approach to weed management. List A weeds are targeted for eradication, List B species are targeted for containment to limit spread, and List C species are targeted for integrated weed management including biocontrols, additional education resources, and research.

Botany surveys conducted in May 2013, and a site visit in July 2013, identified state-listed noxious weeds within the Lower Kelly Gulch Development area, as well as other non-native plant species which can also have detrimental impacts on native plant communities. The project would include expansions of existing well pads, construction of a new well pad and access road, installation of a new buried pipeline, and use of temporary surface waterlines. All of the development would occur on privately owned lands. The project area lies within salt-desert shrubland, sagebrush shrubland, and pinyon-juniper habitat types.

Most of the currently undisturbed portions of the project area are relatively weed free, with noxious weeds and other invasive nonnatives primarily established near existing disturbance areas. There are two State List B species present southeast of the existing SG 24-22 pad, salt cedar (*Tamarix ramosissima*), which occurs primarily in the wash bottoms, and hoary cress (*Cardaria draba*), located along the existing access road and the proposed surface waterline corridor. Four State List C noxious weed species are widely scattered throughout the project area. These are cheatgrass (*Bromus tectorum*), field bindweed (*Convolvulus arvensis*), halogeton (*Halogeton glomeratus*), and redstem filaree (*Erodium cicutarium*).

In addition to these noxious weeds are a number of other undesirable nonnative plant species, primarily in association with previously disturbed areas. These include alfalfa (*Medicago sativa*), annual wheatgrass (*Eremopyrum triticeum*), crested wheatgrass (*Agropyron cristatum*), bur buttercup (*Ceratocephala testiculata*), clasping pepperweed (*Lepidium perfoliatum*), common dandelion (*Taraxacum officinale*), desert madwort (*Alyssum desertorum*), flixweed (*Descurainia sophia*), horehound (*Marrubium vulgare*), intermediate wheatgrass (*Thinopyrum intermedium*), Russian-thistle (*Salsola tragus*), Russian wildrye (*Psaythyrostachys juncea*), salsify (*Tragopogon dubius*), smooth brome (*Bromus inermis*), tall tumble-mustard (*Sisymbrium altissimum*), and yellow sweetclover (*Melilotus officinalis*). Six of these, crested wheatgrass, intermediate wheatgrass, Russian wildrye, smooth brome, alfalfa, and yellow sweetclover, have been widely used in dryland pastures and in reclamation of non-BLM lands but can expand beyond seeded areas, persist indefinitely and resist control efforts, and impede or prevent establishment of native species (Jordan et. al. 2008, Grant-Hoffman et. al. 2012).

Environmental Consequences

Proposed Action

Under the Proposed Action, 20.33 acres would be initially disturbed in the short-term and 5.95 acres would remain in use until final reclamation is implemented. Following construction, drilling and well completion, interim reclamation would occur on all areas not needed for ongoing operations.

Reclamation work would consist of seeding in accordance with the reclamation COAs presented in Appendix A. Because all of the disturbance would occur on privately owned lands, the composition of plant species used for reclamation would be at the discretion of the landowner.

Surface-disturbing activities, such as those proposed for this project, provide a niche for invasion and establishment of non-native plant species particularly when these species are already present in the surrounding area. The mechanisms for this invasion and establishment are multi-fold. Soil disturbance and removal of native vegetation creates 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). Construction equipment and heavy vehicles often transport invasive plant seeds alone or in dirt clods on tires or the vehicle undercarriage (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, Jordan et. al. 2008, Vogelsgang and Bever 2009). Some weed species produce defensive chemicals which can impede germination of native plant seeds, as well as germination of spores for mycorrhizal fungi species upon which most perennial native plants are dependent (Bainard et. al. 2009). Due to the quantity and longevity of weed seeds and the effects of weeds on the soil, once these invasive species have established on a site they can be extremely difficult to eliminate.

The project area has a history of disturbance associated with oil and gas development, telecommunications development, and livestock grazing. As a result, noxious weeds and other problematic nonnative species are widespread in disturbed sites throughout the project area, particularly along existing roads and around existing well pads where the project activities would occur. With new project disturbances, the potential for increased establishment of these undesirable plants following construction activities is very high. Movement of soil by construction equipment could be expected to spread weed seeds within the project area, and the total area of disturbed habitat would increase. 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 from invasive species, the standard weed control COA would be attached to APDs to require periodic monitoring and weed control practices to ensure that noxious weeds are controlled (Appendix A). Establishment of native plant species is also crucial in preventing invasive non-native plant species establishment and spread. Therefore, the standard reclamation COAs would also be attached to APDs to require seeding and monitoring of reclamation seeding results (Appendix A).

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts from invasive, non-native plants would be marginally reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

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. Four Class III cultural resource inventories (see section on Cultural Resources) have been conducted in the Proposed Action's area of potential effect 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 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. As no Native American areas of concern have been identified either through survey or past consultations, 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 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. WPX Energy Rocky Mountain LLC will notify its staff and contractors of the requirement under the NHPA, that work must cease if cultural resources are found during project operations. A standard Education/Discovery COA for the protection of Native American values would be attached to the APDs (Appendix A). The importance of these COAs 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

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to cultural resources would be only slightly reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

Noise

Affected Environment

The Proposed Action lies southwest of Parachute, Colorado, with activities occurring adjacent (within 0.4 mile) to I-70 and along the north side of the highway. The Proposed Action would involve expanding the existing SG 24-22 and SG 21-27 pads and constructing the new SG 23-22 pad to drill, complete, and operate 12 new Federal wells and 15 fee wells. A new access road and buried 8-inch gas pipeline would be constructed to serve the planned wells on the SG 23-22 pad. The existing SG 43-22 pad, presently serving as remote frac pad for wells being drilled on the SG 42-22 pad (analyzed in EA #DOI-BLM-CO-N040-2013-0001), would also be used to stage well completions operations for the SG 23-22 wells. Well completion work for the existing pad locations would occur on each respective pad site. The total project short-term disturbance would be 20.33 acres and the long-term disturbance after reclamation would be 5.95 acres (Table 1). All of the Lower Kelly Gulch project components would occur on private land.

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 I-70 and the frontage road and traffic serving existing wells and ongoing drilling and completion activities. The closest proposed drilling activities would be located approximately 0.3 mile from the nearest residence which exists on the other side of I-70.

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 (USEPA 1974, Harris 1991). As a basis for comparison, the noise level would be 60 dBA during a normal conversation between two people standing 5 feet apart.

Environmental Consequences

Proposed Action

The project would result in increased levels of noise during the construction, drilling, and completion phases. The noise would be most noticeable along the roads used to haul equipment and at the pad location. Drilling activities are subject to noise abatement procedures as defined in the COGCC Rules and Regulations (Aesthetic & Noise Control Regulations). Operations involving pipeline or gas facility installation or maintenance, compressors, the use of a drilling rig, completion rig, workover rig, or 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 6) at a distance of 350 feet.

Table 6. Noise Standards for Light industrial, Residential/Agriculture/Rural

Zone	***7:00 A.M. to 7:00 P.M***	***7:00 P.M. to 7:00 A.M***
Light Industrial	70 dBA	65 dBA
Residential/Agricultural/Rural	55 dBA	50 dBA

Given the remote locations of the project activities, with no reasonably close occupied structure or designated recreational area, the light industrial standard is applicable. The allowable noise level for periodic impulsive or shrill noises is reduced by 5 dBA from the levels shown (COGCC 2008).

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

Table 7. Noise Levels at Typical Construction Sites and along Access Roads

Equipment	*Noise Level (dBA)*		
	50 feet	*500 feet*	*1,000 feet*
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 7 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 this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Noise impacts would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

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. Highway I-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 8 lists the top 10 industries in Garfield County for the fourth quarter of 2011.

Table 8. Selected Industry Sectors for Garfield County

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

Personal income in Garfield County 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, below the U.S. average of 100 (City Data 2012).

Activities on public land in the vicinity of the project area are primarily ranching/farming, hunting, OHV travel, and the development of oil and gas resources. Hunters contribute to the economy because many require lodging, restaurants, sporting goods, guides and outfitting services, food, fuel, and other associated supplies.

Production of natural gas in Garfield County increased dramatically during 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 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 2013).

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

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

Environmental Consequences

Proposed Action

The Proposed Action would have minor positive impacts on the local economy of Garfield County through the creation of additional job opportunities in the oil and gas industry and in supporting trades and services. In addition, Garfield County would receive additional tax and royalty revenues.

The Proposed Action could result in negative social impacts including changing the character of the area, reducing scenic quality, increasing dust levels especially during construction, and increasing traffic.

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Socioeconomic impacts, positive or negative, would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

Soils

Affected Environment

The Proposed Action would occur in the South Grand Valley field on surrounding slopes that are generally south-facing or southwest-facing, at elevations between 5,150 and 5,680 feet, and with gradients ranging from less than 5% to greater than 50%. Based on the Soil Survey of Rifle Area, Colorado (USDA1985), the project area contains the erosive soil described in Table 9.

Table 9. Erosive Soils in the Project Area

Mapping Unit Name	*Description*	*Erosion Hazard*	*Proposed Infrastructure*
Torriorthents- - Rock Outcrop Complex 15-70%	Rock outcrops are exposed sandstone and shale bedrock and stony basaltic alluvium. Torriorthents are on foothills and mountainsides below the rock outcrop.	Moderate to Severe	All three pad sites; new SG 23-22 road and pipeline.
Arvada Loam 6-20%	Deep, well-drained, sloping soils are found on fans and high terraces and are formed in highly saline alluvium derived from shale and sandstone.	Severe	SG 43-22 frac pad and existing roads serving SG 24-22 and SG 21-27 pads.

Environmental Consequences

The Proposed Action would involve expanding the existing SG 24-22 and SG 21-27 pads and constructing the new SG 23-22 pad to drill, complete, and operate 12 new Federal wells and 15 fee wells. A new access road and buried 8-inch gas pipeline would be constructed to serve the planned wells on the SG 23-22 pad. The existing SG 43-22 pad, presently serving as remote frac pad for wells being drilled on the SG 42-22 pad (analyzed in EA #DOI-BLM-CO-N040-2013-0001), would also be used to stage well completions operations for the SG 23-22 wells. Well completion work for the existing pad locations would occur on each respective pad site. The total project short-term disturbance would be 20.33 acres and the long-term disturbance after reclamation would be 5.95 acres (Table 1). All of the Lower Kelly Gulch project components would occur on private land.

All road sections would be maintained and graveled, as needed. The two proposed pad expansions and the new SG 23-22 pad construction and associated road and pipeline improvements would be designed and positioned in the optimal locations to take advantage of the topography and avoid disturbances to the drainages and steep slopes. The area generally contains adequate vegetation buffers that would minimize the potential for sediment transport to unnamed ephemeral drainages and the Colorado River. However, construction activities would cause slight increases in local soil loss, loss of soil productivity, and sediment available for transport to surface waters. Potential for such soil loss and transport would increase as a function of slope, features (pad, road, or pipeline route), constructed, and proximity to drainages.

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

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to soil resources would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

Special Status Species

Federally Listed, Proposed, or Candidate Plant Species

Affected Environment

According to the latest species list from the USFWS, four Federally listed plant species may occur within or be impacted by actions occurring in Garfield County. Table 10 lists these species and summarizes information on their habitat associations, potential for occurrence in the project vicinity based on known geographic range and habitats present, and potential for adverse impacts from the Proposed Action.

