



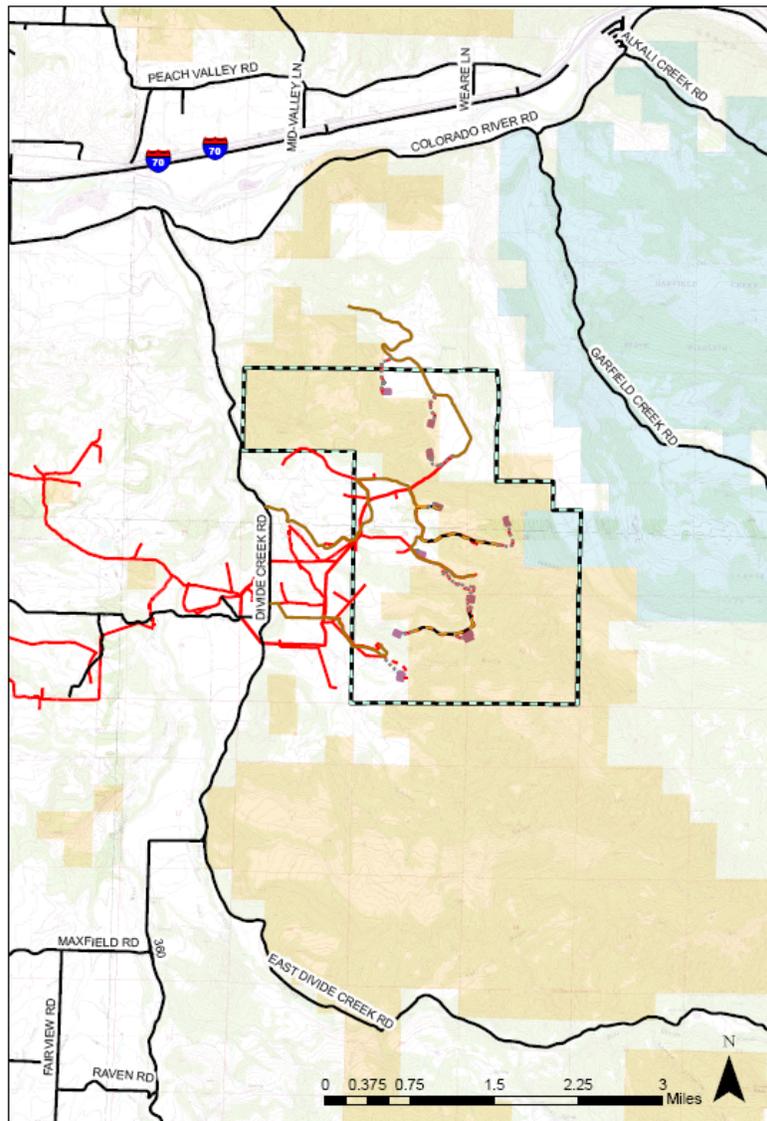
U.S. Department of the Interior
Bureau of Land Management
Colorado State Office

Glenwood Springs Field Office

December 2009



Environmental Assessment
Gibson Gulch Master Development Plan
for Oil and Gas Development
CO-140-2008-007-EA



Glenwood Springs Field Office
2300 River Frontage Road
Silt, Colorado 81652

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EXECUTIVE SUMMARY

Proposed Action

Bill Barrett Corporation (BBC) is proposing a 5-year program for oil and gas development on approximately 3,800 acres of public and private lands located approximately 3 miles southeast of Silt, Garfield County, Colorado. The proposed development plan, referred to as the Gibson Gulch Master Development Plan (GGMDP), was prepared by the Bureau of Land Management (BLM), Glenwood Springs Field Office (GSFO), to meet the requirements for an Environmental Assessment (EA) under the National Environmental Policy Act (NEPA). The GGMDP was prepared based on information provided by BBC and its consultants and on independent review and analysis by a BLM Interdisciplinary Team.

This proposal consists of constructing, drilling, completing, and operating up to 131 wells (104 Federal wells and 27 private). The wells would be drilled from five proposed BLM surface locations, one existing Fee location (private surface, private minerals), two proposed Fee locations, and two split-estate locations (private surface, Federal minerals). BBC is expected to submit a request for year-round drilling on some pads during at least the first winter and probably for subsequent winters. BLM would consider such a request, in consultation with the Colorado Division of Wildlife, based on the number and location of well pads for which the exception is requested and on mitigation measures proposed by BBC to offset impacts to big game. If approved, winter drilling would be authorized by the granting of an exception to a lease stipulation attached to the affected Federal lease(s). An exception would have to be approved each year of winter drilling. Preliminary concepts for mitigation include habitat treatments in pinyon/juniper and/or sagebrush habitats and, potentially, retaining hay pastures in an unmown condition or keeping cattle off the mown pastures to increase the amount of forage available to wintering big game.

Implementation of the GGMDP would include the construction of up to 4.2 miles of new access roads and up to 3.8 miles of buried pipelines to convey natural gas and produced water. The new roads and pipelines would be built within a 30-foot-wide permanent right-of-way (ROW), with an additional 20-foot-wide temporary use area for road and pipeline construction. Permanent surface facilities needed at each pad to support oil and gas development would include the wellheads, separation/dehydration units, and aboveground tanks for storage of condensate and produced water. Each pad would also have a “cuttings pit” for the disposal of drill cuttings. Following completion of the wells at a pad, cuttings would be removed from the pit. The pit would be allowed to dry and then be backfilled, covered, and reclaimed. Produced water transported from the wells by buried pipeline or (when necessary) by truck would go to BBC’s water collection facilities located south of Silt. Natural gas pipeline compressors are not expected as part of this proposal.

Following completion activities at a pad, areas not needed during production would undergo interim reclamation to minimize the pad of the size during the production phase. Interim reclamation would use the methods, standards, and plant species specified by BLM. When all of the wells at a pad are no longer producing economic quantities of gas, the wells would be closed and abandoned, and the pad would undergo final reclamation.

No Action Alternative

In order to provide a basis for comparison, the environmental impacts of a No Action alternative were also evaluated. In this case, “No Action” means that the BLM would not approve any of the proposed developments located on Federal surface or involving Federal mineral estate. Under this alternative, the five proposed Federal pads and associated wells would not be constructed, and the remaining Federal

wells on private surface would not be approved. However, it is anticipated that Fee wells from pads on private surface, along with access roads and pipelines on private surface, would be developed.

Impacts and Mitigation

The estimated total initial surface disturbance under the Proposed Action would be approximately 82.4 acres (53.4 acres for pads, 23.4 acres for new roads with collocated pipelines, and 5.6 acres for new pipelines not located along roads). Long-term disturbance following reclamation of temporarily disturbed areas along the roads and pipelines and interim reclamation of the well pads would reduce long-term surface impacts to approximately 29.7 acres. Protective surface use stipulations associated with the Federal leases include the following:

- A big game winter timing limitation (TL) stipulation to prohibit construction, drilling, and completion activities from January 1 through May 31 on Federal lease COC41048 and from January 16 through April 29 on Federal leases COC46972, COC50126, and COC51440.
- A big game winter range TL applied as a COA to prohibit construction, drilling, and completion activities from January 1 to March 1 for Federal wells drilled directionally from surface locations on private surface overlying private minerals.
- A raptor nesting TL from April 2 through August 30 on the portion of Federal lease COC50126 in the NE/4 of Section 19.

In addition to the protective stipulations attached to the Federal leases, surface-use conditions of approval (COAs) (Appendix C) would be applied as appropriate. These COAs were developed in conformance to the current land use plan for the GSFO or within the general authority for resource protections granted to BLM under 43 CFR 3101. Downhole COAs (Appendix D) would also be applied and enforced by BLM to ensure that drilling operations protect other potentially valuable mineral resources and groundwater, including connected surface waters and domestic water wells.

Based on the existing conditions of the GGMDP area, the impacts associated with implementation of the Proposed Action, and the mitigation measures incorporated into project design or attached as COAs, the project is not expected to result in significant impact levels for any environmental elements.

The No Action alternative would result in no new disturbance on BLM surface. However, BBC would continue to drill and develop the Fee mineral estate. Although the types of environmental impacts anticipated under the No Action alternative would be generally similar to the Proposed Action, the scope of the impacts would be smaller because fewer developments are proposed that would require Federal approval. With implementation of the same mitigation measures described for the Proposed Action, impacts under the No Action alternative are considered minor. The No Action alternative would not meet the purpose and need for the Proposed Action; that is, the development of Federal leases for the purpose of increasing the availability of natural gas resources to the public would not occur.

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The environmental assessment analyzing the environmental effects of the Proposed Action has been reviewed. The approved mitigation measures result in a Finding of No Significant Impact on the human environment. Therefore, an environmental impact statement is not necessary to further analyze the environmental effects of the Proposed Action.

DECISION RECORD

DECISION: It is my decision to approve (with the exceptions outlined below) the Gibson Gulch Master Development Plan (GGMDP) submitted by Bill Barrett Corporation (BBC) and revised during collaboration between BBC and BLM. This decision to approve the GGMDP will provide for the orderly, economical, and environmentally sound exploration and development of oil and gas resources in valid Federal leases.

RATIONALE:

1. Approval of the Proposed Action described and analyzed in this EA validates the rights granted with Federal oil and gas leases to develop the leasehold for the purpose of providing commercial commodities of oil and gas to the public.
2. This decision does not authorize surface-disturbing activities on Federal surface lands or the development of Federal oil and gas leases. Such authorizations will result only from approval by BLM of Applications for Permit to Drill (APD) Federal oil and gas wells or granting by BLM of rights-of-way for the use of Federal surface to access and convey Fee minerals.

MITIGATION MEASURES: Measures to avoid, minimize, or offset impacts to surface and subsurface resources in the GGMDP area or potentially affected by the project include:

- Project design and implementation measures incorporated into the Proposed Action.
- Timing Limitation (TL) stipulations attached to the Federal leases prohibiting construction, drilling, or completion activities on big game winter range during the winter season.
- A variety of standard and site-specific surface use and downhole Conditions of Approval (COAs) attached by BLM to activities associated with the Proposed Action for the protection of surface and subsurface resources, land uses, and other aspects of the human environment.

PREPARED BY: Vanessa Bull, Natural Resource Specialist/Physical Scientist, BLM

SIGNATURE OF AUTHORIZED OFFICIAL:



Authorized Officer

12-9-09

Date

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INTRODUCTION

Bill Barrett Corporation (BBC) is proposing a 5-year program for oil and gas exploration and development on approximately 3,800 acres of Federal and private lands located in the Township 6 South (T6S), Range 91 West (R91W), Sections 19-21, 28-29, 32, and 33, Sixth Principal Meridian, approximately 3 miles southeast of the town of Silt, Garfield County, Colorado (Figure 1). This proposal, referred to as the Gibson Gulch Master Development Plan (GGMDP), arises from the implementation of private drilling that successfully demonstrated the potential of the Jolley Mesa area for economically viable reserves of natural gas.

The project area includes 2,520 acres of Federal surface administered by Bureau of Land Management (BLM) and underlain by Federal mineral estate; 240 acres of split-estate consisting of private surface and Federal minerals; and 1,040 acres of “Fee” land consisting of private surface and private minerals. The GGMDP boundary shown in Figure 1 includes all portions of the affected Federal leases as well as all bottomhole targets for the proposed oil and gas wells. Note that the GGMDP boundary shown on the location map provided with the Proposed Action as initially published did not include all portions of the Federal leases to be developed and all of the proposed bottomhole targets. The revision of the GGMDP boundary has increased its size to 3,800 acres instead of the original 2,700 acres but has not altered the Proposed Action otherwise.

If approved as proposed, implementation of the GGMDP would result in drilling up to 104 new wells in 2,760 acres of Federal oil and gas leases COC041048, COC050126, COC046972, and COC051440 and up to 27 new wells in 1,040 acres of private mineral estate. The discrepancy between 2,520 acres of Federal surface and 2,760 acres of Federal leases reflects the 240 acres of split-estate lands within the GGMDP area. The total of 131 new wells would be drilled from ten well pads, including five proposed BLM surface locations, one existing and two proposed private surface locations, and two proposed locations that overlap both Federal and private surface.

Permanent surface facilities needed at each pad to support oil and gas development would include the wellheads, separation/dehydration units, and aboveground tanks for storage of condensate and produced water. Each pad would also have a “cuttings pit” for the disposal of drill cuttings. Produced water from the wells would be transported by buried pipeline, or by truck when necessary, to BBC’s water collection facilities located south of Silt. Natural gas compressor units are not anticipated and are not part of this proposal.

Following completion activities at a pad, areas not needed during production would undergo interim reclamation using methods, standards, and plant species specified by BLM. When all of the wells at a pad are no longer producing economic quantities of gas, the wells would be closed and abandoned, and the pad would undergo final reclamation.

Purpose and Need

The purpose of this proposal is to develop natural gas resources on Federal leases COC041048, COC050126, COC046972, and COC051440 consistent with existing Federal lease rights. The action is needed to increase the development of natural gas resources for commercial marketing to the public.

Instead of structuring the development of this lease as a series of individual actions, the current Glenwood Springs Field Office (GSFO) land use plan (BLM 1984, revised 1988), amendments to that plan for oil and gas exploration and development (BLM 1991, 1999a), and BLM regulations specify the use of multi-well development plans to more effectively manage the development of Federal fluid mineral resources.

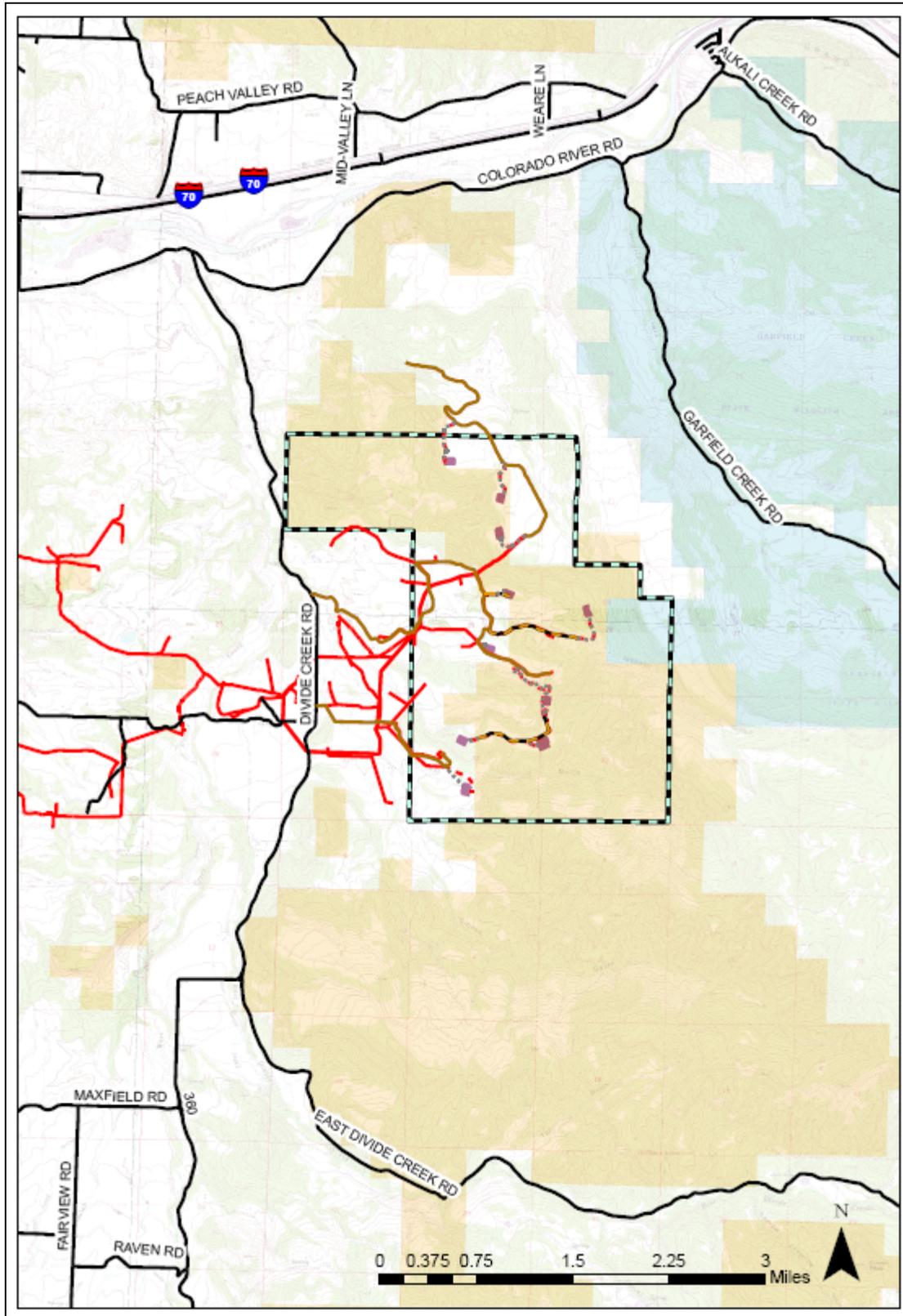


Figure 1. Gibson Gulch MDP Project Area

PROPOSED ACTION

The Proposed Action consists of constructing, drilling, completing, and operating up to 104 new Federal wells and 27 new Fee wells from a total of ten well pads (nine new and one existing). The nine new pads would include five constructed entirely on BLM lands and two located partially on BLM lands but also including private lands. Total new surface disturbance would be 82.4 acres, including 53.4 acres for pads, 23.4 acres for access roads, and 5.6 acres for pipelines. BBC would use directional multi-well drilling from the new and existing locations, with up to 18 wells on a pad, to minimize the amount of surface disturbance and optimize efficiency. Figure 2 shows the location of surface facilities in relation to surface ownership. Figure 3 shows the proposed bottomhole locations.

Interim reclamation of the pads following completion of the wells would reduce pad size to between 1.2 and 1.9 acres. Reclamation of areas disturbed during road and pipeline construction would reduce those initial impacts from 23.4 acres to 15.7 acres along 4.2 miles of roads. Total long-term disturbance, including roads and pads, would be 29.7 acres, of which 22.4 acres would be located on BLM surface. New pipelines would be fully reclaimed upon completion of construction and therefore are not considered long-term disturbance. Table 1 shows the initial disturbance, long-term disturbance, and the amount of acres reclaimed during interim reclamation for new and existing pads, new roads, and new pipelines.

Federal wells would be drilled into Federal leases COC041048, COC046972, COC050126, and COC051440, which total 2,520 acres. Fee wells would be drilled into 1,040 acres of private mineral estate, which comprises the remainder of the 3,800 acres within the GGMDP area. Figure 2 shows the location of surface components and bottomhole targets in relation to mineral ownership.

The GGMDP includes a variety of protective measures to avoid or minimize impacts to surface resources. Additional protections would include mitigation measures and Best Management Practices (BMPs) incorporated by BBC as part of the Proposed Action and the surface use Conditions of Approval (COAs) to be applied by BLM in connection with the permitting process for individual project components.

The total number of wells drilled, and the number drilled per year, would depend largely on factors out of BBC's control, including availability of drill rigs, geologic success, engineering technology, economic factors (e.g., the price of natural gas and the cost of services), availability of commodity markets, and lease notices. Bottomhole locations are shown on Figure 3.

Major elements of the Proposed Action are described below under the headings Development (Construction, Drilling, and Completion), Production (Operation and Maintenance), Abandonment and Reclamation, and Road Maintenance.

DEVELOPMENT PHASE (Construction, Drilling, and Completion)

During the course of development, numerous construction activities would be needed. All of these activities could occur simultaneously. The following is a description of construction methods proposed for well pads, access roads, and gas gathering and produced water pipelines.

Construction

Proposed Well Pads

The nine proposed well pad locations reflect the results of onsite inspections conducted by the BLM, BBC, BBC subcontractors, and private landowners, as applicable. The primary purpose of the onsite evaluations was to assess potential resource impacts associated with the various construction activities.

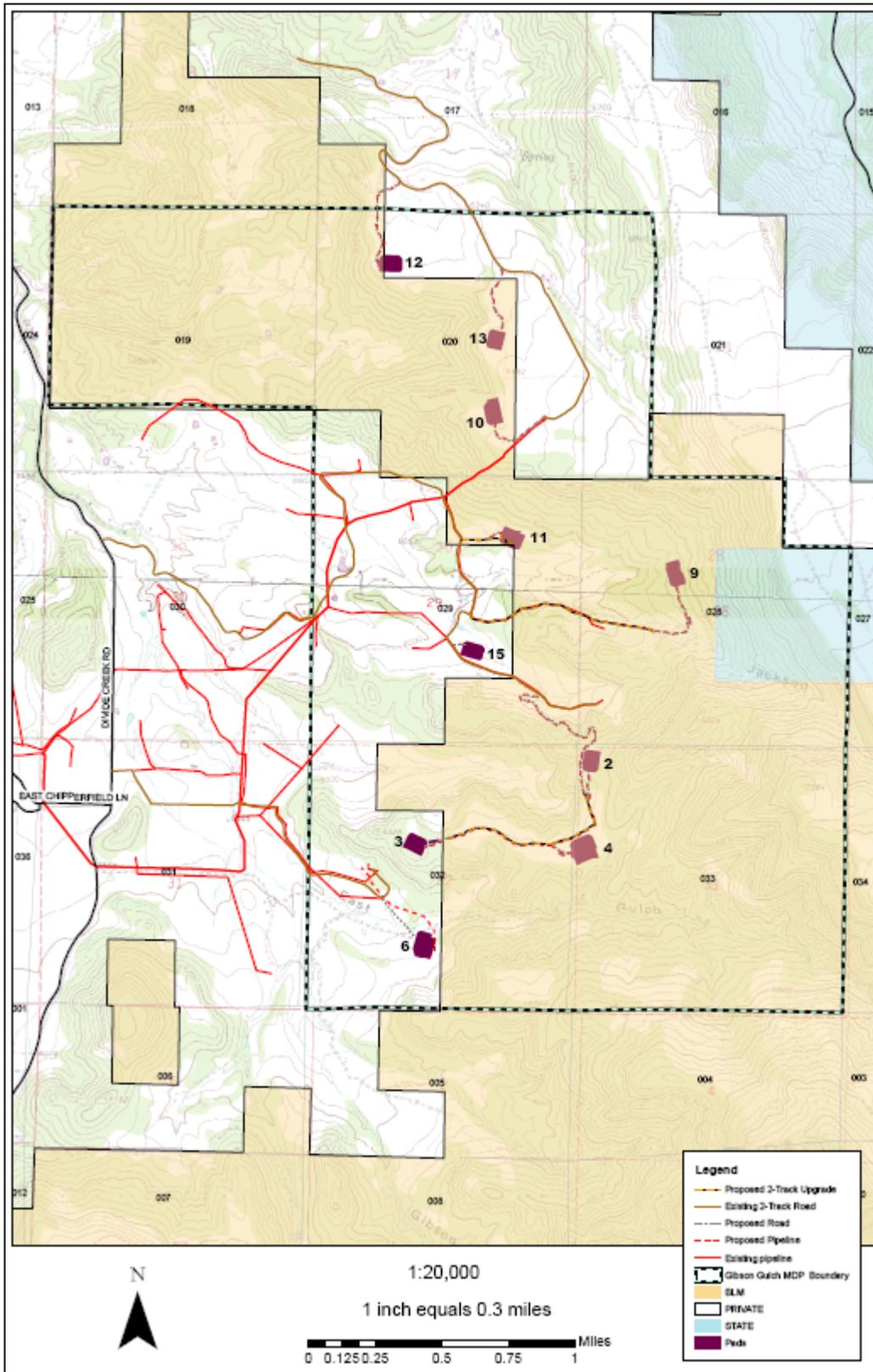


Figure 2. Gibson Gulch MDP Surface Locations

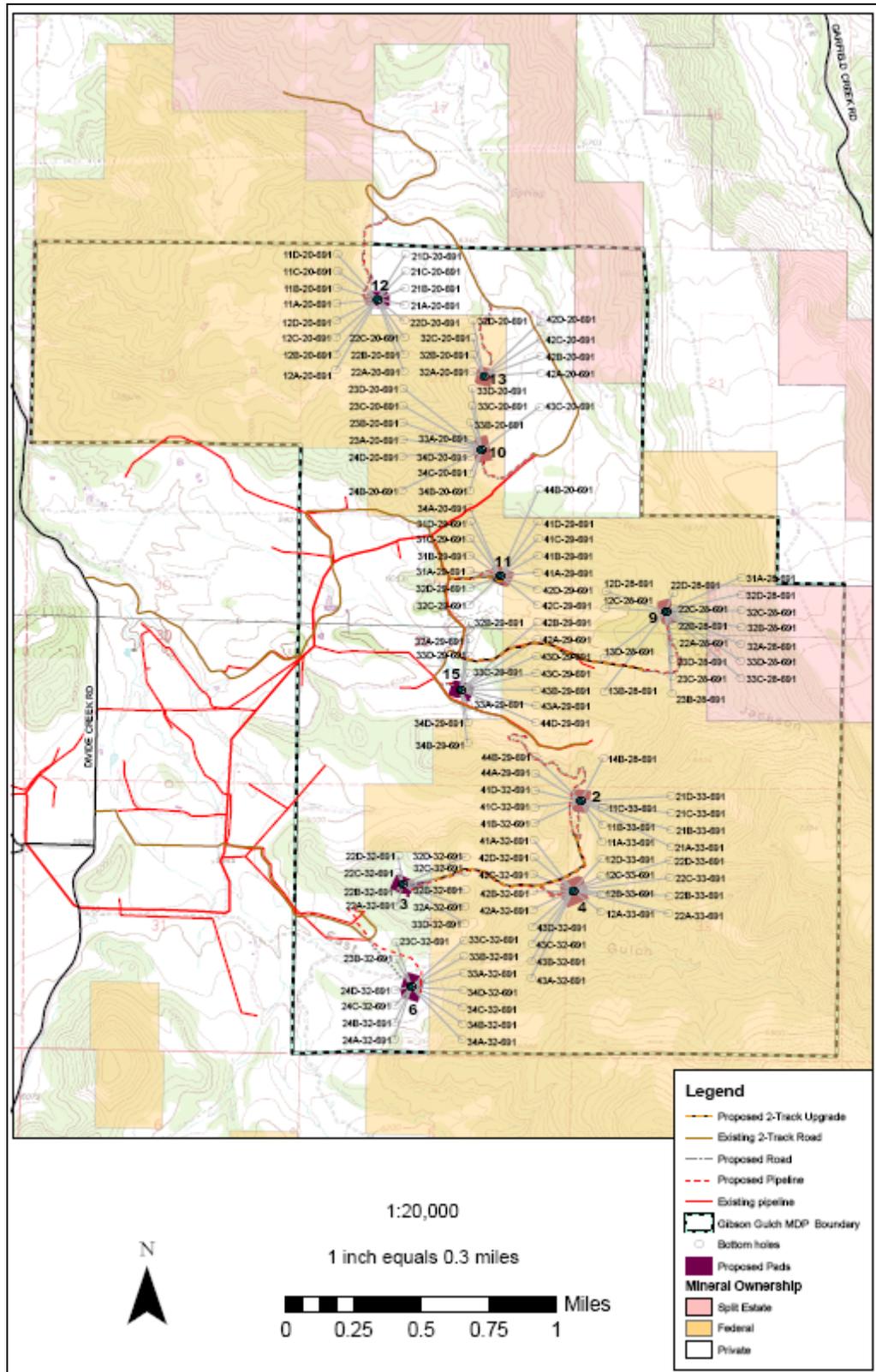


Figure 3. Gibson Gulch MDP Bottomhole Locations

Table 1. Location and Disturbance Acres of Proposed Project Components

Well Pads						
Pads	Lease	Location T6S, R 91W	Surface Status	Disturbance (acres)		Interim Reclamation (acres)
				Initial	Long-term	
Proposed New Pads						
Pad 2	COC051440 COC046972	NWNW Sec. 33	Federal	5.8	1.7*	4.1
Pad 3	COC046972 / Fee	SENW Sec. 32	Fee	5.4	1.5*	3.9
Pad 4	COC051440 COC046972	SWNE Sec. 32 SWNW Sec. 33	Federal	10.4	1.9*	8.5
Pad 6	COC046972 / Fee	E/2SW Sec. 32	Fee	7.1	1.6	5.5
Pad 9	COC41048	SENW Sec. 28	Federal	5.6	1.2*	4.4
Pad 10	COC50126 / Fee	SWSE Sec. 20	Federal	4.9	1.8*	3.1
Pad 11	COC046972 COC50126 Fee	NWNE Sec. 29	Fed/Fee	5.1	1.6	3.5
Pad 12	COC50126 Fed	NENW Sec. 20	Fed/Fee	5.0	1.5*	3.5
Pad 13	COC50126 Fee	SWNE Sec. 20	Federal	4.1	1.2	2.9
Subtotal New Pads				53.4	14.0	39.4
Existing Pads						
Pad 15	COC046972 / Fee	NWSE Sec. 29	Fee	--	--	--
Subtotal Existing Pads				--	--	--
BLM				<i>38.1</i>	<i>9.7</i>	<i>28.4</i>
Private				<i>15.3</i>	<i>4.3</i>	<i>11.0</i>
TOTAL				53.4	14.0	39.4
New Access Roads						
Well Pad Accessed	Length		Surface Status	Disturbance (acres)		Reclamation (acres)
	miles	feet		Initial	Long-term	
Pad 2	0.96	5,046	Federal	5.6**	3.5	2.1
Pad 3	0.51	2,683	Fee	2.5**	1.9	0.6
Pad 4	0.27	1,426	Fed/Fee	1.4**	1.0	0.4
Pad 6	0.20	1,067	Fee	1.3	0.8	0.5
Pad 9	1.05	5,563	Federal	5.4**	3.9	1.5
Pad 10	0.26	1,386	Fed/Fee	1.6	1.0	0.6
Pad 11	0.27	1,441	Federal	1.3**	1.0	0.3
Pad 12	0.38	1,990	Fed/Fee	2.3	1.4	0.9
Pad 13	0.27	1,443	Fed/Fee	1.7	1.0	0.7
Pad 15	0.05	260	Fee	0.3	0.2	0.1
BLM	3.47	18,250		19.0	12.7	6.3
Private	0.75	4,055		4.4	3.0	1.4
TOTAL	4.22	22,305		23.4	15.7	7.7

<i>New Pipelines</i>						
Well Pad Served	Length		Surface Status	Disturbance (acres)		Reclamation (acres)
	miles	feet		Initial	Long-term	
Pad 2	0.85	4,498	Federal	***	***	***
Pad 3	0.50	2,662	Fed/Fee	***	***	***
Pad 4	0.38	2,003	Fed	***	***	***
Pad 6	0.45	2,370	Fee	5.6	***	5.6
Pad 9	0.56	2,959	Fed/Fee	***	***	***
Pad 10	0.26	1,354	Fed/Fee	***	***	***
Pad 11	0.16	823	Fed/Fee	***	***	***
Pad 12	0.37	1,956	Federal	***	***	***
Pad 13	0.26	1,397	Fed/Fee	***	***	***
BLM	2.97	15,667		<i>0</i>	<i>0</i>	<i>0</i>
Private	0.82	4,355		<i>5.6</i>	<i>0</i>	<i>5.6</i>
TOTAL	3.79	20,022		5.6	0	5.6
SUBTOTAL PADS + ROADS + PIPELINES: BLM LANDS				57.1	22.4	34.7
SUBTOTAL PADS + ROADS + PIPELINES: PRIVATE LANDS				25.3	7.3	18.0
GRAND TOTAL PADS + ROADS + PIPELINES: ALL LANDS				82.4	29.7	52.7
Notes:						
(1) Road disturbance is estimated at an average of 50 feet from the toe of fill to top of cut. Long-term disturbance is estimated at 30 feet (22 feet running surface and 4 feet for each of two borrow ditches).						
(2) Pipelines would parallel the road corridor and would require a 50-foot short-term disturbance and 30-foot long-term disturbance.						
(3) Associated production facilities are included in the pad disturbance estimate (indicated in table by *).						
(4) It was assumed that the two-track to Pads 2, 3, 4, 9, and 11 would be improved for the disturbance calculations (indicated in table by **).						
(5) To avoid double calculation, pipeline disturbance is included under the associated road disturbance estimate because pipeline/road collocation would avoid additional disturbance (indicated in table by ***).						

Each onsite evaluation included assessment of the proposed pad and pit layout, cuts and fills, topsoil stockpiling, erosion control, access, pipeline routes, and reclamation potential of each activity. In some cases, multiple revisions to the proposed well location, pipeline, and access routes were made to minimize potential impacts and accommodate private landowners' requests. A surface use agreement (SUA) currently exists between BBC and the private landowners.

The proposed well pads would be constructed from native soil and rock materials using a bulldozer, grader, and excavator. The pads would be constructed by clearing all vegetation, stripping and stockpiling topsoil, and leveling the pad area using cut-and-fill techniques. Where appropriate, BBC would windrow ("berm") the topsoil in accordance with BMPs. Juniper trees would be selectively removed by the excavator and placed at the toe of the fill slopes to "catch" the fill and act as a filtration system for stormwater management. Pinyon trees would be chipped onsite or logged and removed from the site. Any other woody vegetation would be mulched or used in reclamation, and/or placed at the toe of the fill slopes. Cut slopes associated with pad construction would be left rough to provide a seed catchment surface, and may require "step cutting" when heights exceed 15 feet. Cut slopes for pad construction would not be steeper than 1.5:1 (horizontal to vertical) except when approved by the BLM. [In some situations, BLM approves steeper cut slopes to reduce the length, or visual height, of the cut.]

Where directed by BLM, the tops of the cut slopes and pad corners would be rounded to improve their appearance and reduce the volume of cut-and-fill material.

Initially, the size of the newly constructed pads would range from about 4.1 to 10.4 acres. After all wells are drilled, completed and production facilities are installed, interim reclamation activities would begin. Cuts and fills would be recontoured and revegetated to blend in with adjacent natural slopes as much as possible, and seeded to reestablish vegetation cover. These interim reclamation techniques would result in approximately a 61% reduction of surface disturbance that would remain over the long-term life of the project (i.e., 20 to 30 years). Table 1 presents data on short-term ground disturbance during drilling and completion and long-term ground disturbance following interim reclamation.

Drill cuttings would be allowed to dry and would be buried on location in the cuttings pit. If all wells on the pad are not drilled consecutively, BBC would request approval to leave the pad unreclaimed, fencing the cuttings pit until the following drilling season. Within 90 days of completing a well, BBC would implement temporary (pre-interim) reclamation or standard interim reclamation practices for that portion of each well pad not needed for production facilities/operations as identified in the surface COAs. If additional practices are needed, BBC would submit proposed BMPs approved by the Authorized Officer that would be implemented on the "open" pad to control storm water drainage and weeds, and provide for wildlife protection measures, dust abatement, and visual resource management.

To prevent livestock from accessing any open cuttings pit, a fence would be constructed and remain until all wells are drilled, completed and the pit is closed.

The sides of the well pads would be bermed, as appropriate, to prevent stormwater from flowing off the pad and into nearby drainages. Stormwater would be directed to an opening in the berm that leads off the pad to a sediment trap as appropriate. The channel from the opening to the sediment trap, and the overflow from the trap, would be lined with riprap to dissipate energy and control erosion. BBC's stormwater management efforts may include additional engineering measures, such as the installation of culverts to divert water flow away from surface locations as needed.

Existing Well Pads

The one existing well pad was constructed using the same general methodology as proposed for the new pads. The development of the wells proposed for this location would not require new surface disturbance. The development of the existing well pads on Federal surface or on private lands, but involving Federal mineral estate, would be subject to the same mitigation measures as described for the proposed new pads.

Proposed Access Roads

The primary access route to the area would be from Interstate 70 exiting at Silt, Colorado (Exit 97). The directions to the Gibson Gulch area are as follows: After exiting I-70 proceed to the frontage road at the south end of the Silt/I-70 interchange; proceed in a general easterly direction along this frontage road 0.4 miles to the intersection with County Road 311 (CR 311); turn right and follow CR 311 in a general southerly direction crossing the Colorado River and continue 0.6 miles to the intersection with CR 331; turn left and follow CR 311 in a general easterly direction for 1.4 miles to the intersection with CR 335. To reach Pad 10, Pad 12, and Pad 13, proceed in a general easterly direction along CR 335 for 1.1 miles to an existing gravel pit on the right; turn right and follow a gravel road in a general southeasterly direction through private lands to the project area. To reach all other GGMDP pads, turn right at the intersection of CR 311 and CR 335, and follow CR 335 in a general southeasterly direction along Divide Creek approximately 2.7 miles traveling through private lands and turn left on the gravel access road

which leads into the project area (Figure 1). Please note that BBC is in negotiations with the Garfield County Road and Bridge Department as discussed in the *Access and Transportation* section of this EA.

Within the project area, the road network would be extended from existing and proposed roads to provide access to the proposed pad locations. The extension of the road network would involve improvement of approximately 4.2 miles of new road.

Roads would be designed and maintained to an appropriate standard necessary to accommodate their intended functions, as described in the *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* (BLM and USFS 2007) and BLM Handbook 9113- *Roads Manual*.

Various segments of the proposed and existing access roads are outside BBC's lease boundaries. In order to gain access for the use of existing roads and the construction and use of proposed roads, BBC intends to apply for a Right-of-Way (ROW) authorization to access the 10 well pads. This authorization would grant access across those BLM-administered lands outside the lease boundaries. They would apply for a ROW width of 50 feet for the proposed roads and comply with the standard and site-specific COAs specified by the Authorized Officer. The running surface would be an all-weather type with an aggregate surface. The width could vary from 22 to 24 feet but would typically be 22 feet wide throughout the project area. Actual width of specific road segments would be based on safety, site distance, grade, topography, anticipated traffic flow, and visual resource management issues.