Table 10. Potential for Occurrence of Threatened or Endangered Plant Species

Species and Status	*Occurrence*	*Habitat Association*	*Range or Habitat in Vicinity?*	*Potentially Affected?*
Parachute penstemon *(Penstemon debilis)* -- Threatened	Sparsely vegetated, south-facing, steep, white shale talus of the Parachute Creek Member of the Green River Formation; 8,000 to 9,000 feet	Other oil shale endemic species, such as Roan Cliffs blazing-star, Cathedral Bluffs meadow rue, dragon milkvetch, Piceance bladderpod, and oil shale fescue	Yes	No
DeBeque phacelia *(Phacelia submutica)* – Threatened	Sparsely vegetated, steep slopes in chocolate-brown, gray, or red clay on Atwell Gulch and Shire Members, Wasatch Formation; 4,700 to 6,200 feet	Desert shrubland with four wing saltbush, shadscale, greasewood, broom snakeweed, bottlebrush squirreltail and Indian ricegrass, grading upward into scattered junipers	Yes	No
Colorado hookless cactus *(Sclerocactus glaucus)* – 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 6000 feet	Desert shrubland with shadscale, galleta grass, black sagebrush, Indian ricegrass grading upward into big sagebrush and sagebrush/pinyon-juniper	Yes	No
Ute lady's-tresses orchid *(Spiranthes diluvialis)* – Threatened	Subirrigated alluvial soils along streams and in open meadows in floodplains; 4,500 to 7,200 feet	Boxelder, cottonwoods, willows, and herbaceous riparian graminoids and forbs.	Yes	No

The project is within the range of all four of these Federally listed plant species, but no suitable habitat is present for Ute lady's-tresses orchid in proximity to the project site. Surveys for the other three species were conducted within and around the project area in May 2013. Suitable habitat for Colorado hookless cactus and Parachute penstemon are present in the project area, but no plants were found.

DeBeque phacelia is an annual species which does not germinate every year, so presence or absence cannot necessarily be determined in a single year survey. However, climate conditions in 2013 were relatively good for DeBeque phacelia seed germination, and surveys were conducted at the appropriate time of year to detect plants if they were present. Five areas of marginally suitable DeBeque phacelia habitat were mapped between 30 and 100 meters of the project area. The closest habitat site was 30.6 meters from the surface pipeline location, where no ground disturbance would occur. No plants were found at any of these mapped habitat locations (WWE 2013).

Environmental Consequences

Proposed Action

Because there are no known occurrences of Colorado hookless cactus, Parachute penstemon, or Ute lady's-tresses orchids within 100 meters of any proposed ground-disturbing activities, the project would have "**No Effect**" on these species. Because of the marginal habitat quality of the mapped habitat sites for DeBeque phacelia, the distance of these sites from the proposed disturbance areas, and the absence of plants during the 2013 survey, the project would have **"No Effect"** on DeBeque phacelia.

No Action Alternative

The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. The drilling of only 15 wells instead of 27 wells would have a marginally reduced impact risk for Federally listed plant species. Therefore, the No Action Alternative would have **"No Effect"** on any Federally listed plant species.

BLM Sensitive Plant Species

Affected Environment

BLM sensitive plant species with habitat and/or occurrence records in Garfield County are listed in Table 11, along with summaries of their habitat requirements, potential for occurrence within the project area, and potential to be impacted by the Proposed Action. Species with the potential to occur within the project area are DeBeque milkvetch, Naturita milkvetch, Piceance bladderpod, Roan Cliffs blazing-star, and Cathedral Bluffs meadowrue. Rare plant surveys were conducted within the project area in May 2013. Suitable habitat for DeBeque milkvetch and Naturita milkvetch were found within the project area, and suitable habitat for Piceance bladderpod, Roan Cliffs blazing-star, and Cathedral Bluffs meadowrue were found in Kelly Gulch near the project area. However, no occurrences of any BLM sensitive plant species were found within 30 meters of the project area (WWE 2013).

Environmental Consequences

Proposed Action

Because there are no known occurrences of BLM sensitive plants within or adjacent to the project area, the project would have no impact on these species.

Table 11. Potential for Occurrence of BLM Sensitive Plant Species				
Species and Status	***Occurrence***	***Habitat Association***	***Range or Habitat in Vicinity?***	***Potentially Affected?***
DeBeque milkvetch (*Astragalus debequaeus*)	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 (*Astragalus naturitensis*)	Sandstone mesas, ledges, crevices and slopes in pinyon/juniper woodlands; 5,000 to 7,000 feet	Pinyon-juniper woodlands	Yes	No
Piceance bladderpod (*Lesquerella parviflora*)	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	Yes	No
Roan Cliffs blazing-star (*Mentzelia rhizomata*)	Steep, eroding talus slopes of shale, Green River Formation; 5,800 to 9,000 feet	Pinyon-juniper woodlands, shrublands; often with other oil shale endemic species	Yes	No
Harrington's beardtongue (*Penstemon harringtonii*)	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	No	No
Cathedral Bluffs meadowrue (*Thalictrum heliophilum*)	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	Yes	No

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Potential impacts to special status plant species would be marginally reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action. However, because there are no known occurrences of BLM sensitive plants within or adjacent to the project area, the project would have no impact on these species.

Federally Listed, Proposed, or Candidate Animal Species

Affected Environment

Federally listed, proposed, or candidate species potentially occurring within or affected by actions in Garfield County include eight species of vertebrate wildlife. Table 12 lists these species and summarizes information on their habitat associations, potential for occurrence in the project vicinity based on known geographic range and habitats present, and potential for adverse impacts from the Proposed Action. Species indicated as potentially affected are described in more detail following the table.

Table 12. Potential for Occurrence of Listed, Proposed, or Candidate Threatened or Endangered Animal Species

Species and Status	*Distribution in Region*	*Preferred Habitats*	*Potentially Present in Vicinity?*	*Potentially Adversely Affected?*
Canada lynx *(Lynx canadensis)* – 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 the upper montane.	No	No
Greater Sage-grouse (*Centrocercus urophasianus*) – Candidate	Concentrated use during courtship; more dispersed use during nesting, brood-rearing, and winter seasons	Mature sagebrush shrublands providing dense cover and a diverse understory of perennial grasses and forbs	No	No
Western yellow-billed cuckoo (*Coccyzus americanus*) – Proposed	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 (*Strix occidentalis lucida*) – 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 (*Xyrauchen texanus*) – Endangered	Colorado River and major tributary rivers, including mainstem Colorado River upstream to town of Rifle in CRVFO.	General: Deep, slow runs, pools, and eddies. Spawning: silt to gravel substrates in shallow water and seasonally flooded overbank areas.	Yes	**Yes**
Colorado pikeminnow *(Ptychocheilus lucius*) – Endangered			Yes	**Yes**
Humpback chub (*Gila cypha*) -- 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 (*Gila elegans*) – Endangered			No	**Yes**
*Lineage GB cutthroat trout (*Oncorhynchus clarki* 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

*Lineage GB = Relict populations of cutthroat trout indigenous to the Colorado/Gunnison/Dolores River drainages. Currently protected under the ESA pursuant to prior listing of the greenback cutthroat trout (*O. c. stomias*) pending completion of genetic and morphometric studies and taxonomic reassessment of native cutthroat trout in Colorado.

Environmental Consequences

Proposed Action

Canada Lynx, Greater Sage-grouse, Mexican Spotted owl, and Western Yellow-billed Cuckoo. These species are not expected in the project vicinity based on habitat types, known geographic ranges, and documented occurrences. Therefore, the Proposed Action would have "**No Effect**" on these species.

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

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

In 2008, the BLM prepared a Programmatic Biological Assessment (PBA) addressing water-depleting activities associated with 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 would be added to the CRVFO tracking log and submitted to the USFWS per the PBA/PBO at the end of the year to account for depletions associated with BLM's fluid mineral program. The calculated mitigation fees are used by the USFWS for mitigation projects and contribute to the recovery of these endangered species through restoration of habitat, propagation, and genetics management, instream flow identification and protection, program management, non-native fish management, research and monitoring, and public education.

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

In contrast to inflow of sediments, the inflow of chemical pollutants could impact the endangered big-river fishes if concentrations are sufficient to cause acute effects. The potential for adverse impacts would be limited to the Colorado pikeminnow and razorback sucker, the two species known to occur within the CRVFO area. Spills or other releases of chemical pollutants as a result of oil and gas activities are infrequent in the CRVFO area due to the various design requirements imposed by BLM and the State of Colorado. In the event of a spill or accidental release into an ephemeral drainage that could flow to the Colorado River, the operator would be required to implement its Spill Prevention, Control, and Countermeasures (SPCC) plan, including such cleanup and mitigation measures as required by BLM or the State. For these reasons, and because any spills into the Colorado River would be rapidly diluted to levels below that are not deleterious, or even detectable, the potential for adverse impacts from chemical releases is not considered significant.

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

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to special status animal species would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

BLM Sensitive Animal Species

Affected Environment

Table 13 lists BLM sensitive vertebrate wildlife species that are known to occur in the region and, if present, could potentially be adversely affected by the Proposed Action. Potential impacts to species indicated as present or possible in the area of potential direct or indirect effects are discussed following the table.

Table 13. BLM Sensitive Vertebrate Species Present or Potentially Present in the Project Area

Common Name	***Habitat***	***Potential for Occurrence***
Fringed myotis (*Myotis thysanodes*)	Roosting: Caves, trees, mines, and buildings. Foraging: Pinyon-juniper, montane conifers, and semi-desert shrubs.	Possible
Townsend's big-eared bat (*Corynorhinus townsendii*)		
Northern goshawk (*Accipiter gentilis*)	Montane and subalpine coniferous forests and aspen forests; may move to lower elevation pinyon/juniper woodland in search of prey during winter.	No suitable habitat
Bald eagle (*Haliaeetus leucocephalus*)	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
Peregrine falcon (*Falco peregrinus*)	Nesting: Cliffs, usually near a river, large lake, or ocean. Foraging: Waterfowl on rivers and lakes; upland fowl in open grassland or steppe.	Nests on Roan Cliffs

Table 13. BLM Sensitive Vertebrate Species Present or Potentially Present in the Project Area		
Common Name	***Habitat***	***Potential for Occurrence***
Brewer's sparrow (*Spizella breweri*)	Extensive stands of sagebrush, primarily Wyoming sagebrush on level or undulating terrain.	Possible – habitat marginal
Midget faded rattlesnake (*Crotalus oreganus concolor*)	Cold desert of NW Colorado, SW Wyoming, and NE Utah, primarily in sagebrush with rock outcrops and exposed canyon walls.	Possible – habitat marginal
Great Basin spadefoot (*Spea intermontana*)	Permanent or seasonal ponds and slow-flowing streams in pinyon-juniper woodlands and semi-desert shrublands.	No suitable habitat
Northern leopard frog (*Lithobates pipiens*)	Clean perennial waters in slow-flowing streams, wet meadows, marshes, and shallows of clean ponds and lakes.	Possible along Colorado River
Bluehead sucker (*Catostomus latipinnis*)	Primarily smaller streams with a rock substrate and mid- to fast- moving waters; also shallows of larger rivers.	Not present
Flannelmouth sucker (*Catostomus discobolus*)	Runs, riffles, eddies, and backwaters in large rivers.	Present in Colorado River
Roundtail chub (*Gila robusta*)	Slow-moving waters adjacent to fast waters in large rivers.	
*Lineage CR cutthroat trout (*Oncorhynchus clarki* ssp.)	Headwaters streams and ponds with cool, clear waters isolated from populations of non-native cutthroats and rainbow trout.	Not present
*Lineage CR = Relict populations of cutthroat trout indigenous to the Yampa/Green River drainages but widely transplanted throughout the state. Managed as a BLM sensitive species pursuant to prior designation of the Colorado River cutthroat trout (*O. c. pleuriticus*) pending completion of genetic and morphometric studies and taxonomic reassessment of native cutthroat trout in Colorado.		

Environmental Consequences

Proposed Action

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

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

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

Brewer's Sparrow. Because the habitat is marginal for nesting by this species, and because project initiation is expected to occur outside the nesting season for this species, the project is not expected to have significant direct or indirect impacts at the population level. However, a small number of individual Brewer's sparrows could potentially be precluded from nesting in the project vicinity in future years due to avoidance of the noise and light pollution associated with ongoing production and maintenance.

Midget Faded Rattlesnake. This small viper was formerly considered a small, pale-colored subspecies of the common and widespread prairie or western rattlesnake (*Crotalus viridis*), but more recent at taxonomic analysis has led to its being considered a subspecies of the Great Basin rattlesnake (*C. oreganus*). The midget faded rattlesnake is sometimes considered a genetically distinct species. Although movement patterns of this species are not well known, individuals are believed to be limited to a few hundred meters from den sites. The limited distribution and small home range make this snake susceptible to impacts from human disturbance (USGS 2007). Threats include direct mortality from vehicles traveling on roads and pads, off-highway vehicle use throughout the landscape, capture by collectors, and livestock grazing. As access increases into previously undeveloped areas, the risk of encounters with humans would increase, resulting in some cases of mortality or collection.

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

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to special status animal species would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

Vegetation

Affected Environment

The project area lies within terrain of steeply eroded, arid, primarily south-facing slopes within the Wasatch formation, grading down into flat to gently rolling hills near the Colorado River. The surrounding upper slopes range from barren to well vegetated, with numerous rocky outcrops ranging from 10 to 100 feet in height. The project elevation ranges from approximately 5,150 to 5,680 feet. Vegetation types include salt desert scrub and arid grassland habitats at the lower elevations, shifting up into pinyon-juniper woodland at the upper elevations.

Lower elevation areas around the lower pads, access roads, and pipelines are within salt desert scrub habitats. Dominant shrub species here include broom snakeweed (*Gutierrezia sarothrae*), bud sagebrush (*Artemisia spinescens*), fourwing saltbush (*Atriplex canescens*), Gardner's saltbush (*Atriplex gardneri*), greasewood (*Sarcobatus vermiculatus*), rubber rabbitbrush (*Ericameria nauseosa*), and siltbush (*Zuckia brandegeei*). Common native perennial grasses include bottlebrush squirreltail (*Elymus elymoides*), galleta grass (*Pleuraphis jamesii*), and purple three-awn (*Aristida purpurea*). Common native forbs include cryptantha (*Cryptantha glomerata*), common sunflower (*Helianthus annuus*), kingcup cactus (*Echinocereus triglochidiatus*), long-leaf phlox (*Phlox longifolia*), pointed gumweed (*Grindelia fastigiata*), prickly pear cactus (*Opuntia polyacantha*), purple springparsley (*Cymopterus purpureus*), scarlet globemallow (*Sphaeralcea coccinea*), sharpleaf twinpod (*Physaria acutifolia*), spiny phlox (*Phlox*

hoodii), and yellow milkvetch (*Astragalus flavus*). Common invasive species include two non-native annual grasses (cheatgrass and annual wheatgrass) and a non-native annual forb (redstem filaree).

At higher elevations, the pinyon-juniper woodlands consist of mostly mature pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees averaging 8-12 feet in height. Mountain mahogany (*Cercocarpus montanus*) and serviceberry (*Amelanchier utahensis*) are thinly scattered on north and east facing slopes. Other dominant species include Mormon-tea (*Ephedra viridis*), mountain-mahogany (*Cercocarpus montanus*), Utah serviceberry (*Amelanchier utahensis*), siltbush (*Zuckia brandegeei*), snowberry (*Symphoricarpos rotundifolius*), and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*).

Disturbed areas around existing well pads and along roads are vegetated predominantly with non-native species and noxious weeds. These are described in greater detail in the Invasive Non-Native Plants section above. Reclamation areas around these previously disturbed sites also include common reclamation species such as bottlebrush squirreltail, Indian ricegrass (*Achnatherum hymenoides*), slender wheatgrass (*Elymus trachycaulus*), streambank wheatgrass (*Elymus lanceolatus*), fourwing saltbush, and shadscale (*Atriplex confertifolia*). Nonnative reclamation species are also common in these areas, including crested wheatgrass, intermediate wheatgrass, Russian wildrye, and smooth brome.

Nearby wash bottoms support basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), Great Basin wildrye (*Leymus cinereus*), and scattered infestations of invasive salt cedar (*Tamarix ramosissima*), with an occasional narrowleaf cottonwood (*Populus angustifolia*).

Steep hillsides above the lower pads and across which the SG 23-22 access road would pass have large barren patches, and sparsely vegetated areas dominated by black sagebrush (*Artemisia nova*), siltbush, Wyoming big sagebrush, winterfat (*Kraschenninnikovia lanata*), and saline wildrye (*Leymus salinus*). Patches on the upper hillsides and near the SG 23-22 pad site were previously seeded with nonnative crested wheatgrass, which now dominates these areas and forms patches of near monoculture.

Environmental Consequences

Proposed Action

Under the Proposed Action, 20.33 acres would be initially disturbed in the short-term and 5.95 acres would remain in use until final reclamation is implemented. Vegetation lost in these areas would be a mix of native desert shrub, sagebrush, and pinyon-juniper woodland vegetation, in addition to seeded nonnative reclamation species and nonnative invasive species. After construction, drilling and completion operations have been conducted, the 20.33 acres of initial disturbance would be reclaimed per interim reclamation practices outlined in Appendix A. Final reclamation COAs related to the 5.95 acres of long-term disturbance are also presented in Appendix A. Because the project is located on privately owned lands, the composition of plant species used for reclamation would be at the discretion of the landowner.

Adjacent native vegetation would not be directly impacted, but could be indirectly impacted by increased dust deposition on leaves. Dust levels could be expected to increase above ambient levels in the short term from pad expansion, well drilling, new road construction, and new pipeline installation. Increased dust levels can negatively impact plants by clogging stomatal openings in the leaves, impeding gas exchange and reducing light availability at the leaf surface, and thereby reducing photosynthesis rates, plant growth rates, and seed production. Dust on leaf surfaces can also facilitate plant tissue uptake of toxic pollutants (Thompson et. al. 1984, Farmer 1993, Sharifi et. al. 1997). Dust can also affect snowmelt patterns and resulting hydrology and soil moisture availability, alter soil pH and nutrient availability, and

result in plant community composition changes (Angold 1997, Auerbach et. al. 1997, Johnston and Johnston 2004, Field et. al. 2010).

Cumulative impacts from the project development and plant habitat loss, in combination with previous oil and gas development in this area, could also indirectly impact adjacent vegetation through negative effects on pollinators. Pollinators depend on both appropriate floral communities and on appropriate nesting habitat. Many pollinators show fidelity to specific habitat areas, and if these sites become isolated from contiguous habitat by disturbances such as roads, pollinators may be reluctant to cross these barriers to utilize other habitats (Osborne and Williams 2001, Bhattacharya et. al. 2003). Roads and well pad construction can negatively impact pollinators by creating barriers, by removing habitat as a result of new construction, and by direct mortality through collisions with vehicles.

Additional indirect impacts to adjacent vegetation could occur from noxious weeds and other non-native plants associated with project area disturbances. The proposed removal of native vegetation would increase the site vulnerability to invasion and establishment of noxious weeds and other non-native invasive plant species, particularly with the existing widespread establishment of noxious weeds and other non-native species. Neighboring vegetation would also become more vulnerable to invasion by noxious weeds and other non-native species. Ground disturbance combined with vehicle traffic and construction equipment provides habitat and vectors (agents of spread) for invasive species, particularly when these species are already present within the soil seed bank (Schmidt 1989, Parendes and Jones 2000, Gelbard and Belnap, 2003, Larson 2003, Zwaenepoel et. al. 2006). These non-native species can negatively impact native plant communities, both directly through competition for resources, and indirectly through alteration of soil microbial communities (Klironomos 2002, Hierro et. al. 2006, Reinhart and Callaway 2006, Vogelsgang and Bever 2009). Herbicide treatments of noxious weeds can also result in negative effects or mortality to native plants if they are co-occurring or located nearby (BLM 2007b). Implementation of standard COAs for noxious weeds and interim reclamation (Appendix A) would reduce the risk of noxious weed establishment and spread through the combination of chemically treating noxious weeds while also seeding with desired plant species.

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to vegetation would be marginally reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

Visual Resources

Affected Environment

The Proposed Action would occur entirely on private land (private surface underlain by private minerals) approximately 3 air-miles southwest of the town of Parachute. Visual resource management (VRM) objectives do not apply to non-BLM lands, and visual values for those lands are protected by land owner discretion. The BLM can only make recommendations to mitigate impacts to scenic values.

Mount Callahan, directly north of the project area, is a dominant topographic feature to adjacent communities along the I-70 corridor, including Parachute. The project area consists of finger-like ridges extending south and east from Mount Callahan. The ridges are dissected by drainages that terminate immediately north of the I-70 Corridor. The Proposed Action would occur within Kelly Gulch and on

two of the finger-like ridges adjacent to Kelly Gulch. The area is characteristic of light industrial and oil and gas development. Vegetation consists of salt desert scrub and arid grasslands intermixed with scattered patches of Pinyon-juniper with exposed tan and coral/salmon-colored soils.

The visual impact analysis is based on views from three Key Observation Points (KOPs) representing three linear viewing locations, viewing angles, and viewing directions with the highest frequency of viewers: I-70, U.S. Highway 6, and County Road (CR) 300, also known as Stone Quarry Road. The three KOPs represent typical views that a viewer would see while travel eastbound or westbound along the I-70 corridor and U.S. 6, and from nearby rural residences adjacent to CR 300. These viewsheds are important, as they are viewed by people who live, work, commute, and recreate in the area. The Proposed Action would be located in the viewer's foreground/middleground, within 5 miles from I-70, U.S. 6, and CR 300. BLM guidance states that lands with high visual sensitivity are those within a five miles of a primary travel corridor and of moderate to very high visual exposure, where details of vegetation and landform are readily discernible and changes in visual contrast can easily be notice by the casual observer. The KOPs are shown in Figure 8 through 11.

Environmental Consequences

Proposed Action

The planning process involved several site visits to review the Proposed Action. Two existing well pads (SG 24-22 and SG 21-27) would be expanded slightly to accommodate safe working platforms for drilling new wells and one new well pad (SG 23-22) would be constructed. The existing access roads and gas gathering system that currently serve the SG 24-22 and SG 21-27 pads would be utilized and no new improvements or modifications would be required. Temporary surface poly pipelines would be laid along the existing pad roads to support fracing operations once drilling is completed. The expansion of the SG 24-22 and SG 21-27 pads and associated infrastructure for completions and production would create minimal visual impacts because the pad locations are screened by surrounding topography and the associated surface disturbance would be minimal.

The construction of the proposed SG 23-22 pad and access road would have the greatest visual impact because the pad and access road would be constructed on a prominent ridge that is visible from the valley floor below (Figures 9 to 11). However, the overall visual impact of the access road would be reduced some because portions of the existing road would not be used for vehicular traffic to access the pad, but would be reclaimed once the gas-gathering line that would serve the SG 23-22 pad is installed (Figure 10). Portions of the existing access road that are more visible from the valley floor would also be improved but without side casting in the highly visible locations.

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

The Proposed Action would create 20.33 acres of new short-term surface disturbance, but over the long-term, the disturbance would amount to 5.95 acres and would be associated with the pad working surfaces and the maintainable portions of the access roads. Since the Proposed Action occurs entirely on private land, the standard Best Management Practices (BMPs) related to reclamation, facility paint colors, and screening the production facilities from view would mitigate the visual impacts of the project.