Road construction or reconstruction would include clearing and grubbing of brush and trees, windrowing of topsoil, constructing reinforced rolling dips and grade dips where feasible, installing culverts in ditched sections and side drainages to provide ditch relief and sediment control, constructing retaining structures on steep slopes (as approved by the BLM), placement of slash and topsoil on cut-and-fill slopes, placing erosion control matting on cut-and-fill slopes as designated on the ground by the BLM, seeding disturbed areas outside the driving surface (except pullouts and ditches), and installing cattle guards and road closure gates where needed to accommodate use for grazing of livestock.

Revegetation of road ditches and cut-and-fill slopes would help stabilize exposed soil and reduce sediment loss, reduce the growth of noxious weeds, reduce maintenance costs, maintain scenic quality and forage, and protect habitat. To ensure successful growth of plants and forbs, topsoil would be stripped and stockpiled during road construction and re-spread to the greatest degree practical on cut slopes, fill slopes, and borrow ditches prior to seeding.

The average grade would be 10% or less, wherever possible. The 10% grade would only be exceeded where the physical terrain or unusual circumstances require it. Minimum horizontal curve radii would be 100 feet. Where terrain would not allow a 100-foot curve radius, the curve would be widened. Road construction would result in 23.4 acres of initial ground disturbance. Following interim reclamation, the long-term disturbance would be approximately 15.7 acres. Road maintenance would be performed as needed to ensure safe travel.

Proposed Gas Gathering and Water Pipelines

A gas gathering and water pipeline network is necessary to gather and deliver gas offsite to existing main gathering lines, and to transport flowback and produced water for use in other completion operations. Approximately 3.8 miles of pipelines would be installed as part of the Proposed Action. The gas gathering system would consist of steel pipelines, with a maximum allowable working pressure of 1440 psi and a diameter up to 12 inches. The water lines would be from 4 to 12 inches in diameter and installed next to the gas pipelines in a common trench to minimize surface disturbance. Gathering lines that parallel new road construction would generally be installed in the uphill or cut side of the road along

the shoulder prior to final grading and aggregate application. These pipelines would be operated and maintained by BBC through the life of the project.

The clearing width for pipeline construction would generally be 50 feet, with additional width determined by topography. BBC would install the gathering lines in the disturbed area necessary to construct the access road. Construction would be performed within this area of disturbance. The road would be the working side of the construction. The pipeline trench would be excavated mechanically primarily in the uphill, or cut side of the road corridor, with an excavator (trackhoe), and would be approximately three feet wide and at least four feet deep. Gas pipeline segments would be welded together and lowered in the trench. The water line would then be placed into the ditch and separated from the gas line by sandbags or other means. Both lines would be covered with excavated material, and then each pipeline would be pressure tested with fresh water and/or nitrogen gas to locate any leaks.

Fresh water or nitrogen used for pressure testing of pipelines would be obtained offsite and transported to the testing location by truck. Any water used in pressure testing would be transported to an existing offsite evaporation pond facility or approved disposal facility. Nitrogen used in pressure testing would be vented to the atmosphere.

Mitigation Common to All Construction Operations

Trees removed from the pad locations would be placed at the toe of the fill slopes to act as a sediment control and filtration system for storm water management, and/or placed back on the reclaimed surfaces. Trees removed along access roads would be selectively removed by an excavator and placed at the toe of the fill slopes to “catch” the fill, as well as act as a filtration system for storm water management. Cut pinyon pine trees would be chipped, buried, or logged and removed from the site to prevent the spread of the *Ips* beetle.

If an excavator is not used, trees would be cut to a maximum stump height of 6 inches and placed back onto the cut and/or fill slopes with the slash height not to exceed 24 inches. Rootballs would be buried or placed at the toe of the fill slopes. Trees would not be dozed off the access road, except on private surface where trees may be dozed with consent from the landowner. Trees and other vegetation may be dozed on pipeline routes and then pulled back onto the ROW as part of final reclamation. Other vegetation, such as sagebrush and other shrubs, may be scattered offsite or placed on well pads and road fills to help visually screen the slopes. On pads where boulder fields exist, reclamation would include replacement of boulders in order to create a more natural appearance.

Drilling and Completion

Up to 131 wells would be drilled as part of the Proposed Action. Table 2 lists the surface location of the wells, as well as the well bottomhole locations. BBC’s drilling operations would be conducted in compliance with all Federal Onshore Oil and Gas Orders, all applicable rules and regulations, and Notices to Lessees. Drilling rigs in the GGMDP area would be targeting natural gas producing horizons in the Mesa Verde and Iles formations at depths of 6,500 to 8,500 feet.

Individual wells would require approximately 7 to 12 days to drill and approximately 7 days to complete. Pads with multiple wells would be occupied for a more extended period of time depending on the number of wells drilled. Production results for wells drilled during the first year would be used to plan and design the drilling program for subsequent years.

Table 2. List of Wells and Bottomhole Locations

<i>Well Name</i>	<i>Sec.</i>	<i>T.</i>	<i>R.</i>	<i>Footages</i>	<i>Minerals</i>
Pad 2: Federal Surface					
GGU Fed 41B-32-691	32	6S	91W	490 ft FNL, 664 ft FEL	Federal
GGU Fed 41C-32-691	32	6S	91W	820 ft FNL, 664 ft FEL	Federal
GGU Fed 41D-32-691	32	6S	91W	165 ft FNL, 664 ft FEL	Federal
GGU Fed 44A-29-691	29	6S	91W	165 ft FSL, 664 ft FEL	Federal
GGU Fed 14B-28-691	28	6S	91W	490 ft FSL, 664 ft FWL	Federal
GGU Fed 11C-33-691	33	6S	91W	490 ft FNL, 664 ft FWL	Federal
GGU Fed 11B-33-691	33	6S	91W	820 ft FNL, 664 ft FWL	Federal
GGU Fed 11A-33-691	33	6S	91W	1,135 ft FNL, 664 ft FWL	Federal
GGU Fed 21D-33-691	33	6S	91W	205 ft FNL, 1,990 ft FWL	Federal
GGU Fed 21C-33-691	33	6S	91W	531 ft FNL, 1,990 ft FWL	Federal
GGU Fed 21B-33-691	33	6S	91W	857 ft FNL, 1,990 ft FWL	Federal
GGU Fed 21A-33-691	33	6S	91W	1,184 ft FNL, 1,990 ft FWL	Federal
GGU Fed 44B-29-691	33	6S	91W	490 ft FSL, 664 ft FEL	Federal
Pad 3: Private Surface					
GGU Barge 22A-32-691	32	6S	91W	2,450 ft FNL, 1,990 ft FWL	Fee
GGU Barge 22B-32-691	32	6S	91W	2,145 ft FNL, 1,990 ft FWL	Fee
GGU Barge 22C-32-691	32	6S	91W	1,800 ft FNL, 1,990 ft FWL	Fee
GGU Barge 22D-32-691	32	6S	91W	1,475 ft FNL, 1,990 ft FWL	Fee
GGU Barge Fed 32D-32-691	32	6S	91W	1,475 ft FNL, 1,990 ft FEL	Federal
GGU Barge Fed 32C-32-691	32	6S	91W	1,800 ft FNL, 1,990 ft FEL	Federal
GGU Barge Fed 32B-32-691	32	6S	91W	2,130 ft FNL, 1,990 ft FEL	Federal
GGU Barge Fed 32A-32-691	32	6S	91W	2,450 ft FNL, 1,990 ft FEL	Federal
GGU Barge Fed 33D-32-691	32	6S	91W	2,490 ft FNL, 1,990 ft FEL	Federal
Pad 4: Federal Surface					
GGU Fed 41A-32-691	32	6S	91W	1,145 ft FNL, 664 ft FEL	Federal
GGU Fed 42A-32-691	32	6S	91W	2,500 ft FNL, 664 ft FEL	Federal
GGU Fed 42B-32-691	32	6S	91W	2,160 ft FNL, 664 ft FEL	Federal
GGU Fed 42C-32-691	32	6S	91W	2,820 ft FNL, 664 ft FEL	Federal
GGU Fed 42D-32-691	32	6S	91W	1,485 ft FNL, 664 ft FEL	Federal
GGU Fed 43D-32-691	32	6S	91W	2,460 ft FSL, 664 ft FEL	Federal
GGU Fed 43C-32-691	32	6S	91W	2,120 ft FSL, 664 ft FEL	Federal
GGU Fed 43B-32-691	32	6S	91W	1,780 ft FSL, 664 ft FEL	Federal
GGU Fed 43A-32-691	32	6S	91W	1,440 ft FSL, 664 ft FEL	Federal
GGU Fed 22A-33-691	33	6S	91W	2,525 ft FNL, 2,000 ft FWL	Federal
GGU Fed 22B-33-691	33	6S	91W	2,175 ft FNL, 2,000 ft FWL	Federal
GGU Fed 12D-33-691	33	6S	91W	1,475 ft FNL, 664 ft FWL	Federal
GGU Fed 12C-33-691	33	6S	91W	1,825 ft FNL, 664 ft FWL	Federal
GGU Fed 12B-33-691	33	6S	91W	2,175 ft FNL, 664 ft FWL	Federal
GGU Fed 12A-33-691	33	6S	91W	2,525 ft FNL, 664 ft FWL	Federal
GGU Fed 22C-33-691	33	6S	91W	1,825 ft FNL, 2000 ft FWL	Federal
GGU Fed 22D-33-691	33	6S	91W	1,475 ft FNL, 2000 ft FWL	Federal

Well Name	Sec.	T.	R.	Footages	Minerals
Pad 6: Private Surface					
GGU Miller Fed 33A-32-691	32	6S	91W	1,510 ft FSL, 1,990 ft FEL	Federal
GGU Miller Fed 33B-32-691	32	6S	91W	1,837 ft FSL, 1,990 ft FEL	Federal
GGU Miller Fed 33C-32-691	32	6S	91W	2,163 ft FSL, 1,990 ft FEL	Federal
GGU Miller 23C-32-691	32	6S	91W	2,130 ft FSL, 1,990 ft FWL	Fee
GGU Miller 24D-32-691	32	6S	91W	1,184 ft FSL, 1,990 ft FWL	Fee
GGU Miller 24C-32-691	32	6S	91W	857 ft FSL, 1,990 ft FWL	Fee
GGU Miller 24B-32-691	32	6S	91W	531 ft FSL, 1,990 ft FWL	Fee
GGU Miller 24A-32-691	32	6S	91W	205 ft FSL, 1,990 ft FWL	Fee
GGU Miller Fed 34A-32-691	32	6S	91W	205 ft FSL, 1,990 ft FEL	Federal
GGU Miller Fed 34B-32-691	32	6S	91W	531 ft FSL, 1,990 ft FEL	Federal
GGU Miller Fed 34C-32-691	32	6S	91W	857 ft FSL, 1,990 ft FEL	Federal
GGU Miller Fed 34D-32-691	32	6S	91W	1,184 ft FSL, 1,990 ft FEL	Federal
GGU Fed 23B-32-691	32	6S	91W	1,800 ft FSL, 1,990 ft FWL	Fee
Pad 9: Federal Surface					
GGU Fed 13D-28-691	28	6S	91W	2,450 ft FSL, 664 ft FWL	Federal
GGU Fed 12C-28-691	28	6S	91W	1,837 ft FNL, 664 ft FWL	Federal
GGU Fed 12D-28-691	28	6S	91W	1,510 ft FNL, 664 ft FWL	Federal
GGU Fed 22D-28-691	28	6S	91W	1,510 ft FNL, 1,990 ft FWL	Federal
GGU Fed 22C-28-691	28	6S	91W	1,837 ft FNL, 1,990 ft FWL	Federal
GGU Fed 22B-28-691	28	6S	91W	2,163 ft FNL, 1,990 ft FWL	Federal
GGU Fed 22A-28-691	28	6S	91W	2,490 ft FNL, 1,990 ft FWL	Federal
GGU Fed 23D-28-691	28	6S	91W	2,466 ft FSL, 1,990 ft FWL	Federal
GGU Fed 23C-28-691	28	6S	91W	2,130 ft FSL, 1,990 ft FWL	Federal
GGU Fed 23B-28-691	28	6S	91W	1,800 ft FSL, 1,990 ft FWL	Federal
GGU Fed 33C-28-691	28	6S	91W	2,142 ft FSL, 1,990 ft FEL	Federal
GGU Fed 33D-28-691	28	6S	91W	2,471 ft FSL, 1,990 ft FEL	Federal
GGU Fed 13B-28-691	28	6S	91W	1,800 ft FSL, 664 ft FWL	Federal
Pad 10: Federal Surface					
GGU Fed 23A-20-691	20	6S	91W	1,496 ft FSL, 1,990 ft FWL	Federal
GGU Fed 23B-20-691	20	6S	91W	1,837 ft FSL, 1,990 ft FWL	Federal
GGU Fed 23C-20-691	20	6S	91W	2,163 ft FSL, 1,990 ft FWL	Federal
GGU Fed 24B-20-691	20	6S	91W	490 ft FSL, 1,990 ft FWL	Federal
GGU Fed 24D-20-691	20	6S	91W	1,184 ft FSL, 1,990 ft FWL	Federal
GGU Fed 33A-20-691	20	6S	91W	1,475 ft FSL, 1,990 ft FEL	Federal
GGU Fed 33B-20-691	20	6S	91W	1,837 ft FSL, 1,990 ft FEL	Federal
GGU Fed 33C-20-691	20	6S	91W	2,100 ft FSL, 1,990 ft FEL	Federal
GGU Fed 34C-20-691	20	6S	91W	820 ft FSL, 1,990 ft FEL	Federal
GGU Fed 34B-20-691	20	6S	91W	490 ft FSL, 1,990 ft FEL	Federal
GGU 43C-20-691	20	6S	91W	2,095 ft FSL, 664 ft FEL	Fee
GGU Fed 34D-20-691	20	6S	91W	1,184 ft FSL, 1,990 ft FEL	Federal
GGU Fed 33D-20-691	20	6S	91W	2,440 ft FSL, 1,990 ft FEL	Federal
GGU Fed 23D-20-691	20	6S	91W	2,450 ft FSL, 1,990 ft FWL	Federal

<i>Well Name</i>	<i>Sec.</i>	<i>T.</i>	<i>R.</i>	<i>Footages</i>	<i>Minerals</i>
Pad 11: Federal/Private Surface					
GGU Fed 34A-20-691	20	6S	91W	165 ft FSL, 1,990 ft FEL	Federal
GGU 44B-20-691	20	6S	91W	460 ft FSL, 666 ft FEL	Fee
GGU Fed 41D-29-691	29	6S	91W	165 ft FNL, 664 ft FEL	Federal
GGU Fed 41C-29-691	29	6S	91W	490 ft FNL, 664 ft FEL	Federal
GGU Fed 41B-29-691	29	6S	91W	820 ft FNL, 664 ft FEL	Federal
GGU Fed 41A-29-691	29	6S	91W	1,184 ft FNL, 664 ft FEL	Federal
GGU Fed 31A-29-691	29	6S	91W	1,153 ft FNL, 1,990 ft FEL	Federal
GGU Fed 31B-29-691	29	6S	91W	820 ft FNL, 1,990 ft FEL	Federal
GGU Fed 31C-29-691	29	6S	91W	490 ft FNL, 1,990 ft FEL	Federal
GGU Fed 31D-29-691	29	6S	91W	165 ft FNL, 1,990 ft FEL	Federal
GGU Fed 42D-29-691	29	6S	91W	1,475 ft FNL, 664 ft FEL	Federal
GGU Fed 42C-29-691	29	6S	91W	1,812 ft FNL, 664 ft FEL	Federal
GGU 32C-29-691	29	6S	91W	1,800 ft FNL, 1,990 ft FEL	Fee
GGU 32D-29-691	29	6S	91W	1,475 ft FNL, 1,990 ft FEL	Fee
Pad 12: Federal/Private Surface					
Jolley 21C-20-691	20	6S	91W	531 ft FNL, 1,990 ft FWL	Fee
Jolley Fed 11A-20-691	20	6S	91W	1,184 ft FNL, 664 ft FWL	Federal
Jolley Fed 12A-20-691	20	6S	91W	2,490 ft FNL, 664 ft FWL	Federal
Jolley 21A-20-691	20	6S	91W	1,184 ft FNL, 1,990 ft FWL	Fee
Jolley Fed 22A-20-691	20	6S	91W	2,490 ft FNL, 1,990 ft FWL	Federal
Jolley Fed 11D-20-691	20	6S	91W	205 ft FNL, 664 ft FWL	Federal
Jolley Fed 12D-20-691	20	6S	91W	1,510 ft FNL, 664 ft FWL	Federal
Jolley Fed 22D-20-691	20	6S	91W	1,510 ft FNL, 1,990 ft FWL	Federal
Jolley Fed 11B-20-691	20	6S	91W	857 ft FNL, 664 ft FWL	Federal
Jolley Fed 12B-20-691	20	6S	91W	2,163 ft FNL, 664 ft FWL	Federal
Jolley 21B-20-691	20	6S	91W	857 ft FNL, 1,990 ft FWL	Fee
Jolley Fed 22B-20-691	20	6S	91W	2,163 ft FNL, 1,990 ft FWL	Federal
Jolley Fed 11C-20-691	20	6S	91W	531 ft FNL, 664 ft FWL	Federal
Jolley Fed 12C-20-691	20	6S	91W	1,837 ft FNL, 664 ft FWL	Federal
Jolley Fed 22C-20-691	20	6S	91W	1,837 ft FNL, 1,990 ft FWL	Federal
Jolley 21D-20-691	20	6S	91W	205 ft FNL, 1,990 ft FWL	Fee
Pad 13: Federal Surface					
Federal 32A-20-691	20	6S	91W	2,490 ft FNL, 1,990 ft FEL	Federal
Jolley 42A-20-691	20	6S	91W	2,490 ft FNL, 664 ft FEL	Fee
Federal 32D-20-691	20	6S	91W	1,495 ft FNL, 1,990 ft FEL	Federal
Jolley 42D-20-691	20	6S	91W	1,495 ft FNL, 664 ft FEL	Fee
Federal 32B-20-691	20	6S	91W	2,160 ft FNL, 1,990 ft FEL	Federal
Jolley 42B-20-691	20	6S	91W	2,160 ft FNL, 664 ft FEL	Fee
Federal 32C-20-691	20	6S	91W	1,830 ft FNL, 1,990 ft FEL	Federal
Jolley 42C-20-691	20	6S	91W	1,830 ft FNL, 664 ft FEL	Fee
Pad 15: Fee Surface					
GGU Swanson Fed 42B-29-691	29	6S	91W	2,142 ft FNL, 665 ft FEL	Federal
GGU Swanson Fed 42A-29-691	29	6S	91W	2,471 ft FNL, 665 ft FEL	Federal

<i>Well Name</i>	<i>Sec.</i>	<i>T.</i>	<i>R.</i>	<i>Footages</i>	<i>Minerals</i>
GGU Swanson 32A-29-691	29	6S	91W	2,471 ft FNL, 1,990 ft FEL	Fee
GGU Swanson 32B-29-691	29	6S	91W	2,141 ft FNL, 1,990 ft FEL	Fee
GGU Swanson Fed 43D-29-691	29	6S	91W	2,471 ft FSL, 664 ft FEL	Federal
GGU Swanson Fed 43C-29-691	29	6S	91W	2,142 ft FSL, 664 ft FEL	Federal
GGU Swanson Fed 43B-29-691	29	6S	91W	1,812 ft FSL, 664 ft FEL	Federal
GGU Swanson Fed 43A-29-691	29	6S	91W	1,475 ft FSL, 664 ft FEL	Federal
GGU Swanson 33D-29-691	29	6S	91W	2,471 ft FSL, 1,990 ft FEL	Fee
GGU Swanson 33C-29-691	29	6S	91W	2,141 ft FSL, 1,990 ft FEL	Fee
GGU Swanson 33A-29-691	29	6S	91W	1,475 ft FSL, 1,990 ft FEL	Fee
GGU Swanson Fed 44D-29-691	29	6S	91W	1,153 ft FSL, 664 ft FEL	Federal
GGU Swanson Fed 34D-29-691	29	6S	91W	1,153 ft FSL, 1,990 ft FEL	Federal
GGU Swanson Fed 34B-29-691	29	6S	91W	490 ft FSL, 1,990 ft FEL	Federal

BBC intends initially to drill and complete 7 to 18 wells on each pad. Development would be sensitive to price of gas and cost of services. The BLM would be notified of scheduling changes in a timely manner. If all wells on the pad are not drilled consecutively, BBC may request approval for the pad to remain unreclaimed until the following drilling season. BMPs would be implemented on the “open” pad to control stormwater drainage and weeds, and to provide for wildlife protection measures, dust abatement, and visual resource management. Because of geologic and market uncertainties, BBC may drill fewer wells than those described in the GGMDP.

Prior to drilling below the surface casing, well control equipment (blowout preventer and choke manifold) would be installed on the surface casing and both the well control equipment and surface casing would be tested to ensure adequate well control. The well control equipment would meet the minimum standards of Onshore Oil and Gas Order 2 (Drilling Operations), and the BLM would be notified in advance of all pressure tests in order to be present and witness the tests, if so desired. Charts of the test would be kept on location and made available to the BLM for inspection at any time.

BBC would use a small truck-mounted drilling rig to drill the conductor pipe and rat holes. Once the conductor pipe is set and cemented in place to the surface, a conventional drilling rig would be moved in and rigged up to spud (begin drilling) the surface hole and production holes to total depth. A downhole motor is used to directionally drill the well and to increase penetration rate. The motor is powered by drilling fluids that are used to drive the motor, cool the bit, and carry drill cuttings to the surface. Conventional water-based drilling mud/fluids would be utilized in the drilling of the wells. In order to maintain borehole stability, minimize possible damage to the formation, provide adequate carrying viscosity (thickness) to carry the drill cuttings out of the wellbore, and reduce downhole fluid losses, various non-toxic chemicals and additional materials may be added to the mud system.

For directional wells, an S-shaped directional design would be used to reach the targeted bottomhole locations. In general, a target radius of 25 feet would be used. Specific directional plans for each well would be included with the APDs. Downhole operations would be done with directional tools to facilitate proper direction and path of the well. The actual bottomhole locations would be horizontally separated from the surface pad positions by up to 2,000 feet.

Drill cuttings from the wellbore (mainly shale, sand, and miscellaneous rock minerals) would be directed to a reserve pit or a closed-loop system, and eventually buried on location. The reserve pit would adhere to BLM and Colorado Oil and Gas Conservation Commission (COGCC) guidelines.

After drilling the hole to its total depth, logging tools would be run into the well to evaluate the potential hydrocarbon resource. If the evaluation indicates adequate hydrocarbon resources are present and recoverable, steel production casing would be run and cemented in place in accordance with the well design, as approved by the BLM and any applicable COAs. The proposed casing and cementing program would be designed to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. BLM approval is necessary prior to the use of any isolating medium other than cement.

After production casing has been cemented in place, completion equipment would be moved onto the location. Well completion consists of running a cement bond log to evaluate the cement integrity and to correlate the cased hole logs to the open hole logs, perforating the casing across the hydrocarbon producing zones, and stimulating the formation to enhance the production of oil and gas. The typical method used for stimulation consists of hydraulic fracture treatment (“fracing” of the reservoir, in which sand mixed with non-toxic fluids is pumped into the producing formation with sufficient hydraulic pressure to fracture the rock formation. The sand serves as a proppant to keep the created fracture open, thereby allowing reservoir contents to move more efficiently into the wellbore.

The next phase would be to flow and test the wells to determine rates of production. A completion pit would be constructed adjacent to each pad, or centrally located to store water for frac operations and as a repository for flowback fluids. Completion pits would be designed to maintain at least 2 feet of freeboard. Spoil from the pits would be stockpiled within a drainage control berm along the edge of each pit and adjacent to the edge of each well pad. All of the above completion procedures would be conducted using truck-mounted workover rigs and would take approximately 7 days for each well. However, flow tests would continue at each well until such time as ultimate well productivity and production characteristics can be determined. Testing would require the installation of a wellhead, test meter, separator, and tank battery at each well.

A flare pit would be constructed a minimum of 110 feet from each wellhead and would be used during completion work. In the event a flare pit proves to be unworkable for a specific well, a flare stack would be installed. BBC would flow back the fluids and gas into a pressurized separation vessel, separating the fluid from the natural gas. The fluid would then either be returned to the pit or placed in a tank. Natural gas would primarily be directed into the gas gathering system or into the flare pit or flare stack with a constant source of ignition.

Flare lines would be directed so as to avoid environmental damage and as required by regulations. A deflector and/or directional orifice would be used to safeguard both personnel and the adjacent environment.

The source of water for drilling purposes would be from private landowners. The water would be transported by pipeline or licensed haulers. Water permits would be filed by the licensed haulers.

PRODUCTION PHASE – OPERATIONS AND MAINTENANCE

Surface Facilities

Surface facilities at each well pad location would consist of wellheads, separation units, gas metering units, volatile emission combusters, radio antennas, solar panel brackets, chemical storage containers less than 500 gallons in capacity and aboveground condensate and produced water tanks with approximately 300- to 500-barrel (bbl) capacities each. Multi-well locations would share production equipment, whenever feasible, to minimize surface occupancy and disturbance. All facilities would be located on the well pad, except for pads 2, 9 and 12. The tanks for Pad 2 would be located approximately 425 feet south

of Pad 2; the tanks for Pad 9 would be located approximately 670 feet south of Pad 9; and the tanks for Pad 12 would be located approximately 235 feet south of Pad 12. All production equipment located on, or associated with the development of Federal leases, would be painted to match the surrounding terrain and located to reasonably minimize visual impact. The BLM would select the color for these facilities, including containment barriers, at each site. The production equipment would be fenced to prevent contact with wildlife/livestock. Telemetry equipment would be used where feasible to remotely monitor well conditions. The use of telemetry equipment would minimize traffic to and from the well locations.

Tank batteries would be placed within secondary containment to prevent the offsite migration of accidentally spilled condensate or produced water. Secondary containment would consist of corrugated steel containment rings. Construction of the containment rings surrounding the tank batteries would be constructed to prevent lateral movement of fluids through an impermeable barrier attached to the rings and laid under the tanks. Secondary containment would be sized to contain a minimum of 110 % of the storage capacity of the single largest tank within the barrier. All loading lines would be placed inside the containment barrier or would have secondary containment vessels.

Road Maintenance

New or existing roads used for access to the proposed well pads or other surface facilities within the GGMDP area would be inspected by the BLM and maintained by BBC on an as-needed or (at a minimum) quarterly basis throughout the production phase as well as the construction phase. This inspection and maintenance would include such items as:

- Road surface grading and graveling
- Relief ditch, culvert, and cattle guard cleaning
- Erosion control measures for cut-and-fill slopes and other disturbed areas
- Road closures in periods of excessive soil moisture to prevent rutting caused by vehicular traffic
- Road and slope stabilization measures as required until final abandonment and reclamation
- Weed control
- Dust abatement using methods and frequency determined in consultation with BLM.

Gas Gathering

Several new gas-gathering pipelines would be added to the existing pipeline network. The new pipelines would generally be buried adjacent to the new access roads. Construction of the pipelines would precede construction of the new roads in a planned sequence. All vehicles and trenching equipment would use the road as part of the construction right-of-way. This would limit the temporary disturbance to average 50 feet in width. The pipeline alignment would first be cleared of vegetation remaining after road construction. The pipeline trench would be excavated mechanically to a depth that would allow approximately four to five feet of earth to be placed on top of the pipeline. Pipe segments would then be welded together and tested, lowered into the trench, and covered with excavated material.

After construction, pipelines would be pressure tested with fresh water or nitrogen gas to locate any leaks. Fresh water or nitrogen used for testing would be obtained offsite. After testing, the water would be disposed in the same manner as produced water, i.e., hauled to existing evaporation pond facility or to an approved disposal facility. If nitrogen is used, it would be released to the atmosphere following testing.

Produced Water Management

All “frac” flowback water would be contained in temporary tanks or lined frac pits during completion operations and would be recycled for re-use in drilling and completion operations or transported offsite to an approved treatment facility.

Multiple 300- to 500-bbl steel tanks would be installed on the well pad or offsite facilities to capture produced water. These tanks would be onsite for the life of the wells. As with frac flowback water, produced water may be recycled for re-use in drilling and completion operations of other wells within the GGMDP area or transported offsite to an approved disposal facility.

Condensate would be captured at the well site in steel storage tank(s) and transported to market by tanker trucks.

Interim Reclamation

After well completion activities are finalized, BBC would reduce the size of the well pad to the minimum surface area needed for production facilities and future workovers, while providing for reshaping and stabilization of cut and fill slopes. In brief, interim reclamation would be accomplished by grading, leveling, and seeding, as required by the BLM or landowner. Interim reclamation would reduce the disturbed area at each pad to approximately 1.9 acres or less after well development. BBC would implement the following interim reclamation activities after all wells have been completed on a location:

- The well location and surrounding areas(s) would be cleared of all debris, materials, and trash not required for production. Other waste materials would be disposed at an approved landfill.
- All pits, cellars, rat holes, and other boreholes at drilling locations unnecessary for further lease operations would be backfilled to conform to surrounding terrain after the drilling rig is released.
- All drill cuttings would either be buried in the onsite pit or buried in an onsite cuttings trench.
- Areas not necessary for production and future workovers would be reshaped to resemble the original landscape contour. Stockpiled topsoil would be redistributed and disked on the area to be reclaimed and reseeded using a BLM-approved mix.

Interim reclamation of that portion of each well pad and access road not needed for production facilities/operations would be reclaimed within 90 days from the date of well completion, weather permitting. Dry or other non-producing well locations would be plugged, abandoned, and reclaimed within 90 days of well completion, weather permitting.

Some locations would require the use of special reclamation practices. These practices could include hydromulching, straw mat application on steeper slopes, fertilizing, seedbed preparation, contour furrowing, watering, terracing, water barring, and the replacement of topsoil. All reclamation efforts would employ seed mixes as approved by the BLM or the landowner. To prevent livestock/wildlife grazing pressure, pads would be fenced for the first two growing seasons or until the seeded species are established.

Workovers / Recompletions

Periodically, the workover or recompletion of a well may be required to ensure that efficient production is maintained. Workovers can include repairs to the well bore equipment (casing, tubing, rods, or pump) the wellhead, or the production facilities. These repairs would usually be completed during daylight hours.

The frequency of this type of work cannot be accurately projected because workovers vary from well to well. In the case of multi-well pads, space for equipment would usually be limited to the “in-use” (i.e., disturbed) area of the surface location, although it is possible that interim reclamation could be delayed by workover operations. In the case of a well recompletion, a water completion pit may have to be constructed.

FINAL ABANDONMENT AND RECLAMATION

Well and Pipeline Plugging and Abandonment

Upon abandonment, each well would be plugged with cement and its related surface equipment would be removed. Subsurface pipelines would be plugged at specific intervals and site contouring would be accomplished using appropriate heavy equipment. All disturbed surface soil would be reseeded with native vegetation. The seed mix used would conform to the typical vegetation surrounding the specific well site and would be approved by the BLM or private landowner.

A Sundry Notice would be submitted by BBC to the BLM describing the technical or environmental aspects of final plugging and abandonment. This notice would describe final reclamation procedures and any mitigation measures associated with the final reclamation performed by the operator. The BLM and COGCC standards for plugging would be followed. A configuration diagram, a summary of plugging procedures, and a job summary with techniques used to plug the well bore (e.g., cementation) would be included in the Sundry Notice.

Final Reclamation

All surface disturbances would be recontoured and revegetated according to an approved reclamation plan. Final well site reclamation would be performed and monitored in accordance with the Glenwood Springs Resource Area (GSRA) reclamation policy in the 1998 Draft Supplemental Environmental Impact Statement (DSEIS), including control of noxious weeds, or consistent with new standards and protocols in effect at the time of final reclamation. Further information on reclamation standards is available in Appendix I of the 1999 FSEIS (BLM 1999b). One of the basic goals of the policy is to “establish desirable (seeded and native) vegetation to set the stage for the natural process to restore the site.” Consequently, one of the goals in this proposal is to accomplish as much reclamation on each well pad during the life of the well as possible, even on those pads with a large final reclamation or “in-use” area.

Unreclaimed areas or reclaimed areas that do not meet the objective of 3 to 4 years of sustained progress toward reclamation success (known as “operator complete”) would undergo the reclamation retreatment measures described in the SUPO, submitted as part of the GGMDP, and referenced with each APD. BBC would also meet the BLM bonding requirements. Additional bonding would be provided for sites with extremely difficult reclamation conditions, if repeated reclamation attempts have been unsuccessful, or final reclamation cannot be completed with standard reclamation measures.

BBC would restore the well locations and access roads to approximately their original contours. During reclamation of these sites, fill material would be pushed into cuts and up over the back slope. No depressions would be left that would trap water or form ponds. Upon completion of backfilling, leveling, and recontouring, the stockpiled topsoil would be evenly spread over the reclaimed area(s). All disturbed surfaces would be reseeded with a seed mixture recommended by the BLM or private landowner. The seedbed would then be prepared by disking and roller packing following the natural contours. Seed would be drilled on contours at a depth no greater than 0.5 inch. In areas that cannot be drilled, seed would be broadcast at double the seeding rate and harrowed into the soil. Certified weed-free seed would be used per BLM policy. Seeding should occur within 24 hours following completion of final seedbed preparation to

reduce the potential for establishment of weeds and before crusting of the soil, which can impede germination. If the seeding is unsuccessful, BBC would be required to make subsequent seedings.

Reclamation would be considered successful when the objectives described in the 1998 GSRA reclamation policy (BLM 1998) or other standards and protocols in effect at the time of initiation of final reclamation are achieved. Revegetation would be considered successful if it meets the objectives set forth in the 1998 DSEIS (BLM 1998). To summarize the objectives in Appendix E of the DSEIS, revegetation would be considered successful when the following objectives are met:

- Immediate short term: Establishment of desirable perennial vegetation by the end of the second growing season, capable of renewing itself.
- Acceptable establishment: Acceptable level of desirable vegetation by the end of the fifth growing season.
- Long-term establishment: Level of revegetation approximates the original predisturbance condition, in terms of canopy cover and species composition.

NO ACTION ALTERNATIVE

The No Action alternative would constitute denial of the APDs associated with the Proposed Action. However, elements of the Proposed Action do not require Federal approval prior to implementation. For example, three of the ten pads are located solely on private lands, and the 13 proposed Fee wells could be developed even if the APDs associated with the Federal leases are denied.

Although the development of the Fee wells would not result from the selection of the No Action alternative *per se*, impacts to the affected environment would occur from the development of the Fee location. These effects provide the basis for comparison to the impacts of the Proposed Action. This comparison is important because it shows what is likely to happen if the Proposed Action was not taken.

Under the No Action Alternative, the drilling and development of all wells proposed on BLM surface would not occur. The two pads on located on BLM and private surface would be moved to a location entirely on private land, and the seven Fee wells on those pads would still be developed. The construction of the two proposed Fee well pads would involve approximately 12.5 acres of initial surface disturbance and 3.1 acres over the long-term (i.e., after interim reclamation). Access to the area would follow the route defined and as presented in the Proposed Action. However, the construction of 3 miles of new pipeline and 3.5 miles of new road, resulting in approximately 19.0 acres of initial surface disturbance on BLM land, would not be required. Gas and flowback water would be transported offsite through the construction of approximately 3.8 miles of new pipelines. Construction, drilling and completion, production, interim reclamation, workovers or recompletion, final abandonment, final reclamation, and weed management would generally follow the methods presented in the Proposed Action.

Under this alternative, BLM would have no authority to institute mitigation measures designed to minimize impacts to natural and cultural resources. Any such measures would come under the jurisdiction of the COGCC.

SUMMARY OF LEASE STIPULATIONS

Table 3 provides a summary of lease stipulations that would apply to the Proposed Action. For a complete description of lease stipulations, see Federal leases COC41048, COC46972, COC50126, and COC51440. Although these lease stipulations do not apply to all of the elements of the Proposed Action and No Action alternative, these and any other protective measures deemed appropriate by the Authorized

Officer could be applied as COAs on individual APDs. They would also not apply to the wells drilled under the No Action alternative from the three pads located on private property, since no Federal gas would be produced.

Table 3. Summary of Lease Stipulations within the GGMDP Area

<i>Lease</i>	<i>Description of Lands</i>	<i>Pad</i>	<i>Lease Stipulations</i>
COC41048 Year: 1981	T6S, R91W, 6 th P.M., Garfield County, CO Section 28: W2, SE, S2NE, NWNE	Pad 9	Timing Limitation: No surface use is allowed during the following time period: January 1 through May 31. This stipulation does not apply to operation and maintenance of production facilities. For the purpose of protecting season wildlife habitats.
COC46972 Year: 1988	T6S, R91W, 6 th P.M., Garfield County, CO Section 29: E2E2, NWNE, SWSE Section 32: E2, NENW	Pad 11 Pad 15	Timing Limitation: No surface use is allowed during the following time period: January 16 through April 29. This stipulation does not apply to operation and maintenance of production facilities. For the purpose of protecting important seasonal wildlife habitat.
COC50126 Year: 1989	T6S, R91W, 6 th P.M., Garfield County, CO Section 19: N2, N2S2, Section 20: NWNW, S2NW, N2SW, SESW, W2SE, SWNE Section 21: W2NW	Pad 10 Pad 12 Pad 13	Timing Limitation: No surface use is allowed during the following time period: January 16 through April 29. This stipulation does not apply to operation and maintenance of production facilities. For the purpose of protecting critical deer and elk winter ranges.
COC51440 Year: 1990	T6S, R91W, 6 th P.M., Garfield County, CO Section 33: N2NW, SWNW	Pad 2 Pad 4	Timing Limitation: No surface use is allowed during the following time period: January 16 through April 29. This stipulation does not apply to operation and maintenance of production facilities. For the purpose of protecting critical deer and elk winter ranges.
COC50126 Year: 1989	T6S, R91W, 6 th P.M., Garfield County, CO Section 19: N2, N2S2 Section 20: NWNW, S2NW, N2SW, SESW, W2SE, SWNE Section 21: W2NW	Pad 10 Pad 12 Pad 13	Timing Limitation: No surface use is allowed during the following time period: April 2 through August 30. This stipulation does not apply to operation and maintenance of production facilities. For the purpose of protecting raptor nesting areas.

LAND USE 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 to the Plan include the *Oil and Gas Plan Amendment to the Glenwood Springs Resource Management Plan* (BLM 1991) and the *Oil & Gas Leasing & Development Record of Decision and Resource Management Plan Amendment* (BLM 1999a).

Decision Language: The 1991 Oil and Gas Plan Amendment (BLM 1991) included the following at page 3: “697,720 acres of BLM-administered mineral estate within the Glenwood Springs Resource Area are open to oil and gas leasing and development, subject to lease terms and (as applicable) lease stipulations” (BLM 1991, page 3). This decision was carried forward unchanged in the 1999 Record of Decision and RMP amendment at page 15 (BLM 1999a).

“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 two to three years activity for operator controlled leases within a reasonable geographic area” (BLM 1999a).

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. In addition, the Proposed Action describes a multi-year development plan over a large geographic area and, as such, is in conformance with the decision to require operators to submit MDPs, referred to at that time as GAPs.

STANDARDS FOR PUBLIC LAND HEALTH

In January 1997, Colorado BLM approved the Standards for Public Health. The five standards cover upland soils, riparian systems, plant and animal communities, threatened and endangered species, and water quality. Standards describe conditions needed to sustain public land health and relate to all uses of the public lands. The environmental analysis must address whether the Proposed Action or alternatives being analyzed would result in impacts that would maintain, improve or deteriorate land health conditions relative to these resources. A formal Land Health Assessment (LHA) conducted in 2009 included the GGMDP area, but the report will not be published until 2010. Sections of this EA that relate to one of the land health standards include an analysis of whether the Proposed Action would be likely to prevent the pertinent standards from being met.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section provides a description of the human and natural environmental resources that could be affected by the Proposed Action and No Action alternative. In addition, the section presents comparative analyses of the direct and indirect consequences on the affected environment stemming from the implementation of the various actions.

CRITICAL ENVIRONMENTAL ELEMENTS

A variety of laws, regulations, and policy directives mandate the evaluation of the effects of a Proposed Action and alternative(s) on certain critical environmental elements. The following discussions of individual resources address critical elements of the human environment that are present and affected by the Proposed Action and/or No Action alternative (see Table 4). Note in the table that not all of the critical elements that require inclusion in this Environmental Assessment (EA) are present, or if they are present, they may not be affected by the Proposed Action and alternative. Only those mandatory critical elements that are present and affected are described in the following discussions.

In addition to the mandatory critical elements are other resources that would be affected by the Proposed Action. These additional resources are discussed later under **Other Affected Resources**.

Table 4. Critical Elements of the Human Environment (Public Land Health Standard*)

Critical Element	Present		Affected		Critical Element	Present		Affected	
	Yes	No	Yes	No		Yes	No	Yes	No
Air Quality	X		X		Prime or Unique Farmlands	X		X	
ACECs		X		X	Special Status Species*	X		X	
Cultural Resources	X		X		Wastes, Hazardous or Solid	X		X	
Environmental Justice		X		X	Water Quality, Surface and Ground*	X		X	
Floodplains		X		X	Wetlands and Riparian Zones*	X		X	
Invasive, Non-native Species	X		X		Wild and Scenic Rivers		X		X
Migratory Birds	X		X		Wilderness/ WSAs		X		X
Native American Religious Concerns	X			X					

Air Quality

Affected Environment

The GGMDP is located in a semi-arid (dry and cold), mid-continental climate regime. The area is typical of the western high country with abundant sunshine, low humidity, low rainfall, and cold, snowy winters. The nearest meteorological measurements were collected at Rifle, Colorado (1910-2008) (WRCC 2009), approximately 10 miles northwest of the GGMDP area.

The annual average total precipitation at Rifle is 11.48 inches and includes an average total snowfall of 39.9 inches, with December and January being the snowiest months. Precipitation is relatively evenly distributed throughout the year. The Rifle area has cool temperatures, with average daily temperatures ranging between 9.4°F (low) and 36.8°F (high) in mid-winter and between 52.0°F (low) and 90.2°F (high) in mid-summer. The frost-free period (above 32°F) generally occurs from mid-May to mid-September. Table 5 shows the mean monthly temperature ranges and total monthly precipitation.

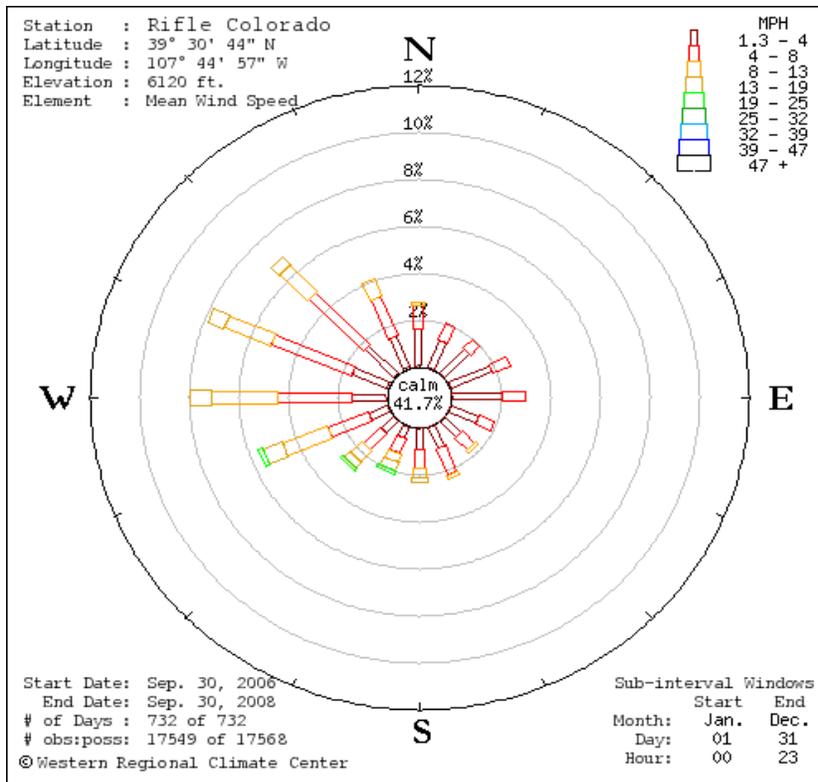
Figure 4 shows the relative frequency of winds with radial distributions by speed class indicating the direction of the wind source. From this information, it is evident that the winds originate from the northwest to southwest nearly 30% of the time. The annual mean wind speed is approximately 3.7 mph. The frequency and strength of the winds greatly affect the dispersion and transport of air pollutants. The potential for atmospheric dispersion is generally good, although nighttime cooling enhances stable air, inhibiting air pollutant mixing and transport. Dispersion conditions are the greatest on ridges, plateaus, and mountaintops. Table 6 shows the wind speed distribution.

Table 5. Mean Monthly Temperature Ranges and Total Mean Monthly Precipitation Amounts

Month	Average Temperature Range (°F)	Total Precipitation (inches)
January	9.3-36.8	0.86
February	16.6-43.9	0.77
March	24.2-53.8	0.94
April	31.4-64.2	1.01
May	38.7-74.0	1.00
June	45.2-84.0	0.73
July	52.1-90.2	1.03
August	50.4-87.6	1.13
September	41.4-79.4	1.11
October	31.1-67.3	1.19
November	21.2-51.4	0.88
December	12.4-39.4	0.93
ANNUAL	31.2-64.3	11.58

Source:(WRCC 2009)

Figure 4. Wind Rose for the Gibson Gulch MDP Area



Source: Rifle, CO meteorological data collected 2006-2008 (WRCC 2008).

Table 6. Wind Speed Distribution

Wind Speed (miles/hour)	Percent of Occurrence
1.3 – 4	20.4
4 – 8	22.6
8 – 13	11.7
13 – 19	4.1
19 – 25	0.8
>25.0	0.1
Calms (<1.3)	40.3

Source: Rifle meteorological data collected 2006-2008 (WRCC 2008).

The 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 at all locations to which the public has access. Although specific air quality monitoring has not been conducted in the field, regional air quality monitoring has been conducted near the study area. Air pollutants measured in the region for which ambient air quality standards exist include: carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter less than 10 microns (µ) in effective diameter (PM₁₀), particulate matter less than 2.5µ in effective diameter (PM_{2.5}), and sulfur dioxide (SO₂). Background pollutant concentrations for these pollutants are compared to the CAAQS and NAAQS in Table 7. As shown in Table 7, regional background values are well below established standards. The region is within attainment levels for all criteria pollutants.

Table 7. Air Pollutant Background Concentrations, Colorado and National Ambient Air Quality Standards, and Prevention of Significant Deterioration (PSD Increments)

Pollutant/Averaging Time		Measured Background Concentration	Colorado and/or National AAQS	Incremental Increase Above Legal Baseline PSD Class I/ II	
Carbon Monoxide (CO) ¹	1-hour	1,160 µg/m ³	40,000 µg/m ³ (35 ppm)	n/a	n/a
	8-hour	1,160 µg/m ³	10,000 µg/m ³ (9 ppm)	n/a	n/a
Nitrogen Dioxide (NO ₂) ²	Annual	10 µg/m ³	100 µg/m ³ (0.053 ppm)	2.5 µg/m ³	25 µg/m ³
Ozone ³	8-hour	149 µg/m ³ (highest)	147 µg/m ³ (0.075 ppm)	n/a	n/a
Particulate Matter (PM ₁₀) ¹	24-hour	114 µg/m ³ (highest)	150 µg/m ³	8 µg/m ³	30 µg/m ³
Particulate Matter (PM _{2.5}) ⁴	24-hour	40 µg/m ³ (highest)	35 µg/m ³	n/a	n/a
	Annual	11.2 µg/m ³	15 µg/m ³	n/a	n/a
Sulfur Dioxide (SO ₂) ⁵	3-hour	24 µg/m ³	1,300 µg/m ³ (0.5 ppm)	25 µg/m ³	512 µg/m ³
	24-hour	13 µg/m ³	365 µg/m ³ (0.14 ppm)	5 µg/m ³	91 µg/m ³
	Annual	5 µg/m ³	80 µg/m ³ (0.03 ppm)	2 µg/m ³	20 µg/m ³

¹ Background data collected in Rifle, 2008; highest levels recorded in April (Air Resource Specialists 2009).
² Background data collected by EnCana at site north of Parachute, 2007 (CDPHE 2008a).
³ Background data collected in Rifle, 2008; highest levels recorded in July (Air Resource Specialists 2009).
⁴ Background data collected in Rifle, September - December 2008; highest levels recorded in December (Air Resource Specialists 2009).
⁵ Background data collected at Unocal site, 1983-1984 (CDPHE 2008a).

Federal air quality regulations adopted and enforced by Colorado Department of Public Health and Environment (CDPHE) limit incremental emissions increases to specific levels defined by the classification of air quality in an area. The Prevention of Significant Deterioration (PSD) Program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. 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. The 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 Monument (approximately 65 miles south), and Eagles Nest Wilderness (approximately 60 miles east). Dinosaur National Monument (approximately 80 miles northwest) is listed as a Federal Class II area but is regulated as a Class I area for SO₂ by CDPHE. These sensitive areas have the potential to be impacted by cumulative project source emissions. Regional background pollutant concentrations and NAAQS, CAAQS, and PSD Class I and II increments are also presented in Table 7.

CDPHE, under its Environmental Protection Agency (USEPA)-approved State Implementation Plan (SIP), is the primary air quality regulatory agency responsible for determining potential impacts once detailed industrial development plans have been made. Those development plans are subject to applicable air quality laws, regulations, standards, control measures, and management practices. Therefore, CDPHE has the ultimate responsibility for reviewing and permitting the project prior to its operation. Unlike the conceptual “reasonable, but conservative” engineering designs used in National Environmental Policy Act (NEPA) analyses, any required CDPHE air quality preconstruction permitting demonstrations would be based on very site-specific, detailed engineering values, which would be assessed in the permit application review.

Environmental Consequences

Proposed Action

The GGMDP includes constructing, drilling, completing, and operating up to 131 wells, including 104 Federal wells and 27 private wells on 10 pads (9 new and 1 existing); constructing or upgrading 4.2 miles of associated access roads and 3.8 miles of pipelines; and installing several 300-500 bbl condensate and produced water tanks and a separator at each pad. The project does not include construction of any compressor stations or installation of any generators, dehydration units, or other treatment processes. Individual wells would require approximately 7 to 12 days to drill and approximately 7 days to complete.

Air quality would decrease during construction of the GGMDP wells due to pollutants generated from drilling and well pad construction. These pollutants include combustion emissions and fugitive dust associated with construction equipment and vehicles. Once construction activities are complete, air quality impacts associated with these activities would also cease. Drilling the wells at each of the pads is anticipated to take between 3 and 8 months depending on the number of wells installed per pad. Up to three drilling rigs would be utilized simultaneously; each rig includes three 1,486-hp engines. The highest potential estimated emissions from construction and drilling activities are shown in Table 8, assuming three rigs operating at once on separate pads, with 40% drill rig utilization; and also assuming that timing limitations are waived, allowing a 12-month drilling season. Emission calculations further assume that each well would take 7 to 12 days to drill and 7 days to complete, with the full drilling program requiring approximately 3 years. The anticipated air quality impacts associated with well pad construction and drilling are limited in duration and are anticipated to be minor sources. Emissions are not anticipated to affect Class I areas or to exceed ambient air quality standards.

Table 8. Potential Emissions from Drilling and Construction Activities*

Source	Pollutant	Emission Limits (g/braking hp/hr)	Yearly Hours of Operation	Annual Emissions (tons/year)	Reference
Three Drilling Rigs (H&P FlexRig3), each with Three 1,500-HP Diesel Engines	NMHC + NO _x	4.8	3,504	250.3	EPA Tier II
	CO	2.6	3,504	135.6	EPA Tier II
	VOC	1.0	3,504	52.1	EPA Tier I
	PM ₁₀	0.15	3,504	7.8	EPA Tier II
	PM _{2.5}	n/a	3,504	0.8	EPA PM ₁₀ Multiplier
	Formaldehyde	0.0018	3,504	0.094	EPA AP 42, Table 3.3-2
Construction Heavy Equipment	PM ₁₀	1.2 (tons/acre/mo)	1,008 (4.1 mo)	113.6	EPA AP 42, Table 13.2.3.3
	PM _{2.5}	n/a	1,008 (4.1 mo)	17.4	EPA PM ₁₀ Multiplier

*Activity durations are about 2 weeks each (well pad construction, 2 weeks at 8 hours per day; access road construction, 1-2 weeks per pad; pipeline construction, 2 weeks per pad; drilling and completion, 2 weeks per well). Assumes a 12 month per year construction and drilling season, spread evenly over 3 years, with 40% drill rig utilization. Total GGMDP disturbed acreage of 82.4 acres over 3 years equates to 27.5 acres per year. NMHC = non-methane hydrocarbons. Sources: CDPHE (2008b), USEPA (1996, 2005).

Once the wells are completed, ancillary equipment would be installed at each well pad associated with production and operation, including several 300 to 500 bbl condensate and produced water tanks and separators. The emissions from the condensate tanks are provided in Table 9. The calculated estimates assume that 15 bbl/day of water would be produced from each well and that approximately 10% of the produced water would be separated into condensate.

Table 9. Condensate Tank Emission Estimates Per Completed Well Pad

Source	Pollutant	Emission Factors (lb/bbl)	Production* (bbl/day)	Annual Emissions* (tons/year)	Reference
Several 400-bbl Condensate Tanks per Pad (7 to 18 Wells)	VOC	10	11-27	19-49	CDPHE Guidance for Garfield County

*Production and annual emission estimates are based on 7 and 18 wells, respectively.

Volatile organic compound (VOC) emissions are dependent on the characteristics of the condensate, tank operations, and production. The air impacts associated with the condensate tanks at each well pad are anticipated to be minor, but a stipulation listed in Appendix C requires VOC emissions controls on all producing pads in the GGMDP area, using either a vapor recovery or thermal destruction system. This equipment would reduce VOC emissions to a maximum of 1.0 G/hp-hr, as required by USEPA (Tier I) and CDPHE, and can effectively reduce VOC emissions by up to 95%.

Since the current land use plan was approved, 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 (National Academy of Sciences 2007).

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 (2007) 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” (National Academy of Sciences 2007). Other theories about the effect of GHGs on global climate change exist.

The assessment of GHG emissions and climate change remains in its formative phase. Therefore, it is not yet possible to know with certainty the net impact to climate from GHGs produced globally over the last century or from those produced today. 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. In addition, while any oil and gas leasing or development projects may contribute GHGs to the atmosphere, these contributions would not have a significant effect on a phenomenon occurring at the global scale believed by some to be due to more than a century of human activities.

No Action Alternative

In general, the air impacts of the No Action alternative would be less than the Proposed Action, but would include similar types of emissions and sources. Well pad, road, and pipeline construction and well drilling would still occur on private lands for the development of Fee gas resources. Thus, temporary fugitive dust and combustion emissions would still be associated with construction equipment, drilling rigs, and vehicles. Once the wells are installed, impacts on air quality are anticipated to be small to negligible and would include emissions from condensate tanks, separator heaters, and truck traffic.

Cultural Resources

Cultural resources are fragile and nonrenewable remains of prehistoric and historic human activity, occupation, or endeavor as reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features. Cultural resources comprise the physical remains themselves and the areas where significant human events occurred.

The National Historic Preservation Act (NHPA) of 1966 and the Archaeological Resource Protection Act of 1979 provide for the protection of significant cultural resources and traditional cultural properties. Section 106 of the NHPA describes the process that Federal agencies must follow to identify, evaluate, and coordinate their activities and recommendations concerning cultural resources. Significant cultural resources are defined as those listed on or eligible for listing on, the National Register of Historic Places (NRHP) and are referred to as historic properties.

Affected Environment

For the purposes of this analysis, the study area for cultural identification was defined as the area for the GGMDP. The project area encompasses 21 intensive (Class III) cultural resource inventories for various projects covering approximately 1500 acres. Grand River Institute of Grand Junction conducted six surveys (GSFO#'s 1104-3, 1105-15, 1106-2, 1108-4, 1109-1, and 1110-2) which focused on the majority of well pad locations and associated linear features, as well as relocations. These surveys identified 60 cultural resources; 11 sites (5GF253, 5GF526, 5GF527, 5GF528, 5GF529, 5GF4084, 5GF4085, 5GF4086, 5GF4088, 5GF4091, and 5GF4092) are considered historic properties. The remaining 49 cultural resources are not considered eligible for listing on the NRHP.

Environmental Consequences

Proposed Action

Impacts to cultural resources are caused primarily during the development and maintenance phases of the Proposed Action. Disturbance to historic properties, is considered an adverse effect, and should be avoided or the adverse effects mitigated. Direct impacts of construction have the potential to irreparably damage or destroy culturally sites. Indirect affect can occur from proximity to historic or culturally sensitive resources. Isolated finds and sites considered not eligible for listing on the NRHP do not constitute historic properties, as recording was deemed to fulfill the intellectual information inherent in the resource therefore these cultural resources require no further consideration.

Early in the planning phases for the GGMDP cultural avoidance buffers were developed to avoid the historic properties. Avoidance was accomplished by employing a number of methods including rerouting and/or relocation of facilities. However, one of the GGMDP pads is within the avoidance buffer for site 5GF4084, an open prehistoric camp and might affect this cultural property. Therefore, archaeological monitoring of the disturbance associated with this site should be undertaken by a qualified archaeologist to mitigate any impacts identified.

Formal consultation was initiated with the Colorado State Historic Preservation Office (SHPO) on February 12, 2008. No response or comments were received within the required 10-day review period, as required by the Colorado Protocol. Additional consultation was not required under the Colorado Protocol for the 2009 and 2010 cultural resource inventories. Therefore, the BLM made a determination of “**Conditional No Adverse Affect**” for BBC’s Proposed Actions within the GGMDP project area. This determination was made in accordance with the NHPA as amended [(16U.S.C 470f), the National BLM/SHPO Programmatic Agreement (1997) and Colorado Protocol (1998)].

Cumulative impacts to cultural resources and Native American areas of concern include administrative actions, energy development, off highway vehicle use, and private lands management. Impacts associated with these actions vary based on the accessibility and numbers of public and energy personnel within the GGMDP. Prior to the approval of previous energy development projects human use of the GGMDP area was low and principally limited to hunting and grazing. Roads were typically low-density two-tracks that did not significantly increase the access or the numbers of the public that now have access. Cumulatively, the Proposed Action would alter the environmental setting of the project area. These changes may not be quantifiable at the level of individual sites, but the cumulative effects of these changes over time and over the entire GGMDP area would result in degradation of the condition and integrity to most sites due to the potential for increased surface collection, increased casual travel (which may physically impact sites), and to the integrity of setting, location, association, and feeling for which the surrounding landscape is a part of the site’s significance.

No Action Alternative

As a result of this alternative, three proposed Fee pads, associated wells, and ancillary facilities would be constructed, and the remaining Federal wells on private lands would not be approved. It is anticipated, under this alternative, that the two split-estate pads would be relocated to Fee lands (private surface, private minerals). Development on these Fee locations could still result in impacts to known significant cultural resources located on private lands.

BLM has the legal responsibility under two authorities to take into account the effects of its actions on historic properties on private lands. These authorities are the NHPA as amended and its implementing regulations found at 36 CFR Part 800 and Executive Order No. 11593, and its implementing regulations found at 3 CFR 154 (1971). In order for the BLM to fully consider the effects of its actions, it has the responsibility to gather the information necessary to know what cultural resources may be affected, evaluate the resources for eligibility for inclusion in the NRHP, and mitigate adverse effects to historic properties where needed. In essence these authorities state that a Federal agency cannot knowingly permit a project or action that might affect historic properties on non-Federal lands.

However, this alternative would likely result in fewer impacts to cultural resources than the Proposed Action since there would be significantly less construction of Federal well locations, associated access roads, and pipelines. Although cultural resources in the general area would still remain vulnerable to damage from illegal activities and natural processes.

Mitigation

A standard Education/Discovery COA for the protection of cultural resources would be attached to the APDs (Appendix C). These include measures specifying that BBC must inform all of its project personnel about the importance of the COAs and their responsibilities to protect and report any cultural resources encountered, including unmarked human graves on private lands (CRS 24-80-1301). BLM would require that archaeological monitoring of ground-disturbing activities adjacent to site 5GF4084 be conducted by a qualified archaeological firm (Appendix C).

Invasive Non-native Species

Affected Environment

Cheatgrass (*Anisantha tectorum*), a List C noxious weed, is extensive throughout most of the project area with moderate to high density. Bulbous bluegrass (*Poa bulbosa*), an invasive grass, is also common throughout the project area. A small population of Russian knapweed (*Acroptilon repens*) is located on pad 13. Other non-native species in the project area include common mullein (*Verbascum thapsus*), tumble mustard (*Sisymbrium altissimum*), and prickly lettuce (*Lactuca serriola*). Some of the private land within the GGMDP area was historically planted with non-native pasture species such as crested wheatgrass (*Agropyron cristatum*) and alfalfa (*Medicago sativa*).

Environmental Consequences

Proposed Action

Surface-disturbing activities provide a niche for the invasion and establishment of invasive non-native species, particularly when these species are already present in the surrounding area. Because numerous invasive, non-native species are present in the project area, the potential for invasion following

construction activities is high. Mitigation measures designed to minimize the spread of these species would be attached to well APDs as COAs (Appendix C).

No Action Alternative

Under the No Action alternative, none of the proposed ground disturbance on BLM land would occur; however, the Fee well pads, roads, and pipelines would be constructed. Although this alternative would have less potential for weed invasion, existing infestations would be expected to spread if untreated.

Migratory Birds

Affected Environment

The project area is comprised of pinyon-juniper woodlands and sagebrush grasslands with some Gambel oak and aspen in Jackson Gulch. Given this vegetation, the project area provides cover, forage, breeding, and nesting habitat for a variety of migratory birds. Species found on the U. S. Fish and Wildlife Service (USFWS) list of Birds of Conservation Concern (BCC) that may be present in pinyon-juniper woodlands include the pinyon jay (*Gymnorhinus cyanocephalus*) and juniper titmouse (*Baeolophus griseus*). Other species associated with this habitat type include the Townsend's solitaire (*Myadestes townsendi*) and blue-gray gnatcatcher (*Poliophtila caerulea*) and neotropical migrants such as the broad-tailed hummingbird (*Selasphorus platycercus*), Say's phoebe (*Sayornis saya*), gray flycatcher (*Empidonax oberholseri*), mountain bluebird (*Sialia sialis*), plumbeous vireo (*Vireo plumbeus*), black-throated gray warbler (*Dendroica nigrescens*), chipping sparrow (*Spizella passerina*), lark sparrow (*Chondestes grammacus*), and lesser goldfinch (*Carduelis psaltria*).

Within the sagebrush habitats the sage sparrow (*Amphispiza belli*), vesper sparrow (*Pooecetes gramineus*), and Bendire's thrasher (*Toxostoma bendirei*) may occur. These habitats are suitable for nesting by one BCC species, the Brewer's sparrow (*Spizella breweri*). Oakbrush and mixed mountain shrub habitats in the area are suitable for Neotropical migrants such as common poorwill (*Phalaenoptilus nuttallii*), western kingbird (*Tyrannus vociferans*), dusky flycatcher (*Empidonax oberholseri*), western meadowlark (*Sturnella neglecta*), Virginia's warbler (*Vermivora virginiae*), MacGillivray's warbler (*Oporornis tolmiei*), spotted towhee (*Pipilo maculatus*), and lazuli bunting (*Passerina amoena*).

A variety of raptor species are known to exist in this area, including, but not limited to Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus*), turkey vulture (*Cathartes aura*), northern harrier (*Circus cyaneus*), Swainson's hawk (*Buteo swainsoni*), and American kestrel (*Falco sparverius*). A raptor species that is found on the BCC list and known to exist in the area is the golden eagle (*Aquila chrysaetos*). An additional raptor on the BCC list—the flammulated owl (*Otus flammeolus*)—is less likely to occur but potentially present in the pinyon-juniper and oakbrush habitats. A raptor survey was conducted by O&G Environmental in May 2008 (OGE 2008). No active nest sites were identified within 0.25 mile of the GGMDP. However, the project area offers suitable foraging and nesting habitat for a variety of raptor species.

Observations of raptors during project surveys included a northern harrier roosting along the tree line near an open field near call point 25 and an unidentified Buteo hawk perched in a large juniper at call point 27. In addition to the observations, responses to great horned owl vocalizations produced a sharp-shinned hawk that flew away from its perch on a rock outcrop by call point 5 and an unknown raptor briefly seen soaring above the ridge to the south of call point 10. A scrub-jay responded to a red-tailed hawk call at call point 13.

Environmental Consequences

Proposed Action

The bird species discussed above—and most native bird species in the U.S.—are protected by the Migratory Bird Treaty Act (MBTA). The MBTA prohibits the “take” of a protected species. 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.

The Proposed Action would result in the removal of approximately 82.4 acres of vegetation due to pad, road, and pipeline construction. Some of the vegetation loss would be short-term until such time as interim reclamation is completed. Total long-term vegetation/habitat loss is estimated at 29.7 acres. Where larger pinyon and juniper trees are removed and replaced with grasses and forbs, the vegetation/habitat would not function as it does in its current capacity. This would result in a loss of cover, forage, breeding and nesting habitat.

The Proposed Action would further fragment habitat and reduce habitat patch size and connectivity in the area. Fragmentation could alter species composition and abundance. Species that require interior habitat could be displaced, while more common species that prefer openings or forest edges could benefit. In fragmented habitats, nest predation occurs more frequently near forest edges (Dobkin 1994). In addition, the most common avian and mammalian nest predators (e.g. American crow, blue jay, common grackle, raccoons, opossums, and domestic cats) typically occur in higher densities around forest edges (Bider 1968). Fragmentation can also increase the risk of nest parasitism by brown-headed cowbirds (*Molothrus alter*), causing declines in local bird populations, including BCC species. These impacts, in conjunction with existing fragmentation and disturbance within and adjacent to the GGMDP area, would reduce the value of the largely unfragmented interior habitat available to migratory birds.

Operation of heavy equipment would be likely to displace birds away from preferred habitats for a short time due to noise and human presence. Displaced individuals may fail to nest due to a lack of suitable habitat that is not already occupied and may also be subject to reduced survival if the areas into which they are displaced provide less food and cover. Research indicates that noise associated with development and production activities can also lead to lower avian diversity and density in both adjacent and distant areas (Forman 2000, Forman and Deblinger 2000). Noise can decrease usable habitat for birds by reducing the distance at which calls made by males are heard, affecting mate selection and reproductive potential.

Vegetation clearing conducted during the spring nesting season could result in the destruction of nests and/or eggs. Indirect take (e.g. failure due to abandonment of one or both adults) of nearby nests can also occur as a result of disturbance, although reactions vary among species. Some birds that are flushed from an area may appear relatively undisturbed, but their absence from the nest for a protracted period would leave eggs and nestlings vulnerable to overheating, chilling, predation, or (for the young) starvation.

The presence of fluid-containing pits could attract migratory birds for purposes of foraging or as a source of water. The extent and nature of the problem is not well defined can include drowning, loss of buoyancy or insulation from contact with chemicals, or direct toxicity from ingestion or absorption through the skin.

These impacts may result in a short-term decrease in the local populations of some species, particularly residents, although a loss of species viability within the overall range is not expected. Other species may

be less susceptible to adverse impacts due to greater tolerance for human activity or more transitory use of the area.

Mitigation

Federal lease COC50126 includes a stipulation prohibiting ground-disturbing activities on that lease from April 2 to August 30 unless surveys indicate that no active raptor nest is present in proximity to planned activities. Additionally, a COA would be applied to prohibit removal of vegetation during the period May 1 to June 30 unless a nesting survey conducted by a qualified biologist reveals no nesting BCC species within 10 meters of the planned disturbed (Appendix C). Another COA in Appendix C requires measures to protect migratory birds from physical or toxic impacts related to fluids contained in pits on the well pads.

No Action Alternative

Compared to the Proposed Action, the No Action alternative would have less potential to cause disturbance to migratory birds because less ground disturbance would occur and no additional Federal well development would occur. Disturbance to migratory birds would occur as localized, short-term events that are not expected to have a negative impact on the breeding population.

Native American Religious Concerns

Affected Environment

At present the Ute Indian Tribes claim this area as part of their ancestral homeland. One area of Native American concern was identified during the cultural resource inventories for the GGMDP. The Ute Tribes of the Uinta and Ouray Bands (Northern Ute), Southern Ute, and Ute Mountain Ute Tribes were notified of the proposed GGMDP on August 19, 2009. No responses, questions, or requests for additional information were received by September 21, 2009. However, previous information provided by the Northern Ute Tribe indicates that these areas should be avoided due to their cultural value. If new data is disclosed, new terms and conditions may have to be negotiated to accommodate their concerns.

Environmental Consequences

Proposed Action

Direct impacts of construction and maintenance have the potential to irreparably damage or destroy Native American sensitive sites. Additionally, impacts that affect the physical setting, location, association, and feeling could result in a loss of what makes an area significant. Impacts to the auditory and visual environment are often of importance in considering values placed on some sites by Native American tribes. Proximity to these environmental changes may in fact adversely affect the significance of a Native American resource.

During the cultural resource inventories within the GGMDP one Native American area of concern was identified that could be affected by these types of impacts. The well location that would have affected this area was dropped during the early planning phases for the GGMDP. Therefore, there should not be any direct impacts to this local. However, unauthorized modification of roads, pipelines, and well pads may lead to adverse impacts. Other, unidentified culturally sensitive or significant locations that have not been identified by the cultural inventories or the Ute tribes may require new terms and conditions.

Cumulative impacts to cultural and Native American areas of concern include administrative actions, energy development, off highway vehicle use, and private lands management. Impacts associated with these actions vary based on the accessibility and numbers of public and energy personnel within the GGMDP. Prior to the approval of previous energy development projects human use of the GGMDP area was low and principally limited to hunting and grazing. Roads were typically low-density two-tracks that did not significantly increase the access or the numbers of the public that now have access. Cumulative impacts of increased development, accesses, construction, operation, and maintenance may also adversely affect these sites, possibly degrading the cultural significance by either destroying the sensitive area or its landscape setting.

A standard Education/Discovery COA for the protection of Native American values and Colorado State Statute (CRS 24-80-1301) protecting unmarked human graves on private and state lands. These COAs should be attached to the APDs (Appendix C). The importance of these COAs should be stressed to the operator and its contractors, including informing them of their responsibilities to protect and report any cultural resources encountered.

No Action Alternative

Under the No Action alternative, the Fee mineral estate would continue to be developed from the existing private pads outside the GGMDP boundaries. Although no direct impacts to known Native American areas of cultural concern would occur, cultural resources in the general area would still remain vulnerable to damage from illegal activities and natural processes.

Prime or Unique Farmland

Affected Environment

The Natural Resources Conservation Service (NRCS) has mapped farmlands for Garfield County, Colorado (NRCS 2008). The analysis of farmlands applied here includes the system of farmlands occurring in the Gibson Gulch plan area and a 0.5-mile buffer (here called the analysis area). No farmlands of national importance occur in the analysis area. The following category of farmland of statewide importance occurs within the analysis area: Irrigated land (water supply inadequate).

Additional land within the analysis area is categorized as potential prime farmland if irrigated, but is not considered to be of statewide importance (NRCS 2008).

Environmental Consequences

Proposed Action

Within the analysis area, there are approximately 260 acres of farmland of statewide importance, according to the NRCS (NRCS 2008). Only approximately 60 acres of this farmland is situated within the Gibson Gulch plan area, representing about 2 percent of the plan area. The Proposed Action would have no direct, long-term impact on this farmland caused by construction of roads, drilling pads, or other facilities. Additionally, some of the area mapped as farmland in the plan area by the NRCS is currently covered in sagebrush or perennial grasses and being utilized only for grazing. Thus, the Proposed Action would be unlikely to have any impacts on this resource within the plan area. Any impacts that did occur would be indirect and minor.

No Action Alternative

Under the No Action alternative, there would be no construction of facilities within prime or unique farmland in the plan area or the broader analysis area. Therefore, there would be no impact to this resource.

Special Status Species (includes an Analysis on Public Land Health Standard 4)

Affected Environment

Federally Listed, Proposed, or Candidate Plant Species

According to the latest species list from the USFWS (<http://mountain-prairie.fws.gov/endspp/CountyLists/COLORADO.pdf>), the following Federally listed, proposed, or candidate plant species may occur within or be impacted by actions occurring in Garfield County: Colorado hookless cactus (*Sclerocactus glaucus*), Parachute beardtongue (*Penstemon debilis*), Ute ladies' tresses orchid (*Spiranthes diluvialis*), and DeBeque phacelia (*Phacelia submutica*).

The GGMDP contains no Federally listed, proposed, or candidate plant species or suitable habitat for these species.

BLM Sensitive Plant Species

BLM sensitive plant species with habitat and/or occurrence records in Garfield County include adobe thistle (*Cirsium perplexans*), DeBeque milkvetch (*Astragalus debequaeus*), Naturita milkvetch (*Astragalus naturitensis*), Roan Cliffs blazing star (*Mentzelia rhizomata*), Piceance bladderpod (*Lesquerella parviflora*), and Harrington's penstemon (*Penstemon harringtonii*).

The project area contains no BLM sensitive plant species or suitable habitat for these species.

Federally Listed, Proposed, or Candidate Animal Species

According to the latest species list from the USFWS (<http://www.fws.gov/mountain-prairie/endspp/CountyLists/Colorado.pdf>), the following Federally listed, proposed, or candidate animal species may occur within or be impacted by actions occurring in Garfield County: Canada lynx (*Lynx canadensis*), Mexican spotted owl (*Strix occidentalis*), yellow-billed cuckoo (*Coccyzus americanus*), razorback sucker (*Xyrauchen texanus*), Colorado pikeminnow (*Ptychocheilus lucius*), bonytail chub (*Gila elegans*), and humpback chub (*Gila cypha*). The Colorado River and its 100-year floodplain, which lie in proximity to the proposed activity, are designated Critical Habitat for the razorback sucker and Colorado pikeminnow.

Razorback Sucker (Endangered) – The razorback sucker is one of the largest suckers in North America, growing to lengths exceeding 3 feet and weighing up to 13 pounds. Once widespread throughout most of the Colorado River Basin, this species is now found only in the upper Green River in Utah, the lower Yampa River in Colorado, and occasionally in the Colorado River near Grand Junction. The current population estimate is about 500 individuals (USFWS 2006). Razorback suckers inhabit large rivers and are generally not found in smaller tributaries and headwater streams. Adults are associated with backwaters and areas of strong current in depths from four to ten feet.

Colorado Pikeminnow (Endangered) – The Colorado pikeminnow is the largest minnow in North America, growing at one time to nearly 6 feet in length and weighing up to 80 pounds. It was historically

found throughout the entire Colorado River Drainage but is now restricted to the lower reaches of the Green, Yampa, White, Colorado, and Gunnison Rivers in Colorado (USFWS 2006). Within the Colorado River, this fish is found from Palisade, Colorado, downstream to Lake Powell. Adults are found in large, deep eddies, pools, and other areas adjacent to the main current flow; young inhabit shallow, quiet backwater areas off main river channels.