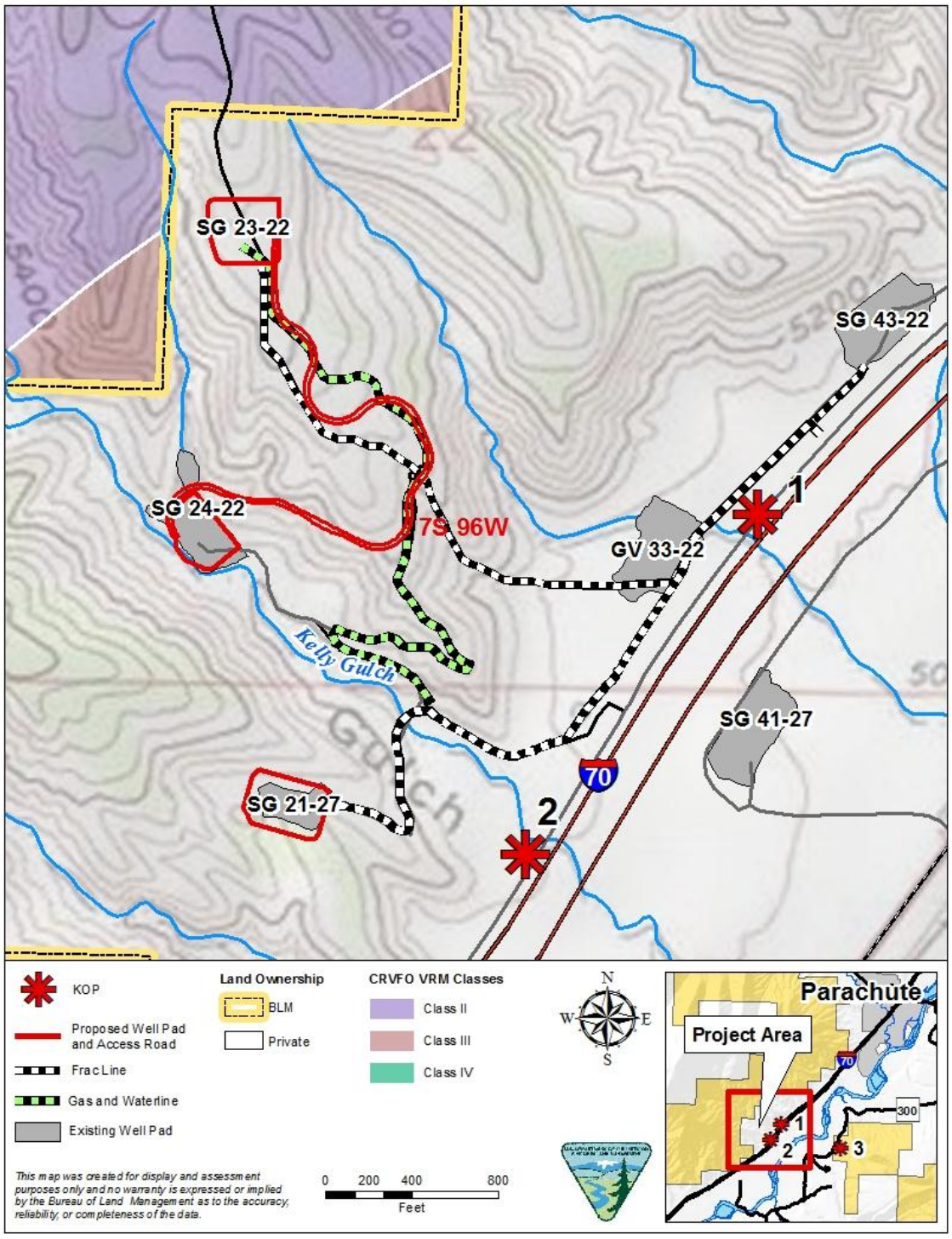

Figure 8. Proposed Action in Relation to VRM Class Designations.

No Action Alternative

Under this alternative, the Federal wells would not be approved or developed. However, the proposed Fee wells would be developed requiring the implementation of all the pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The surface disturbance would remain the same as analyzed in the Proposed Action and impacts to visual resources would be marginally reduced with only 15 wells being drilled and developed instead of 27 wells described in the Proposed Action.

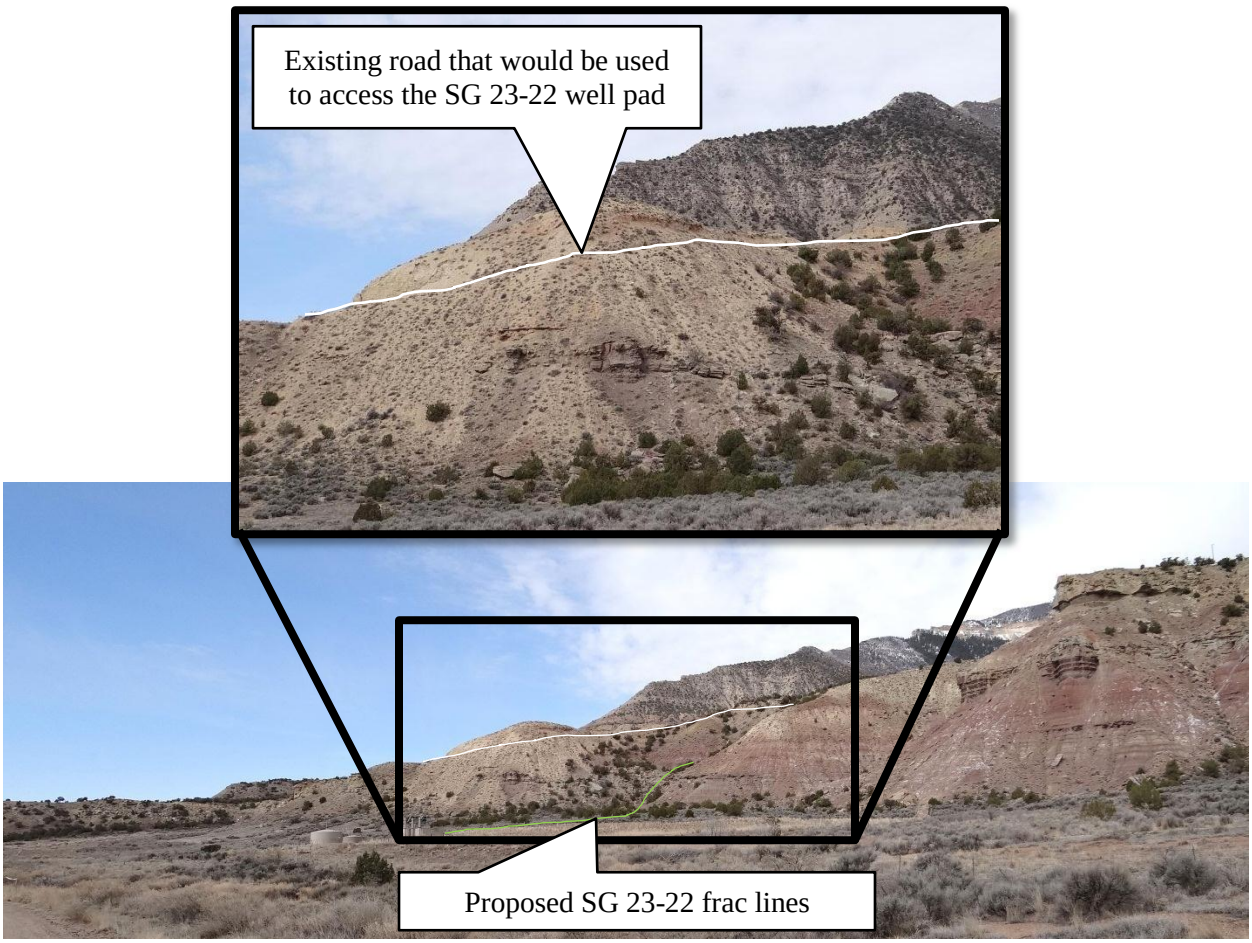

Figure 9. KOP 1 is located along the oil and gas field development road that parallels I-70 immediately the north. This KOP represents a typical view while westbound on I-70 and U.S. 6. The Proposed Action would attract attention but would not dominate the view because of limited duration at highway speeds.

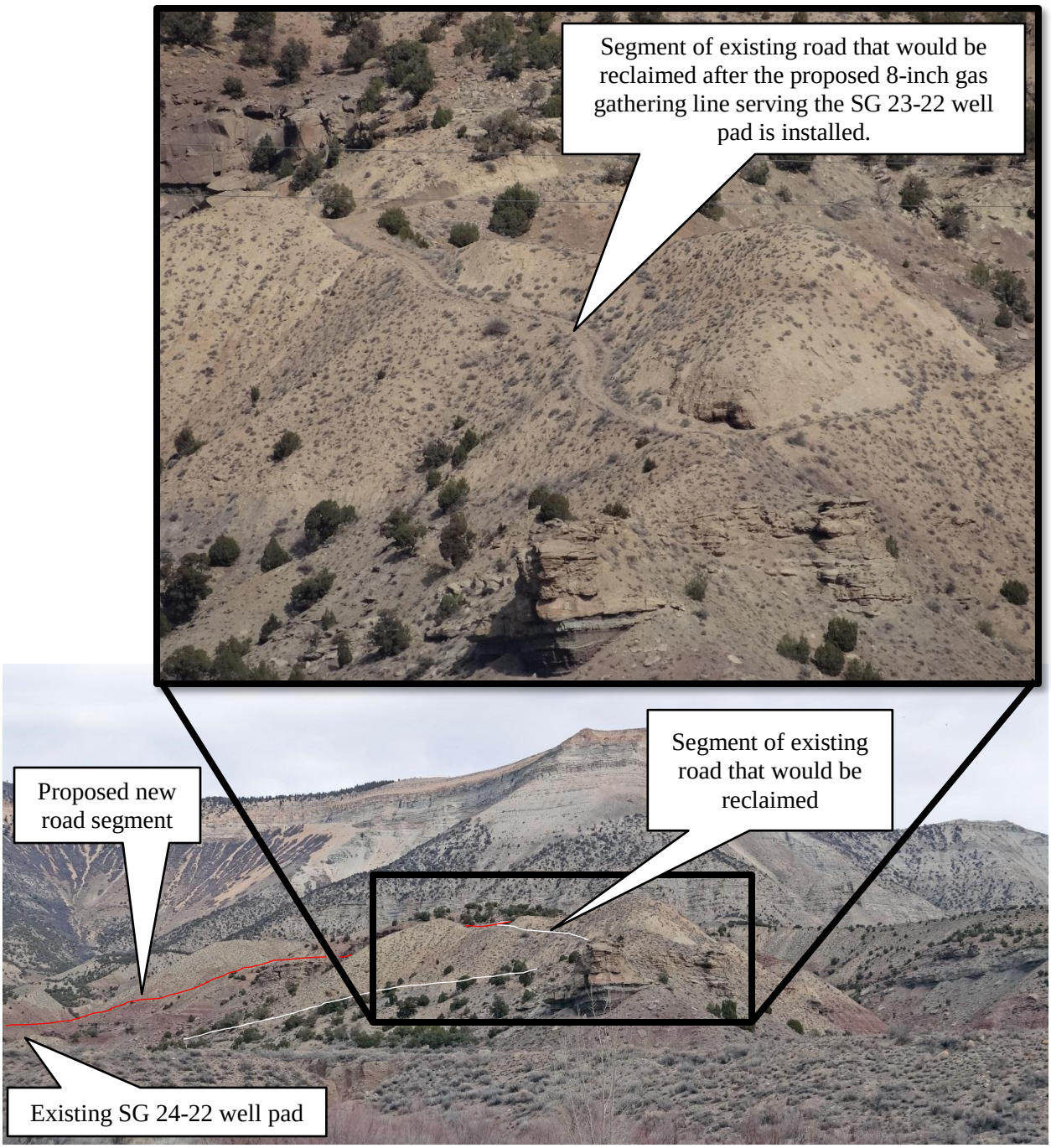

Figure 10. KOP 2 is also located along the oil and gas development road north of I-70. This KOP represents a typical view while eastbound on I-70 and U.S. 6. The Proposed Action would attract attention but would not dominate the view because the limited duration at highway speeds. The SG 24-22 pad expansion would be screened by ridgelines to the east and west.