Humpback Chub (Endangered) – The pronounced hump behind its head gives the humpback chub a striking, unusual appearance. Like the Colorado pikeminnow and bonytail, the humpback chub is a member of the minnow family. It lives primarily in canyons with swift currents and white water. Historically, it inhabited canyons of the Colorado River and four of its tributaries: the Green, Yampa, White, and Little Colorado rivers (USFWS 2006). Now, there are two populations near the Colorado/Utah border: one at Westwater Canyon in Utah and one in an area called Black Rocks, in Colorado. Although now smaller in number than historically, these two populations seem to be fairly stable. Additional, smaller numbers of humpback chubs have been found in the Yampa and Green rivers in Dinosaur National Monument, Desolation and Gray canyons on the Green River in Utah, Cataract Canyon on the Colorado River in Utah, and the Colorado River in Arizona. The largest known population is in the Little Colorado River in the Grand Canyon, which may contain up to 10,000 fish. No population estimates are available for the rest of the upper Colorado River basin.

Bonytail (Endangered) – Once common in portions of the upper and lower Colorado River basins (USFWS 2006), reproducing populations of this large chub are no longer known to occur in the wild, and the species is believed to be extirpated (extinct) upstream from Lake Powell. In the last decade, only a handful of individuals have been captured on the Yampa River in Dinosaur National Monument, on the Green River at Desolation and Gray canyons, and on the Colorado River near the Colorado/Utah border, and in Cataract Canyon in Utah. In the lower basin (downstream from Grand Canyon), bonytails are known to exist in Lake Mohave and Lake Havasu.

Greenback Cutthroat Trout (Threatened) – The greenback cutthroat trout is a small salmonid fish native to the headwaters of the South Platte and Arkansas River drainages in Colorado and a small segment of the Platte River drainage in Wyoming. It is one of three subspecies of cutthroat trout that currently occur in Colorado. Based on recent genetic work, greenbacks have been documented in certain waters across the west slope of Colorado outside their native (east slope) range. It is likely that greenbacks were stocked into a few small streams in western Colorado when the subspecies was still common in its natural range.

Greenbacks, like all cutthroat subspecies, inhabit coldwater streams and lakes that provide adequate spring spawning habitat. Spawning generally occurs when water temperatures reach 5°C to 8°C. Greenbacks feed on a wide variety of organisms, but their primary food source is aquatic and terrestrial insects. One population of greenback cutthroat trout has been found within the GSFO area, in Cache Creek on National Forest System lands and private lands.

Mexican Spotted Owl (Threatened). The Mexican spotted owl is believed not to occur in the GSFO area, and potentially suitable habitat is limited to forested mountains and canyons. Therefore, suitable habitat for this species is not present in the project vicinity.

Western Yellow-billed Cuckoo (Candidate). The western yellow-billed cuckoo occupies mature riparian forests dominated by cottonwoods or other large deciduous trees and with a dense shrub understory. Unlike many species of riparian birds, yellow-billed cuckoos do not venture outside the riparian habitat to feed in nearby more open habitats but instead remain within the canopies of the trees or tall shrubs.

Canada Lynx (Threatened). This medium-sized predator is slightly larger than the more common bobcat (*Lynx rufus*) and more often associated with higher elevation (subalpine) zones. In Colorado, the lynx

was historically present at low densities in some of the more rugged or remote mountain ranges of the state. Preferred habitat consists of northern coniferous forests, which in Colorado are represented by Engelmann spruce and subalpine fir. Spruce-fir forests with dense tree cover, often in association with rock outcrops or boulders, are the principal habitat type in Colorado. Aspen forests are also used by lynx, although primarily during non-winter seasons. Lynx typically den under rock overhangs or deadfall.

The U.S. Forest Service (USFS) has mapped suitable denning, winter, and other habitat for lynx within the White River National Forest (WRNF), portions of which are adjacent to BLM lands within the GSFO. The mapped suitable habitat in the WRNF comprises several areas known as Lynx Analysis Units (LAUs). Several LAUs border BLM lands along the I-70 corridor from east of Wolcott to west of DeBeque. While BLM lands within the GSFO area are generally not suitable habitat *per se*, they may support movement by animals dispersing to a new area or, potentially, moving to lower elevations during severe winter weather in search of prey. Canada Lynx potential habitat exists more than four miles south of the GGMDP. Canada Lynx could move through the GGMDP but without suitable habitat present, effects from the Proposed Action are not expected.

BLM Sensitive Animal Species

BLM sensitive animal species with habitat and/or occurrence records in the area include bald eagle (*Haliaeetus leucocephalus*), spotted bat (*Euderma maculatum*), fringed myotis (*Myotis thysanodes*), milk snake (*Lampropeltis triangulum taylori*), midget faded rattlesnake (*Crotalus viridis concolor*), and Great Basin spadefoot (*Spea intermontana*). In addition, three BLM sensitive fish species - the flannelmouth sucker (*Catostomus latipinnis*), roundtail chub (*Gila robusta*), and Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) - are known to inhabit the Colorado River.

Bald Eagle – Bald eagle roost sites exist one mile or more north of the Gibson Gulch project area boundary within the 100-year floodplain of the Colorado River (CDOW 2008). A known bald eagle nest site is about four miles northeast of the project area boundary. Because of these distances, effects from the Proposed Action to bald eagle and their habitat are not expected. However, bald eagles may use the GGMDP for upland foraging habitat to scavenge on winter-killed big game.

Fringed Myotis – It is found in ponderosa pine woodlands, greasewood, oakbrush, and saltbush shrublands at elevations to 2,290 m (7,500 ft). It roosts in caves, mines, rock crevices, buildings, and other protected sites. Nursery colonies occur in caves, mines, and sometimes buildings. It may also utilize the project area for foraging or dispersal activities.

Townsend's big-eared bat – This species breeds and roosts in caves, trees, mines, and buildings; hunts over pinyon-juniper, montane conifer, and semi-desert shrubland habitats. Suitable foraging habitat is found in the project area.

Milk Snake – The milk snake occurs in a wide variety of habitats in Colorado, including shortgrass prairie, sand prairie, shrubby hillsides, canyons, open stands of ponderosa pine, pinyon-juniper woodland, and arid river valleys. Although no occurrence records for this species exist near the project area, suitable habitat is present (CNHP 2008).

Midget Faded Rattlesnake – The midget faded rattlesnake is a small, pale-colored subspecies of the common and widespread western rattlesnake. The midget faded rattlesnake is endemic to a small area of southwestern Wyoming, northwestern Colorado, and adjacent Utah. Suitable habitats include sandy and rocky areas in pinyon-juniper and semi-desert shrub.

Great Basin Spadefoot – This species is found in rocky canyons, broad dry basins, and stream floodplains scattered throughout northwestern Colorado. It is inactive most of the year, emerging from the substrate of seasonal ponds or ephemeral streams to breed and feed during periods of protracted surface moisture. Suitable habitats include pinyon-juniper woodlands, and sagebrush and semi-desert shrublands.

Northern leopard frog – It can occur in wet meadows and the banks and shallows of marshes, ponds, glacial kettle ponds, beaver ponds, lakes, reservoirs, streams, and irrigation ditches. There is a known population approximately one mile from the project area.

Flannelmouth Sucker – The flannelmouth sucker is restricted to larger streams and rivers in the middle and upper Colorado River Basin. In Colorado, this species is found only in large rivers, where it occupies in all habitat types, including riffles, runs, eddies, and backwaters (CDOW no date).

Roundtail Chub – The roundtail chub is found in the Colorado River mainstem and large tributaries (CDOW no date). Adults inhabit slow-moving water near areas of faster water and swim into the faster water in small groups to forage. Young-of-the-year prefer shallow river runs, while juveniles concentrate in eddies.

Colorado River Cutthroat Trout – Remaining populations of this species now occur mostly in headwater streams and lakes of the Colorado River drainage, potentially including Beaver Creek and Cottonwood Creek due to the presence of suitable habitat.

Environmental Consequences

Proposed Action

Federally Listed, Proposed, or Candidate Plant Species

The project area contains no Federally listed, proposed, or candidate plant species or suitable habitat for these species. Therefore, the Proposed Action would have “**No Effect**” on these species.

BLM Sensitive Plant Species

The project area contains no BLM sensitive plants or suitable habitat. Therefore, there would be no impacts to these species.

Federally Listed, Proposed, or Candidate Animal Species

Canada Lynx – Project activities would not occur within a Lynx Analysis Unit. Suitable lynx habitat including travel linkages does not occur within one mile of proposed developments. Therefore, implementation of the Proposed Action would have “**No Effect**” on Canada lynx.

Razorback Sucker, Colorado Pikeminnow, Bonytail Chub, and Humpback Chub – In May 1994, BLM prepared a programmatic biological assessment (PBA) that addressed water-depleting activities in the Colorado River Basin. In response, USFWS issued a programmatic biological opinion (PBO), which determined that depletions from the Colorado River Basin would jeopardize the continued existence of the endangered Colorado River fishes and consequently would lead to a “**May Affect, Likely to Adversely Affect**” determination for all water-depleting activities. The PBO was written to remain in effect until a total depletion of 2,900 acre-feet per year for Federally permitted activities is reached and includes measures to allow BLM to authorize projects with depletions of less than 125 acre-feet per year.

An amendment to the PBO in 2000 increased the threshold to 3,000 acre-feet per year and excluded depletions associated with oil and gas drilling, based on the assumption at that time that such operations produce more water than they deplete. BLM will soon complete a new PBA addressing the impact of depletions associated with oil and gas development in western Colorado, including the GSFO area. Once the USFWS issues a new PBO the BLM will be responsible for tracking all wells drilled into Federal leases and reporting the corresponding depletions annually to the USFWS. In the meantime, BLM is continuing to operate under the 2000 amendment to the 1994 PBO.

Construction of the proposed developments would increase the potential for soil erosion and sedimentation. The mitigation measures presented in Appendix C would reduce the potential. Although a minor temporary increase in sediment transport to the Colorado River may occur, it is not likely that the increase would be detectable above current background levels. In any case, all of these Federally listed fishes are adapted to naturally high sediment loads.

BLM Sensitive Animal Species

Milk Snake, Midget Faded Rattlesnake, and Great Basin Spadefoot – Direct effects on these species could include injury or mortality as a result of construction, production, and maintenance activities. These effects would be most likely during the active season for these species, which are April to October for the milk snake, March to October for the midget faded rattlesnake, and May through September for the Great Basin spadefoot. Indirect effects for the two snake species could include a greater susceptibility to predation if the road or pad is used for temperature regulation. The potential for injury or mortality as a result of vehicles traveling on new roads and pads would increase for individuals of all three species. However, the potential for effects is low and impacts at the population level are not expected.

Flannelmouth Sucker, Bluehead Sucker, and Roundtail Chub – Mitigation measures presented in the groundwater/soils sections and water quality, surface and ground sections would be implemented to minimize sedimentation of the Colorado River and tributary streams. Although minor temporary increases may occur, they are unlikely to be detectable above background levels. For this reason, and because the flannelmouth sucker, bluehead sucker, and roundtail chub are adapted to high sediment loads, the Proposed Action would not be expected to adversely affect these species.

Colorado River Cutthroat Trout – A potential increase in sediment as a result of the project would not affect populations in Beaver Creek or Cottonwood Creek because no portion of the project area drains to these creeks. Individuals present in the Colorado River would not be expected to be adversely affected as only minor temporary increases in sediment are expected that are unlikely to be detectable above background levels.

No Action Alternative

Federally Listed, Proposed, or Candidate Plant Species

The No Action alternative would not cause impacts to any Federally listed, proposed, or candidate plants because these species do not occur in the GGMDP.

BLM Sensitive Plant Species

Under the No Action alternative, there would be no impacts to BLM sensitive plants because these species do not occur in the project area.

Federally Listed, Proposed, or Candidate Animal Species

For the purposes of comparison, the No Action alternative is associated with the drilling and completion of nine Fee wells on an existing private pad and roads and pipelines involving Federal surface would not be installed or constructed. Access to the Fee pad would follow the existing routes.

The potential for the No Action alternative to affect endangered fish would be less than the Proposed Action because less new surface disturbance would occur. The potential for soil erosion and sedimentation into nearby ephemeral drainages would still exist due to the exposed soil on the two pads and associated access roads. However, it is unlikely that the No Action alternative would cause a sediment load increase in the Colorado River above detectable background levels. Consequently, listed fish species are unlikely to be impacted under this alternative.

BLM Sensitive Animal Species

The potential for the No Action alternative to affect sensitive species would be less than the Proposed Action because less new surface disturbance would occur. Sensitive fish species are unlikely to be impacted for the same reasons identified for Federally listed fish species. Sensitive reptiles and amphibians could be affected as a result of exposure to traffic on roads and pads. However, given the small amount of potential exposure relative to undisturbed habitat, it is unlikely that the No Action alternative would cause discernible impacts to these species.

Analysis on Public Land Health Standard 4 for Special Status Species

A formal Land Health Assessment (LHA) was completed in 2009 for the portion of the GSFO that includes the project area. The LHA report will be published in 2010. The Proposed Action, in conjunction with similar oil and gas activity throughout the greater area, would be likely to result in a downward trend due to habitat loss and fragmentation and increased human use. However, the mitigation measures included as COAs in Appendix C are expected to avoid impacts special status species. Therefore, the Proposed Action should not result in a failure of the area to achieve Standard 4 for special status species.

Under the No Action alternative, it is likely the pad and road would be built to access private minerals. However, as is the case with the Proposed Action, failure of the area to achieve Standard No. 4 for special status plant and animal species is not expected.

Wastes, Hazardous or Solid

Affected Environment

BLM Instruction Memoranda numbers WO-93-344 and CO-97-023 require that all National Environmental Policy Act documents list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a proposed project. The GSRA, 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 by 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 contamination 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 Garfield County Emergency Operations Plan (developed by the Garfield County Sheriff's Emergency Operations Office), 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.

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.

Only one USEPA-regulated facility is located within one mile of the GGMDP area (USEPA 2007). Flag Sand & Gravel (1412 CR 311) is located immediately northwest of the proposed development area in SENE, Section 24, T 6 S, R 92 W. It is classified as a minor source of air pollution (PM₁₀ and suspended particulates) and is currently in compliance with procedural requirements.

A variety of substances, including solvents, gasoline, diesel fuel, lubricating oils, hydraulic fluid, and treatment chemicals, would be used to construct and operate the proposed wells, pipelines, and associated facilities. While it is highly unlikely, it is possible that explosives may be used for blasting rock on portions of the road or pipeline corridors. Smaller quantities of other materials such as herbicides, paints, and other chemicals would be used during project operation and maintenance. These materials would be used to control noxious weeds, facilitate revegetation on the ROW, and operate and maintain meter stations during the life of the project. Potentially harmful substances used in the construction or operation would be kept onsite in limited quantities for short periods.

Waste generated by construction activities would not be exempt from hazardous waste regulations under the oil and gas exploration and production exemption of RCRA. Exempt wastes would include those associated with well production 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 during the construction or operation of the facilities. None of the chemicals that would be used in construction meet the criteria for an acutely hazardous material/substance, or meet the quantities criteria per BLM Instruction Memorandum No. 93-344. In addition, no extremely hazardous

substance, as defined in 40 CFR 355, in amounts above threshold planning quantities, would be produced, used, stored, transported, or disposed of during construction or operation of the facilities.

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

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

Environmental Consequences

Proposed Action

Possible pollutants that could be released during the construction phase of this project would include diesel fuel, hydraulic fluid, and lubricants. These materials would be used during construction of the road, pad, and pipeline, and for refueling and maintaining equipment and vehicles. Potentially harmful substances used in the construction and operation would be kept onsite in limited quantities and trucked to and from the site as required. As noted above in the affected environment section, no hazardous substance, as defined by 40 CFR 355 would be used, produced, stored, transported, or disposed in amounts above threshold quantities.

Surface water or groundwater could be impacted 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 (used as antifreeze for project vehicles and equipment). While uncommon, an accident could occur which 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.

Hydraulic fracturing of wells has the potential to cause surface water contamination through leakage of the surface pipes used to inject frac fluid into the wells. A stipulation included in Appendix C requires the operator and its well completion subcontractors to (a) develop and implement a procedure that would identify any loss of pressure on their surface frac lines, and (b) develop and implement a spill containment protocol should such an event occur.

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

Potential effects of solid or hazardous wastes would be reduced under the No Action alternative. Three of the ten proposed pads are located on Fee lands, but only the 27 proposed Fee wells could be developed on these pads if the APDs associated with the Federal leases are denied.

Mitigation

Solid and hazardous waste impacts would be minimized by implementing measures proposed in BBC’s Plan of Development and Spill Prevention, Containment, and Countermeasures Plan, included in the Plan of Development. BBC would:

- Maintain the project area in a sanitary condition at all times.
- Provide an adequate number of trash containers onsite.
- Minimize waste to the extent practical; practice re-use and recycling when possible; substitute non-hazardous substances for hazardous substances, if available.
- Dispose of trash and nonflammable wastes at an appropriate waste disposal site.
- Provide portable toilets onsite. Contents would be removed and disposed of in accordance with applicable laws and regulations.
- Use, store, transport, and/or dispose of hazardous materials in accordance with applicable Federal and state laws.
- Implement spill prevention measures, inspection and training requirements, and spill response and notification procedures to minimize potential for accidental spills or leaks.

Water Quality, Surface and Ground (includes an Analysis on Public Land Health Standard 5)

Affected Environment

Surface Water and Waters of the U.S.

Most of the GGMDP area lies within the Divide Creek drainage basin, which is tributary to the Colorado River. However, approximately 170 acres in the northeastern portion of the project area (portions of Sections 20 and 21, T6S, R91W) drains northward into an unnamed tributary of the Colorado River.

Divide Creek, a perennial stream, is located outside the MDP boundary. Two of Divide Creek’s ephemeral tributaries, Jackson and East gulches, would be crossed by proposed project access roads and pipelines. These two drainages (as shown on 1:24,000 scale U.S. Geological Survey (USGS) topographic maps) are considered “Waters of the U.S.” by the U.S. Army Corps of Engineers (USACE) in 33 CFR Part 328. Utility line crossings and access roads fall under USACE Nationwide Permits 12 and 14, respectively. Locations of these crossings are presented in Table 10.

Table 10. Waters of the U.S. Crossed by Project Infrastructure

Stream Name	Crossing Location	Type of Crossing	Perennial Stream?
Jackson Gulch	NESW, Sec. 28, T6S, R91W	proposed access road & proposed pipeline	no
East Gulch	NESW, Sec. 32, T6S, R91W	proposed access road & proposed pipeline	no

Source: Gibson Gulch and New Castle 7.5-minute topographic quadrangle maps, USGS, 1:24,000.

Peak runoff in project area streams is a result of spring (April through early June) snowmelt and large summer and early autumn thunderstorms. Ephemeral drainages flow only in direct response to snowmelt and intense summer and early autumn storms (BLM 1994). During large flow events, channels are often deeply incised with steep banks that slough and develop new head cuts perpendicular to the main stem. Sediment yield in local streams can be high due to runoff from localized thunderstorms, which could affect water quality by increasing sediment and salt yields and accelerating erosion (BLM 1994).

Water quality standards and guidance for streams within the GGMDP area are included in the CDPHE Water Quality Control Commission Regulation No. 37, which describes Classifications and Numeric Standards for the Lower Colorado River Basin (CDPHE 2007b). The State has adopted basic standards and anti-degradation rules for surface waters. These standards define water bodies with four different categories of classified uses (aquatic life, water supply, recreation, and agriculture); designate uses for each water body; and adopt numeric or narrative water quality standards to protect those classified uses. The classified uses for surface water in the GGMDP area are Aquatic Life Cold, Class 1 or 2; Aquatic Life Warm, Class 1 or 2; Recreation Class 1 (1a or 1b) or 2; Domestic Water Supply; Agriculture; and Wetland (CDPHE 2007a).

The GGMDP area contains stream or watershed segments with four of the classified/protected uses. *Aquatic Life Cold Class 1* waters are capable or could be capable of sustaining a wide variety of cold-water biota. *Recreation Class 1a* waters are suitable or intended to become suitable for recreational activities in or on the water in which primary contact uses have been documented or are presumed to be present. *Water Supply* waters are suitable or intended to become suitable water supplies. *Agriculture* waters are suitable or intended to become suitable for irrigation of crops and are not hazardous as drinking water for livestock. Stream segments and classifications relative to the project area are provided in Table 11. A complete listing of numeric standards for physical, biological, inorganic, and metal parameters for each segment can be found in Classifications and Numeric Standards for the Lower Colorado River Basin (CDPHE 2007a).

Table 11. Beneficial Use Classifications for Potentially Affected Streams

<i>Stream Segment Description</i>	<i>Classifications</i>
BASIN: LOWER COLORADO RIVER	
7. Mainstem of Mitchell, Canyon, Elk, Garfield, Divide, Beaver, Cache, and Battlement Creeks, including all tributaries, wetlands, lakes and reservoirs, from the boundary of the White River National Forest to their confluences with the Colorado River.	Aquatic Life Cold 2 Recreation 2 Water Supply Agriculture
Source: CDPHE 2007a.	

Colorado Regulations Nos. 93 and 94 (CDPHE 2006a and 2006b, respectively) were also reviewed for information related to the proposed project area drainages. Regulation No. 93 is the State’s Section 303(d) list of water-quality-limited segments requiring Total Maximum Daily Loads (TMDLs). The 2006 303(d) list of segments needing development of TMDLs includes “tributaries to Colorado River, Roaring Fork to Parachute Creek except for specific segments.” Thus, all perennial and ephemeral streams that drain the GGMDP area are considered “water quality limited.” The classification is based on impairment by elevated levels of selenium and has been assigned a medium priority. Regulation 94 is the State’s list of water bodies identified for monitoring and evaluation to assess water quality and determine if a need for TMDLs exists. No stream segments are listed which would be affected by the proposed project.

The USGS has collected limited surface water flow and quality data at several sites along Divide Creek near the project area (USGS 2007b). Results are summarized in Table 12. Data have also been collected

from the Colorado River above the project area at New Castle (Site #09087600) on a regular basis since 1966. Additional data were collected along the Colorado below the project area at Silt (Site #09090800) from 1970 to 1973.

Table 12. Summary of USGS General Water Quality Parameters

Parameter	Divide Creek above Ward Ditch near Silt, CO; USGS Site # 393120107365001; Date: 8/9/1979	Divide Creek at Divide Creek Road near Silt, CO; USGS Site #393225107372001; Date: 10/15/2003	Divide Creek near Mouth near Silt, CO; USGS Site #393227107372200; Date: 12/6/1977
Specific conductance ($\mu\text{S}/\text{cm}/\text{cm}$ at 25°C)	575	1020	1100
Field pH (standard units)	7.7	8.5	7.6
Temperature, water (°C)	20.0	11.5	4.0
Instantaneous discharge (cfs)	6.7	1.1	0.44
Calcium (mg/L)	43.0	124	62
Magnesium (mg/L)	9.60	75.9	50
Sodium (mg/L)	110	68	180
Sodium adsorption ratio	4	1	4
Potassium (mg/L)	9.90	3.78	6.6
Bicarbonate (mg/L)	-	-	520
Chloride (mg/L)	24.0	41	66
Sulfate (mg/L)	140	398	230
Selenium ($\mu\text{g}/\text{L}$)	-	6.6	-

No sediment measuring stations are located on the Colorado River or its tributaries near the GGMDP area. The closest downstream station on the Colorado River is near DeBeque, Colorado. A summary of the 2 years of data collected at this station is presented in Table 13 (USGS 2007a). The closest upstream station is near Glenwood Springs, for which data are limited to only eight samples from 1959.

**Table 13. Sediment Yields USGS Station 9093700
(Colorado River near DeBeque, CO)**

Maximum (tons/day)	Minimum (tons/day)	Mean (tons/day)	Median (tons/day)	Period of Record
41,300	8.4	1817.6	267	1974 – 1976
Source: USGS 2007a.				

Groundwater

The proposed project is located within the Colorado Division of Water Resources (CDWR) Water Division 5, the Colorado River Basin Main Stem. Groundwater in this division is generally found in both alluvial and sedimentary aquifers. Unconsolidated alluvial aquifers are the most productive aquifers in the region and consist of boulders, cobbles, gravel, sand, silt and clay. Alluvial wells depths are generally less than 200 feet and water levels typically range between 100 and 150 feet. The thickness of the

alluvium is variable, but tends to be thicker in the lower reaches and basin center where it can accumulate easier. Well yield is dependent upon the intended use of the well, well construction design, type of sediment, and saturated thickness, represented by the interval from the water table to the top of the underlying bedrock. Domestic use wells are limited to 15 gallons per minute (gpm) administratively, while municipal wells are constructed and engineered for maximum potential yield. There have been reported yields from wells completed in the Colorado River alluvium of up to 800 gpm near Silt and 600 gpm in the DeBeque area (Crifasi 2000).

The saturated Tertiary rocks of the Piceance Basin are divided into two aquifer units—the upper and lower Piceance Basin aquifers—and two confining units. The upper Piceance Basin aquifer is found within the sandstone and fractured siltstone of the Uinta Formation and the fractured marlstone and solution cavities of the upper part of the Parachute Creek Member of the Green River Formation (Robson and Saulnier 1981). The lower Piceance Basin aquifer is found within the lower part of the Parachute Creek Member and is separated from the upper unit by the Mahogany zone confining unit. The Mahogany zone is located in the upper one third of the Parachute Creek Member. Averaging about 160 feet thick, this areally extensive oil shale interval is the principal oil shale mining zone (Robson and Saulnier 1981). Beneath these two aquifer systems is a confining unit that includes the two lower members of the Green River Formation, the middle Garden Gulch Member and the basal Douglas Creek Member, and the Wasatch Formation. Although some fresh water wells are completed in Wasatch Formation sediments, the water bearing sands are considered localized due to the discontinuous lenticular nature of the formation.

These two aquifer systems are bounded on the north by the White River and on the south by the Colorado River, although the basal confining unit is present throughout most of the Piceance Basin. South of the Colorado River, these aquifers have largely been eroded off. Beneath these Tertiary-aged units are the Cretaceous aged rocks of the Mesaverde aquifer. This aquifer consists of sandstone with interbedded shale and coal of the Williams Fork Formation and the marine sands and shales of the Iles Formation. The depth to the top of this aquifer beneath the project area is more than 5,000 feet below ground surface, far too deep for economic development. Studies of the potentiometric surface by Glover et al. (1998) indicate that water from the Mesaverde aquifer does discharge into the Colorado River and its alluvium downstream from Parachute, Colorado. The water quality of this aquifer is considered poor due to the presence of the minerals nahcolite (NaHCO_3 , sodium bicarbonate), dawsonite ($\text{NaAl}(\text{OH})_2\text{CO}_3$), and halite (NaCl), which contribute to total dissolved solids ranging from less than 1,000 milligrams per liter (mg/L) in many of the basin-margin areas to more than 10,000 mg/L in the central part (USEPA 2004).

The chemical quality of groundwater is dependent on the mineral composition and hydrologic properties of the aquifer. Factors such as surface contact, porosity, and rate of water movement all influence water quality. The quality of alluvial groundwater in the Colorado River Basin can vary widely, and is affected by return flow quality, mineral weathering and dissolution, cation-anion exchange with alluvial minerals, and organic compound loading from fertilizer and pesticide leaching. In the project area, alluvial aquifers typically contain high sulfate concentrations.

Groundwater within bedrock aquifers is recharged from snowmelt in upland areas. In the Piceance Basin, recharge flows from areas near the margins of the basin to discharge areas near principal stream valleys. The groundwater moves laterally and/or upward discharging directly into streams, springs, and seeps by upward movement through confining layers and into overlying aquifers or by withdrawal from wells (USGS 2007c). The natural discharge areas generally are found along the Colorado River and its tributaries (USGS 2007d). According to the CDWR (2007b), 20 registered water wells are located within the GGMDP area or within 0.25 mile (Table 14). The use of the wells is primarily domestic, indicating that water quality is fit for human consumption.

Table 14. Water Wells within 0.25 Mile of the GGMDP Boundary

Permit No.	Use	Yield (gpm)	Depth (ft)	Water Level (ft)	Twp Rng	Sec	Quarter-Quarter
142666	domestic				6S 91W	19	SW of SW
142667	domestic				6S 91W	19	SW of SW
32089F	domestic				6S 91W	19	SW of SW
36496F	domestic	5	162	70	6S 91W	19	SW of SW
146511	domestic, stock				6S 91W	20	SW of SW
146370	domestic				6S 91W	30	NW of SW
90221VE	domestic				6S 91W	30	NW of NW
115104	domestic, stock				6S 91W	30	SE of NW
103292	domestic				6S 91W	30	NW of SW
141406	domestic				6S 91W	30	SW of NW
115105	domestic, stock				6S 91W	30	SW of NE
124925	domestic				6S 91W	31	NW of NE
92355VE	domestic				6S 91W	31	NE of SE
106974	domestic				6S 91W	31	NE of SW
8860AD	household only				6S 92W	24	SE of NE
29674F	domestic				6S 92W	24	NE of SE
151997	domestic	15	100		6S 92W	24	SE of NE
158746	domestic, stock	30			6S 92W	25	SE of SE
115290	household only				6S 92W	25	SE of NE
128723	domestic				6S 92W	25	not listed
Source: CDWR 2007a							

Water Rights

A search of water rights records at the CDWR (2007a) found 74 locations that are within the GGMDP area or appear to be within 0.25 mile. In addition, several other surface water rights are more than ¼ mile from the GGMDP area but are down-drainage of the area.

Environmental Consequences

Proposed Action

Surface Water

Constructing the project facilities including pads, pipelines, and access roads could have temporary to short-term impacts on surface water quality in Divide Creek and the Colorado River if construction takes place when their ephemeral tributary streams are flowing through the area. Clearing and grading of streambanks, placement of fill for access roads in stream channels, in-stream trenching, trench dewatering, and backfilling could affect surface waters through increased sedimentation and releases of chemical pollutants from sediments. A reduction in streambank integrity could increase streambank erosion. Suspended sediment during flow events would increase until disturbed areas are stabilized by

reclamation. The greatest sediment load would occur immediately below stream crossings, and suspended sediment concentration would progressively decrease downstream as the large sediment particles are deposited in the channel bed.

Near-surface soil compaction caused by construction equipment and vehicles could reduce the soil's ability to absorb water and could increase surface runoff and the potential for ponding. The magnitude and duration of potential impacts to surface runoff would depend on soil depth, susceptibility of a particular soil type to erosion, vegetation cover, slope aspect and gradient, erosive force of rainfall or surface runoff, and duration and extent of construction activities. Impacts would be greatest immediately following commencement of construction activities and would naturally decrease thereafter due to soil stabilization and revegetation.

As noted in the previous section, conditions of approval listed in Appendix C would further protect surface waters from contamination by sediment or fluid spills. These include the application of riprap to storm drainage ditches, construction of containment berms or pans around tanks, the implementation of a procedure to identify leaks in surface frac lines, and the utilization of a spill containment protocol.

Groundwater

Potential impacts to groundwater resources from the Proposed Action would include contamination of the groundwater with produced water, drilling mud, and petroleum constituents. Hydraulic fracturing (fracing) would be incorporated to complete the wells, which would include produced and freshwater mixed with proppants, or propping agents, to stimulate the formation to create fractures that would allow gas to travel more freely from the rock pores where the gas is trapped. Hydrofracturing would be conducted well below the ground surface, and would be unlikely to cause impacts to groundwater resources near the surface, such as springs or shallow alluvium. Isolation of any water bearing zones during installation of the production casing as well as cementing the production casing to 200 feet above the top of the Mesaverde Group would minimize the effects of fracing on deeper groundwater resources.

Water Rights

Because of their proximity to project access roads, two of the springs identified in CDWR water rights records (SWSE, Sec. 29, T6S, R91W and SENW, Sec. 30, T6S, R91W) could be impacted by spills from an increased number of vehicles using the access roads.

No Action Alternative

Fewer negative environmental consequences on surface waters would result from the No Action alternative. Only one drainage channel would be crossed by new access road and pipeline construction (East Gulch) instead of the two crossed under the Proposed Action, thereby reducing impacts to surface water. Additionally, the smaller amount of surface disturbance associated with the much less intensive oil and gas development would reduce the potential for erosion and transport of sediments into streams.

The No Action alternative would also have less potential for impacts to water wells and to groundwater resources in general due to the less intensive oil and gas development.

Although the two springs potentially affected by the Proposed Action could also be affected by the No Action alternative, the potential would be lower since the less intensive oil and gas development would result in fewer vehicles using access roads.

Analysis on Public Land Health Standard 5 for Water Quality

A formal Land Health Assessment (LHA) was completed in 2009 for the portion of the GSFO that includes the project area. The LHA report will be published in 2010. Reestablishment of pre-construction contours and adequate vegetation cover following completion of the project would allow surface waters to infiltrate back into groundwater recharge areas and would not affect the land health status. Existing surface water quality is within the standards set by the State, thus meeting the land health standard. With proper techniques for crossing streams, restoring disturbed streambanks and channels, controlling erosion and sedimentation, preventing spills, and revegetating disturbed areas (e.g., see COAs in Appendix C), the Proposed Project would not prevent Standard 5 from being met.

Wetlands and Riparian Zones (includes an Analysis on Public Land Health Standard 2)

Affected Environment

Floodplain habitats occur along the intermittent drainages within the Colorado River Basin Main Stem, but no floodplain habitat would be impacted by the Proposed Action. While scattered riparian vegetation (e.g., willows and cottonwoods) occur along ephemeral drainages within the project area, no wetland habitats or riparian zones have been documented in the GGMDP.

Environmental Consequences

Proposed Action

No direct impacts from the GGMDP would occur in wetlands or riparian areas. The only location where riparian vegetation could be affected is the crossing of Jackson Creek by the access road to Pad 9. However, if the road crossing is made at the location that has been staked in the field, it is unlikely that any riparian vegetation would be disturbed.

Indirect and cumulative impacts, i.e., sedimentation to floodplains, are discussed under the Water Quality (Surface and Groundwater) section of this EA.

No Action Alternative

Wetland and riparian habitat would not be affected by the drilling of the proposed wells on the existing and proposed pads, due to the lack of wetland or riparian zones within the Colorado River Basin Main Stem. This alternative would also avoid the crossing of Jackson Gulch mentioned above.

Analysis on Public Land Health Standard 2 for Riparian Systems

A formal Land Health Assessment (LHA) was completed in 2009 for the portion of the GSFO that includes the project area. The LHA report will be published in 2010. The, the mitigation measures included as COAs in Appendix C are expected to avoid impacts special status species. Therefore, the Proposed Action should not result in a failure of the area to achieve Standard 2 for riparian systems.

OTHER AFFECTED RESOURCES

In addition to the critical elements, the resources presented in Table 15 were considered for impact analysis relative to the Proposed Action and No Action alternative. Those resources that would be affected by the Proposed Action and No Action alternative are discussed below.

Table 15. Other Resources Considered in the Analysis

Resource	NA or Not Present	Present and Not Affected	Present and Affected
Access and Transportation			X
Cadastral Survey	X		
Fire/Fuels Management		X	
Forest Management	X		
Geology and Minerals			X
Law Enforcement	X		
Paleontology			X
Noise			X
Range Management			X
Realty Authorizations			X
Recreation			X
Socio-Economics			X
Soils			X
Transportation			X
Vegetation			X
Visual Resources			X
Wildlife, Aquatic			X
Wildlife, Terrestrial			X

Access and Transportation

Affected Environment

The primary access route to the area would be from I-70 at Silt, Colorado (Exit 97). Directions to the Gibson Gulch area are as follows: After exiting I-70 proceed to the frontage road at the south end of the Silt/I-70 interchange; proceed in a general easterly direction along this frontage road 0.4 miles to the intersection with CR 311; turn right and follow CR 311 in a general southerly direction crossing the Colorado River and continue 0.6 miles to the intersection with CR 331; turn left and follow CR 311 in a general easterly direction for 1.4 miles to the intersection with CR 335. To reach Pad 10, Pad 12, and Pad 13, proceed in a general easterly direction along CR 335 for 1.1 miles to an existing gravel pit on the right; turn right and follow a gravel road in a general southeasterly direction through private lands to the project area. To reach all other GGMDP pads, turn right at the intersection of CR 311 and CR 335, and follow CR 335 in a general southeasterly direction along Divide Creek approximately 2.7 miles traveling through private lands and turn left on the gravel access road which leads into the project area. Heavy loads could access the Gibson Gulch project area using these routes as identified in Garfield County’s “Road Haul Route Map” on the Garfield County website (Garfield County 2008).

Within the project area, the road network would be extended from existing and proposed roads to provide access to the proposed pad locations. The extension of the road network would involve construction and improvement of approximately 4.2 miles of new road.

Environmental Consequences

Proposed Action

The Garfield County Road and Bridge Department's preferred haul routes would be used, and BBC would be restricted from using other county roads for heavy loads. The Proposed Action would result in periods of substantial increases in the volume of traffic on the preferred haul routes, other existing BLM roads, and newly constructed roads within the GGMDP area. The greatest increase in traffic 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 16).

Table 16. Traffic Associated with Drilling and Completion Activities

Vehicle Class	Trips per Well	Percentage 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: USDI 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.

Once the wells are producing, traffic would decrease to occasional visits for monitoring or maintenance activities, and hauling produced water and condensate. Each well may have to be recompleted once per year, requiring three to five truck trips per day for approximately seven days.

The increased traffic on county roads may cause temporary conflicts with normal traffic, including travel delays and increased vehicle collision rates. The project traffic would also cause an increase in fugitive dust and noise and an increased risk of collision with wildlife. Degradation of county roads may occur from heavy equipment travel, resulting in increased maintenance and safety management requirements.

Within the project area, the road network would be extended from existing roads to provide access to the proposed pad locations. The extension of the road network would involve construction of approximately 4.2 miles of new roads. Use of multi-well pads and directional drilling greatly reduces the need for new access road construction.

Roads would be designed and maintained to an appropriate standard no higher than necessary to accommodate their intended functions, as described in the *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* (BLM and USFS 2006) and BLM Handbook 9113 - *Roads Manual*.

Mitigation measures presented in Appendix C would reduce potential road and traffic related impacts.

No Action Alternative

In comparison with the Proposed Action, this alternative would considerably reduce impacts to access and transportation because only 27 wells on three Fee pads would be developed. Well drilling and other construction-related traffic volumes would be lower as would volumes during the production phase.

Geology and Minerals

Affected Environment

Geology and Physiography

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. Outcropping on or near the land surface are thick layers of Tertiary bedrock mantled by unconsolidated, colluvial and alluvial deposits. The project area is located only 4 miles southwest of the Grand Hogback, which marks the boundary of the Colorado Plateau and the Southern Rocky Mountains. Elevations within the GGMDP area range from approximately 5630 to 7080 feet. Thus, relief is approximately 1450 feet.

The project area is within a small structural basin located between the Divide Creek Anticline to the south and the Grand Hogback (a prominent, steeply southwest dipping monocline). The Wasatch and Mesaverde formations dip slightly to the north or northeast within the GGMDP area (Ellis and Freeman 1984, Shroba and Scott 1997).

The youngest rocks in the GGMDP are Quaternary in age and are distributed as unconsolidated sedimentary surface deposits. Although the predominant surface formation is mapped as the Wasatch Formation, field inspection revealed the Wasatch exposed only in a few outcrops outside the proposed disturbance footprint, on mesa sides and summits. Noted surface sediments were made up of stream, terrace, and outwash gravels (Qg), pediment gravels (Qgo), and high-level alluvium (QTa). The thickness of these alluvial deposits is uncertain, but depth to the underlying Wasatch Formation may be determined during construction excavation. Table 17 lists the formations present within the GGMDP area and their characteristics.

Table 17. Geologic Formations within the GGMDP Area

<i>Map Symbol</i>	<i>Formation Name</i>	<i>Age</i>	<i>Characteristics</i>	<i>Location</i>
Qal	Alluvium	Pleistocene & Holocene	layered flood deposits of silt, sand, and gravel	drainage valleys & terraces
Qsw	Sheetwash deposits	Pleistocene & Holocene	poorly-layered, water-deposited silt, sand, and gravel	lower slopes above drainage valleys
Qls	Landslide deposits	Pleistocene & Holocene	heterogeneous rapid gravity flow deposits of clay- to boulder-sized materials	mesa side slopes
Qc	Colluvium	Pleistocene & Holocene	heterogeneous slow gravity flow deposits of clay- to boulder-sized materials	mesa side slopes
Qlo	Loess	Pleistocene	wind-blown silt deposits	mesa summits
Qbb	Basaltic boulder gravel	Pleistocene	weathered igneous deposits of Tertiary volcanic origin	mesa summits
QTa	high level Alluvium	Pleistocene	fine-grained to boulder alluvial deposits and gravels, characterized by abundant basalt	ridge tops
Tw	Wasatch formation	Eocene & Paleocene	Claystone, shale, siltstone, sandstone bedrock	outcrops on mesa sides and summits
Kmv	Mesaverde formation	Upper Cretaceous	Sandstone, shale, conglomerate bedrock with some coal beds	below Tw & not exposed in project area

Source: Tweto 1978, Ellis and Freeman 1984, Shroba and Scott 1997

The target zone for oil and gas production is the Mesaverde Group, which lies unconformably below the Wasatch Formation. The Mesaverde can be over 7,000 feet in thickness within the Piceance Basin but is approximately 5,000 feet thick in the GGMDP area. The Mesaverde Group is often called the Mesaverde “Formation” and includes informal subdivisions based on gas productivity characteristics including the barren Ohio Creek, the stacked lenticular, fluvial sandstones, sandy and carbonaceous shales, and coals of the Williams Fork Formation, and the underlying marine sandstones and shales of the Iles Formation.

The proposed GGMDP drilling project would target sandstone layers within the Williams Fork (including the Cameo Coal and un-named sandstones) between 4,500 and 7,000 feet TVD. The Williams Fork Formation sandstones are considered “tight” because of their low permeability reservoir characteristics. Individual sandstones are stacked and concentrated into 400-500 foot thick potentially productive sequences, and distributed throughout a vertical interval of about 3,000 feet. Sand bodies originating from a river or fluvial depositional setting typically demonstrate irregular and spatially limited reservoir distributions. Studies of the Rulison Gas Field, located east of the project area, show that these Williams Fork sandstones have limited horizontal extent, based on the lack of pressure communication between existing wells spaced less than 1,000 feet apart (Vargas 2004).

Deeper pay intervals within the lower Mesaverde include the Rollins, Cozette, and Corcoran sands. Most of the gas reservoirs also produce varying amounts of oil/gas condensate. The GGMDP action includes up to five new Federal surface locations to directionally drill to a total of 109 bottomhole locations for natural gas from sands of the Williams Fork.

Geologic Hazards

The project area lies within Seismic Risk Zone 1 (on a scale of 0 to 3, with Zone 3 having the highest risk) (Algermissen 1969). Within Zone 1, minor damage to structures from distant earthquakes may be expected. No faults have been identified within the GGMDP area (Ellis and Freeman 1984, Shroba and Scott 1997). The National Earthquake Information Center database (2007) was searched for the area within approximately 100 miles of project site. Since 1960, the largest event within the search area was magnitude 5.7 (Modified Mercalli Intensity VII) and was centered approximately 46 miles northwest of the project site. Most of the GGMDP area is located in moderate erosion-potential areas or on potentially unstable slopes (Soule and Stover 1985). Table 18 describes the severity and characteristics of the geologic hazards found within the GAP area.

Table 18. Geologic Hazards within the GGMDP Area

Map Symbol	Hazard	Hazard Rating	Characteristics
DMA	Debris-flow/mudflow-flooding area	moderate-high	Debris fans, alluvial fans, and drainage channels subject to potentially destructive inundation by rapid downslope flowage of wet commonly fluid-like masses during periods of heavy rainfall and/or snowmelt runoff.
PUS	Potentially unstable slope	moderate	Areas subject to slope failure(s) if natural conditions, especially those related to slope, soil moisture, vegetation cover, and drainage, are disrupted.
US	Unstable slope	moderate-high	Areas subject to natural translational or rotational landslides and/or earthflows.
CS	Collapsing soils	moderate-high	Low density, mechanically weak soils subject to hydrocompaction associated with excessive wetting and loading.
FP	Physiographic floodplain	moderate	Area subject to overbank flooding underlain by modern flooding-derived deposits.
MEP	Moderate erosion-potential area	moderate-high	Area undergoing moderate gullying, headward erosion, and exhibiting a moderate potential for continued erosion (generalized).
Source: Soule and Stover 1985			

Mineral Resources

The GGMDP area includes the Mamm Creek gas field, which taps resources of the Lower Cretaceous-age Mesa Verde Formation.

Coalbed methane (CBM) is not currently exploited in the immediate project area, but there is a potential of CBM within coal-bearing strata of the Mesaverde Formation which is found at depth beneath the GGMDP area. The geologic formations underlying the GGMDP do not contain metallic deposits in significant concentrations and contain no coal deposits that could be mined by conventional methods. No mineshafts, pits, or adits appear to be found within the GGMDP (Shroba and Scott 1997).

No sand and gravel operations are located within the GGMDP. Sand and gravel resources within the GAP area are limited to stream terrace and alluvial fan gravels of relatively poor quality (Stover and Soule 1985).

Environmental Consequences

Proposed Action

Geologic Hazards

Pipeline damage can result from earthquake-related seismic wave propagation. For an Intensity VII earthquake (the largest predicted for the project area), less than 0.0001 repairs per 1,000 feet are predicted for steel pipe with arc-welded joints (O'Rourke and Liu 1999). Seismic hazards associated with project drilling equipment and facilities appear to be very low given the low earthquake potential for the area.

Natural gas pads would be located on relatively flat sites with stable soils and away from drainages. Thus, pad construction issues related to slope stability, collapsing soils, and gulying would be largely avoided. However, access roads and gathering lines would cross some unstable or potentially unstable areas.

Flash floods can scour streambeds, resulting in several feet of alluvium being removed and deposited farther down the channel. Streambed scour can expose buried pipe where it crosses streambeds.

Mineral Resources

Development of the gas reserves within the GGMDP area would result in a permanent loss of these reserves. Other exploitable mineral resources within the GGMDP area are limited.

No Action Alternative

Under the No Action alternative, fewer gas reserves would be permanently lost. Other potential impacts related to geologic resources would be minor and similar to impacts of the Proposed Action.

Mitigation

During construction, gathering lines would be buried below the potential depth of flash-flood scour. Steep, unstable slopes would be avoided to the extent possible. Once construction is completed, BBC would rebury and repair pipe exposed by flash flooding or slope failure. BBC would coordinate construction activities with other active oil and gas development operations in the GGMDP area.

Noise

Affected Environment

Noise is generally described as unwanted sound and is measured as sound pressure in units of decibels (dB(A)s). The decibel scale is logarithmic, or nonlinear, 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 in 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 dB(A) (USEPA 1974, Harris 1991). The Proposed Action would be located in a rural, sparsely-populated area with few potential noise sources. Noise levels from human activity are mostly mechanical, consisting mainly of existing oil and gas wells, new exploration activities, and ranching/farming operations. Human noise is widely dispersed throughout the area, and there are few impacts associated with industrial noise sources and vehicular traffic. As a basis for comparison, the noise level during normal conversation of two people 5 feet apart is 60 dB(A).

Interstate 70 is the only high-speed road within the vicinity of the plan area, and it is not anticipated to significantly contribute to the existing noise levels because of its distance (greater than 1 mile) from the area. Roadway traffic on county roads and BLM roads in the GGMDP area contributes to noise, but this source is transient, produced primarily by vehicles used for exploration and maintenance.

Noise from oil and gas development comes from a number of sources: truck traffic, drilling and completion activities, well pumps, and compressors. Table 19 summarizes noise levels of typical construction equipment; Table 20 summarizes noise levels for a number of oil and gas activities. Noise levels experienced by a receptor depend on the distance between the receptor and the equipment, the topography, vegetation, and meteorological conditions (e.g., wind speed and direction, temperature, humidity).

Table 19. Noise Levels Associated with Typical Construction Equipment

Equipment	Noise Level dB(A)		
	50 feet	500 feet	1,000 feet
Tractor	80	60	54
Bulldozer	89	69	63
Motor Grader	85	65	59
Mechanic Truck	88	68	62
Backhoe	85	65	59
Crane	88	68	62
Air Compressor	82	62	56
Dump Truck	88	68	62
Average (nearest dB(A))	85	65	59
Source: La Plata County 2002.			

Table 20. Noise Levels Associated with Oil and Gas Activity

Noise Source	Sound Level at 50 Feet*
Well Drilling	83 dB(A)
Pump Jack Operation	82 dB(A)
Produced Water Injection (Disposal) Facilities	71 dB(A)
Gas Compressor Facilities	89 dB(A)
Source: Woodward-Clyde 1988 Raw noise data. Portland, Oregon; USDI, BLM 2003, Las Cruces Field Office, December 2003 PRMPA/FEIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties Note: *Sound levels are based on highest measured sound levels and are normalized to a distance of 50 feet from the source.	

Overall, ambient sound levels within the vicinity of the plan area are likely to be slightly elevated above the typical levels for rural recreational areas. Sensitive noise receptors include wildlife and recreationists and hunters visiting the area for solitude and a sense of remoteness. The closest residence belongs to Miller Land & Cattle Company, and is situated approximately 2,500 feet from Pad 9 and 2,700 feet from Pad 3. The next two closest residences are between 3,500 and 4,200 feet from the nearest proposed drilling pad.

The November 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 following maximum permissible levels (Table 21).

Table 21. Noise Standards for Light industrial, Residential/Agriculture/Rural

Zone	7:00 A.M. to next 7:00 P.M	7:00 P.M. to next 7:00 A.M
Light Industrial	70 dB(A)	65 dB(A)
Residential/Agricultural/Rural	55 dB(A)	50 dB(A)
Note: The allowable noise level for periodic, impulsive or shrill noises is reduced by five (5) db(A) from the levels shown (COGCC 2006).		

Given the remote locations of the proposed project activities, where there is no reasonably proximate occupied structure or designated outside activity area, the light industrial standard is applicable.

Environmental Consequences

Proposed Action

Implementation of the Proposed Action would result in increased noise levels above the general background levels during all phases of project development. Noise disturbances during road, well pad, and pipeline construction would be temporary and most noticeable at the construction site and along the access roads used by project-related traffic. Typical noise levels from construction sites at 50 feet are 85 dB(A). Based on the Inverse Square Law of Noise Propagation (Harris 1991) and an average construction site noise level of 65 dB(A) at 500 feet (Table 20), construction noise would equal approximately 59 dB(A) at 1,000 feet. At 1,000 feet, noise levels would approximate those of an active commercial area (USEPA 1974).

Noise levels around the well pads during drilling and completion activities would also increase above the general background levels. These elevated levels would last approximately 40 to 60 days at each well. Noise would occur continuously, 24 hours per day, during the drilling and completion period. Based on a measured noise level of 68 dB(A) at 500 feet, actions associated with drilling and completion would generate approximately 62 dB(A) at 1,000 feet. This level of noise approximates that associated with light industrial activities (USEPA 1974). Since the closest residence is approximately 3500 feet from the nearest drilling pad, noise levels experienced at area residences should be substantially lower than discussed here.

Traffic noise levels would also be elevated as a consequence of the Proposed Action. The greatest increase would be along county and BLM access roads during the drilling and completion phases. Based on the La Plata County data presented in Table 20, approximately 68 dB(A) 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 after construction and drilling activities are completed and the production phase begins, but impacts would still be greater than background noise levels. Permanent sources of noise and noise level increases would be associated with an increase in periodic truck traffic to the well sites, and during maintenance and workovers, noise would increase above levels associated with routine well production. This noise level increase is not anticipated to be significant and would be intermittent and short-term and in duration.

The only residence within 3,500 feet of a proposed pad is the Miller residence, which is located approximately 2,500 feet west of Pad 6. The Miller Land & Cattle Company LCC also owns the land where Pad 6 is sited, so this landowner would have authority to require sound barriers to be installed on the pad during drilling and completion. A site-specific COA listed in Appendix C requires any noise mitigation installed on Pad 6 to also be installed on Pad 3, which would be located approximately 2,700 feet from the Miller residence but owned by another private landowner.

Paleontology

Affected Environment

The predominant bedrock formations present at or near the surface within the boundary of the GGMDP are the Wasatch Formation (including the Fort Union Formation or equivalent at its base) and the Ohio Creek formation. Isolated areas of Quaternary gravels and alluvium, wind-blown loess, colluvium, and weathered volcanic boulders and gravel are interspersed throughout the MDP area and cover older Wasatch formation sediments. 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.

The Wasatch Formation is a BLM Condition 4 formation, defined as an area that is known to contain vertebrate fossils or noteworthy occurrences of invertebrate fossils. These types of fossils are known to occur or have been documented, but may vary in occurrence and predictability. The Wasatch Formation is divided into the early Eocene Shire, and the Paleocene age Molina and Atwell Gulch members. 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 1999).

Environmental Consequences

Proposed Action

Although mapped as the predominant surface formation of the GGMDP area, field inspection revealed the Wasatch exposed only in a few outcrops found on mesa sides and summits. The thickness of the Quaternary sediments cannot be accurately determined, but construction activities have the potential to adversely affect important fossils that may be present in the underlying Wasatch Formation. The greatest potential for impacts is associated with excavation of shallow bedrock that may be unearthed during well pad and facilities (especially pipeline) construction. In general, alluvium, colluvium, and other unconsolidated sediments are much less likely than bedrock to contain well-preserved fossils.

An examination of the BLM paleontology database indicates that there are no known fossil occurrences within the GGMDP boundary. The closest known site occurs in Section 15, T6S, R91W, more than one mile northeast of proposed pads 10, 12, and 13. Three additional sites are found northwest in Section 15, T6S, R92W, over 3 miles from the nearest proposed pad site. Areas covered with thick vegetation and soil cover do not usually yield fossil resources, but onsite inspections should be conducted for proposed facilities that are located on or within 200 feet of Wasatch Formation bedrock surface exposures. In the event paleontological resources are encountered, a standard paleontological COA would be attached to the APDs (Appendix C).

No Action Alternative

Because new ground-disturbing activities would be considerably less with the No Action alternative, the potential for impacts to paleontological resources would be lower.

Range Management

Affected Environment

The Gibson Gulch site would be partially in the following four Allotments: Scott (#08106), Jackson Gulch (#18046), Whitman (#08102), and Kamm Mesa (#08101). See Table 22 for allotment details.

Environmental Consequences

Proposed Action

Development of the proposed GGMDP would result in approximately 82.4 acres of total short-term surface disturbance including pads, roads, and pipelines within the allotment and a potential loss of 7 Animal Unit Months (AUMs) of available forage. This loss would last for approximately 3 years or until grasses and forbs seeded during interim reclamation became productive. Long-term loss, which would last 20 to 30 years, would then be reduced to approximately 29.7 acres total within the allotments.

Table 22. Grazing Allotments within the Gibson Gulch MDP Area

No.	Allotment Name	Acre	No. of Livestock	Livestock Type	Begin	End	Public Land %	AUM	Affected By Gibson Gulch Gap
08106	Scott	978	103	Cattle	5/15	6/13	100	102	120 acres (Sec S1/2 32)
18046	Jackson Gulch	1837	150	Cattle	5/16	6/14	100	148	920 acres (Sec 28, 29, N1/2 32, N1/2 33)
08102	Whitman	845	60	Cattle	5/1	5/31	100	61	480 acres (Sec 19)
08101	Kamm Mesa	748	1230	Cattle	5/10	6/9	4	50	360 acres (Sec 20)

In addition to the loss of forage, an increase in human activity related to development and maintenance of the developments would cause cattle to avoid certain areas of the allotments. However, livestock may also benefit from improved access. New roads and pipelines would open access to areas of the allotments that are difficult for livestock to access because of thick brush and/or steep slopes. Improvement in livestock distribution would improve forage utilization throughout the allotment.

It is not anticipated that the impacts from implementation of the Proposed Action would require adjustment of the stocking rate for livestock. The level of forage utilization would be monitored on the allotment and if necessary, adjustments in livestock use would be made to protect land health.

Mitigation

Range improvements (fences, gates, reservoirs, water lines, etc.) would be avoided during development of natural gas resources to the maximum extent possible. If range improvements are damaged during exploration and development, the operator would be responsible for repairing or replacing the damaged range improvements.

If a new or improved access road bisects an existing livestock fence, steel frame gate(s) or a cattleguard with associated bypass gate shall be installed across the roadway to control grazing livestock.

No Action Alternative

No impacts to range management resources would occur because development would take place on proposed pads located on private lands.

Realty Authorizations

Affected Environment

Road rights-of-way are granted through the GGMDP approval process. Pipelines internal to the GGMDP would require the approval of an SF 299, Right of Way approval form. Roads used for access to the GGMDP area from outside the GGMDP boundary are also subject to the SF 299 approval process. A total of 4.2 miles of road construction is projected and 3.8 miles of new pipelines. Terms and conditions of the grants would include a watershed and winter range timing limitation that precludes construction, drilling, or completion activity traffic during a portion of the winter season.

Environmental Consequences

Proposed Action

Under the Proposed Action, the ROW authorizations would be granted subject to appropriate terms and conditions. These authorizations would provide BBC legal access for the construction and development of the proposed pads, roads, and pipelines. Standard BLM reclamation requirements would apply.

No Action Alternative

This alternative would have no effect on reality authorizations because all development would take place on Fee lands.

Recreation

Affected Environment

No Special Recreation Management Areas are located within or adjacent to the Proposed Action (USDI 1999b). The Proposed Action is located within Region 4 (area within GSRA with the highest potential for oil and gas development), which provides for dispersed recreation in rural to semi-primitive motorized settings on BLM lands. Recreation activities primarily consist of hunting (big and small game), camping (undeveloped), off-highway vehicle (OHV) riding, and sightseeing.

The project area is located within both private and BLM surface lands, where the private landowners have seasonal hunting restrictions identified within their SUAs. Hunting activities occur on both private and BLM lands with restrictions on the private lands. Hunting is managed and licensed by CDOW, which provides permits for both big and small game within the area. One commercial hunting outfitter—Majestic Outfitters (Cheryl Monger, 4786 County Road 312, New Castle, CO 81647, 970-984-9763)—holds Special Recreation Permit #CO-078-140-90-2 for guided hunting in an area that includes the GGMDP. Most of the area covered by this permit is located farther south (upslope) between Divide Creek and Garfield Creek, and also the area east of Garfield Creek.

No developed recreational facilities such as campgrounds, picnic areas, or improved hiking/biking trails are present within the GGMDP area. Several unpaved two-track roads including county roads suitable for four-wheel drive and OHVs cross the GGMDP, but their use is limited primarily to hunters and hikers.

Oil and gas development activities modify the landscape and the quality of recreational settings to varying degrees. The proposed activity (gas field development) is more consistent with roaded natural (RN) settings, based on the BLM-administered lands, the Recreation Opportunity Spectrum classification system. The RN physical and social recreation setting is typically characterized by a natural appearing environment with moderate evidence of the sights and sounds of man, where modification and use practices are evident, but harmonize with the natural environment (USDI 1982). The recreational setting character of the proposed project area remains generally natural and primitive.

Environmental Consequences

Proposed Action

The Proposed Action would temporarily result in increased vehicle traffic, noise, dust, and human activity during construction. These activities would decrease nominally throughout the operational life of the project. Well pad construction and drilling activities would likely displace wildlife in localized areas

adjacent to these activities. Recreation activities, such as hunting would be displaced to other locations within or adjacent to the project area, except where SUAs call for no drilling activities during certain hunting seasons.

Over the 20-30 year operating life of the project, the presence of natural gas production facilities (wells, tanks, pipelines, and operations and maintenance traffic) would alter the recreational character of the project area but not enough to lose the general natural setting of the area. The recreation setting of the project area can be expected to remain within the RN (roaded natural) category.

The use of multi-well production pads limits the extent of surface disturbance within a given area, which allows the RN settings to be retained after the project area has been developed. Both short term (construction) and long term (operations) would cause changes in the physical and social recreation setting impacting the recreation experience of traditional users. During the short term, hunters and other recreationists, would be temporarily displaced, but would be able to shift their activities to surrounding public lands. Long-term impacts could potentially increase access to public lands from the newly constructed access roads and pipeline ROWs supporting the proposed project. It is recommended that BMPs (fencing and other movable barriers) be installed to limit access to previous inaccessible public lands. Without such BMPs, traditional recreational users such as hunters would be replaced by recreational users seeking different activity opportunities and experiences (e.g., OHV riders). However, recreation activities of the new users would not be outside the RN experience and activity opportunity characters. The Proposed Action is unlikely to increase public recreational access to and through the project area. Also, recreational activities would likely continue on adjacent lands by existing users.

No Action Alternative

Under the No Action alternative, the Proposed Action would not be approved. The existing environment on BLM lands in the Gibson Gulch area would remain in its current condition. The only new impacts on recreation would potentially occur where Fee wells would be developed.

Socio-Economics

Affected Environment

The GGMDP area is located within Garfield County, Colorado. The population of Garfield County has grown by approximately 2.8% per year from 2000 to 2005, resulting in an increase from 44,300 to 51,000 residents (U.S. Bureau of the Census 2005). Population growth in Garfield County is expected to more than double over the next 20 years from over 50,000 in 2005 to 116,000 in 2025 (Colorado Department of Local Affairs 2007).

In the year 2000, industry groups in Garfield County with the highest percentage of total employment were construction (20.4%), tourism (10.7%), retail trade (13.7%), and education and health (15.4%). An estimated 13.3% of the population was retired in the year 2000 and did not earn wages. Employment in agriculture, forestry, hunting, and mining accounted for 2.4% of total employment.

Personal income in Garfield County has also risen, growing 120% from \$513 million in 1990 to \$1.1 billion in 2000. Annual per capita income has grown by 50% during the same period, from about \$17,000 to \$26,000 (USDI 2006) and the average earnings per job in 2005 was approximately \$37,500 (Garfield County 2007). The communities of Parachute, Silt, and Rifle are considered the most affordable for housing; the communities of Battlement Mesa, New Castle, and Glenwood Springs the least affordable where the cost to rent or own similar housing may be 50% higher or more (USDI 2006).

Activities on public land in the vicinity of the plan area are primarily ranching/farming, hunting, 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 and services. Big game hunting, in particular, is viewed as critical to the economy of Garfield County, and especially to the local community economies that depend on BLM and Forest Service public lands where most hunting occurs (USDI 2006). Expenditures by hunters in the Roan Plateau Planning Area have been estimated to be as much as \$1 million annually, with perhaps an additional \$1 million annually of indirect and local expenditures (CDOW 1995 in USDI 2006).

The growth of the oil and gas industry in the past 10 years has been increasingly important to local economies (USDI 2006). Oil and gas production in Garfield County has increased more than three-fold during the past five years from 70 billion cubic feet (BCF) in 2000 to more than 235 BCF in 2005 (COGCC 2006 in USDI 2006). In addition, Garfield County has experienced the fastest oil and gas development in Colorado with 1,800 drilling permits issued in 2005 (USDI 2006). In 2005, 60 drill rigs were operating in Garfield County, and a new well was estimated to be drilled every 15 to 20 days (COGCC 2006 in USDI 2006). While the number of workers employed in the mining and extraction industry in Garfield County has been shown to be only 1.7%, this number is considered misleading because some oil and gas employment has been incorporated as part of the construction sector statistics instead (USDI 2006). For example, in the year 2005, an estimated 4000 persons were directly employed by gas development companies and their subcontractors in Garfield County (Garfield County 2007).

The Federal government makes “Payments in Lieu of Taxes” (PILT) to county governments to help offset property tax revenue lost of nontaxable Federal lands within county boundaries (USDI 2006). Payments are based on Federal acreage in the county for all land management agencies, including BLM, U.S. Forest Service, U.S. Fish and Wildlife Service, and National Park Service. The amount may also be adjusted based on population and as appropriated by Congress. By formula, payments are decreased as other Federal funds, such as mineral royalty payments, increase. PILT received by Garfield County in the last 4 years has been as follows: \$1,170,205 in 2004; \$808,348 in 2005; \$1,065,158 in 2006; and \$1,078,087 in 2007 (USDI/NBC 2008).

In addition, to PILT payments, the BLM shares revenue generated by commercial activities on public lands with State and county governments (USDI 2006). 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. Half the royalty receipts are distributed to Colorado. The amount distributed to Garfield County in 2002 attributable to oil and gas production was \$5.5 million. In 2001, the amount was \$14.1 million (USDI 2006). These funds are then allocated to fund county services, schools, and local communities.

Property tax revenue from oil and gas development has also become the largest source of public revenue in Garfield County (USDI 2006). In the year 2007, oil and gas assessed valuation in Garfield County amounted to \$1,867,927,350 or about 65% of total assessed value. Total tax revenues from property taxes and special district levies were \$130,180,686. Tax dollar distributions in 2007 were Schools 37%, County 30%, Special Districts 13%, Fire Districts 10%, Colleges 8%, and Towns 2%.

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 Latino community is the only minority population of note in the vicinity of the GGMDP area. In 2000, 16.7% of the residents of Garfield County identified themselves as Hispanic or Latino, which is close to the state average (17.1%). African

Americans, American Indians, and Pacific Islanders account for less than 1% of the Garfield County population, which is below the state levels.

Environmental Consequences

Proposed Action

The Proposed Action would positively impact the local economies of Garfield County through the creation of additional job opportunities in the oil and gas industry and in supporting trades and services. In addition, local governments in Garfield County would experience an increase in tax and royalty revenues. Some minor economic loss to private landowners or guides may result from the potential displacement of big game and resulting reduction in big game hunting within the project area.

The Proposed Action could result in negative social impacts including: 1) a decrease in the recreational character of the area (see **Recreation** section), 2) reducing scenic quality (see **Visual Resources** section), 3) increased dust levels especially during construction (see **Air Quality** section), and 4) increasing traffic (see **Access and Transportation** section).

No Action Alternative

Due to the small-scale of development that would occur under this alternative, additional job opportunities would be considerably less than those associated with the Proposed Action. Local governments would not benefit from Federal mineral royalties because the development would occur on private mineral estate from private surface locations.

On the other hand, landowners and guides should not be impacted because the displacement of big game would be reduced. Other negative social impacts, such as increased dust levels and traffic, would be less.

Soils (includes an Analysis on Public Land Health Standard 1)

Affected Environment

Soils within the GGMDP area have formed in several types of surficial materials (Soule and Stover 1985):

- Residual material produced by in-situ weathering of the underlying sedimentary bedrock, which is primarily shale.
- Colluvium and other mass wasting deposits including landslides, debris flows, and slumps.
- Aeolian (wind) deposits of sand and silt.
- Alluvial deposits including alluvial fan gravels and floodplain alluvium in stream valleys.

Lack of moisture associated with the semi-arid climate has suppressed vegetation growth and slowed the chemical and biological processes commonly associated with soil development (BLM 1994). In addition, soil fertility is hampered by high salinity and susceptibility to wind and water erosion. Soils in the project area support low-density livestock grazing and wildlife habitat, but generally have a poor revegetation potential due to these limiting factors. However, soils in alluvial valleys and some gently sloping mesa summits are capable of supporting irrigated and dryland crops, principally hay and alfalfa.

Table 23 lists the soil mapping units within the GGMDP area and indicates the environmental and construction-related constraints associated with each soil type. The total acreage of each mapping unit that would be affected by well pads, pipelines, and new access roads) is also presented.

Table 23. Environmental and Construction-Related Constraints for Project Area Soils

Mapping Unit Name	Water Erosion Hazard	Wind Erosion Hazard	Bedrock Depth	Drainage	Permeability	Available Water Capacity	Suitability for Natural Surface Roads
Cochetopa-Jerry complex, 25-50% slopes	severe	slight	>60"	well drained	slow	high	poor
Heldt clay loam, 6-12% slopes	slight-severe	moderate	>60"	well drained	slow	moderate	moderate
Ildefonso stony loam, 6-25% slopes	slight- severe	moderate	>60"	well drained	moderate - moderately rapid	low	poor
Jerry loam, 12-50% slopes	moderate-severe	slight	>60"	well drained	slow	high	poor
Morval-Tridell complex, 6-25% slopes	slight-severe	moderate	>60"	well drained	moderate - moderately rapid	moderate - low	moderate
Olney loam, 3-6% slopes	slight-moderate	slight	>60"	well drained	moderate	moderate	moderate
Olney loam, 6-12% slopes	slight-severe	slight	>60"	well drained	moderate	moderate	moderate
Potts loam, 3-6% slopes	slight-moderate	moderate	>60"	well drained	moderate	high	moderate
Potts loam, 6-12% slopes	slight-severe	moderate	>60"	well drained	moderate	high	moderate
Potts-Ildefonso complex, 12-25% slopes	moderate-severe	moderate	>60"	well drained	moderate - moderately rapid	high - low	poor
Torriorthents-Camborthids-Rock outcrop complex, steep (15-70% slopes)	severe-very severe	not rated	0 - 60"+	variable	not rated	not rated	poor
Torriorthents-Rock outcrop complex, steep (15-70% slopes)	severe-very severe	not rated	0 - 60"	variable	not rated	not rated	poor
Vale silt loam, 3-6% slopes	slight-moderate	slight	>60"	well drained	moderate	high	moderate
Villa Grove-Zoltay loams, 15-30% slopes	moderate-severe	moderate	>60"	well drained	moderately slow - slow	high	poor

Sources: Harman, J.B. and D.J. Murray. 1985. Soil Survey of Rifle Area, Colorado. USDA Soil Conservation Service and NRCS. 2007. Web Soil Survey. Accessed at: <http://websoilsurvey.nrcs.usda.gov/app/>.

Soils with a severe or very severe water erosion hazard tend to be found on moderately to steeply sloping lands. These soils also tend to be relatively impermeable, meaning that more precipitation tends to run off the surface rather than infiltrate into the soil. Other important soil characteristics that make a soil highly erodible by water include high contents of silt and very fine sand; expansive types of clay; a tendency to form surface crusts; the presence of impervious soil layers; and blocky, platy, or massive soil structure (Brady and Weil 2002).

Soils with slow to very slow permeability are susceptible to ponding of water at the surface. A low available water capacity can be an impediment to revegetation. Soils within the GGMDP area are not subject to flooding or high water tables.

While it is unlikely within the GGMDP area, in areas where soils average less than 60 inches to bedrock, trenching for pipeline or road construction may encounter bedrock, and on mesa tops such construction could encounter boulders that are too large for equipment to move. In such cases, blasting could be necessary depending on the hardness of the encountered bedrock or boulders.

Environmental Consequences

Proposed Action

The areas of proposed disturbance include approximately 65.0 acres of soils listed that may have severe or very severe water erosion hazard. This represents approximately 79 percent of the total acreage of proposed soil disturbance (82.4 acres). Clearing, grading, and movement of construction equipment in these areas would remove the protective vegetation cover from these soils, accelerating the erosion process. Water erosion of soils associated with construction is a concern because it results in loss of valuable topsoil by sheet, rill, and gully erosion. Eroded topsoil and subsoil ultimately contribute to increased sedimentation of area streams and wetlands. Sedimentation adversely affects water quality and aquatic life.

No soils would be affected that are classified as highly erodible by wind. Nevertheless, even sandy soil classified as moderately erodible by wind can be dispersed by high winds into off-ROW areas where it can negatively impact vegetation and increase stream sedimentation. Wind erosion also affects air quality.

The proposed buried pipelines would cross approximately 3.7 miles of soils that have a depth to bedrock averaging less than 60 inches. This represents nearly 100 percent of the total length of proposed pipelines. As discussed above, depending on bedrock hardness and cohesion, blasting may be needed in order to excavate a trench through these soil mapping units, although this is unlikely within the project area. Even if blasting is not required, standard excavation with a trenching machine or excavator can be slowed considerably. Furthermore, there is the potential for mixing of soil horizons during construction, which could reduce soil fertility and hinder revegetation potential.

No soils that are subject to flooding or high water tables would be affected by the proposed project.

The Proposed Action would result in the potential throughout the affected area for accidental spills or leaks of petroleum products and hazardous materials during construction. These events would cause soil contamination and an associated decrease in soil fertility and revegetation potential.

Mitigation

Impacts of the project on soil resources would be minimized by implementing measures for handling topsoil and subsoil, erosion control, compaction, spill control, and reclamation. These measures include the following:

- Topsoil would be stripped to a minimum depth of 6 to 12 inches. Trench spoil and other subsoil stripped during grading would be stored separately from topsoil to prevent mixing. During reclamation, soils would be returned to their pre-construction locations.
- Topsoil would be windrowed around pad perimeters to create berms that limit and redirect stormwater runoff and extend the viability of the topsoil per BLM Topsoil Best Management Practices (BLM 2009 PowerPoint presentation available upon request from Glenwood Springs Field Office). Topsoil would also be windrowed, segregated, and stored along pipelines and roads for later spreading across the disturbed corridor during final reclamation. Topsoil berms would be promptly seeded to maintain soil microbe health, reduce erosion, and prevent weed establishment.
- Temporary erosion and sediment controls including diversion channels, wattles, silt fences, and/or slope breakers would be installed immediately following clearing and grading. These structures would be maintained and would be removed during reclamation, as appropriate.
- Effects of leaks and spills of petroleum products and hazardous materials would be minimized by implementation of the project Spill Prevention, Control, and Countermeasures Plan. Measures would include use of containment structures, regular inspection of machinery and storage containers, over-excavation of spill-impacted soils, and disposal of impacted soils and cleanup material at authorized facilities.
- Following construction, compacted soils would be loosened using a tractor-pulled ripper or similar device. Disturbed areas would be returned to their pre-construction contours. All disturbed areas would be seeded with seed mixes recommended by the BLM or NRCS or with mixes requested by private landowners. Permanent erosion control measures such as slope breakers, mulch, and erosion-control netting would be installed where needed.
- Segregated stockpiled topsoil and spoil piles would be replaced during reclamation in their respective original positions (last out, first in) to minimize mixing of soil horizons.
- The operator would ensure stockpiled topsoil was evenly distributed over the top of spoil used in re-contouring efforts.
- The operator would be required to monitor all reclaimed areas for signs of erosion and the presence of noxious and invasive plant species. If problems arise, the operator would consult with the BLM for further assistance.
- It would be the responsibility of the operator to continue revegetation/reclamation efforts until vegetative communities on all disturbed surfaces were composed of desirable seeded vegetation (as determined by the BLM).

No Action Alternative

Under the No Action alternative, the Proposed Action would not be approved. Only the Fee wells would be developed. As a result, the effects on soils would be much less than effects associated with the Proposed Action.

Analysis on Public Land Health Standard 1 for Upland Soils

A formal Land Health Assessment (LHA) was completed in 2009 for the portion of the GSFO that includes the project area. The LHA report will be published in 2010. With successful topsoil handling procedures, erosion control methods, and restoration measures during construction and restoration activities, the Proposed Action would not prevent the area from meeting Standard 1.

Vegetation (includes an Analysis on Public Land Health Standard 3)

Affected Environment

The primary vegetation types in the GGMDP include pinyon-juniper (*Pinus edulis- Juniperus osteosperma*) woodland, Wyoming big sagebrush (*Artemisia tridentata subsp. wyomingensis*) shrubland, and private land historically planted with crested wheatgrass and alfalfa.