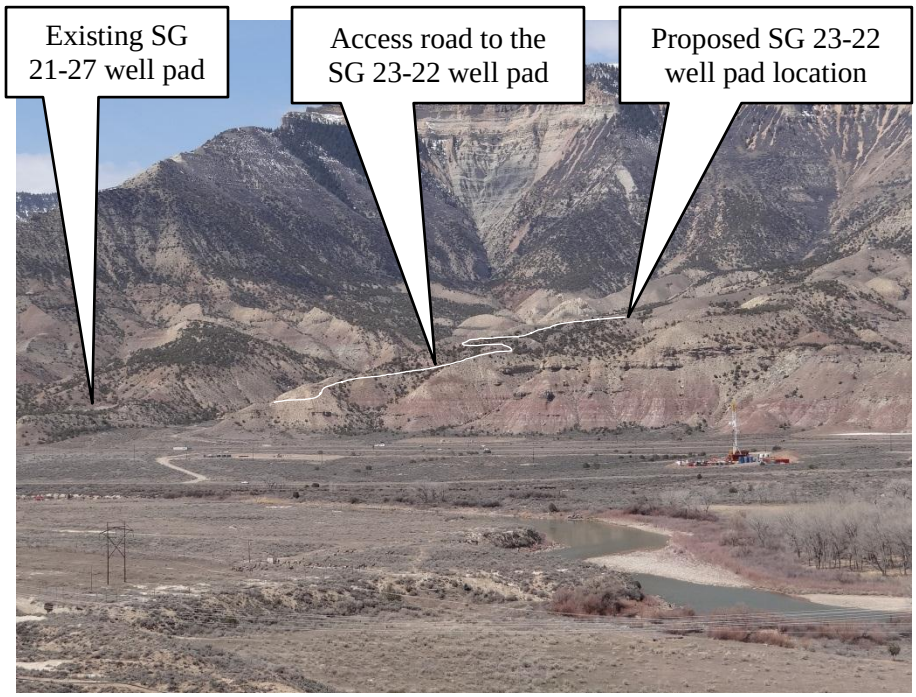

Figure 11. KOP 3 is on the SG 41-26 pad immediately south of CR 300 (Stone Quarry Road). This KOP represents a typical view of travelers westbound on CR 300 and residents in the project vicinity. The proposed SG 24-22 pad expansion and the new segment of the SG 23-22 access road would be screened by ridgelines east of the project location.

Wastes, Hazardous or Solid

Affected Environment

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

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

- The Oil Pollution Act (Public Law 101-380, August 18, 1990) prohibits discharge of pollutants into Waters of the U.S., which by definition 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, right-of-way holders are not. RCRA strictly regulates the management and disposal of hazardous wastes.

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. Emergency responses to releases of 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 include those associated with well production and transmission of natural gas through the gathering lines and the natural gas itself.

With the exception of produced hydrocarbons, ethylene glycol (antifreeze), lubricants, and amine compounds, chemicals subject to reporting under Title III of the Superfund Amendments and Reauthorization Act in quantities of 10,000 pounds or more would not be used, produced, stored, transported, or disposed of during construction or operation of the facilities. None of the chemicals 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 larger extent, during drilling and completion operations since the workforce would increase during

those activities. Trailers housing workers would be outfitted with self-contained sewage collection system; regular trash collection would occur throughout the drilling and well completion process.

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 this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts from wastes, hazardous or solid, would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

Water Quality, Surface and Ground

Surface Water

Affected Environment

The project lies approximately 7 miles southwest of Parachute, Garfield County, Colorado alongside I-70 within the ephemeral Kelly Gulch watershed that flows directly to the Colorado River. The proposed activities would occur within Colorado River below Rifle Creek 6th code watershed unit, which empties directly into the Colorado River approximately 0.5 mile south 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 includes tributaries to the Colorado River from its confluence with the Roaring Fork River to a point immediately below its confluence with Parachute Creek. 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.

All streams within segment 4a are 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. *Colorado's Monitoring and Evaluation List* identifies water bodies for which a reason exists to suspect water quality problems, but for which uncertainty also exists regarding one or more factors. The tributaries to the Lower Colorado River which include the project area are on the State of Colorado's *Monitoring and Evaluation List* for sediment load

The USGS has collected surface water flow and quality data from the Colorado River below the project area near Rulison in 1977 and is currently being collected upstream at Canyon Creek and downstream near Cameo (USGS 2013)(Table 14).

Table 14. Selected Water Quality Data for Sampling Locations near the Project Area

Parameter	***Colorado River Near Cameo, CO, USGS Site #0909550 8/8/2013***	***Colorado River Above S. Canyon USGS Site #09085150 7/1/2013***	***Colorado River below Rulison CO, USGS Site #09092570 7/8/1977***
Instantaneous discharge (cfs)	2,160	3,040	2,000
Temperature, water (°C)	18.4	17.1	21
Field pH (standard units)	8.3	7.9	8.3
Specific conductance (µS/cm/cm at 25°C)	847	728	970
Total Dissolved Solids (mg/L)	NA	586	585
Hardness as CaCO3 (mg/L)	116	119	230
Chloride (mg/L)	NA	192	180
Selenium (µg/L)	NA	0.38	1
Dissolved oxygen (mg/L)	7.7	8.5	9.2

Note: NA = data not available
Source: USGS 2013 http://nwis.waterdata.usgs.gov

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 involve expanding the existing SG 24-22 and SG 21-27 pads and constructing the new SG 23-22 pad to drill, complete, and operate 12 new Federal wells and 15 fee wells. A new access road and buried 8-inch gas pipeline would be constructed to serve the planned wells on the SG 23-22 pad. The existing SG 43-22 pad, presently serving as remote frac pad for wells being drilled on the SG 42-22 pad (analyzed in EA #DOI-BLM-CO-N040-2013-0001), would also be used to stage well completions operations for the SG 23-22 wells. Well completion work for the existing pad locations would occur on each respective pad site. The total project short-term disturbance would be 20.33 acres and the long-term disturbance after interim reclamation would be 5.95 acres (Table 1). All of the Lower Kelly Gulch project components would occur on private land.

Direct impacts to the ephemeral Kelly Gulch drainage and the Colorado River would occur but be minimized by many design features of the pad expansions, access road improvements, cuttings storage placements, and buried or surface pipeline installations. All road sections would be maintained and graveled, as needed. The pad construction work would be designed and positioned in the optimal location to take advantage of the topography and avoid disturbances to the drainages and steep slopes

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 implementing stormwater management BMPs, stockpiling topsoil, controlling erosion, and rehabilitating disturbed surfaces quickly. Long-term soil protection could be achieved by continued road and pad maintenance to reduce erosion, remediation of contaminated soils, and minimizing the size of the long-term pad footprints through interim reclamation measures. As proposed, these measures would include limiting 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.

In addition to individual containment measures, the entire pads would be bermed to contain an accidental release on the pad. In the event of an accidental release, produced water and condensate would be confined for cleanup in a containment area and would not migrate to surrounding soils or surface waters. Pipelines associated with the transport of these liquids would be pressure tested to detect leakage prior to use. Implementation of the 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 this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to surface waters would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

Waters of the U.S.

Affected Environment

Waters of the U.S. located in the project vicinity include an unnamed ephemeral tributary to the Colorado River. 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.

Environmental Consequences

Proposed Action

Impacts to waters of the U.S., the rerouting of the drainages and any upgrades to the road and pipeline crossings of drainages within the project would be authorized by the USACE. A COA listed in Appendix A required 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.

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to waters of the U.S. would be reduced with the drilling of only 15 wells instead of the 27 wells in 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, several domestic water wells are located within 0.25 mile of the project site. These wells range between a depth of 120 and 58 feet, have an average static water level of 40 feet below ground surface, and have a discharge rate of 15 gallons per minute.

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 (NAS 2012).

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

Hydraulically induced fracture orientation in relation to the wellbore depends upon the downhole environment (i.e., rock mechanics, minimum and maximum principle stress directions, rock physical properties, etc.) and the wellbore trajectory. In vertical or normal directional wells such as in the Mesaverde formation—the predominant hydrocarbon-producing formation in the CRVFO area—fracture growth is primarily lateral or outward from the wellbore, with minimal secondary fractures extending at some angle away from the lateral fractures. In horizontal wells such as being used to develop deep marine shales, fracture growth from the wellbore is mainly determined by the orientation of the wellbore in relation to the principal stresses of the rock. Fracture growth toward the surface is limited by barriers such as variations in stress and lithology, as is also the case in vertical and normal directional wells. In some horizontal wells, fracture growth is similar to that in vertical or normal directional wells due to wellbore trajectory along the maximum principal stress direction. Analysis of data from thousands of wells indicates fracture extent (length) of less than 350 feet in the vast majority of cases, with outliers of 1,000 to 2,000 feet (Maxwell 2011, Davies et al. 2012). The extreme outlier lengths are associated with fractures in thick deposits of lithologically uniform marine shales.

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

Based on a review of available information on microseismic monitoring and fracture dimensions, Fisher and Warpinski (2011) concluded that fractures from deep horizontal wells are not a threat to propagate across the long distances (thousands of feet) needed to reach fresh-water aquifers much closer to the surface. This conclusion applies to the CRVFO area, and is also applicable to much shallower potable groundwater sources consisting of unconsolidated alluvium (streambed deposits) associated with the

Colorado River and major tributaries. In general, alluvial water wells in the CRVFO extend to depths of less than 200 feet, with few in the range of 400 feet. Typical water levels in these wells range from 50 to 100 feet deep. Impacts to water quality of these shallow fresh-water wells is highly improbable as a result of hydraulic fracturing, which occurs at depths of 5,000 to 11,000 feet below ground surface.

In addition to vertical separation of several thousand feet between the upper extent of fractures and fresh-water aquifers are requirements by the BLM and COGCC for proper casing and cementing of wellbores to isolate the aquifers penetrated by a wellbore. 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 15). Since fracture jobs are tailored to the downhole environment and companies are aware of the concerns involving hydraulic fracturing, the chemicals listed in Table 15 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 15 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 15. The sand is as a proppant, or propping agent, to help keep the newly formed fractures from closing.

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.

Table 15. Constituents of Typical Hydraulic Fracturing Operation in Tight Gas Formations				
Additive Type*	***Typical Example****	***Percent by Volume***	***Function****	***Common Use of Example Compound***
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
Total Additives		**0.49**		
Total Water and Sand		**99.51**		

*FracFocus Chemical Disclosure Registry, fracfocus.org/chemical-use/what-chemicals-are-used
**USDOE 2009

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to ground water would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

Wildlife, Aquatic

Affected Environment

The Proposed Action would occur in an area of highly dissected terrain containing a number of ephemeral drainages. Due to the short stream lengths and small watersheds of ephemeral streams potentially affected by the Proposed Action, fish species do not occur. Aquatic macroinvertebrates most likely to occur include water striders, water boatmen, predaceous diving beetles, and the aquatic larvae of caddisflies and true flies such as biting midges, nonbiting midges, and mosquitoes. Amphibians, if present, would probably be limited to spadefoots and true toads, which are adapted to seasonal flow regimes in arid environments.