Pinyon-Juniper Woodland

Pinyon-juniper woodlands in the project area generally consist of scattered Utah juniper interspersed with Wyoming sagebrush. Pinyon pine is a minor component. Several other shrub species also occur in this community, including bitterbrush (*Purshia tridentata*) and snakeweed (*Gutierrezia sarothrae*). In general, the sparse herbaceous layer consists of graminoids such as cheatgrass, bulbous bluegrass, western wheatgrass (*Pascopyrum smithii*), Indian ricegrass (*Achnatherum hymenoides*), and squirreltail (*Elymus elymoides*). Forbs are a minor component.

Wyoming Big Sagebrush Shrubland

These shrublands are dominated by Wyoming big sagebrush. Scattered juniper, 4-wing saltbush (*Atriplex canescens*) and rubber rabbitbrush (*Chrysothamnus nauseosus*) may be present in some stands. Common graminoid species include Indian ricegrass, galleta grass (*Pleuraphis jamesii*), thickspike wheatgrass (*Elymus lanceolatus*), needle-and-thread grass (*Hesperostipa comata*), western wheatgrass, Sandberg's bluegrass (*Poa secunda*) and bluebunch wheatgrass (*Pseudoroegneria spicata*). Coppermallow (*Sphaeralcea coccinea*) and tapertip onion (*Allium acuminatum*) are common forbs.

Crested Wheatgrass/Alfalfa Fields

Some of the private land within the GGMDP was historically cultivated for agricultural purposes. Common grasses found in these historic fields include the weedy annual cheatgrass; the non-native pasture grasses crested wheatgrass, Russian wildrye (*Psathyrostachys juncea*), smooth brome (*Bromopsis inermis*), and intermediate wheatgrass (*Thinopyrum intermedium*); and the native Indian ricegrass. Alfalfa, a non-native legume, is the dominant forb.

Proposed Action

Environmental Consequences

Construction of the proposed pads, pipelines, and access roads would result in both direct and indirect effects on vegetation. Direct effects would include short and long-term loss of vegetation and long-term modification of community structure and composition. Indirect effects could include increased potential for noxious weed invasion, increased soil erosion and sedimentation, reduced wildlife habitat quantity or quality, and changes in fire regime.

The Proposed Action would result in the short-term loss of approximately 82.4 acres of vegetation, or 57.1 acres of BLM land. Of the 82.4 acres of physical disturbance, approximately 29.7 acres would not be reclaimed during the life of the wells. With implementation of standard COAs, desirable forbs and grasses on the unused portions of the pads, roads, and pipelines could be established within 2 to 3 years. However, because of periodic workovers and the potential for additional well bores in the future, it is likely that vegetation would remain in an early seral stage for the life of the wells.

Although pinyon-juniper woodlands and sagebrush shrublands would regenerate over time, this process could take several decades, depending on the growth and persistence of seeded species and the intensity of grazing by livestock or wildlife. Pinyon-juniper woodlands could take hundreds of years to return to predisturbance conditions. This would result in an increase in the proportion of herbaceous (i.e., non-woody) species in the areas of disturbance. The success or failure of revegetation would affect other resources including soils, surface water quality, wildlife, visual resources, and livestock grazing.

No Action Alternative

Environmental Consequences

Under the No Action alternative, none of the proposed ground disturbance on BLM land would occur. Therefore, vegetation on BLM land would not be directly impacted. However, it is likely that the Fee well pads, roads, and pipelines would still be constructed, thus impacting vegetation on private land.

Analysis on Public Land Health Standard 3 for Plant and Animal Communities (partial, see also **Wildlife, Aquatic and Wildlife, Terrestrial**)

A formal Land Health Assessment (LHA) was completed in 2009 for the portion of the GSFO that includes the project area. The LHA report will be published in 2010. The Proposed Action would likely contribute, albeit in a minor way, to the further deterioration of vegetation communities and would move the area farther from achieving conformance with Standard 1 for Plant and Animal Communities.

The No Action alternative would have no bearing on the ability of the area to meet the public land health standard for plant and animal communities because no new development would occur on BLM land.

Visual Resources

Affected Environment

The Proposed Action would take place on public and private lands southeast of Silt, Colorado, south of I-70 and east of Divide Creek Road. Portions of the Proposed Action would be located on top of Jolley Mesa, with access roads and pads also located on the west side of the mesa. The proposed project area is comprised of flat to rolling valley bottoms with irrigated agricultural patchwork fields, agriculture-related

structures and occasional dark-green pinyon/juniper stands. The valley bottom transitions to steeper, rolling hills and mesas. Dark-green pinyon/juniper stands cover the steeper hillsides while the flatter mesa tops have been cleared for agricultural fields. Rolling to steep mountains rise in the background.

The rolling and rising topography would interrupt the views of the proposed project area from the I-70 corridor. Divide Creek Road is the public road in the area that would have the greatest visual exposure to the project. A few residences are located in the valley off Divide Creek Road. This viewshed is comprised of varying textures created by complex topography, vegetation types, and existing cultural modifications, which mainly occur on private lands.

The Proposed Action includes areas classified by the BLM as Visual Resource Management (VRM) Class III and IV, as defined by the Glenwood Springs Resource Area 1984 Resource Management Plan. VRM Classes represent the relative value of the visual resource, providing a basis for considering the visual objectives and defining how the visual resource is to be managed. Figure 5 shows the location and relative extent of VRM classes for the project area. VRM objectives and visual concerns may be addressed on split estate where Federal minerals occur. VRM classes shown for private lands are an indication of the visual values for those lands and are protected at the discretion of the landowner.

Note from Figure 5 that the Proposed Action would take place in areas classified as VRM Class III and IV, as follows:

- Proposed Pads 2, 3, 4, 6, 9, 11, and 15 would be located on VRM Class III lands, allowing for a moderate change in the characteristic landscape.
- Proposed Pads 10, 12, and 13 would be located on VRM Class IV lands, allowing for major modifications to the existing landscape.

BLM Manual H-8410-1 states that objectives for VRM Class III lands are as follows:

“Land located under the VRM Class III designation can have moderate change but should still partially maintain the existing character of the landscape. Changes to the landscape in Class III areas should still repeat basic elements found in the natural features of the landscape. Management activities may attract attention but should not dominate the view of the casual observer.”

BLM Manual H-8410-1 states that objectives for VRM Class IV lands are as follows:

“Land located under the VRM Class IV allows for major modifications to the existing character to the landscape. The level of change can be high. These management activities may dominate the view and be the major focus of viewer attention. Every attempt should still be made to minimize the impact of these activities through careful location, minimal disturbance, and repetition of the basic landscape elements”

The general emphasis for BLM’s visual resource management in the region is to protect the scenery visible from roads, residences, and areas with high sensitivity. Due to a great portion of the Proposed Action being located on private or Class IV lands, this impact analysis is based on the views from one selected Key Observation Point (KOP) representing the linear viewer locations from the Divide Creek Road. KOP 1 is Divide Creek Road where a point was taken at an intersection with a private road looking to the east, as an example viewshed. The viewer would lower in elevation than elements of the Proposed Action (Figure 6).

Figure 5. Visual Resource Management Classes in the Gibson Gulch MDP area.

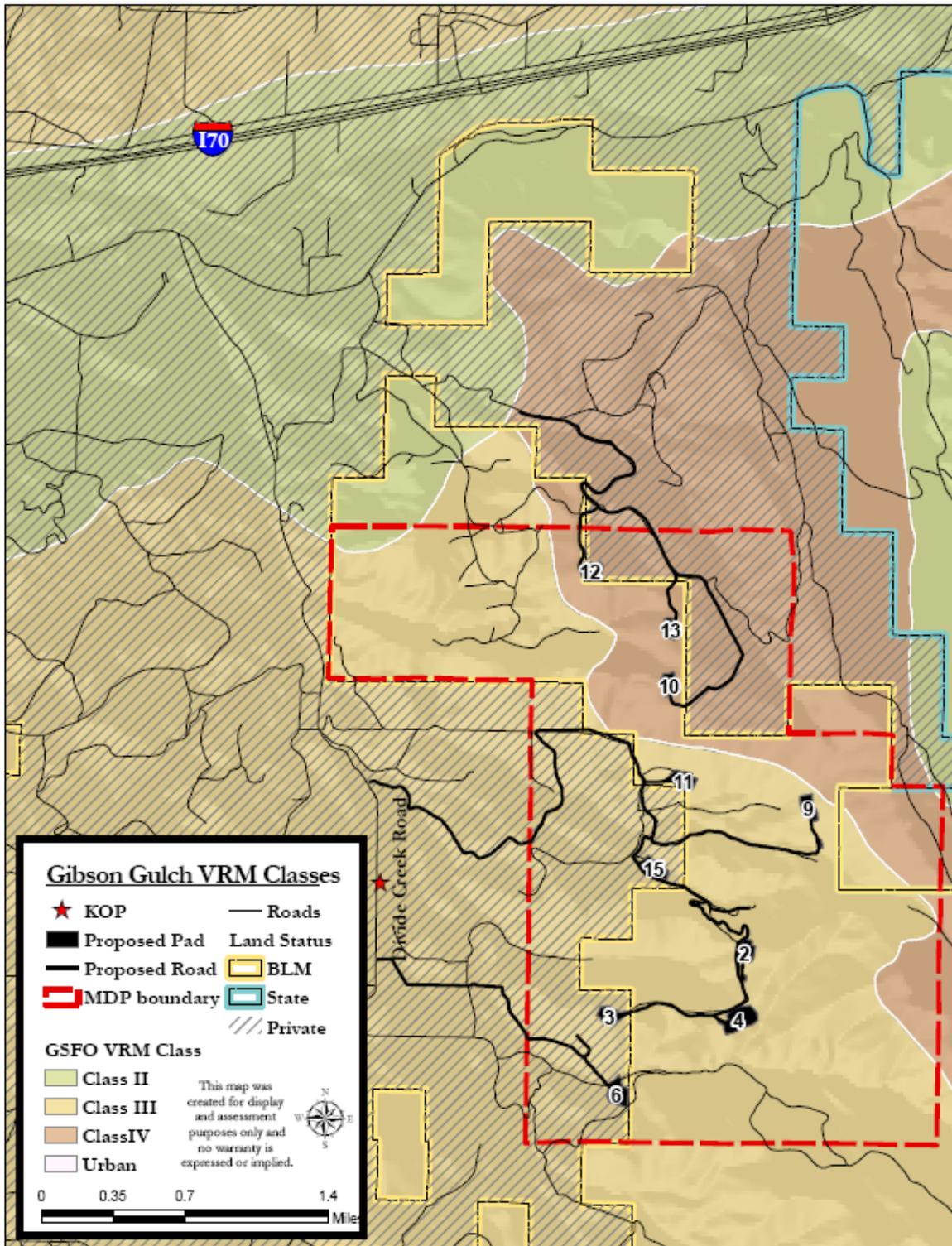


Figure 6. Project Area from Key Observation Point on Divide Creek Road



As can be seen in Figure 6, the immediate foreground consists of undulating, light-green agricultural fields and pastures, rising toward rolling, dark-green pinyon/juniper hills and low mountains in the middleground and background. The Proposed Action would take place approximately 1.5 miles from the KOP, placing it in the viewer's foreground and middleground.

Environmental Consequences

Short-term visual impacts from construction, drilling, and completion activities would result from the Proposed Action. New pads and other surface facilities, new roads, and new pipelines would increase the presence of drilling rigs, heavy equipment and vehicular traffic with an associated increase in dust, light pollution and well-flaring.

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

VRM Class III allows for moderate contrast with the existing landscape and VRM Class IV allows for major changes. The Proposed Action would fall within these requirements.

Proper location of pads and roads to minimize visibility, as well as the use of chosen BLM colors on production equipment, would largely mitigate long-term impacts. The planning process for this project involved many site visits where layout and locations for the pad, pipeline, and access road were reviewed. All associated facilities would be painted Shadow Gray in open areas and Shale Green when located in a pinyon/juniper stand.

No Action Alternative

Environmental Consequences

Under the No Action alternative, the Federal wells and associated roads and pipelines would not be approved. Consequently, overall impacts to the visual and scenic quality of the site would be less.

Wildlife, Aquatic (includes an Analysis on Public Land Health Standard 3)

Affected Environment

Garfield and Divide Creeks are not located within the project boundaries but are perennial streams located to the east and west of the project, respectively. Jackson Gulch, East Gulch, and other unnamed tributaries within the project boundaries that drain into Garfield and Divide Creeks are ephemeral and therefore do not support fish. Both Garfield and Divide Creeks drain directly into the Colorado River located approximately 0.5 mile to the north. The Colorado River supports numerous native and non-native fish species and a variety of aquatic macroinvertebrates.

Environmental Consequences

Proposed Action

Construction activities associated with the proposed project would initially remove approximately 82.4 acres of upland vegetation. Some areas would be revegetated but total long-term upland habitat loss would total about 29.7 acres. This would result in both short-term and long-term erosion and soil loss. Short-term losses would result where all soils are disturbed until such time as proper revegetation is in place to stabilize soils. Long-term soil loss and sedimentation would be associated with the new roads, which would be in place and in use for several years. Sediment can impact some fish species that prefer clear water and clean gravels for spawning. Sediment can smother fish eggs, reduce water quality, and also reduce aquatic insect productivity. Due to the proximity of the Proposed Action to Garfield and Divide Creeks, mitigation measures as described for groundwater/soils sections and surface and groundwater quality sections would be implemented. In addition, the following mitigation would be implemented to minimize negative impacts associated with soil loss and sediment transport.

The small amount of sediment anticipated to ultimately reach the Colorado River from this source should have minimal impact on fisheries, because it would likely be well within the background levels for the Colorado River. Minor increases in sediment associated with the Proposed Action would be undetectable.

Mitigation

Mitigation for impacts to aquatic wildlife would include a variety of measures to avoid or minimize impacts to surface waters, including erosion and transport of sediments from disturbed upland areas.

No Action Alternative

The potential for the No Action alternative to affect fish adversely would be less than the Proposed Action because less new surface disturbance would occur. The potential for soil erosion and sedimentation into nearby ephemeral drainages would still exist due to the exposed soil on the pads and associated access roads. However, it is unlikely that the No Action alternative would cause a sediment load increase in the Colorado River above detectable background levels. Consequently, aquatic wildlife is unlikely to be impacted under this alternative.

Analysis on Public Land Health Standard 3 for Plant and Animal Communities (partial, see also **Vegetation and Wildlife, Aquatic**)

A formal Land Health Assessment (LHA) was completed in 2009 for the portion of the GSFO that includes the project area. The LHA report will be published in 2010. Habitat loss and fragmentation and disturbance from human activity has the potential to trend the area away from meeting this standard.

However, with implementation of the mitigation measures to be applied as COAs (Appendix C), the Proposed Action is not expected to prevent Standard 3 from being met.

Wildlife, Terrestrial (includes an Analysis on Public Land Health Standard 3)

Affected Environment

Many terrestrial animals are known to exist in the project area. The following summary focuses on species for which seasonal ranges have been delineated by CDOW (2008) and for which BLM has outlined associated management objectives. The GGMDP area is located within overall range for mule deer (*Odocoileus hemionus*) as well as winter range, winter concentration area, and severe winter range for both mule deer and Rocky Mountain elk (*Cervus elaphus nelsonii*) (CDOW 2008). The CDOW monitors and manages these populations in Data Analysis Units (DAU) and Game Management Units (GMU). The site is found in deer DAU D-12, and elk DAU E-14, and in GMU 42.

Numbers of mule deer and elk vary naturally due to a variety of environmental and biological factors and in response to hunting pressure. As a result, populations have varied dramatically over the past several decades. Mule deer numbers were substantially higher in the early 1960s, subsequently declined dramatically, but are gradually recovering. Elk numbers have also varied in response to winter die-offs and probably other factors but have steadily increased over the past several years. Past use coupled with ongoing current use of limited winter range habitats by both species may at least in part account for the less than desirable range conditions (browse species condition) found in some areas. Mule deer and elk concentration on winter range and repeated heavy use of browse species can reduce plant vigor and productivity over time.

Factors related to localized deer and elk populations include increasing oil and gas development; construction of linear infrastructure such as roads, powerlines, and pipelines; industrial, commercial, and residential development associated with the overall human population growth of the area; and disturbance associated with increased human presence and activity in areas of winter range. The potential for impacts to localized deer and elk populations from these factors is exacerbated by the fact that winter range habitats are relatively limited in areal extent and, being located at lower elevations, in more gentle terrain, and along major transportation corridors are also the areas within which habitat loss from land development is concentrated.

Federal leases associated with the GGMDP have a Timing Limitation (TL) stipulation to reduce impacts to seasonally important use by deer and elk of winter range. This TL prohibits construction, drilling, or completion activities from January 1 through May 31 on lands overlying Federal lease COC41048 and from January 16 through April 29 on lands overlying Federal leases COC46972, COC50126, and COC51440. Areas with a big game winter range TL stipulations represent approximately 2,760 acres, or 72% of the project area. The remaining 1,040 acres (28%) is private surface overlying private minerals and would not be subject to a TL stipulation even if a well were to be directionally drilled into Federal minerals. However, a 60-day TL for the period January 1 to March 1 would be applied as a COA to wells drilled directionally into a Federal lease from private surface overlying private minerals (Appendix C).

Environmental Consequences

Proposed Action

The Proposed Action is estimated to result in the direct loss or fragmentation of 88.24 acres of wildlife habitat in the project area due to construction of new well pads, access roads, and pipelines. Reclamation

of pipelines and temporary disturbances associated with road construction and interim reclamation of well pads would reduce this total to approximately 34.73 acres for the remainder of oil and gas production.

A much larger area would be subject to indirect habitat loss as a result of disturbance. Human activity, including vehicular traffic and the operation of heavy equipment, can cause deer, elk, and other species to avoid areas of otherwise suitable habitat. Even when wildlife sensitive to disturbance do not avoid an area altogether, the changes in their movement patterns can result in greater use of less suitable habitats and increased physiological stress. These impacts are more significant during critical seasons such as winter, when cold temperatures, reduced forage quality, and reduced forage availability due to snow cover deplete their energy stores accumulated during summer and fall.

Another adverse impact of indirect habitat loss can occur in winter range that supports both deer and elk. Although these species compete to some extent for the same foods, particularly during winter, elk are generally able to tolerate colder temperatures and deeper snow cover. If disturbance from human activity and infrastructure affects the distribution of elk and causes them to congregate into smaller areas, the elk can out-compete deer for food and cause them to shift their patterns of use even farther.

Assuming that some displacement of deer and elk does occur, winter range adjacent to the project area could also be indirectly affected and decline in quality as a result of increased use of those areas (White and Bartmann 1998). Another potential impact from greater concentrations of animals in areas to which affected animals are displaced is an increased risk for spread of infectious diseases.

The width of areas of indirect impact, or “effective habitat loss,” due to relative avoidance of otherwise suitable habitats depends on several variables. These include the type of habitat adjacent to the human activity (availability of topographic or vegetation screening), the extent and quality of habitat into which displaced animals might move, the intensity and duration of the disturbance, the seasonality of the disturbance, and the innate sensitivity of the particular wildlife species. The scientific literature contains a number of references to the width of indirect habitat zones along roads and other areas of disturbance. These include the following:

- Ward (1976) and Irwin and Peek (1979) reported reductions in use by elk within 400 meters (0.25 mile) of little-used, slow-speed National Forest roads. Hershey and Legee (1976) reported reduced use within 400 meters (0.25 mile) of forest roads in summer range. Lyon (1979) reported that use by elk was reduced by 37% within 0.1 mile of a road and by 57% within 0.2 mile. Pedersen (1979) and Rost and Bailey (1979) reported that use by elk decreased within 250 meters (820 feet) of paved roads. Czech (1991) reported reduced use within 500 meters of a logging road after it was opened to public use. Frederick (1991) found that 73% of use by elk occurred in the 50% of an area more than 400 meters (0.25 mile) from a road.
- Sawyer and Nielson (2005) reported that elk showed reduced use of areas within 2.8 kilometers (1.7 miles) of roads on summer range. In winter, the zone of reduced use was 1.2 kilometers (0.75 miles), which the authors attributed to reduced human use of the roads.
- Both Lyon (1979) and Perry and Overly (1976) noted that the actual extent of reduced habitat use along roads was affected by the amount of vehicular traffic and the density of nearby vegetation cover. Witmer and DeCalesta (1985) found that open spur roads showed a significant reduction up to 250 meters away.
- Witmer and DeCalesta (1985) found no reduction in use within 250 meters of spur roads after the roads were closed to vehicles. Edge and Marcum (1985) found that elk avoided logging roads by distances of 500 to 1,000 meters on working days but showed no avoidance of the roads on

weekends. Similarly, Johnson et al. (1990) reported that elk returned to areas of both summer range and winter range when construction activities that had caused them to leave an area had ceased. Czech (1991) reported that tolerance of logging roads by elk was correlated with the distance to hiding cover.

- Knight et al. (2000) found that use by mule deer was reduced within 200 meters of a road (i.e., a road-effect zone of 200 meters, or 0.125 mile). Lyon (1979) found that the reduction in habitat use was greater in sagebrush than in pinyon/juniper, apparently due to difference in screening.

The following literature provides information specific to oil and gas activities:

- Hiatt and Baker (1981) found that an oil well drill pad was temporarily avoided but that the access road was not. Johnson et al. (1990) also found that elk avoided oil and gas activities temporarily but returned to these areas when the activities ceased. Knight (1980) reported that elk showed alarm responses when exposed to a continually shifting seismic exploration line but not in relation to regular activities at an oil and gas well pad and access road. Van Dyke and Klein (1996) reported that elk responses to oil drilling activities were not permanent but instead that “elk compensated for site-specific environmental disturbance by shifts in use of range, centers of activity, and use of habitat rather than abandonment of range.”
- Powell (2003) found reduced use by mule deer within 500 meters of oil and gas roads and drill pads in southwestern Wyoming during fall, winter, spring, and calving season (early summer). However, he did not collect data for narrower zones, so it is not known whether the overall reduction was uniform or greater in closer proximity to the disturbance, as would be assumed. The habitat type was a sagebrush shrubland with low topographic relief.
- Sawyer et al. (2006), in ongoing studies of oil and gas activities on mule deer in southwestern Wyoming, documented increasing avoidance of access roads during the first 3 years of development, with the average distance from wells to areas of highest use increasing from 2.1 to 3.7 kilometers (1.3 to 2.3 miles). However, deer distribution showed the opposite pattern during the fourth year, with greater use near the wells than remote from them. The authors attributed this reversal in deer winter use to the severe winter (the well pads were located farther into the basin, at lower elevations, than the reference area that had no winter drilling). During the fifth year, with a relatively mild winter, deer distribution was the same as prior to drilling, which the authors interpreted as possibly indicating habituation.

In their final report, Sawyer et al. (2007) reported on their findings relative to implementation in their study area of winter drilling combined with use of pipelines (which they called a “liquids gathering system [LGS]”) to convey produced water and condensate as well as natural gas:

“[The] most effective mitigation measures for reducing impacts to mule deer will likely involve technology and planning that minimize the number of well pads and the human activity associated with them. Combined with careful planning, LGS [pipelines] and directional drilling represent two development strategies that provide effective means for reducing the number of well pads needed to recover gas resources and minimizing the amount of human activity at producing pads. Our results suggest that indirect habitat loss to mule deer may be reduced by approximately 38-60% when water and condensate products are collected in pipelines rather than being stored at well pads and hauled off with tanker trucks. Additionally, because [an] LGS can be installed underground and usually in existing pipeline corridors, the associated direct habitat loss is minimal. When directional drilling technology is used to drill multiple wells from

a single pad, the amount of habitat loss is significantly reduced compared to a scenario where single wells are drilled from multiple pads. However, given the high levels of human activity associated with drilling, wildlife managers should expect considerable short-term displacement of wintering mule deer if year-round drilling is permitted in crucial winter range.”

BBC has also committed to installing buried lines, equivalent to the liquid gathering system, to collect and convey produced water to centralized collection facilities. Use of pipelines instead of trucks to haul produced water is expected to reduce truck traffic—and associated disturbance—by thousands of trips per year, thereby reducing impacts to wildlife year-round.

BBC is expected to request an exception to the big game winter range TL stipulation that prohibits construction, drilling, and completion activities associated during a portion of the winter season (Appendix C). Such a request is expected to be for two to three pads per winter throughout the drilling phase of the project. BLM would consider requests for TL exceptions based on the location of the location of the specific pads and on mitigation measures proposed by BBC. A separate request would have to be made and considered each year.

Aspects of the Proposed Action that would reduce the severity of adverse impacts to big game ungulates, in addition to use of pipelines to convey produced water, include the following:

- BBC has designed the development using directional drilling from multi-well pads to reduce the amount of surface disturbance in relation to the number and spacing of downhole targets. As a result, the surface density of pads would be approximately 2.4 pads per square mile. The current land use plan for the GSFO (BLM 1999:15) specifies a density of less than 4.0 pads per square mile as a management goal.
- Historically, operators relied on truck traffic to haul saline water produced with the natural gas. Increasingly, operators are using pipelines to move this water to reduce both the costs and the impacts associated with truck haulage.
- BBC has committed to use radiotelemetry to the extent practicable to reduce truck traffic and human activity associated with routine monitoring and inspection of the production facilities.
- A BMP applied by COA to well permits would require that topsoil storage piles, stormwater control features, and cut-and-fill slopes undergo temporary seeding to stabilize the material and minimize weed infestations within 30 days following completion of pad construction (see Downhole COAS, Appendix C. Interim reclamation to reduce a well pad to the maximum size needed for production shall be completed within 6 months following completion of the last well planned for the pad.

Mitigation

Mitigation for wildlife impacts resulting from the development of Federal oil and gas leases is provided in the current GSFO land use plan (BLM 1999), which requires operators to implement measures to reduce impacts to winter range if developments reach a predetermined level:

“Within high value or crucial big game winter range, the operator is required to implement specific measures to reduce impacts of oil and gas operations on wildlife and wildlife habitat....Measures to reduce impacts would generally be considered when well density exceeds four wells per 640 acres, or when road density exceeds three miles of road per 640 acres (BLM 1999:15).”

The threshold analyses of pad and road density for the GGMDP yield an average density for the ten well pads (one existing and nine proposed) of one pad per 367 acres, or 1.7 pads per 640 acres, considerably below the threshold of four pads per 640 acres. The total of 21.3 miles of access roads (4.2 miles of new roads and 17.1 miles of existing roads) to be used to access the ten well pads yields an average road density of 3.5 miles per 640 acres, above the threshold of 3.0 miles per 640 acres.

When either the pad or road density threshold is exceeded, the GSFO requires oil and gas operators to implement mitigation measures to offset this habitat loss. Because of the many variables involved, it is difficult to quantify the amount of compensatory mitigation needed to offset impacts from habitat fragmentation and increased disturbance associated with exceeding the road density threshold. Consequently, the GSFO does not have an established formula for this situation. A mitigation measure agreed to by BBC, in consultation BLM and CDOW, consists of installing a wildlife “guzzler” as a supplemental water source on BLM land within the GGMDP area. The purpose of the guzzler—which captures precipitation and releases it over a protracted period—is to reduce the need for big game to travel through the as development areas in order to access water. A properly sited guzzler can support use by deer and elk across a large area year-round. BLM (in collaboration with CDOW) has previously accepted up to 125 acres of mitigation credit for installation of a guzzler and has concluded that this amount of mitigation is sufficient to offset the habitat fragmentation attributable to the GGMDP.

As noted above, BBC is expected to request an exception to the big game winter range TL that prohibits construction, drilling, and completion activities on BLM or split-estate lands during a portion of the winter season. Such a request is anticipated for at least the first winter season and probably for subsequent winters. If and when this occurs, BLM would work with BBC and CDOW to identify mitigation measures sufficient for approving the request. Preliminary concepts discussed among the parties include implementing habitat treatments in selected sagebrush areas; retaining selected hay meadows in an unmown condition or keeping cattle off mown meadows in fall; and closing and revegetating roadways within the project area that are unnecessary or impassable. All of these measures would increase the amount of forage for big game.

No Action Alternative

For the purposes of comparison, the No Action alternative is associated with the drilling and completion of nine Fee wells on an existing private pad and roads and pipelines involving Federal surface would not be installed or constructed. Access to the Fee pad would follow the existing routes.

Under this alternative, the BLM would have no authority to institute mitigation measures designed to minimize impacts to terrestrial wildlife. Any such measures would come under the jurisdiction of the COGCC. In addition, none of the proposed habitat modifications would take place. If the plan area went untreated, eventually the sagebrush openings would be replaced by juniper and overall value of the area to big game and some other species of wildlife would be diminished. In the areas where development and use are already present, the potential for effects to wildlife would still exist, and in the areas with a limited amount of activity, a relatively low potential for direct impacts would be maintained.

Analysis on Public Land Health Standard 3 for Plant and Animal Communities (partial, see also **Vegetation and Wildlife, Aquatic**)

A formal Land Health Assessment (LHA) was completed in 2009 for the portion of the GSFO that includes the project area. The LHA report will be published in 2010. Habitat loss and fragmentation and disturbance from human activity has the potential to trend the area away from meeting this standard. However, with implementation of the mitigation measures to be applied as COAs (Appendix C), the Proposed Action is not expected to prevent Standard 3 from being met.

CUMULATIVE IMPACTS SUMMARY

The following cumulative impact assessment is the Proposed Action of a 5-year plan for oil and gas development on approximately 3,800 acres of public, split-estate, and private lands in the GGMDP.

Generally, cumulative impacts are assessed for four areas of consideration, which include:

- Past, present, and reasonably foreseeable future actions in the project area that could affect the same resources as the project,
- Determination if the impacts of the project and other actions would overlap in time and geographic extent,
- Determination if the impacts of the project would intensify the impacts of other actions,
- Identification of any potentially significant cumulative impacts.

For the last 5 years, the Piceance Basin has experienced an increase in natural gas development, particularly as a result of the passage of the Energy Policy Act of 2005, authorizing the opening of natural gas leases throughout the west and creating a mechanism of energy offices to handle regulatory requirements. As a result, the increased availability of resources for domestic exploration increased, as did the level of activity throughout the western United States.

Currently, approximately 6,000 wells are in production in Garfield County, of which most were drilled in the last 5 years. It is projected that the number of wells to be drilled over the coming years would progress at a slower rate given the current value of natural gas and the decline in rig activity.

BBC proposes to drill 131 wells on 10 pads within an area of 3,800 acres. The project was designed and located within an effort to reduce visual and environmental impacts. This Proposed Action is a small percentage of activity within Garfield County.

Cumulative impacts would be primarily observed as surface disturbance and loss of vegetation. This removal of vegetation would affect soil erosion, visual resources, livestock, and wildlife habitat. Impacts to soil erosion would be primarily short term during construction of the new roads, ditches, and well pads. Vegetation removal for well pad and road construction would be a long-term visual impact for the life of the producing well. Loss of vegetation for the life of the well (approximately 20 to 30 years) would be a long-term impact to livestock and wildlife forage production.

The loss of forage production in small isolated locations or linear strips would not generally affect forage allocations in large grazing allotments. After wells are reclaimed, forage production can be restored or increased from forage production levels prior to disturbance. Loss of vegetation would be a reduction in wildlife habitat during 20 years of well production. Wildlife habitat would be restored after wells are abandoned and final reclamation occurs. In addition to anticipated surface impacts, drilling activities would be a short-term impact to recreation, visual resources, and wildlife that would be temporarily displaced.

Cultural and paleontological resources have been surveyed, and changes to pad locations and roads have been made as a result. Cumulative impacts to cultural and Native American areas of concern include administrative actions, energy development, off highway vehicle use, and private lands management. Impacts associated with these actions vary based on the accessibility and numbers of public and energy personnel within the GGMDP. Prior to the approval of previous energy development projects, human use of the GGMDP area was low and limited primarily to hunting and grazing. Roads were typically low-

density two-tracks that did not significantly increase the access or the numbers of the public that now have access.

Cumulatively, the Proposed Action would alter the environmental setting of the project area. These changes may not be quantifiable at the level of individual sites, but the cumulative effects of these changes over time and over the entire GGMDP area would result in degradation of the condition and integrity to most sites. These impacts could result from increased surface collection, increased casual travel (which may physically impact sites), and changes in the integrity of the setting, location, association, and overall “feel” of the surrounding landscape, which is part of the site’s significance.

Cumulative impacts of future oil field development beyond these projections cannot be accurately estimated at this time as activity is still in the exploratory phase and the level of long-term development is unknown. Actual surface disturbance would depend upon natural gas reserves and the number of wells drilled. Any additional wells would require separate NEPA analysis and approval. It is likely that a portion of the surface disturbance from future wells would be reclaimed with no long-term impacts to vegetation and that additional specific measures could be developed to minimize cumulative impacts as needed.

Although impacts to soils, vegetation, recreational use, and wildlife are expected, it can be assumed that the actions proposed would be short term and not contribute significantly to overall degradation of the area’s environment. The area is experiencing a significant increase in mineral production on both private and Federal lands. A variety of BMPs would be employed to reduce overall impact. Appendix C lists COAs that would be applied and enforced by BLM for activities on Federal lands or private lands with underlying Federal oil and gas leases.

Due to the relatively low number of wells, roads, pads, and pipelines considered in this project in comparison to other area activities, cumulative impacts to visual resources, air quality, biological and cultural resources, geology and soils, water resources, and wildlife are considered less than significant.

PERSONS AND AGENCIES CONSULTED

The following organizations were consulted in the development of this EA:

- Bill Barrett Corporation
- Colorado Division of Wildlife
- Colorado State Historic Preservation Officer
- Northern Ute Tribe
- Southern Ute Tribe
- Ute Mountain Ute Tribe
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- Geosurv Land Surveying and Mapping
- Bookcliffs Survey Services

LIST OF PREPARERS AND INTERDISCIPLINARY REVIEW

This EA was prepared by O&G Environmental Consulting, LLC, serving as a third-party NEPA contractor to the BLM. Resource management direction and final EA review and preparation was performed by the BLM resource specialists listed in Table 24.

Table 24. List of BLM Authors and Reviewers

<i>Resource Parameter / Area of Responsibility</i>	<i>Responsible IDT Member</i>
Project Lead	Vanessa Bull
NEPA Compliance	Allen Crockett
Critical Elements	
Air Quality	Noel Ludwig
Cultural Resources	Cheryl Harrison
Invasive Non-native species	Beth Brenneman
Migratory Birds	Sylvia Ringer
Native American Religious Concerns	Cheryl Harrison
Prime or Unique Farmlands	Noel Ludwig
Special Status Species	Beth Brenneman (plants), Sylvia Ringer (wildlife)
Wastes, Hazardous or Solid	Noel Ludwig
Water Quality, Surface and Ground	Noel Ludwig
Wetlands and Riparian Zones	Noel Ludwig
Other Affected Resources	
Access and Transportation	Vanessa Bull
Geology and Minerals	Karen Conrath
Noise	Noel Ludwig
Paleontology	Karen Conrath
Range Management	Isaac Pittman
Realty Authorizations	D.J. Beaupeurt
Recreation	Vanessa Bull
Socio-economics	Vanessa Bull
Soils	Noel Ludwig
Vegetation	Beth Brenneman
Visual Resources	Lindsey Utter (OTAK)
Wildlife, Aquatic	Sylvia Ringer
Wildlife, Terrestrial	Sylvia Ringer

REFERENCES

Algermissen, S.T. 1969. Seismic risk studies in the United States. U.S. Dept. of Commerce, Env. Science Services Admin., Coast and Geodetic Survey. Washington, D.C.

Air Resource Specialists, Inc. 2009. 2008 air quality summaries for Rifle and Parachute monitoring stations. Provided via e-mail by Cassie Archuleta. Fort Collins, CO.

Bider, J. R. 1968. Animal activity in uncontrolled terrestrial communities as determined by a sand transect technique. *Ecol. Monogr.* 38:269-308. *In: Dobkin 1994.*

Brady, N.C., and R.R. Weil. 2002. The nature and properties of soils (13th Edition). Delhi, India: Pearson Education, Inc.

Bureau of Land Management (BLM). 1982. Glenwood Springs Draft Environmental Impact Statement on the Resource Management Plan. Appendix E, Recreational Opportunity Spectrum Classes. Bureau of Land Management, Glenwood Springs Field Office, Glenwood Springs, Colorado. U.S. Department of the Interior.

_____. 1984. Glenwood Springs Resource Area Resource Management Plan. Grand Junction District Office, Colorado. U.S. Department of the Interior.

_____. 1991. Glenwood Springs Resource Area Record of Decision and Resource Management Plan (ROD). Grand Junction District Office, Colorado. U.S. Department of the Interior.

_____. 1994. White River Resource Area Draft Resource Management Plan and Environmental Impact Statement. White River Resource Area, Craig District Office, Craig, Colorado. U.S. Department of the Interior.

_____. 1998. Glenwood Springs Resource Area Oil & Gas Leasing & Development Final Supplemental Environmental Impact Statement, June. U.S. Department of the Interior.

_____. 1999. Glenwood Springs Resource Area Oil & Gas Leasing & Development Record of Decision and Resource Management Plan, March. U.S. Department of the Interior.

_____. 2005. Land Health Assessment Report Rifle-West Watershed. U.S. Department of the Interior.

_____. 2006. Final Roan Plateau Planning Area Resource Management Plan Amendment and Environmental Impact Statement. Glenwood Springs Field Office. U.S. Department of the Interior.

Colorado Department of Local Affairs (DOLA). 2007. Population forecasts by County. <http://dola.colorado.gov/dlg/demog/population/forecasts/counties1yr.xls>. Accessed May 2007.

Colorado Department of Public Health and Environment (CDPHE). 2006a. Water Quality Control Commission (WQCC) Regulation No. 93, 2006 Section 303(d) List Water-Quality-Limited Segments Requiring TMDLs, effective April 30, 2006. <http://www.cdphe.state.co.us/regulations/wqccregs/100293wqlimitedsegmdls.pdf>.

_____. 2006b. Water Quality Control Commission (WQCC) Regulation No. 94, Colorado's Monitoring and Evaluation List, effective April 30, 2006.
Wathttp://www.cdphe.state.co.us/regulations/wqccregs/100294wqccmonitoringevaluationlist.pdf.

_____. 2007a. Water Quality Control Commission (WQCC) Regulation No. 31: The Basic Standards and Methodologies for Surface Water (5 CCR 1002-31). Effective July 1, 2007.
http://www.cdphe.state.co.us/regulations/wqccregs/31_0207ts.pdf.

_____. 2007b. Water Quality Control Commission (WQCC) Regulation No. 37 Classifications and Numeric Standards for Lower Colorado River Basin and Tables. Amended January 8, 2007; Effective March 4, 2007. http://www.cdphe.state.co.us/regulations/wqccregs/37_0207ts.pdf and <http://www.cdphe.state.co.us/regulations/wqccregs/37tables12007.pdf>.

_____. 2008a. Nancy Chick, 303-692-3226. Garfield County Background air pollutant concentrations. E-mail between CDPHE, Nancy Chick and O&G Environmental Consulting, J. Mizoue on October 14.

_____. 2008b. Air Quality Control Commission (AQCC) Regulation Number 7: Control of Ozone via Ozone Precursors, 5 CCR 1001-9. Available at <http://www.cdphe.state.co.us/regulations/airregs/>.

Colorado Division of Water Resources (CDWR). 2007a. Water rights database. Accessed at: <http://cdss.state.co.us/DNN/WaterRights/tabid/76/Default.aspx>.

_____. 2007b. Water well database. Accessed at: <http://cdss.state.co.us/DNN/MapView/tabid/62/Default.aspx>.

Colorado Division of Wildlife (CDOW). Undated. Wildlife species page. <http://ndis.nrel.colostate.edu/wildlife.asp>.

_____. 2008. Natural Diversity Information Source GIS Data. <http://ndis.nrel.colostate.edu/ftp/index.html>.

Colorado Natural Heritage Program (CNHP). 2008. Colorado Natural Heritage Program Website. Element occurrence and potential conservation Area Data. (www.cnhp.colostate.edu/gis.html).

Colorado Oil and Gas Conservation Commission (COGCC). 2006. Rule 802.c. Noise Abatement. Rule 800 Series Aesthetic and Noise Control Regulations, Colorado Oil and Gas Conservation Commission. Department of Natural Resources, as amended November 30, 2006.

Crifasi, B. 2000. The Colorado River, *In* Aikin, Andrea, and others (ed.), Colorado ground-water atlas. Colorado Ground-Water Association, Lakewood.

Czech, B. 1991. Elk behavior in response to human disturbance at Mount St. Helens National Volcanic Monument. *Applied Animal Behavior Science* 29: 269-277.

Dobkin, D.S. 1994. Conservation and management of Neotropical migrant landbirds. University of Idaho Press. 220 pp.

Edge, W.D., and C.L. Marcum. 1985. Movements of elk in relation to logging disturbances. *Journal of Wildlife Management* 49(4):926-930.

Ellis, M.S., and V.L. Freeman. 1984. Geologic map and cross-sections of the Carbondale 30' x 60' quadrangle, west-central Colorado. U.S. Geol. Surv., Coal Investigations Map C-97-A, scale 1:100,000.

Forman, R.T.T. 2000. Estimate of the area affected ecologically by the road system in the United States. *Conservation Biology* 14:31-35.

Forman, R.T.T., and R.D. Deblinger. 2000. The ecological road-effect zone of a Massachusetts (U.S.A.) suburban highway. *Conservation Biology* 14:36-46.

Franczyk, K.J., J.K. Pitman, and D.J. Nichols. 1990. Sedimentology, mineralogy, and depositional history of some Uppermost Cretaceous Lowermost Tertiary rocks along the Utah Book and Roan Cliffs east of the Green River: U.S. Geological Survey Bulletin 1787:27 pp.

Frederick, G. P. 1991. Effects of forest roads on grizzly bears, elk, and gray wolves: A literature review. USDA Forest Service, Kootenai National Forest. Libby, Montana.

Garfield County, Colorado. 2007. Garfield County Socio-Economic Impact Study, Final Report, January 17, 2007. www.garfield-county.com/index.aspx?page=1027.

Garfield County Road and Bridge Department. 2008. Map of Preferred Road Haul Routes, Garfield County, Colorado. Map updated 1/14/08, Revision 11. www.garfield-county.com, Road and Bridge, Maps, Preferred Haul Routes, PreferredHaulRoutes3618.pdf.

Glover, K.C., D.L. Naftz, and L.J. Martin. 1998. Geohydrology of Tertiary rocks in the Upper Colorado River basin in Colorado, Utah, and Wyoming, excluding the San Juan Basin, regional aquifer-system analysis: U.S. Geological Survey Water-Resources Investigations Report 96-4105, 103p.

Harmon, J.B., and D.J. Murray. 1985. Soil Survey of Rifle Area, Colorado, Parts of Garfield and Mesa Counties. USDA Soil Conservation Service.

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

Hershey, T.J., and T.A. Leege. 1976. Influences of logging on elk on summer range in north-central Idaho. *In* Elk-logging-roads (symposium proceedings). University of Idaho. Moscow.

Hershey, T.J., and T.A. Leege. 1982. Elk movements and habitat use on a managed forest in north-central Idaho. *Wildlife Bulletin* No. 10. Idaho Department of Fish and Game, Boise.

Hiatt, G.S., and D. Baker. 1981. Effects of oil/gas drilling on elk and mule deer winter distribution on Crooks Mountain, Wyoming. Unpublished Report. Wyoming Game and Fish Department, Sinclair, Wyoming.

Irwin, L.L., and J.M. Peek. 1979. Relationships between road closures and elk behavior in northern Idaho. *In* North American elk: Ecology, behavior, and management. M.S. Boyce and L.D. Hayden-Wing (Eds.). University of Wyoming Press. Laramie.

Johnson, B.K., L.D. Hayden-Wing, and D.C. Lockman. 1990. Responses of elk to development of Exxon's Riley Ridge Gas Field in western Wyoming. *In* Proceedings of the Western States and Provinces Elk Workshop.

- Knight, J.E. Jr. 1980. Effect of hydrocarbon development on elk movements and distribution in northern Michigan. Ph.D. Dissertation. University of Michigan. Ann Arbor.
- Knight, R.L., F.W. Smith, S.W. Buskirk, W.H. Romme, and W. L. Baker. 2000. Forest fragmentation in the southern Rocky Mountains. University Press of Colorado. Boulder.
- La Plata County, Colorado. 2002. Final La Plata County Impact Report. October.
- Lyon, L.J. 1979. Habitat effectiveness for elk as influenced by roads and cover. *J. Forestry* 77(10):658-660.
- Murphy, P.C., and D. Daitch, 2007. Paleontological overview of oil shale and tar sands areas in Colorado, Utah, and Wyoming, p. 58.
- National Academy of Sciences. 2007. Weather and climate extremes in a changing climate. [Online]. National Academies Press. Available at <http://dels.nas.edu/globalchange/reportDetail.php?id=4288&c=clim&t=pubs>.
- National Earthquake Information Center (NEIC). 2006. Earthquake database search. Accessed at: <http://neic.usgs.gov/neis/epic/epic.html>.
- O&G Environmental Consulting (OGE). 2008. Raptor survey report for Bill Barrett Corporation Gibson Gulch Project Site, Garfield County, Colorado.
- O'Rourke, M.J., and X. Liu. 1999. Response of buried pipelines subject to earthquake effects. Monograph Series, Multidisciplinary Center for Earthquake Engineering Research, St. U. of NY at Buffalo.
- Pederson, R.J. 1979. Management and impacts of roads in relation to elk populations. *In* Proceeding conference on recreational impacts on wildlands. UDSA Forest Service and USDI National Park Service. Washington, D.C.
- Perry, C., and R. Overly. 1976. Impact of roads on big game distribution in portions of the Blue Mountains of Washington. *In* Elk-logging-roads symposium proceedings. University of Idaho, Moscow.
- Powell, J. 2003. Distribution, habitat use patterns, and elk response to human disturbance in the Jack Morrow Hills, Wyoming. Master of Science thesis. University of Wyoming. Laramie.
- Robson, S.G., and G.J. Saulnier, Jr. 1981. Hydrogeochemistry and simulated solute transport, Piceance Basin, northwestern Colorado; U.S. Geological Survey Professional Paper 1196, 65p.
- Rost, G.R., and J.A. Bailey. 1979. Distribution of mule deer and elk in relation to roads. *Journal of Wildlife Management* 43(3):634-641.
- Sawyer, H. and R. Nielson. 2005. Seasonal distribution and habitat use patterns of elk in the Jack Morrow Hills Planning Area, Wyoming. Western EcoSystems Technology, Inc., Cheyenne, Wyoming.
- Sawyer, H., R. Nielson, L. McDonald, D. Strickland, and L. McDonald. 2006. Annual Report. Sublette mule deer study (Phase II): Long-term monitoring plan to assess potential impacts of energy development on mule deer in the Pinedale Anticline Project Area. Western EcoSystems Technology, Inc., Cheyenne, Wyoming.

Shroba, R.R., and R.B. Scott. 1997. Revised preliminary geologic map of the Rifle quadrangle, Garfield County, Colorado: U.S. Geological Survey, OFR OF-97-852, scale 1:24,000.

Soule, J.M., and B.K. Stover. 1985. Surficial geology, geomorphology, and general engineering geology of parts of the Colorado River Valley, Roaring Fork River Valley, and Adjacent Areas, Garfield County, Colorado. Colo. Geol. Surv. OFR 85-1.

Taylor, O. 1987. Hydrologic systems of the Piceance Basin – oil shale, water resources, and valuable minerals of the Piceance Basin, Colorado: The challenge and choices of development. U.S. Department of the Interior, U.S. Geological Survey Professional Paper 1310. U.S. Government Printing Office. Washington, D.C. 1987.

Tweto, O., R.H. Moench, and J.C. Reed, Jr. 1978. Geologic map of the Leadville 1° X 2° Quadrangle, Northwestern Colorado. U.S. Geol. Surv. Map I-999.

U.S. Bureau of the Census. 2005. 2004 Garfield County. April 2000; July 2001 through 2004 estimates, created by the State Demography Office. Available at <http://www.garfield-county.com/docs/census2004countiesalphabetically.pdf>.

U.S. Department of Agriculture (USDA). 2007. Web soil survey – Garfield County, Colorado. Natural Resources Conservation Service (NRCS). Available at <http://websoilsurvey.nrcs.usda.gov/app/>.

_____. 2008. Garfield County prime farmland map. Natural Resources Conservation Service (NRCS). Available at <http://www.garfield-county.com/Index.aspx?page=744>.

U.S. Department of the Interior (USDI). 2008. Payments in Lieu of Taxes (PILT) – County payments and acres. National Business Center (NBC). Available at <http://www.nbc.gov/pilt/pilt/search.cfm#search> Accessed April 2008.

U. S. Department of the Interior (USDI) and U.S. Department of Agriculture (USDA). 2006. Surface operating standards and guidelines for oil and gas exploration and development. The Gold Book. Fourth edition.

U.S. Environmental Protection Agency (USEPA). 1974. Information on noise levels identified as requisite to protect public health and welfare with an adequate margin of safety. EPA-550/9-74-004, Arlington, VA.

_____. 1996. AP 42, Fifth edition, Volume I, Chapter 3: Stationary internal combustion sources, Section 3.3: Gasoline and diesel industrial engines. Available at <http://www.epa.gov/ttn/chief/ap42/ch03/index.html>. Accessed October 2009.

_____. 2005. Examination of the multiplier used to estimate PM_{2.5} fugitive dust emissions from PM₁₀. Presented by T.G. Pace at the 14th International Emission Inventory Conference, Las Vegas, NV.

_____. 2007. Surf your watershed. <http://www.epa.gov/surf>.

U.S. Fish and Wildlife Service (USFWS). 2002. Birds of conservation concern. Division of Migratory Bird Management, Arlington, VA. 99 pp. Available at <http://migratorybirds.fws.gov/reports/bcc2002.pdf>. U.S. Department of the Interior.

_____. 2006. Upper Colorado River endangered fish recovery Program. Updated December 14, 2006. Available at <http://www.fws.gov/coloradoriverrecovery/>. Accessed March 16, 2007. U.S. Department of the Interior.

U.S. Geological Survey (USGS). 2007a. Suspended-sediment database: Daily values of suspended sediment and ancillary data. Accessed at: <http://co.water.usgs.gov/sediment/>.

_____. 2007b. Water resources of the United States, NWISWeb, Water Quality Samples for the Nation. Accessed at <http://nwis.waterdata.usgs.gov/nwis/qwdata>.

_____. 2007c. Directory of project information and data-collection sites. Colorado Water Science Center. <http://co.water.usgs.gov/Website/projects/viewer.htm>.

_____. 2007d. Groundwater atlas of the United States – Arizona, Colorado, New Mexico, Utah. HA 730-C. http://capp.water.usgs.gov/gwa/ch_c/C-text8.html. Accessed February 2008.

Van Dyke, F., and W. C. Klein. 1996. Response of elk to installation of oil wells. *Journal of Mammalogy* 77:1028-1041.

Vargas, M.F., and T.L. Davis. 2006. Characterization and 3-D reservoir modeling of fluvial tight-gas sandstones in the Williams Fork Formation, Rulison Field, Piceance Basin, Colorado, USA. American Association of Petroleum Geologists, Annual Convention, (SEPM) Technical Program Abstracts.

Ward, A. L. 1976. Elk behavior in relation to timber harvest operations and traffic on the Medicine Bow Range in south-central Wyoming. *In* Elk-logging-roads symposium proceedings. University of Idaho. Moscow.

Western Regional Climate Center (WRCC). 2008. Rifle, Colorado, wind/wind rose. U.S. Department of Commerce. www.wrcc.dri.edu/cgi-bin/wea_windrose2.pll.

_____. 2009. Rifle Colorado Historical Climate Summary. www.wrcc.dri.edu/cgi-bin/cliRECTM.pl?corifl.

White, G. C., and R. M. Bartmann. 1998. Effect of density reduction on overwinter survival of free-ranging mule deer fawns. *Journal of Wildlife Management* 62:214-225.

Witmer, G.W., and D.S. deCalesta. 1985. Effect of forest roads on habitat use by Roosevelt elk. *NW Science* 59(2):22-125.

Woodward-Clyde. 1988. Raw noise data. Portland, Oregon

Wray, L.L., A.D. Apeland, H.T. Hemborg, and C. Brchan. 2002. Oil and gas fields map of Colorado. Colorado Geologic Survey. Map Series 33.

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Appendix A

Public Comments and BLM Responses

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PUBLIC COMMENTS AND BLM REPSONSES

A Public Notice addressing the Gibson Gulch Master Development Plan (GGMDP) Proposed Action was published in the Grand Junction *Sentinel* on August 18, 2009, and in the Glenwood Springs *Post Independent* on August 19, 2009. Additionally, a letter containing the public notice information was mailed directly to multiple Federal, State, and local/county government agencies, other organizations, adjacent landowners, and BLM Permit holders. The 30-day public comment period ended on September 21, 2009.

In response to the solicitation for comment identified in the Public Notice, BLM received comments from the Colorado Division of Wildlife (CDOW), Garfield County, Garfield County Road and Bridge, Western Colorado Congress, and Julie Kuper. The written comments are summarized below, along with BLM's responses.

COLORADO DIVISION OF WILDLIFE – LETTER FROM J.T. ROMATZKE, AREA WILDLIFE MANAGER (SEPTEMBER 18, 2009)

Comment 1: *The GGMDP seems to be lacking the overall detail needed for public knowledge and disclosure of impacts. It is difficult to examine impacts without site-specific information. A real need exists for cross-referencing well site information across the various tables and appendices. Private and public land within the boundary of the proposed master plan contains mule deer critical winter range and elk winter concentration areas.*

Response: In conformance with the GSFO's usual practice for EAs, the document published for public review and comment was the Proposed Action, not the entire Environmental Assessment. The EA provides the type of detail requested by CDOW, including considerable discussion of the deer and elk critical winter habitats and measures to minimize or offset impacts from habitat loss and disturbance during the period of winter use by big game.

Comment 2: *CDOW supports the timing stipulations for pads 2, 4, 9, 10, 11, 12, 13, and 15 as identified in the MDP and recommends (as a follow-up to timing stipulations) that BBC and subcontractors schedule operational activities between the hours of 10 a.m. and 3 p.m. and reduce the number of daily/weekly site visits between January 16 and April 29 for the life of the project.*

Response: Comment noted. BLM does not believe that it is reasonable to prohibit operational activities outside this time interval, although BLM encourages the operator to schedule routine activities to occur outside the nighttime and dawn/dusk periods to the extent practicable.

Comment 3: *The fence around the cuttings pit needs to exclude wildlife, and in order to do this the fencing needs to be at least 7 feet high and have a 2-foot- high border around the bottom that is tight enough to deny access by small animals. There should be overhead wires and flagging to discourage waterfowl from landing in the pits.*

Response: The GSFO believes that excluding ungulates, rodents, and reptiles from cuttings pits is impracticable and that the risk of injury or mortality to wildlife is negligible. We are unaware of any situation in which ungulates have gotten into a cuttings pit in this area and suffered injury or death.

Comment 4: *If gas pipeline testing is conducted with water, CDOW recommends test water be captured and consigned to a certified disposal facility. CDOW requests that test water not be discharged to any surface drainage (as described on page 7 of the Proposed Action) due to potential contaminant issues. CDOW does not recommend the use of produced water for wildlife ponds, as suggested on page 14 of the Proposed Action.*

Response: BLM agrees and has modified language regarding pipeline testing water and has added a COA to preclude discharge of frac flowback water, produced water, and pipeline testing water into surface waters. The GGMDP now states, and the COA specifies, that these waters must be transported to an existing offsite evaporation pond or to an approved disposal facility.

Comment 5: *The plan of development refers to a habitat mitigation plan; however, it is not included with or attached to the plan of development, and mitigation is not described in detail sufficient to make comments. Our review of the EA in the context of the January 1999 final Supplemental EIS on Oil and Gas Leasing and Development (FSEIS) reveals many inconsistencies and inaccuracies. We feel requirements and standards set forth in the DSEIS have been omitted, selectively applied, or changed in a manner that does not reflect the intent of the FSEIS. For example, the FSEIS goes to great length to describe the lease stipulation and Conditions of Approval that would be applied to offset or mitigate negative impacts to wildlife (FSEIS, Chapter 2, page 2-35, Section 2.7). The EA is not at all clear or definitive about applying stipulations or COAs to new or existing leases in the MDP area.. In the event that the GGMDP mitigation plan is not adequate or available for inclusion in the MDP, CDOW would be responsive to the idea of working with the operator to create a wildlife mitigation plan that would be sufficient to cover full field development/operational impacts generated by the GGMDP.*

Response: The document reviewed by CDOW, other governmental entities, and the public was the Proposed Action, not the EA, as is BLM's usual practice for scoping projects of this type. The EA contains considerable detail on COAs and other measures that would be implemented to avoid, minimize, or offset impacts to wildlife and other resources. The mitigation plan is currently being developed by BBC in cooperation with BLM and CDOW.

Comment 6: *Prior to facility construction and development, BBC should conduct baseline inventories and establish vegetation conditions to provide a basis for post-development habitat restoration across all plant communities throughout the project components. The 1999 FSEIS states baseline inventories shall be completed prior to development. The MDP does not indicate if this requirement has been met.*

Response: Baseline surveys were conducted and the results incorporated into the EA. The GGMDP area was part of the Divide Creek Land Health Assessment conducted in 2009 by the BLM. The results of that LHA will be used, in conjunction with the baseline surveys, to guide reclamation planning for the project.

Comment 7: *Proper management of topsoil is essential to reclamation success. CDOW recommends using best management practices to prevent weed establishment and to maintain microbial activity and beginning interim revegetation with the first available growing season. Reclamation should be required the same year of the construction. The draft MDP lacks sufficient evaluation with regard to reclamation of impacts from gas development. Evaluation and monitoring of reclamation efforts should be required. Reclamation success should be monitored and evaluated with a standard methodology. The introduction or spreading of non-native, undesirable vegetation is a challenge to control in large-scale ground disturbing activities. Weed impacts can be reduced by limiting the vehicles associated with the construction component of this project, washing vehicles to prevent weed seed spread, topsoil segregation and management, utilization of certified weed-free seed and straw, and conducting pre-disturbance weed surveys along the right-of-ways.*

Response: The document reviewed by CDOW as part of the scoping process was the Proposed Action, not the EA. Requirements for weed and reclamation monitoring and weed control would be attached as COAs to all APDs (Appendix C). Topsoil management is also addressed in the list of standard COAs (Appendix C).

Comment 8: *Vehicle traffic during and post construction can create short and long-term impacts to wildlife. Development of a comprehensive traffic/travel management plan for the project can provide guidance for employees to avoid and minimize vehicle-caused impacts. A comprehensive traffic/travel plan should address carpooling, designated parking areas, limiting non-essential traffic during construction, posting speed limits, restricting travel off established roads, prohibiting motorized access by unauthorized persons, and installing proper erosion and sediment control measures.*

Response: BLM does not agree that these types of measures are needed or practicable on projects, such as the GGMDP, that are located relatively near urban areas and easily access of the existing County Road network.

Comment 9: *The 1999 FSEIS provides direction for operators working in bear country. Increasing employees' level of awareness about bears would benefit workers and wildlife alike. Implementing measures such as bear-proof food storage containers and trash receptacles, keeping food and trash out of sleeping quarters, and establishing company policies on prohibition of feeding bears, and reporting bear conflicts to the DOW will protect employees and wildlife.*

Response: Comment noted. BLM is not aware of substantial human-bear conflicts associated with oil and gas drilling operations in the GSFO area. BBC does not propose "sleeping quarters" in support of its drilling or production operations within the GGMDP area. However, BLM will notify BBC of this concern on the part of CDOW.

GARFIELD COUNTY – LETTER FROM JUDITH H. JORDAN, OIL & GAS LIAISON, DATED SEPTEMBER 18, 2009

Comment 1: *The Gibson Gulch area is a densely populated area. The residents in this area have been affected by industry activities during recent years, and the proposed GGMDP would significantly increase the activity to a new level. The rural and agricultural lands in the area will likely see increased development as the projected population increases.*

Response: BLM recognizes the validity of these points, at least with regard to short-term impacts. Long-term impacts from human population growth are more difficult to predict, and in fact the overall population growth in Garfield County is due to many factors besides oil and gas development. Moreover, the impacts of this specific project are likely to be relatively minor, since the recent slowdown in development makes it unlikely that substantial numbers of new workers would need to be brought into the area rather than providing employment to currently unemployed or underemployed workers. Furthermore, BBC has, through the process of legally acquiring these Federal oil and gas leases, been given a property right that allows them to develop the leases in a way that avoid, minimizes, or offset impacts to other resources, and particularly to sensitive resources. BLM believes that the GGMDP satisfies that requirement.

Comment 2: *Garfield County has received over 569 complaints regarding oil and gas activity in the Divide Creek area from 2003 to 2009. The complaints consist of property damage, dumping of produced water, dust, flaring, haul route violations, speeding, traffic, odors, noise, inadequate stormwater*

management, trespassing, spills, smoke, fire, ground water and surface water problems, and health concerns.

The majority of complaints involved odors, air quality, and associated health concerns. Residents in the Gibson Gulch area would benefit greatly if the BLM encouraged VOC emission controls. Air quality monitoring, noise mitigation, and dust suppression would provide greater health protection to the residents within this area and provide a better opportunity for peaceful enjoyment of their property.

Response: A requirement for VOC emissions control has been added to the list of standard COAs in Appendix C. A requirement for regular suppression of fugitive dust created by road use and construction has also been included in the list of standard COAs. BLM also requires that oil and gas projects comply with the noise standards established by the Colorado Oil and Gas Conservation Commission. Authority for monitoring and enforcing air quality regulations is vested in CDPHE, by agreement of the USEPA. In addition, Garfield County operates air quality monitors in Rifle and a few surrounding locations. BLM understands that oil and gas development cannot be conducted completely free of nuisance to nearby residents and communities.

Comment 3: *All truck traffic shall follow Garfield County haul routes and abide by oversize/overweight regulations of Garfield County and the State of Colorado. All oversize/overweight vehicles requiring permits shall obtain them from the Garfield County Road and Bridge Department, and also have a letter on file with Garfield County Road and Bridge Department from the company they are hauling for stating they may obtain oversize/overweight permits under their road bond on file with Garfield County.*

Bill Barrett Corporation shall be required to repair road damage caused by their use and to participate in a road improvement program for County Road 311 and County Road 335.

Any pipelines within Garfield County right of way shall require a pipeline or utility permit issued by Garfield County Road and Bridge Department. Any new driveway access from a County road shall require a driveway access permit. These permits shall have conditions specific to the location of the pipeline, utility, or driveway access.

Response: Comment noted.

Comment 4: *Average daily traffic for County Road 311/Divide Creek Road is 2,249 vehicles, and average daily traffic for County Road 335/Colorado River Road is 2,712 vehicles (2002 Garfield County Transportation Study). The classification for these roads falls under Minor Collectors and Local (2008 Garfield County Road Inventory Report), which connect developed areas to major roadways and are important routes for moving traffic. With increasing activity and projected population increases, frequent monitoring and inspections and timely maintenance and repairs would increase traveler safety along these routes.*

Response: Comment noted. Inspection and maintenance of County roads is the purview of the Garfield County Road and Bridge Department.

Comment 5: *Garfield County is in the third phase of the Mamm Creek Hydrologic Study, initiated when methane contamination was discovered in nearby water wells. It was indicated that a possible cause of the contamination may be gas wells not cased throughout their entire depth. Such casing is not required by the COGCC, therefore we do not require it. However, if the BLM was interested in protecting groundwater from future contamination, perhaps the BLM would consider full casing as a protective measure.*

Response: BLM petroleum engineers and groundwater hydrologists do not believe that casing the entire depth of a well bore is needed, particularly when gas-producing zones represent such a small portion of a very thick section of sediments (with well depths in the GSFO area commonly approach 2 miles or greater). Proper casing of upper portions of the wellbore, at depths that potentially connect to fresh-water aquifers used for domestic or municipal water sources or to surface waters, has proven effective in the vast large majority of the numerous oil and gas wells already drilled in this area. During the permitting process, the GSFO geologist and petroleum engineers place a priority on identifying situations in which special protections are needed during drilling to ensure protection of surface water and ground water resources. Additionally, the GSFO places a priority for inspections by its petroleum engineering technicians during the drilling phase, with special attention given to the adequacy of the casing and cementing operations.

Comment 6: *Garfield County observed and reported several areas of pipeline and other excavation lacking erosion control measures. The State of Colorado has a limited presence in the Western Slope for enforcement, therefore the BLM's diligence in requiring appropriate stormwater controls and monitoring would be helpful.*

Response: The BLM is currently working with the operator to correct any erosion and/or drainage issues on the access roads, pipelines, and drilling pads on Federal land or accessing Federal minerals within the GGMDP area. We would appreciate being notified by Garfield County any time an existing or potential erosion or drainage issue is identified within the project area.

Comment 7: *The proposed plan indicates that drill cuttings and muds and flowback liquids will be buried on location. Staff from several departments have noted that we have analyses of such materials that indicate high levels of hydrocarbons, barium, and other contaminants that pose a threat to human health, wildlife, property values, and future land use. We would ask the BLM to prohibit the disposal of contaminated materials outside approved disposal facilities, such as permitted landfills.*

Response: Regulations implemented by the COGCC in 2009 require the contents of each pit associated with natural gas extraction to have its contaminant levels reduced below levels of concern before the State can approve reclamation of the pit. Until such approval is granted, the BLM requires the lining of each pit to remain intact in order to confine any potential contamination to the pit. Any potentially hazardous material removed from the pits, including the removed portion of the pit liner, must be taken to an approved landfill.

Comment 8: *The Gibson Gulch area encompasses the Garfield Creek area, which is a more sensitive area due to the large population of a variety of wildlife. The GGMDP does not address any protections that the operator will undertake to avoid these adverse impacts. The proposed plan indicates that produced water may be treated for use for ponding for wildlife, however this is not an approved use per Rule 907(C) of the COGCC. We encourage consultation with and deference to CDOW and we support its recommendations.*

Response: It is possible to reach bottomholes in the Garfield Creek Wildlife Area from Pad 9, thereby eliminating direct impacts to the wildlife area. Additional mitigation measures are discussed in the COAs attached to the GGMDP. In regard to the use of produced water in ponds for wildlife, any implication that produced water may be treated and emptied into surface water bodies has been removed from the document. The BLM has consulted with CDOW regarding this project; see responses to CDOW's comments above.

Comment 9: *Garfield County favors the piping and recycling of water, and we prefer that pipelines be placed in common corridors.*

Response: All of the proposed pipelines in the GGMDP would be placed within existing and proposed roads. If any pipelines are not placed along the roads, they will run through existing utility corridors.

Comment 10: *In general, Garfield County Oil & Gas, Road and Bridge, and Public Health and Environment Departments recommend: VOC emissions control devices wherever practicable, air monitoring, noise mitigation, dust mitigation, compliance with traffic rules and haul routes, communication with the Road and Bridge department regarding road conditions and improvements, disposal of contaminated materials at approved landfills, and communication with the DOW regarding wildlife.*

Response: See responses to Comments 2, 4, 8, and 9 above.

GARFIELD COUNTY ROAD AND BRIDGE DEPARTMENT – LETTER FROM JAKE B. MALL, ADMINISTRATIVE FOREMAN, DATED AUGUST 24, 2009

Comment 1: *All truck traffic shall follow Garfield County haul routes and abide by oversize/overweight regulations of Garfield County and the State of Colorado. All oversize/overweight vehicles requiring permits shall obtain them from the Garfield County Road and Bridge Department, and also have a letter on file with Garfield County Road and Bridge Department from the company they are hauling for stating they may obtain oversize/overweight permits under their road bond on file with Garfield County.*

Response: Comment Noted.

Comment 2: *Bill Barrett Corporation shall be required to repair road damage caused by their use and to participate in a road improvement program for County Road 311 and County Road 335.*

Response: Comment Noted.

Comment 3: *Any pipelines within Garfield County right of way shall require a pipeline or utility permit issued by Garfield County Road and Bridge Department. Any new driveway access from a County road shall require a driveway access permit. These permits shall have conditions specific to the location of the pipeline, utility, or driveway access.*

Response: Comment Noted.

WESTERN COLORADO CONGRESS – EMAIL FROM FRANK RALEY SMITH, DATED SEPTEMBER 21, 2009

Comment 1: *Oil and gas activities in Gibson Gulch carry the risk of exposing private surface owners, downstream landowners and water users, taxpayers, and public land users to large environmental and economic liabilities if reclamation work is not completed successfully by the lessee. The EA should calculate the full costs of reclaiming the area potentially affected by the proposed GGMDP to enable BLM to set site-specific bond amounts either for each well pad and associated infrastructure, or for the Gibson Gulch MDP as a whole. We make this request in order to insure that bond amounts for Federal leases on which wells in the MDP are consistent with the intent and purpose of the Mineral Leasing Act.*

Response: The GSFO does not place performance bonds on individual oil and gas projects, and we have not had a problem with an operator not carrying through to conform to the reclamation requirements for

specified for the project in a Condition of Approval (COA). The reclamation requirements for oil and gas projects were established in our land use plan and are updated periodically to reflect advances in our state of knowledge concerning reclamation, both in general and with reference to the GSFO area in particular.

Comment 2: *The BLM should study the underlying hydrology and the effects of increased natural gas development upon the stressed surface and groundwater resources in the West Divide Creek watershed. The project area is adjacent to West Divide Creek, which has experience large-scale degradation of water quality, and the BLM should protect critical water resources prior to making a final decision.*

Response: BLM has sought to protect critical water resources within Divide Creek and its tributaries by incorporating standard and site-specific COAs as listed in Appendix C. Further protection is provided by the requirement that permits be obtained from the U.S. Army Corps of Engineers, COGCC, and City of Rifle prior to construction of project components. While the BLM does not currently have the resources to perform detailed groundwater and surface-water hydrology studies within the project area, some water and aquatic wildlife sampling has been performed.

Comment 3: *Instruction Memorandum No. 2006-206 gives the authorized officer authority to require bonding for off-lease lands and surface waters potentially affected by operations on a leasehold. The EA should analyze the potential for adverse impacts to off-lease lands and surface waters from the proposed development.*

Response: The EA includes an analysis of such impacts and supports a determination of no significant impact to these or other resources from the proposed project, based on its design and the implementation of requires COAs and BMPs.

JULIE KUPER– LETTER DATED AUGUST 22, 2009

Comment: *I think it should be allowed. I've heard good things about the company being careful to do everything right. We need to business in our area also.*

Response: Comment noted. Thank you for your participation in the public process.

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Appendix B

Bill Barrett Corporation Surface Use Plan of Operations

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SURFACE USE PLAN

BILL BARRETT CORPORATION **GGMDP Pads #2, 3, 4, 6, 9, 10, 11, 12, 13, 15** **Garfield County, CO**

The onsite for this MDP occurred on October 1, 2008. Construction for nine new pads is anticipated to begin late 2009 to early 2010.

The excavation contractor would be provided with an approved copy of the surface use plan of operations before initiating construction.

1. Existing Roads:

- A. The proposed well pads are located approximately 17 miles east of Rifle, CO.

The use of roads under State and County Road Department maintenance is necessary to access the well pad. However, an encroachment permit is not anticipated, as there are no upgrades to these road systems proposed at this time.

- B. No topsoil stripping would occur, as there are no improvements proposed to existing State, County or BLM access roads.

- C. All existing roads would be maintained and kept in good repair during all phases of operation. BBC would coordinate with the necessary owners/agencies to ensure maintenance of the access roads.

- D. Vehicle operators would obey posted speed restrictions and observe safe speeds commensurate with road and weather conditions. Additional signs may be posted, as necessary, to warn the public of project related traffic. Travel would be limited to the existing access roads and proposed access road.

2. Planned Access Road:

- A. New roads would be built or upgraded to accommodate drilling and completion equipment access in a safe manner. ROW width requested for all proposed roads would be 50 feet, with a typical running surface varying between 22 – 24 feet. A maximum grade of 10% would be maintained and any additional drainage structures, where necessary, would be incorporated to prevent soil erosion and accommodate all-weather traffic. Following completion of all wells on the pad, the temporary disturbance area would be reclaimed according to BLM specifications.

- B. Access road construction would typically require a D6 or larger crawler tractor, a D12 or larger motor grader, a Class 12R or larger track hoe, a mid-sized backhoe, two to four 10-yard dump trucks, and possibly a Class 988 loader. Road construction/improvement would include clearing and grubbing of brush and trees, windrowing of topsoil, construction of reinforced rolling dips and grade dips where feasible, installation of culverts in ditched sections and side drainages to provide ditch relief and sediment control, construction of retaining structures on steep slopes (as approved by the BLM), placement of slash and topsoil on cut and fill slopes, placement of erosion and sediment controls on cut and fill slopes as approved by the BLM, seeding of all disturbed areas outside of the travel way, and installation of cattle guards and road closure gates where needed. Topsoil would be stripped and stockpiled during road construction and re-spread to the greatest degree practical on cut slopes, fill slopes, and borrow ditches prior to seeding.
- C. No surfacing material would come from Indian lands or off-lease Federal lands. BBC requests that any excess rock from construction of the pad be used for surfacing of the proposed new access road, if necessary. Any additional materials needed would be purchased from a private source and be properly permitted with the State of Colorado.
- D. Surface disturbance and vehicular travel would be limited to the approved location access road. Adequate signs would be posted, as necessary, to warn the public of project related traffic.
- E. All access roads and surface disturbing activities would conform to the appropriate standard, no higher than necessary, to accommodate their intended function adequately as outlined in the Bureau of Land Management and Forest Service publication: Surface Operating Standards for Oil and Gas Exploration and Development, Fourth Edition – Revised 2007.
- F. The access roads would be inspected by the BLM and, if necessary, maintained by BBC on an as needed or quarterly basis (at a minimum).

3. Location of Existing Wells:

- A. Following is a list of existing wells within a one-mile radius of the proposed well (see enclosed One-Mile Radius Map):
 - i. water wells 3
 - ii. injection wells none
 - iii. disposal wells none
 - iv. drilling wells none
 - v. temp shut-in wells none
 - vi. producing wells 28

- vii. abandoned wells none
- viii. wells drilled; w/o completion none

4. Location of Production Facilities:

- A. Surface facilities would consist of wellheads, separation units, gas metering units, fugitive emission combusters, radio antennas, solar panel brackets, chemical storage containers less than 500 gallons in capacity and above-ground condensate and produced water tanks with approximately 300 to 500-barrel capacities each. Telemetry equipment may be used where feasible to remotely monitor well conditions.
- B. All permanent above-ground structures would be painted a flat, non-reflective Olive Black color to match the standard environment and would be painted the designated color at the time of installation. Facilities required to comply with the Occupational Safety and Health Act (OSHA) may be excluded.
- C. Site security guidelines identified in 43 CFR 3163.7-5 and Onshore Oil and Gas Order No. 3 would be adhered to.
- D. All gas production and measurement shall comply with the provisions of 43 CFR 3162.7-3, Onshore Oil and Gas Order No. 5, and American Gas Association (AGA) Report No. 3.
- E. Any necessary pits would be properly fenced to prevent any wildlife and livestock entry.
- F. The production facility pad would require periodic maintenance to ensure that drainages are kept open and free of debris, ice, and snow and that surfaces are properly treated to reduce erosion, fugitive dust, and impacts to adjacent areas.
- G. Approximately 3.79 miles (20,022 feet) of new pipelines (gas and water) will be installed.
- H. Proposed lines would parallel the access roads (proposed and existing). ROW width requested for all proposed roads would be 50 feet, 20 feet of which may be used as temporary workspace for a period of up to one year. The 50 foot width would include the 22 foot road travel way.
- I. All permanent lines would be buried; BBC may need to lay temporary surface polylines for fracing wells. In some cases, the polylines would run between several pads. The water lines would typically be poly-pipe construction, but steel or aluminum lines may be used in some cases.
- J. BBC would install the lines in the disturbed area necessary to construct the access road where possible. Construction would be performed within this area of disturbance. The road would be the working side of the construction. The

pipeline trench would be excavated mechanically primarily in the uphill, or cut side of the road corridor, with an excavator (trackhoe) and would be approximately three feet wide and at least four feet deep. Gas pipeline segments would be welded together and lowered in the trench. The water line would then be placed into the ditch and separated from the gas line by sandbags, or other means. Both lines would be covered with excavated material, and then each pipeline would be pressure tested with either fresh water, nitrogen gas or natural gas to locate any leaks. Fresh water or nitrogen used for testing would be obtained off site. Water used for testing would be disposed as produced water and hauled away or discharged with the appropriate BLM and State of Colorado approvals and/or permits. Nitrogen would be vented to the atmosphere.