Environmental Consequences

Proposed Action

Implementation of the Proposed Action could result in increases in erosion and sedimentation into nearby drainages and eventually the Colorado River. Because the Proposed Action includes summer use of the project areas, it is likely that roads and pads would not be muddy for extended periods of time. Roads are generally drier and in better condition during the non-winter months and consequently are less prone to erosion. Vehicular use during muddy road conditions could contribute to increased erosion of sediments into nearby ephemeral washes and eventually the Colorado River. The potential increase of sedimentation into the Colorado River would be nominal given background sediment loads currently carried by the river. Sediment-intolerant aquatic wildlife could be negatively affected, as increased erosion potential would persist and impair water and habitat quality. Measures to minimize erosion and sedimentation of aquatic environments are included among the COAs (Appendix A).

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to aquatic wildlife would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

Wildlife, Migratory Birds

Affected Environment

The Migratory Bird Treaty Act (MBTA) provides protection to 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 long-distance and short-distance 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 2008a) 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 11 species potentially present in or near the project area: the bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), peregrine falcon (*Falco peregrinus*), prairie falcon (*Falco mexicanus*), flammulated owl (*Otus flammeolus*), yellow-billed cuckoo (*Coccyzus americanus*), Lewis's woodpecker (*Melanerpes lewis*), gray vireo (*Vireo vicinior*), pinyon jay (*Gymnorhinus cyanocephalus*), juniper titmouse (*Baeolophus griseus*), and Brewer's sparrow (*Spizella breweri*). The yellow-billed cuckoo (candidate for Federal listing as threatened or endangered) and the bald eagle, peregrine falcon, flammulated owl, and Brewer's sparrow (BLM sensitive species) are addressed in the earlier section on Special Status Species.

The minimal amount of pinyon-juniper habitat provides potential nesting sites for the pinyon jay, juniper titmouse, and gray vireo, with the last species much less likely based on geographic range. 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 (*Empidonax oberholseri*), 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*).

Three BCC raptors—the golden eagle, peregrine falcon, and prairie falcon—may include the project vicinity within large foraging areas associated with nest sites along cliffs to the north. This use would be occasional and transitory. Non-BCC raptors potentially nesting and foraging in the project vicinity include the American kestrel (*Falco sparverius*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*A. striatus*), northern harrier (*Circus cyaneus*), great horned owl (*Bubo virginiana*), and long-eared owl (*Asio otus*). Potential nesting sites near the project area include rock ledges and juniper trees north of I-70 and riparian cottonwoods along the Colorado River south of I-70. Two nests were located within the raptor survey boundary however one was unoccupied and a previously documented nest had been destroyed (WestWater 2013).

Environmental Consequences

Proposed Action

Under the Proposed Action, removal of 14.38 acres of sparse juniper woodlands with openings of sagebrush, saltbush, and greasewood would result in loss of existing and potential nesting sites. 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.

No occupied nests were detected within the project-specific survey area. One previously documented long-eared owl nest no longer exists, and one potential new raptor nest was recorded southwest of the SG 21-27 location (WestWater 2013). If the project were to be initiated after February 15, 2014, the potential new would need to be check for occupancy. If the nest were found to be active, a COA (Appendix A) would prohibit initiation of construction, drilling, or completion activities until the nest is no longer occupied. A separate COA would prohibit removal of vegetation during the period May 1 to June 30 to reduce adverse impacts to migratory birds such as BCC species.

In addition to these restrictions, the operator is subject to the MBTA, administered by the USFWS, which precludes the "take" of any raptor or most other native species. Under the Act, the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The USFWS interprets "harm" and "kill" to include loss of eggs or nestlings due to abandonment or reduced attentiveness by one or both adults as a result of disturbance by human activity, as well as physical destruction of an occupied nest. Adherence to the 60-day TL period does not ensure compliance with the MBTA.

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to migratory birds would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

Wildlife, Other Terrestrial

Affected Environment

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

MAMMALS

The project area is within overall ranges of mule deer (*Odocoileus hemionus*) and Rocky Mountain elk (*Cervus elaphus nelsonii*). Because of its low elevation, the project area consists primarily of winter range, meaning that it receives most use by animals that have migrated downslope to where temperatures are milder, snowcover thinner and less persistent, and forage more readily available. In addition to these migrant animals, a small number of mule deer reside in the general vicinity year-round. Winter densities of big game animals in a given area are dependent on the type of habitat present and the severity of the winter.

In addition to overall deer and elk winter range, the project area is mapped by Colorado Parks and Wildlife (CPW 2011) as a mule winter concentration area, and the lower portion immediately north of I-70 is mapped as mule deer severe winter range. Severe winter range is the portion of overall winter range used primarily during the most severe winters in terms of temperatures and, especially, snow cover. Consequently, severe winter range is typically at the lower margins of overall winter range and often

comprised of plant species that are not necessarily ideal as forage but remain available when higher quality winter range is covered with deep snow.

Large carnivores potentially present in the project vicinity include the mountain lion (*Puma concolor*), which moves seasonally with its preferred prey, the mule deer, and the black bear (*Ursus americanus*). Two smaller carnivores, the coyote (*Canis latrans*) and bobcat (*Lynx rufus*) are also present throughout the region in open habitats and broken or wooded terrain, respectively, where they hunt for small mammals, reptiles, and ground-dwelling birds. Smaller carnivores in habitats similar to those near the project site include the raccoon (*Procyon lotor*), ringtail (*Bassariscus astutus*), striped skunk (*Mephitis mephitis*), spotted skunk (*Spilogale gracilis*), and long-tailed weasel (*Mustela frenata*).

Small mammals present within the planning area include rodents such as the rock squirrel (*Otospermophilus variegatus*), golden-mantled ground squirrels *(Callospermophilus lateralis)*, least chipmunk (*Neotamias minimus*), packrat (bushy-tailed woodrat) (*Neotoma cinerea*), black-tailed and/or white-tailed jackrabbit (*Lepus californica*, *L. townsendii*), and desert cottontail (*Sylvilagus audubonii, S. nuttallii*). Rodents and, to a lesser extent rabbits and hares, are the primary prey for a variety of predators.

BIRDS

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 approximately 1.2 miles west of an area mapped by the CPW as wild turkey overall range, but the site lacks the type of vegetation and dense cover normally required by this species. A non-native gamebird, the chukar (*Alectoris chukar*) is also present in the project vicinity. While the chukar tolerates drier, sparser habitats than the wild turkey, the nearly barren slopes surrounding the site generally lack sufficient grass and forb cover for this species. See the sections on Migratory Birds and Special Status Species for discussions of other birds in the area.

REPTILES AND AMPHIBIANS

The project area is within elevational range of most reptile species known to occur in Garfield County. Two snake species—the gopher snake (bullsnake)(*Pituophis catenifer*) and striped whipsnake (*Coluber taeniatus*)—were observed during project-specific wildlife surveys. Other reptile species potentially present include the collared lizard *(Crotaphytus collaris)*, short- horned lizard, (*Phrynosoma hernandesi)*, plateau spiny lizard (*Sceloporus tristichus*), tree lizard (*Urosaurus ornatus*), and plateau whiptail (*Aspidocelis velox*), all commonly associated with pinyon-juniper woodlands, sagebrush shrublands, and rocky areas such as occur in the project vicinity. A BLM sensitive species, the midget faded rattlesnake, is also potentially present (see the section on Special Status Species).

Amphibians potentially present in seasonal waterbodies and wetlands in this portion of the CRVFO include Woodhouse's toad (*Anaxyrus woodhousii*) and the western chorus frog (*Pseudacris triseriata*) in addition to a BLM sensitive species, the Great Basin spadefoot toad (see the section on Special Status Species). No seasonal aquatic habitats suitable for breeding by these species occur in the project area.

Environmental Consequence

Proposed Action

Direct impacts to terrestrial wildlife from the Proposed Action may include mortality, disturbance, nest abandonment/nesting attempt failure, or site avoidance/displacement from otherwise suitable habitats. These effects could result from the 20.33 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. Additional, indirect habitat loss may occur if increased human activity (e.g., traffic, noise) associated with infrastructure causes intolerant species to be displaced or alter their habitat use patterns. The extent of indirect habitat loss varies by species, the type and duration of the disturbance, and the amount of screening provided by vegetation and topography. In general, disturbance-related impacts are temporary, with patterns of distribution and habitat use returning to predisturbance conditions rather quickly when disturbance stops.

No Action Alternative

Under this alternative, none of the 12 Federal wells would be approved or drilled, but the planned 15 fee wells would be developed requiring the implementation of all pad, road, and pipeline improvements for the three pads outlined in the Proposed Action. The disturbance estimate for the No Action Alternative would remain the same as that analyzed in the Proposed Action, i.e., 20.33 acres of initial surface disturbance with a long-term disturbance estimate of 5.95 acres. Impacts to terrestrial wildlife would be reduced with the drilling of only 15 wells instead of the 27 wells in the Proposed Action.

SUMMARY OF CUMULATIVE IMPACTS

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

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

The primary bases for this assessment are twofold. First, although the rate of development, including oil and gas development, has slowed in recent years due to the general economic downturn and depressed

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

In summary, the Proposed Action would contribute to the collective adverse impact for some resources. Although the contribution would be minor, the Proposed Action would contribute incrementally to the collective impact to air quality, vegetation, migratory birds, terrestrial wildlife, and other resources.

PERSONS AND AGENCIES CONSULTED

Colorado Oil and Gas Conservation Commission – Dave Kubeczko

WPX Energy: April Mestas, Adam Tankersley, Kris Meil, Justin Hall, Wally Hammer, Joe Weaver Jr., Derek Haakinson, Richard Jenkins, Wayne Gallahan

INTERDISCIPLINARY REVIEW

BLM staff from the CRVFO who participated in the preparation of this EA, including review of survey results submitted by the operator's consultants, evaluation of impacts likely to occur from implementation of the Proposed Action, and identification of appropriate COAs to be attached and enforced by BLM, are listed in Table 16.

Table 16. BLM Interdisciplinary Team Authors and Reviewers

Name	***Title***	***Areas of Participation***
John Brogan	Archaeologist	Cultural Resources, Native American Religious Concerns
Jim Byers	Natural Resource Specialist	EA Project Lead, Access & Transportation, Socioeconomics, Wastes-Hazardous or Solid
Allen Crockett, Ph.D., J.D.	Supervisory Natural Resource Specialist	Technical Review, NEPA Review
Shauna Kocman, Ph.D., P.E.	Petroleum Engineer	Downhole COAs Air Quality, Noise, Soils, Surface Water, Waters of the U.S.
Julie McGrew	Natural Resource Specialist	Visual Resources
Judy Perkins, Ph.D.	Botanist	Invasive Non-native Species, Special Status Plants, Vegetation
Sylvia Ringer	Wildlife Biologist	Migratory Birds, Special Status Species Animals, Aquatic and Terrestrial Wildlife
Todd Sieber	Geologist	Geology and Minerals, Groundwater, Paleontology

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APPENDIX A

Surface Use and Downhole Conditions of Approval

Including Site-Specific COAs for
SG 23-22 Pad, Road and Gas Pipeline
SG 24-22 Pad
SG 21-27 Pad

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SURFACE USE CONDITIONS OF APPROVAL
FOR APPLICATION FOR PERMIT TO DRILL
LOWER KELLY GULCH PROJECT
DOI-BLM-CO-N040-2013-0106-EA

General COAs

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. No construction activities shall commence without staking of pad construction limits, pad corners, and road/pipeline centerlines and disturbance corridors.

2. Road Construction and Road Maintenance. Roads shall be crowned, ditched, surfaced, drained with culverts and/or water dips, and constructed to BLM Gold Book standards. Initial gravel application shall be a minimum of 6 inches. The operator shall provide timely year-round road maintenance and cleanup on the access roads. A regular schedule for maintenance shall include, but not be limited to, blading, ditch and culvert cleaning, road surface replacement, and dust abatement. When rutting within the traveled way becomes greater than 6 inches, blading and/or gravelling shall be conducted as approved by the BLM.

3. Drill Cuttings Management. Cuttings generated from the numerous planned well bores shall be worked through a shaker system on the drill rig, mixed with a drying agent, if necessary, and deposited in the planned cuttings trench or piled on location against the cut slope for later burial during the interim reclamation earthwork. The cuttings shall be remediated per COGCC regulations (Table 1010-1 standards) prior to earthwork reshaping related to well pad interim reclamation.

4. Dust Abatement. The operator shall implement dust abatement measures as needed to prevent fugitive dust from vehicular traffic, equipment operations, or wind events. The BLM may direct the operator to change the level and type of treatment (watering or application of various dust agents, surfactants, and road surfacing material) if dust abatement measures are observed to be insufficient to prevent fugitive dust.

5. Drainage Crossings and Culverts. Construction activities at perennial, intermittent, and ephemeral drainage crossings (e.g. burying pipelines, installing culverts) shall be timed to avoid high flow conditions. Construction that disturbs any flowing stream shall utilize either a piped stream diversion or a cofferdam and pump to divert flow around the disturbed area.

   Culverts at drainage crossings shall be designed and installed to pass a 25-year or greater storm event. On perennial and intermittent streams, culverts shall be designed to allow for passage of aquatic biota. The minimum culvert diameter in any installation for a drainage crossing or road drainage shall be 24 inches. Crossings of drainages deemed to be jurisdictional Waters of the U.S. pursuant to Section 404 of the Clean Water Act may require additional culvert design capacity. Due to the flashy nature of area drainages and anticipated culvert maintenance, the U.S. Army Corps of Engineers (USACE) recommends designing drainage crossings for the 100-year event. Contact the USACE Colorado West Regulatory Branch at 970-243-1199 ext. 17.

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

6. Jurisdictional Waters of the U.S. The operator shall obtain appropriate permits from the U.S. Army Corps of Engineers (USACE) prior to discharging fill material into Waters of the U.S. in accordance with Section 404 of the Clean Water Act. Waters of the U.S. are defined in 33 CFR Section 328.3 and may include wetlands as well as perennial, intermittent, and ephemeral streams. Permanent impacts to Waters of the U.S. may require mitigation. Contact the USACE Colorado West Regulatory Branch at 970-243-1199 ext. 17. Copies of any printed or emailed approved USACE permits or verification letters shall be forwarded to the BLM.

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 plats, 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 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 October 23, 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 prohibited or restricted noxious weed seeds and shall contain no more than 0.5 percent by weight of other weed seeds. Seed may contain up to 2.0 percent of "other crop" seed by weight, including the seed of other agronomic crops and native plants; however, a lower percentage of other crop seed is recommended. Seed tags or other official documentation shall be submitted to

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 BMPs approved by the BLM. Additional BMPs such as biodegradable wattles, weed-free straw bales, or silt fences shall have be employed as necessary to reduce transport of sediments into the drainages. The BLM may, in areas with high erosion potential, require use of hydromulch or biodegradable blankets/matting to ensure adequate protection from slope erosion and offsite transport of sediments and to improve reclamation success.

i. Site Protection. The pad shall be fenced to BLM standards to exclude livestock grazing for the first two growing seasons or until seeded species are firmly established, whichever comes later. The seeded species will be considered firmly established when at least 50 percent of the new plants are producing seed. The BLM will approve the type of fencing.

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

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 and Pesticide Application Records (PARs) shall be submitted to BLM by **December 1** of each year.

9. Bald and Golden Eagles. It shall be the responsibility of the operator to comply with the Bald and Golden Eagle Protection Act (Eagle Act) with respect to "take" of either eagle species. Under the Eagle Act, "take" includes to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest and disturb. "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle; (2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior. Avoidance of eagle nest sites, particularly during the nesting season, is the primary and preferred method to avoid a take. Any oil or gas construction, drilling, or completion activities planned within 0.5 mile of a bald or golden eagle nest, or other associated activities greater than 0.5 miles from a nest that may disturb eagles, shall be coordinated with the BLM project lead and BLM wildlife biologist and the USFWS representative to the BLM Field Office (970-876-9051).

10. Raptor Nesting. Raptor nest surveys in the project vicinity resulted in the location of one or more raptor nest structures within 0.25 mile of a well pad or 0.125 mile of an access road, pipeline, or other surface facility. To protect nesting raptors, initiation of construction, drilling, or completion activities shall not occur during the 2013 nesting season until the raptor nest is no longer in active use (containing eggs or nestlings). If all or a portion of the project is postponed until a subsequent year (2014 or later), the initiation of construction, drilling, or completion activities shall not occur during a 60-day Timing Limitation from **March 15 to May 15**. An exception to this TL may be granted for any year in which a subsequent survey determines one of the following: (a) all nests within the specified buffer widths are in a severely dilapidated condition or has been destroyed due to natural causes, (b) no nests within the buffer widths are occupied during the normal raptor nesting period, (c) a nest was occupied but subsequently failed due to natural causes, or (d) a nest was occupied, but the nestlings have fledged and dispersed.

    If project-related activities are initiated within the specified buffer distance of any active nest, even if outside the 60-day TL period, 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).

11. 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 June 30**. An exception to this TL may be granted if nesting surveys conducted no more than one week prior to surface-disturbing activities indicate that no BCC species are nesting within 30 meters (100 feet) of the area to be disturbed. Nesting shall be deemed to be occurring if a territorial (singing) male is present within the distance specified above. Nesting surveys shall include an audial 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.

12. 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.

13. Fossil Resources. All persons associated with operations under this authorization shall be informed that any objects or sites of paleontological or scientific value, such as vertebrate or scientifically important invertebrate fossils, shall not be damaged, destroyed, removed, moved, or disturbed. If in connection with operations under this authorization any of the above resources are encountered the operator shall immediately suspend all activities in the immediate vicinity of the discovery that might further disturb such materials and notify the BLM of the findings. The discovery 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 would, as soon as feasible, have a BLM-permitted paleontologist check out the find and record and collect it if warranted. If ground-disturbing activities cannot be immediately suspended, the operator shall work around or set the discovery aside in a safe place to be accessed by the BLM-permitted paleontologist.

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

    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 would 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 would inform the operator as to:

    - whether the materials appear eligible for the National Register of Historic Places
    - what mitigation measures the holder would 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 would 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 would 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).

15. Interim Reclamation Related to Drilling Phases. Within 1 year of completion of all exploratory wells proposed on a pad or within one year of completion of all development wells on a pad (whichever the situation may be), the operator would stabilize the disturbed area by recontouring, mulching, providing run-off and erosion control, replacing topsoil as directed, and seeding with BLM-prescribed native seed mixes (or landowner requested seed mix on Fee surface), and conducting weed control, as necessary. In cases where the exploratory drilling and development drilling on a single pad occur more than 1 year apart, slopes shall be recontoured to the extent necessary to accommodate seeding, and seed mixes required by BLM or requested by the private landowner shall be applied to stabilize the soil between visits per direction of the BLM.

16. 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.

17. Special Status Plant Protections

DeBeque Phacelia

a. Surface-disturbing activities located within 100 meters of mapped delineated DeBeque phacelia habitats shall have dust control measures implemented. Dust abatement applications shall be limited to water only to prevent negative impacts from additives.

b. To prevent impacts from herbicide drift and from noxious weeds, no herbicide shall be applied within 20 meters of any mapped DeBeque phacelia habitat. Within these herbicide prohibition buffers, noxious weeds in these areas shall be controlled by manual treatments. In areas between 20 meters and 100 meters of mapped DeBeque phacelia habitat, spot treatments of noxious weeds

may be made using herbicide, only when no DeBeque phacelia plants are present within mapped habitat areas. A BLM approved Pesticide Use Proposal (PUP) noting this sensitive area restriction must be obtained prior to any herbicide use. All mapped habitat areas within 100 meters of planned herbicide use shall be surveyed for DeBeque phacelia plants by a BLM approved botanist prior to any herbicide application. If DeBeque phacelia plants are found, the BLM botanist shall be notified immediately, and consultation with USFWS shall be reopened.

c. If botany surveys are conducted at the appropriate time of year, in a year when DeBeque phacelia plants are present at known sites of similar elevation and moisture conditions, and no DeBeque phacelia plants are found within the mapped habitat areas, the protections listed above shall no longer be necessary.

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.

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

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

Site-Specific COAs applicable to SG 23-22 Pad, Road and Pipeline

The following site-specific surface use COAs are in addition to the general COAs listed above.

1. SG 23-22 Pad, Road and Pipeline Construction Details

    a. *Pad Containment Berm Spill Prevention Measures*. With the pad being in direct proximity to drainages on all but the north side, attention shall be given to installing a solid containment berm system around the perimeter of the pad working area. Sediment basins shall be located and designed to readily accept pad drainage with focus of locating these basins near the cut/fill balance line of the pad surface. Using windrowed topsoil as sediment controls and/or basin catchments shall be incorporated into the storm water control plan. Sediment basin outlets with drop-down black piping are discouraged and, if used, such piping shall not feed directly into the nearby drainages. As a minimum, a hand-drawn schematic on Plat #2 shall provide the details for the storm water control plan for this pad. This plan shall be presented to the BLM and approved prior to completion of pad construction earthwork.

    b. *Pad Construction Details.* Any sizable rock or boulders generated during the SG 23-22 pad construction or the nearby road construction shall be collected, stockpiled and used to install a rock retaining wall around the pad fillslopes particularly between Corners #4 and #6 in effort to reduce the fillslope disturbance area in the drainage below the pad.

    c. *Road Construction Details.* The new access road serving the SG 23-22 pad shall be constructed with a length of 3,467 feet and a finished roadway width of 25 feet (which includes two 4-foot ditches on either side). The road running surface shall be graveled for its entire length with minimum 6-inch depth of surfacing. The road design package (prepared and stamped by Uintah Engineering and Land Surveying and referenced in the project APDs) shall outline the

construction limits, design standards, road alignment and grades, earthwork quantities, culvert locations and construction practices to be used in the road work. The proposed road shall be staked (centerline and limits of disturbance) prior to start of road work in manner that allows adequate review during the pre-construction meeting.

Road construction work on the new SG23-22 access road shall not occur while there is any drilling or completion activity on the SG 24-22 pad.

A considerable volume of excavated material (~10,000 cy) generated from the SG 24-22 pad expansion shall be used to construct portions of the SG 23-22 access road as there is a deficit of material on the SG 23-22 road design.

The 2-foot by 84-foot culvert planned near Station 2+60 of the SG 23-22 road shall be field reviewed by WPX and BLM personnel during road pioneering with idea of eliminating the culvert and installing a suitably-sized storm water ditch along the outside edge of the road way to divert all drainage flow from the ephemeral drainage west to a storm water drop down structure into Kelly Gulch.

At the SG 23-22 pad, an additional 450-foot segment of new road (18-foot width) shall also be constructed from the SG 23-22 northeast pad corner (#9) west across the SG 23-22 pad cutslope to connect with the existing old road north of the pad that served the phone repeater.

d. *Buried Gas Pipeline Installation Details*. The proposed 8-inch diameter welded steel gas gathering pipeline serving the SG 23-22 pad shall be buried within the old repeater access road for the majority of its run. The limits of the pipeline disturbance corridor shall generally adhere to the existing disturbance limits of the old roadway (generally not to exceed 35 feet in width). Of the total pipeline length of 3,806 feet, about 3,207 feet shall be installed within the old roadway and about 599 feet shall be buried across or within the new access road. After the pipeline installation is complete, the pipeline reclamation earthwork shall reshape and reclaim the cuts and fills related to the old roadway essentially removing the old roadway from service. The pipeline installation work shall adhere to the following standard procedures:

- 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.

- Pipeline Construction and Maintenance. The pipelines (natural gas, condensate, and water for production) shall be installed to industry and BLM "Gold Book" standards.

  All pipeline(s) shall be buried with a minimum depth of 48 inches from the top of the pipe to the surface. Where the alignments are shared, the gas gathering line and the water collection line shall be installed concurrently in the same trench. The centerline and disturbance limits of the proposed pipeline(s) shall be clearly staked and/or flagged prior to any commencement of operations. No equipment or vehicle use shall be allowed outside the staked disturbance corridor of the pipeline ROW unless authorized by BLM personnel.

  Approved permitting shall be obtained by the operator for the planned pipeline boring under County Road 215 and the boring project under Parachute Creek.

- Welding of Pipeline. Visual inspections shall be performed on 100% of all pipeline welds. All welders shall be appropriately certified. (43CFR109.227) *Qualification of welders.* 49CFR192.241*) Inspection and test of welds.*

  Welding must be performed by a qualified welder in accordance with welding procedures qualified under section 5 of API 1104 (incorporated by reference, *see* §192.7) or section IX of the ASME Boiler and Pressure Vessel Code " Welding and Brazing Qualifications" (incorporated by reference, *see* §192.7) to produce welds meeting the requirements of this subpart. The quality of the test welds used to qualify welding procedures shall be determined by destructive testing in accordance with the applicable welding standard(s).

- Pipeline Testing. The entire pipeline shall be tested in compliance with United States Department of Transportation (DOT) Code of Federal Regulations (CFR) (49 CFR Part 192). (Ref. 49 CFR 192.500.Subpart J entitled "Test Requirements"). (49 CFR 192.225, Welding Procedures.)

- Fire Suppression. Welding with acetylene or other open-flame torch shall be operated in an area barren or cleared of all flammable materials at least ten feet on all sides of equipment. Internal combustion engines must be equipped with approved spark arrestors which meet either (a) Department of Agriculture, Forest Service Standard 5100-la, or (b) Society of Automotive Engineers (SAE) recommended practices J335(b) and J350(a).

- Saturated Soil Conditions. When saturated soil conditions exist on or along the proposed right-of-way, construction shall be halted until soil material dries out or is frozen sufficiently for construction to proceed without undue damage and erosion to soils.

- Warning Signs. Pipeline warning signs shall be installed within 5 days of completion of construction and prior to use of the pipeline for transportation of product. Pipeline warning shall be installed at all road crossings and shall be visible from sign to sign along the ROW. For safety purposes each sign shall be permanently marked with the operator's name and shall clearly identify the owner (emergency contact) and purpose (product) of the pipeline.

e. *Surface Pipeline Installation Details.* Three 4½-inch diameter welded steel surface lines shall be temporarily laid in a cross-country alignment from the GV 33-22 pad north up the ridge line to the SG 23-22 pad. The lines shall be laid along the existing road between the SG 43-22 and GV 33-22 pads. The total length of the steel high-pressure lines shall be 4,200 feet. A 10-inch poly surface water supply line (with length of 415 feet) shall be installed to provide recycled water for the frac operations on the SG 43-22 pad and return frac flowback fluids via the existing dual 14-inch water line system to the Smith Gulch water storage facility

2. SG 23-22 Cuttings Storage. Any excess cuttings volume exceeding the capacity of the storage area shown on the pad construction plat in the APD shall be hauled to the SG Cuttings Trench at the existing SG 22-32 pad for storage. Prior to removing the cuttings to the SG Cuttings Trench, the cuttings shall be tested on location and satisfy COGCC Table 1010-1 standards. Cuttings shall be covered with a minimum of 3-foot deep cap.

3. Well Completions Operations. The completion work for the SG 23-22 wells shall be remotely conducted from the SG 43-22 fee pad which also is serving as the remote frac base for the ongoing drilling operations on the SG 42-22 pad.

Site-Specific COAs applicable to SG 24-22 Pad and Existing Road

The following site-specific surface use COAs are in addition to the general COAs listed above.

1. SG 24-22 Pad Construction Details

    a. *Pad Containment Berm Spill Prevention Measures*. With the pad being in direct proximity to drainages on all but the east side, attention shall be given to installing a solid containment berm system around the perimeter of the pad working area. Sediment basins shall be located and designed to readily accept pad drainage with focus of locating these basins near the cut/fill balance line of the pad surface. Using windrowed topsoil as sediment controls and/or basin catchments shall be incorporated into the storm water control plan. Sediment basin outlets with drop-down black piping are discouraged and, if used, such piping shall not feed directly into the nearby drainages. As a minimum, a hand-drawn schematic on Plat #2 shall provide the details for the storm water control plan for this pad. This plan shall be presented to the BLM and approved prior to completion of pad construction earthwork.

    b. *Road Entrance onto Pad*. The existing road entrance onto the SG 24-22 pad shall be reduced in grade as much as feasible to improve the sight distance for vehicles entering and leaving the pad.

    c. *SG 23-22 Road Construction Requirement*. Road construction work on the new SG23-22 access road shall not occur while there is any drilling or completion activity on the SG 24-22 pad.

    d. *Rock Wall Structure Installation along Western Edge of Pad.* If large rocks and boulders are excavated and stockpiled during the SG 23-22 road construction or the SG 24-22 pad expansion, such rock material shall be placed in rock wall sections along the expanded western edge of the pad to limit fill material from encroaching on the drainage and provide a protective armoring of the western edge of the pad from the storm damage.

2. SG 24-22 Cuttings Storage. Any excess cuttings volume exceeding the capacity of the storage area shown on the pad construction plat in the APD shall be hauled to the SG Cuttings Trench at the existing SG 22-32 pad for storage. Prior to removing the cuttings to the SG Cuttings Trench, the cuttings shall be tested on location and satisfy COGCC Table 1010-1 standards. Cuttings shall be covered with a minimum of 3-foot deep cap.

Site-Specific COAs applicable to SG 21-27 Pad and Existing Road

The following site-specific surface use COAs are in addition to the general COAs listed above.

1. SG 21-27 Pad Construction Details

    a. *Pad Containment Berm Spill Prevention Measures*. With the pad being in direct proximity to drainages on all but the east side, attention shall be given to installing a solid containment berm system around the perimeter of the pad working area. Sediment basins shall be located and designed to readily accept pad drainage with focus of locating these basins near the cut/fill balance line of the pad surface. Using windrowed topsoil as sediment controls and/or basin catchments shall be incorporated into the storm water control plan. Sediment basin outlets with drop-down black piping are discouraged and, if used, such piping shall not feed directly into the nearby drainages. As a minimum, a hand-drawn schematic on Plat #2 shall provide the details for the storm water control plan for this pad. This plan shall be presented to the BLM and approved prior to completion of pad construction earthwork.

b. *Road Entrance onto Pad*. The existing road entrance onto the SG 21-27 pad shall be reduced in grade as much as feasible to improve the sight distance for vehicles entering and leaving the pad.

c. *Storm Water Improvements on West Edge of Pad.* A suitably-sized storm water drainage ditch shall be constructed along the western side of the pad (from Corner #2 to Corner 4) to divert storm water drainage flow around the pad footprint and avoid sediments depositing in the cuttings management area or on the pad after it undergoes interim reclamation.

2. SG 21-27 Cuttings Storage. Any excess cuttings volume exceeding the capacity of the storage area shown on the pad construction plat in the APD shall be hauled to the SG Cuttings Trench at the existing SG 22-32 pad for storage. Prior to removing the cuttings to the SG Cuttings Trench, the cuttings shall be tested on location and satisfy COGCC Table 1010-1 standards. Cuttings shall be covered with a minimum of 3-foot deep cap.

   Additionally, the western side of the cuttings management area (between Corners #2 and #4) shall be avoided for cuttings storage in effort to provide space for a reconfigured man-made storm water drainage during pad reshaping at time of interim reclamation. If cuttings are primarily able to be stored along the northern edge of the pad and avoid the western side, the steep cutslope near Corner #3 can be reshaped back to its natural slope onto the pad and the drainage can be reconstructed to encroach and flow more naturally across a man-made channel constructed on the pad during interim reclamation work.

BUREAU OF LAND MANAGEMENT

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

DOWNHOLE CONDITIONS OF APPROVAL
Applications for Permit to Drill

Operator:	Encana Oil & Gas (USA) Inc.
Lease Number:	COC60234
Well:	Bosely SG 543-21 (SG 24-22)
Engineer:	Peter Cowan
Surface Location:	Garfield County; Lot 11 Sec. 22 T7S R96W
Bottom Hole Location	Garfield County; Lot 7 Sec. 21 T7S R96W

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 **3M** system and recorded in the IADC/Driller's log. A casing head rated to 3,000 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) 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 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 CRF 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 5th 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.

Contact Information

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2300 River Frontage Road
Silt, CO 81652

DOWNHOLE CONDITIONS OF APPROVAL
Applications for Permit to Drill

Operator:	WPX Energy Rocky Mountain LLC
Lease Number:	COC58673
Pad(s):	SG 21-27
Engineer:	Peter Cowan
Surface Location:	Garfield County; NENW Sec. 27 T7S R96W

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 **3M** system and recorded in the IADC/Driller's log. A casing head rated to 3,000 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) 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 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 CRF 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 5th 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.

Contact Information

Shauna Kocman, Ph.D., P.E.
Petroleum/ Environmental Engineer

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Peter Cowan
Petroleum Engineer

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List of Wells			
Proposed Pads	***Proposed Wells***	***Surface Locations***	***Bottom Hole Locations***
SG 21-27 (Fee Surface)	Bosely SG 242-28	T7S R96W, Sect. 27 NENW	T7S R96W, Sect. 28 Lot 1

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FONSI
DOI-BLM-CO-N040-2013-0106-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. This decision would provide for the orderly, economical, and environmentally sound exploration and development of oil and gas resources on a valid Federal oil and gas lease.

RATIONALE: The bases for this decision are as follows:

1. Approval of the Proposed Action is validating the rights granted with the Federal oil and gas leases to develop the leasehold to provide commercial commodities of oil and gas.

2. The environmental impacts would be avoided, minimized, or offset with the mitigation measures incorporated into the Proposed Action or attached and enforced by BLM as Conditions of Approval (COAs).

3. This Decision does not authorize the initiation of surface-disturbing activities on BLM lands or of drilling activities associated with any Federal oil and gas well. Initiation of activities related to the new Federal oil and gas well to be added to the existing well pad may commence only upon approval by BLM of the Application for Permit to Drill (APD).

MITIGATION MEASURES: Mitigation measures presented in Appendix A of the EA would be incorporated as COAs for both surface and drilling operations and attached to APDs for the Federal wells drilled in the Lower Kelly Gulch Project (SG 24-22 and SG 21-27 well pads).

Because no APDs have yet been submitted by WPX for natural gas wells planned for the SG 23-22 pad, this EA has analyzed impacts associated with the additional wells based on information provided with the Notice of Staking (NOS) and does not include Downhole COAs for the additional, directional wells. Surface Use and Downhole COAs consistent with CRVFO Appendix A of this EA, revised as necessary based on new information, requirements and/or circumstance, would be attached to APDs for the additional wells in conjunction with BLM's review and approval process

NAME OF PREPARER: Jim Byers, Natural Resource Specialist

SIGNATURE OF AUTHORIZED OFFICIAL:

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

DATE: 11-4-13