- K. Reclamation operations for this disturbed corridor would consist of restoring the topography to near pre-existing contours, replacing topsoil, and reseeding.
5. Location and Type of Water Supply:
- A. Bill Barrett Corporation would utilize water from private landowners. If an alternate source is located, a Sundry Notice would be filed indicating the new source of water.
6. Source of Construction Material:
- A. The use of materials would conform to 43 CFR 3610.2-3.
 - B. No construction materials would be removed from BLM.
 - C. If any gravel is used, it would be obtained from a State approved gravel pit.
7. Methods of Handling Waste Disposal:
- A. All wastes associated with this application would be contained and disposed according to regulatory requirement and at state-approved facilities.
 - B. Drill cuttings from the wellbore (mainly shale, sand, and miscellaneous rock minerals) would be directed to a reserve pit or a closed-loop system, and eventually buried on location. The reserve pit would adhere to BLM and Colorado Oil and Gas Conservation Commission (COGCC) guidelines.
 - C. The reserve pit is located inboard of the location along and would be constructed so as not to leak, break or allow any discharge.
 - D. Pit walls would be sloped no greater than 2:1 and the depth of the reserve pit is approximately 12 feet. A minimum 2-foot freeboard would be maintained in the pit at all times during the drilling and completion operations.

- F. The reserve pit has been located in cut material. Three sides of the reserve pit would be fenced before drilling starts. The fourth side would be fenced as soon as drilling is completed and shall remain until the pit is dry. After the reserve pit has dried, all areas not needed for production would be rehabilitated.
- G. Any necessary pits would be properly fenced to prevent any wildlife and livestock entry.
- H. All “frac” flowback water would be contained in temporary tanks or lined frac pits during completion operations and would be recycled for re-use, or piped off site to approved disposal facilities. Flowback water would be recycled for use in drilling and completion operations, properly disposed of, or treated and recycled or discharged. Prior to any discharges, all required permits from the State of Colorado, as well as approval from the BLM (if discharges are proposed on BLM lands) would be acquired. The frac pit will be permitted as needed through proper regulatory agencies.
- I. After first production, produced wastewater would be confined to a pit or storage tank for a period not to exceed ninety (90) days. Thereafter, produced water would be used in further drilling and completion activities, evaporated in the pit, piped or hauled to a State approved disposal facility.
- J. Any spills of oil, gas, salt water or other produced fluids would be cleaned up and removed.
- K. Any salts and/or chemicals, which are an integral part of the drilling system, would be disposed of in the same manner as the drilling fluid.
- L. Chemicals on the EPA’s Consolidated List of Chemicals subject to reporting under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) in quantities over 10,000 pounds that may be used, produced, stored, transported or disposed of annually in association with the drilling, testing or completion of each well include diesel fuel, hydrochloric acid and silica sand. This material would be consumed in the drilling and completion process. No extremely hazardous substances, as defined in 40 CFR 355, in threshold planning quantities would be used, produced, stored, transported or disposed of in association with the drilling, testing or completion of the well.
- M. Trash would be contained in a trash cage and hauled away to an approved disposal site as necessary but no later than at the completion of drilling operations. The contents of the trash container would be hauled off periodically to an approved landfill.
- N. Sanitary facilities would be onsite at all times during operations. Sewage would be placed in a portable chemical toilet and the toilet replaced periodically utilizing a licensed contractor to transport by truck the portable

chemical toilet so that its contents can be delivered to an approved facility/landfill.

- O. A flare pit may be constructed a minimum of 110' from the wellheads and may be used during completion work. In the event a flare pit proves to be unworkable in this situation, a flare stack would be installed. BBC would flow back as much fluid and gas as possible into vessels, separating the fluid from the gas. The fluid would then be either returned to the reserve pit or placed into a tank. Gas would be then directed into the flare pit or the flare stack with a constant source of ignition. Natural gas would be directed to the pipeline as soon as pipeline gas quality standards are met.
 - P. Hydrocarbons would be removed from the reserve pit according to regulatory guidelines. In the event immediate removal is not practical, the reserve pit would be flagged overhead or covered with wire or plastic mesh to protect migrating birds.
8. Ancillary Facilities:
- A. Garbage containers and portable toilets are the only ancillary facilities proposed in this application
9. Well Site Layout:
- A. Each well would be properly identified in accordance with 43 CFR 3162.6.
 - B. The pads (well and production) and road designs are consistent with BLM specifications.
 - C. All surface disturbing activities would be supervised by a qualified, responsible company representative who is aware of the terms and conditions of the APD and specifications in the approved plans.
 - D. All cut and fill slopes would be constructed so that stability can be maintained for the life of the activity.
 - E. Diversion ditches would be constructed, if necessary, around to prevent surface waters from entering the well site area.
 - F. The site surface would be graded to drain away from the pit to avoid pit spillage during large storm events.
 - G. Pits would remain fenced until site cleanup.
 - H. If air drilling occurs, the blooie line would be located at least 100 feet from the individual wellhead and would run from each wellhead directly to the pit.

- I. Water application may be implemented if necessary to minimize the amount of fugitive dust.
10. Plan for Restoration of the Surface:
- Producing Wells
- A. Rat and mouse holes would be filled and compacted from bottom to top immediately upon release of the drilling rig from location.
 - B. The reserve pit would be closed as soon as reasonably practical, but no later than 90 days from completion of the last well on the pad, provided favorable weather conditions and that there are no plans to re-use the pit within one year. An extension may be given at the discretion of the BLM Authorized Officer. The following are requirements for pit closures:
 - Squeezing of pit fluids and cuttings is prohibited;
 - Pits must be dry of fluids or they must be removed via vac-truck or other environmentally acceptable method prior to backfilling, re-contouring and replacement of topsoil;
 - Mud and cuttings left in pit must be buried at least 3-feet below re-co-contoured grade;
 - The polyethylene nylon reinforced liner shall be torn and perforated before backfilling;
 - The operator would be responsible for re-contouring any subsidence areas that develop from closing a pit before it is sufficiently dry;
 - The operator shall contact the BLM Authorized Officer at least 48-hours prior to the filling and reclamation of pits and the start of any reclamation such as re-contouring and reseeding.
 - C. Reclamation requirements: Prior to reseeding the site, all disturbed areas, including the access road, would be scarified and left with a rough surface. The site would then be seeded and/or planted as prescribed by the private surface owner and BLM. The BLM recommended seed mix would be detailed within their approval documents.
 - D. The operator would control noxious weeds along access road use authorizations, pipeline route authorizations, well sites or other applicable facilities by spraying or mechanical removal. A list of noxious weeds may be obtained from the BLM or the appropriate county extension office. On BLM administered land it is required that a Pesticide Use

Proposal be submitted and approved prior to the application of herbicides, pesticides, or possibly hazardous chemicals.

Dry Holes

A. All disturbed lands associated with this project, including the pipelines, access roads, water management facilities, etc., would be expediently reclaimed and reseeded in accordance with the reclamation plan and any pertinent site specific COAs.

11. Surface and Mineral Ownership:

A. Surface ownership – Pads 2, 4, 9, 10, and 13 are located on Federal surface, managed by the Bureau of Land Management. Pads 3, 6, and 15 are located on private surface. Pads 11 and 12 are located on both private and Federal surface.

B. Mineral ownership – Federal mineral ownership underlies Pads 2, 4, 9, 10, and 13. Private minerals underlie Pads 3, 6, and 15. All pads have bottomholes reaching Federal minerals via directional drilling.

12. Other Information:

- a. Grand River Institute (GRI) has conducted a Class III archeological survey. A copy of the report has been submitted under separate cover to the appropriate agencies by GRI as Report No. 27106.
- b. A combustor may be installed at this location for control of associated condensate tank emissions. A combustor ranges from 24” to 48” wide and is approximately 10’ tall. Combustor placement would be on existing disturbance and would not be closer than 100’ to any tank or wellheads.

Appendix C

Conditions of Approval

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CONDITIONS OF APPROVAL
Gibson Gulch MDP, CO-140-2008-070-EA

STANDARD SURFACE-USE COAs APPLICABLE TO ALL ACTIVITIES IN THE GGMDP

The following standard surface-use COAs are in addition to all stipulations attached to the respective Federal leases and to any site-specific COAs for individual well pads or other authorizations for ground-disturbing activities.

1. Administrative Notification. The operator shall notify the BLM representative at least 48 hours prior to initiation of construction.
2. Road Construction and Maintenance. Roads shall be crowned, ditched, surfaced, drained with culverts and/or water dips, and constructed to BLM Gold Book standards. Gravel shall be placed on new or upgraded roads to a minimum compacted depth 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 authorized officer.
3. Dust Abatement. The operator shall implement dust abatement measures as needed to prevent fugitive dust from vehicular traffic, equipment operations, or wind events. The authorized officer may direct the operator to change the level and type of treatment (watering or application of various dust agents, surfactants, and road surfacing material) if dust abatement measures are observed to be insufficient to prevent fugitive dust.
4. Drainage Crossings and Culverts. Construction activities at perennial, intermittent, and ephemeral drainage crossings (e.g. burying pipelines, installing culverts) shall be timed to avoid high flow conditions. Construction that disturbs any flowing stream shall utilize either a piped stream diversion or a cofferdam and pump to divert flow around the disturbed area.

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

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

5. Jurisdictional Waters of the U.S. The operator shall obtain appropriate permits from the U.S. Army Corps of Engineers (USACE) prior to discharging fill material into waters of the U.S. in accordance with Section 404 of the Clean Water Act. Waters of the U.S. are defined in 33 CFR Section 328.3 and may include wetlands as well as perennial, intermittent, and ephemeral streams. Permanent impacts to waters of the U.S. may require mitigation. Contact the USACE Colorado/Gunnison Basin

Regulatory Office at 970-243-1199. Copies of any printed or emailed copies of any approved USACE permits or verification letters shall be forwarded to the BLM.

6. Wetlands and Riparian Zones. The operator shall restore temporarily disturbed wetlands or riparian areas. The operator shall consult with the BLM to determine appropriate mitigation, including verification of native plant species to be used in restoration.
7. Reclamation. The goals, objectives, timelines, measures, and monitoring methods for final reclamation of oil and gas disturbances are described in Appendix I (Surface Reclamation) of the 1998 Draft Supplemental EIS (DSEIS). Specific measures to follow during interim and temporary (pre-interim) reclamation are described below.
 - a. Deadline for Temporary Seeding and Interim Reclamation. Interim reclamation to reduce a well pad to the maximum size needed for production, including seeding of the interim reclaimed areas, shall be completed within 6 months following completion of the last well planned for the pad. Reclamation, including seeding, of temporarily disturbed areas along roads and pipelines shall be completed within 30 days following completion of construction.

The deadlines for seeding described above are subject to extension upon approval of the authorized officer based on season, timing limitations, or other constraints on a case-by-case basis. If the authorized officer 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.

- b. Topsoil Stripping, Storage, and Replacement. Topsoil shall be stripped following removal of vegetation during construction of well pads, pipelines, roads, or other surface facilities. This shall include, at a minimum, the upper 6 inches of soil. Any additional topsoil present at a site, such as indicated by color or texture, shall also be stripped. The authorized officer may specify a stripping depth during the onsite visit. The stripped topsoil shall be stored separately from subsoil or other excavated material and replaced prior to final seedbed preparation.
- c. 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.

Seedbed preparation is not required for topsoil storage piles or other areas of temporary seeding.

Requests for use of soil amendments, including basic product information, shall be submitted to the BLM for approval.

- d. 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 May 1, 2008). Note that temporary seeding

allows use of a seed mix containing sterile hybrid non-native species in addition to native perennial species.

For private surfaces, the menu-based seed mixes are recommended, but the surface landowner has ultimate authority over the seed mix to be used in reclamation. The seed shall contain no noxious, prohibited, or restricted weed seeds and shall contain no more than 0.5 percent by weight of other weed seeds. Seed may contain up to 2.0 percent of “other crop” seed by weight, including the seed of other agronomic crops and native plants; however, a lower percentage of other crop seed is recommended. Seed tags or other official documentation shall be submitted to BLM at least 14 days before the date of proposed seeding for acceptance. Seed that does not meet the above criteria shall not be applied to public lands.

- e. 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. Hydroseeding and hydromulching may be used in temporary seeding or in areas where drill-seeding or broadcast-seeding/raking are impracticable. Hydroseeding and hydromulching must 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 reseeding until interim reclamation standards are met. Requirements for reseeding of unsuccessful temporary seeding will be considered on a case-by-case basis.

- f. Mulch. Mulch shall be applied within 24 hours following completion of seeding. In areas of interim reclamation that used drill-seeding or broadcast-seeding/raking, mulch shall consist of crimping certified weed-free straw or certified weed-free native grass hay into the soil. Hydromulching shall be used in areas of interim reclamation where crimping is impracticable, in areas of interim reclamation that were hydroseeded, and in areas of temporary seeding regardless of seeding method.

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

- g. Erosion Control. Cut-and-fill slopes shall be protected against erosion with the use of water bars, lateral furrows, or other measures approved by the authorized officer. Biodegradable matting, bales, or wattles of weed-free straw or weed-free native grass hay, or well-anchored fabric silt fence shall be used on cut-and-fill slopes and along drainages to protect against soil erosion. Additional BMPs shall be employed as necessary to reduce erosion and offsite transport of sediment.
- h. 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 authorized officer will approve the type of fencing.
- i. Monitoring. The operator shall conduct annual monitoring surveys of all sites categorized as “operator reclamation in progress” and shall submit an annual monitoring report of these sites to the authorized officer 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 authorized officer.

8. Weed Control. The operator shall regularly monitor and promptly control noxious weeds or other undesirable plant species as set forth in the Glenwood Springs Field Office *Noxious and Invasive Weed Management Plan for Oil and Gas Operators*, dated March 2007. A Pesticide Use Proposal (PUP) must be approved by the BLM prior to the use of herbicides. Annual weed monitoring reports shall be submitted to BLM by **December 1**.
9. Big Game Winter Range Timing Limitation. No construction, drilling, or completion activities shall be conducted during the 60-day TL from **January 1 to March 1** for Federal wells drilled directionally from surface locations on private surface overlying private mineral estate. This COA is not applicable to Federal wells drilled from pads overlying Federal mineral leases, all of which within the GGMDP area contain a big game winter range TL as a lease stipulation. This COA also is not applicable to production and maintenance operations. However, to the extent practicable, routine production and maintenance operations during the 5-month period from **December 1 to April 30** should be conducted between 9:00 a.m. and 3:00 p.m. to minimize disturbance to wintering big game.
10. Raptor Nesting. Raptor nest surveys conducted in 2008 within the GGMDP area did not result in location of raptor nest structures within 0.25 mile of a proposed well pad or 0.125 mile of a proposed access road, pipeline, or other surface facility associated with this project. Although BLM considers surveys conducted for an EA to be valid for 5 years, new nests may be built and occupied between the initial surveys and project implementation. To ensure compliance with the Migratory Bird Treaty Act (MBTA), the operator should schedule construction or drilling activities to begin outside the raptor nesting season (**February 1 to August 15**) if practicable. If initiation of construction, drilling, or completion activities during these dates cannot be avoided, the operator is responsible for complying with the MBTA, which prohibits the “take” of birds or active nests (those containing eggs or young), including nest failure caused by noise and human activity.
11. Migratory Birds. 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. Under the MBTA, “take” means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The operator shall prevent use by migratory birds of any pit containing fluids associated with oil or gas operations—including but not limited to reserve pits, produced water pits, frac-water pits, cuttings trenches (if covered by water/fluid), and evaporation pits. Fluids in these pits may pose a risk to migratory birds (e.g., waterfowl, shorebirds, wading birds, songbirds, and raptors) as a result of ingestion, absorption through the skin, or interference with buoyancy and temperature regulation. Regardless of the method used, it should be employed as soon as practicable after the pit has begun receiving liquids. At a minimum, the method shall be in place within 24 hours following the placement of fluids into a pit. Because of high toxicity to birds, oil slicks and oil sheens should immediately be skimmed off the surface of any pit that is not netted. The most effective way to eliminate risk to migratory birds is prompt drainage, closure, and reclamation of pits, which is strongly encouraged. All mortality or injury to species protected by the MBTA shall be reported immediately to the BLM project lead and to the USFWS representative in the BLM Field Office at 970-876-9000 and visit <http://www.fws.gov/mountain-prairie/contaminants/oilpits.htm>.

12. Birds of Conservation Concern. Pursuant to BLM Instruction Memorandum 2008-050, all surface-disturbing activities are prohibited from **May 15 to July 15** to reduce impacts to Birds of Conservation Concern (BCC). An exception to this COA will be granted if nesting surveys conducted no more than one week prior to surface-disturbing activities indicate that no BCC species are nesting or otherwise present within 10 meters of the area to be disturbed. Nesting surveys shall include an auidial survey for diagnostic vocalizations in conjunction with a visual survey for adults and nests. Surveys shall be conducted by a qualified breeding bird surveyor between sunrise and 10:00 AM under favorable conditions for detecting and identifying a BCC species. This provision does not apply to ongoing construction, drilling, or completion activities that are initiated prior to May 15 and continue into the 60-day period at the same location.
13. Range Management. Range improvements (fences, gates, reservoirs, pipelines, etc) shall be avoided during development of natural gas resources to the maximum extent possible. If range improvements are damaged during exploration and development, the operator will be responsible for repairing or replacing the damaged range improvements. If a new or improved access road bisects an existing livestock fence, steel frame gate(s) or a cattleguard with associated bypass gate shall be installed across the roadway to control grazing livestock. Fencing of pads on BLM surface shall be performed prior to or immediately following pad construction to avoid conflicts with grazing animals.
14. Ips Beetle. To avoid mortality of pinyon pines due to infestations of the *Ips* beetle, any pinyon trees damaged during road, pad, or pipeline construction shall be chipped after being severed from the stump or grubbed from the ground, buried in the toe of fill slopes (if feasible), or cut and removed from the site within 24 hours to a location approved by the Colorado State Forest Service.
15. Paleontological Resources. All persons associated with operations under this authorization shall be informed that any objects or sites of paleontological or scientific value, such as vertebrate or scientifically important invertebrate fossils, shall not be damaged, destroyed, removed, moved, or disturbed. If in connection with operations under this authorization any of the above resources are encountered the operator shall immediately suspend all activities in the immediate vicinity of the discovery that might further disturb such materials and notify the BLM authorized officer of the findings. The discovery must be protected until notified to proceed by the BLM authorized officer.

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

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

Pursuant to 43 CFR 10.4(g), the BLM authorized officer 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 authorized officer 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 authorized officer 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 authorized officer. Approval to proceed will be based upon evaluation of the resource. Evaluation shall be by a qualified professional selected by the BLM authorized officer 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 authorized officer will inform the operator as to:

- whether the materials appear eligible for the National Register of Historic Places
- what mitigation measures the holder will likely have to undertake before the site can be used (assuming that *in-situ* preservation is not necessary)
- the timeframe for the BLM authorized officer 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 authorized officer 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 authorized officer will provide technical and procedural guidelines for relocation and/or to conduct mitigation. Upon verification from the BLM authorized officer that the required mitigation has been completed, the operator will be allowed to resume construction.

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

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

Colorado State Statutes CRS 24-80-1301 for Historic, Prehistoric, and Archaeological Resources, and for Unmarked Human Graves. (state and private lands within Colorado)

24-80-1302. Discovery of human remains.

(1) Except as provided in section 24-80-1303 with regard to anthropological investigations, any person who discovers on any land suspected human skeletal remains or who knowingly disturbs such remains shall immediately notify the coroner of the county wherein the remains are located and the sheriff, police chief, or land managing agency official.

(2) The coroner shall conduct an onsite inquiry within hours of such notification to attempt to determine whether such skeletal remains are human remains and to determine their forensic value. If the coroner is unable to make such determinations, the police chief, the sheriff, the coroner, or the

land managing agency official shall request the forensic anthropologist of the Colorado bureau of investigation to assist in making such determinations. If it is confirmed that the remains are human remains but of no forensic value, the coroner shall notify the state archaeologist of the discovery. The state archaeologist shall recommend security measures for the site.

(3) Prior to further disturbance, the state archaeologist shall cause the human remains to be examined by a qualified archaeologist to determine whether the remains are more than one hundred years old and to evaluate the integrity of their archaeological context. Complete documentation of the archaeological context of the human remains shall be accomplished in a timely manner.

(4) (a) If the onsite inquiry discloses that the human remains are native American, the state archaeologist shall notify the commission.

(b) The remains shall be disinterred unless the landowner, the State archaeologist, and the chairperson of the commission or his/her designee unanimously agree to leave the remains in situ.

(c) Disinterment shall be conducted carefully, respectfully, and in accordance with proper archaeological methods and by an archaeologist who holds a permit issued under sections 24-80-405 and 24-80-406. In the event the remains are left in situ, they shall be covered over.

(d) Without the landowner's express consent for an extension of time, disinterment shall be accomplished no later than ten consecutive days after the state archaeologist has received notification from the coroner pursuant to subsection (2) of this section.

(e) The archaeologist who conducts the disinterment will assume temporary custody of the human remains, for a period not to exceed one year from the date of disinterment, for the purpose of study and analysis. In the event that a period in excess of one year is required to complete such study and analysis, the commission shall hold a hearing and may, based upon its findings, grant an extension. During the period that the human remains are in the temporary custody of the archaeologist who conducted the disinterment, an archaeological analysis and report shall be prepared. At the same time, a physical anthropological study shall be conducted to include, but not be limited to, osteometric measurement, pathological analysis, and age, sex, and cause of death determinations. The cost of the disinterment, archaeological analysis, and physical anthropological study shall be borne by the state archaeologist except when the human remains are recovered from private lands. In the latter case, if no party can be identified who will bear the cost of such scientific study; the state archaeologist shall bear such costs.

(f) Upon completion of the studies pursuant to paragraph (e) of this subsection (4), the state archaeologist shall consult with the commission regarding reinterment.

(5) Those remains which are verifiably nonnative American and are otherwise unclaimed will be delivered to the county coroner for further conveyance to the Colorado state anatomical board.

24-80-1305. Violation and penalty

(1) Any person who knowingly disturbs an unmarked human burial in violation of this part 13 commits a class 1 misdemeanor and shall be punished as provided in section 18-1-106 C.R.S.

(2) Any person who has knowledge that an unmarked human burial is being unlawfully disturbed and fails to notify the local law enforcement agency with jurisdiction in the area where the unmarked

human burial is located commits a class 2 misdemeanor and shall be punished as provided in section 18-1-106, C.R.S.

17. Visual Resources. All applications for permit to drill (APDs) shall include a detailed, site-specific description outlining how the Proposed Action will meet the VRM Class of the area where the action is proposed. The specific location of the Proposed Action, including pads, roads, and pipelines, shall be shown on a map and shall include associated cut-and-fill data (location, horizontal and vertical extent, slope length, and steepness).

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 authorized officer due to other resource concerns—and shall be placed to maximize reshaping of cut-and-fill slopes and interim reclamation of the pad.

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

Above-ground facilities shall be painted a natural color selected to minimize contrast with adjacent vegetation or rock outcrops. The color shall be specified by the BLM and attached as a COA to individual APDs.

18. Soils. Topsoil shall be windrowed around the pad perimeter to create a berm that limits and redirects stormwater runoff and to extend 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 microbe health, reduce erosion, and prevent weed establishment.
19. Placement of Production Facilities. If final locations of production facilities have not yet been determined prior to construction of pads on BLM surface, a meeting shall be arranged with the authorized officer during or immediately following construction of each pad.
20. Frac Surface Line Monitoring. The operator and its well completion subcontractors shall (a) develop and implement a procedure that would identify any loss of pressure on their surface frac lines, and (b) develop and implement a spill containment protocol should such an event occur.
21. VOC Emission Controls. VOC combustors or equivalent VOC emission controls shall be utilized and monitored on all producing pads on BLM land or accessing Federal minerals. This equipment shall reduce VOC emissions to a maximum of 1.0 G/hp-hr, as required by EPA (Tier I) and CDPHE.
22. Water Disposal. All flowback water, produced water, and pipeline pressure-testing water shall be transported to an existing evaporation pond facility or other approved disposal facility and shall not be discharged directly into surface waters.

SITE-SPECIFIC SURFACE-USE COAS

The following site-specific surface use COAs are in addition to the standard COAs applicable to all wells within the Gibson Gulch Master Development Plan and all stipulations attached to the respective Federal leases.

Pad #2

The stormwater diversion ditch around southeast corner of the pad shall be lined with riprap to prevent the ditch from eroding into the pad.

Pad #3

Any sound barriers or similar noise reduction equipment used on Pad #6—located on land owned by the Miller Land & Cattle Company, which has a residence situated approximately 2,500 feet west of the pad—shall also be used on Pad #3, which is approximately 2,700 feet northeast of the Miller residence on land owned by another private landowner.

To reduce impacts to big game use of seasonally important winter habitat, no construction, drilling, or completion activities shall be conducted on Federal wells drilled from Pad #3 from **January 1 to March 1** annually.

Pad #4

The existing stock pond approximately 300 feet northeast of the northeast corner of the pad shall be cleaned of accumulated mud in order to improve its utility for livestock and wildlife.

Pads #6 and #9

Proposed access roads and pipelines servicing these two pads would cross ephemeral streams with nearby riparian vegetation and/or deep, incised channels. The operator shall consult with the U.S. Army Corps of Engineers (USACE) regarding the anticipated need for “Section 404” permits (including Nationwide Permit 14) for these crossings. Copies of USACE permits or notices that permits are not required shall be forwarded to the BLM authorized officer upon receipt. The location of the crossing of Jackson Gulch for the access road to Pad #9 shall be located and constructed to minimize impacts to riparian vegetation.

The operator shall consult with the BLM regarding the sizes of culverts to be placed in the access roads and pipeline corridors leading to these two pads. The drainage crossings closest to Pad #6 (one for the access road, and potentially another for the pipeline) shall incorporate culverts not less than 6 feet in diameter.

To reduce impacts to big game use of seasonally important winter habitat, no construction, drilling, or completion activities shall be conducted on Federal wells drilled from Pad #6 from **January 1 to March 1** annually.

Pad #11

An existing benchmark situated within the pad perimeter marks a 1/16 section corner and property boundary. This benchmark shall be resurveyed, marked during the period that the pad is open, and either daylighted or re-marked with a monumented benchmark during interim reclamation. Similarly, the

existing fenceline along this property boundary shall be replaced during interim reclamation with a fence at either its current location or along the edge of pad disturbance.

Pad #12

Cultural Resources Monitor: The operator shall provide the services of a qualified archaeological firm to monitor construction of the GGMAP Pad # 12. The archaeological monitor shall be a firm that is permitted to conduct archaeological monitoring within the Glenwood Springs Field Office Area. The operator should be advised that this process can be time-consuming and should be started well in advance of anticipated development.

No ground-disturbing construction activities (topsoiling, grading, ditching, etc.) shall begin prior to the archaeologist's arrival. The operator is responsible for notifying the archaeological firm at least 72 hours in advance of any proposed ground disturbance in the specified area. The operator will be responsible for all construction delays and or damage to cultural manifestations due to insufficient notification of the Archaeological Contractor, and or noncompliance with the following procedures. Archaeological monitoring shall involve on-the-ground visual inspection of all construction for the well pad. The archaeologists shall follow all ground-disturbing equipment at a cautionary distance, allowing time for the construction dust to settle and for visible detection of buried cultural features to occur. If cultural resources are discovered, all ground-disturbing activities in the vicinity of identified feature(s) shall be halted and a buffer area at least 100 feet from the identified feature(s) shall be protected from any additional disturbance until which time as the feature(s) are mitigated via data recovery. Appropriate samples for analysis to determine cultural/temporal affiliation and subsistence shall be collected. At least one stratigraphic profile shall be made for each feature identified, and samples for pale-environmental reconstructions shall be taken as appropriate. If no cultural features are identified a stratigraphic profile shall be made and submitted with the report. Reporting to the BLM archaeologist of progress and findings shall be completed on a weekly or more frequent schedule as deemed necessary by the authorized officer.

After all ground-disturbing activities related to the GGMDP Pad #12 are completed, including related mitigation; the archaeological contractor shall produce and submit a draft written report and all necessary forms to the Glenwood Springs Field Office. Upon acceptance of the report, two final reports/forms shall be submitted, one for the BLM and one for the SHPO. This report shall be in a contextual framework compatible with known archaeological knowledge of the area.

Pad #15

An existing trash pit near the eastern edge of the pad site and on the bank of the ephemeral stream shall be cleaned out prior to or during pad construction, and the material taken to an approved landfill.

DOWNHOLE COAS APPLICABLE TO ALL FEDERAL WELLS IN THE GGMPD AREA

Operator: Bill Barrett Corporation

Notification Requirements

- | | |
|---------------------------------|---|
| Location Construction | - At least 48 hours prior to construction of location and access roads. |
| Spud Notice | - At least 24 hours prior to spudding the well. |
| Casing String and Cementing | - At least 24 hours prior to running casing and cementing all casing strings. |
| BOP and Related Equipment Tests | - At least 24 hours prior to initiating pressure tests. |
| First Production Notice | - Within 5 business days after new well begins, or production resumes after well has been off production for more than 90 days. |
| Reclamation | - At least 24 hours prior to reshaping the well pad. |

For more specific details on notification requirements, please check the Conditions of Approval for Notice to Drill and Surface Use Program

Regulatory Reminders

Approval of this application does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease, which would entitle the applicant to conduct operations thereon.

All lease and/or unit operations shall be conducted in such a manner that full compliance is made with applicable laws, regulations (43 CFR 3100), Onshore Oil and Gas Orders, and the approved plan of operations. The operator is fully responsible for the actions of his subcontractors.

A copy of the approved application for permit to drill (APD), including the conditions of approval and accompanying surface use plan shall be furnished to the field representative by the operator to insure compliance and shall be available to authorized personnel at the drill site whenever active construction or drilling operations are underway.

Fire restrictions may be in effect when location is being constructed and/or when well is being drilled. Contact the appropriate Surface Management Agency for information.

A. **DRILLING PROGRAM**

All operations, unless otherwise specifically approved in the APD, shall be conducted in accordance with Onshore Oil and Gas Order No. 2.

1. Estimated Depth at Which Oil, Gas, Water, or Other Mineral Bearing Zones are Expected to be Encountered

Any usable water zones encountered below the surface casing shall be isolated and or protected by cementing across the zone. The minimum requirement is to cement from 50 feet above to 50 feet below each usable water zone encountered.

If gas is found to be present in the Wasatch formation, the zone shall be isolated either by the primary cement job or remedial cementing.

2. Pressure Control Equipment

The blowout protector (BOP) and related equipment shall meet the minimum requirements of Onshore Oil and Gas Order No. 2 for equipment and testing requirements, procedures, etc., for a 3M system and individual components shall be operable as designed. Chart recorders shall be used for all pressure tests.

3. Casing Program and Auxiliary Equipment

The surface casing **shall** be cemented back to surface either during the primary cement job or by remedial cementing. Leak-off tests of the casing shoe shall be performed and recorded for all wells.

4. Mud Program and Circulating Medium

Hazardous substances specifically listed by the EPA as a hazardous waste or demonstrating a characteristic of a hazardous waste shall not be used in drilling, testing, or completion operations.

No chromate additives shall be used in the mud system on Federal and Indian lands without prior BLM approval to ensure adequate protection of fresh water aquifers.

5. Coring, Logging and Testing Program

Daily drilling and completion progress reports shall be submitted to this office on a weekly basis.

All drill stem tests (DST) shall be accomplished during daylight hours, unless specific approval to start during other hours is obtained from the BLM. However, DSTs may be allowed to continue at night if the test was initiated during daylight hours and the rate of flow is stabilized and if adequate lighting is available (i.e., lighting which is adequate for visibility and vapor proof for safe operations). Packers can be released, but tripping should not begin before daylight unless prior approval is obtained from the BLM.

A cement bond log (CBL) shall be run from the production casing shoe to **TOC** and shall be utilized to determine the bond quality for the production casing.

Whether the well is completed as a dry hole or as a producer, "Well Completion and Recompletion Report and Log" (Form 3160-4) shall be submitted not later than 30 days after completion of the well or after completion of operations being performed, in accordance with 43 CFR 3164. **One** copy of all logs, core descriptions, core analyses, well-test data, geologic summaries, sample description, and all other surveys or data obtained and compiled during the drilling, workover, and/or completion operations, shall be filed with Form 3160-4. Samples (cuttings, fluids, and/or gases) shall be submitted when requested by the BLM.

6. Notifications of Operations

No location shall be constructed or moved, no well shall be plugged, and no drilling or workover equipment shall be removed from a well to be placed in a suspended status without prior approval of the BLM. If operations are to be suspended, prior approval of the BLM shall be obtained and notification given before resumption of operations.

The Glenwood Springs Energy Office shall be notified, during regular work hours (7:45 a.m.-4:30 p.m., Monday through Friday except holidays) at least 24 hours **prior** to spudding the well.

Operator shall report production data to MMS pursuant to 30 CFR 216.5 using form MMS/3160.

The date on which production is commenced or resumed shall be construed for oil wells as the date on which liquid hydrocarbons are first sold or shipped from a temporary storage facility, such as a test tank, and for which a run ticket is required to be generated or, the date on which liquid hydrocarbons are first produced into a permanent storage facility, whichever first occurs; and, for gas wells as the date on which associated liquid hydrocarbons are first sold or shipped from a temporary storage facility, such as a test tank, and for which a run ticket is required to be generated or, the date on which gas is first measured through permanent metering facilities, whichever first occurs.

Should the well be successfully completed for production, the BLM shall be notified when the well is placed in a producing status. Such notification shall be sent by telegram or other written communication, not later than five (5) days following the date on which the well is placed on production.

A schematic facilities diagram as required by 43 CFR 3162.7-5 (b.9. d.), and shall be submitted to the appropriate Glenwood Springs Energy Office within sixty (60) days of installation or first production, whichever occurs first. All site security regulations as specified in Onshore Oil & Gas Order No. 3 shall be adhered to. All product lines entering and leaving hydrocarbon storage tanks shall be effectively sealed in accordance with 43 CFR 3162.7-5 (b. 4).

No well abandonment operations shall be commenced without the prior approval of the BLM. In the case of newly drilled dry holes or failures, and in emergency situations, oral approval shall be obtained from the BLM. A "Subsequent Report of Abandonment" Form 3160-5 shall be filed with the BLM within thirty (30) days following completion of the well for abandonment. This report shall indicate where plugs were placed and the current status of surface restoration. Final abandonment will not be approved until the surface reclamation work required by the approved APD or approved abandonment notice has been completed to the satisfaction of the BLM or his representative, or the appropriate Surface Managing Agency.

7. Other Information

All loading lines shall be placed inside the berm surrounding the tank battery.

All off-lease storage, off-lease measurement, or commingling on-lease or off-lease shall have prior written approval from the BLM.

All open-vent exhaust stacks associated with heater-treater, separator, and dehydrator units must be constructed to prevent birds and bats from entering them and to the extent practical to discourage perching and nesting.

The oil and gas measurement facilities shall be installed on the well location. The oil and gas meters shall be calibrated in place prior to any deliveries. Tests for meter accuracy shall be conducted following initial installation and at least quarterly thereafter. The BLM shall be provided with a date and time for the initial meter calibration and all future meter-proving schedules. A copy of the meter calibration reports shall be submitted to the Glenwood Springs Energy Office. All meter measurement facilities shall conform to Onshore Oil & Gas Order No. 4 for liquid hydrocarbons and Onshore Oil & Gas Order No. 5 for natural gas measurement.

The use of materials under BLM jurisdiction shall conform to 43 CFR 3610.2-3.

There shall be no deviation from the proposed drilling and/or workover program without prior approval from the BLM. Safe drilling and operating practices must be observed. All wells, whether drilling, producing, suspended, or abandoned shall be identified in accordance with 43 CFR 3162.

"Sundry Notice and Report on Wells" (Form 3160-5) shall be filed for approval for all changes of plans and other operations in accordance with 43 CFR 3162.3-2.

Section 102(b)(3) of the Federal Oil and Gas Royalty Management Act of 1982, as implemented by the applicable provisions of the operating regulations at Title 43 CFR 3162.4-1(c), requires that "not 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 the 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."

If you fail to comply with this requirement in the manner and time allowed, you shall be liable for a civil penalty of up to \$10,000 per violation for each day such violation continues, not to exceed a maximum of 20 days. See Section 109(c)(3) of the Federal Oil and Gas Royalty Management Act of 1982 and the implementing regulations at Title 43 CFR 3162.4-1(b)(5)(ii).

In the event after-hours approval or notification is necessary, contact one of the following individuals:

Will Howell Petroleum Engineer	Office: 970-876-9049 Cell: 970-319-5837
Steve Ficklin Petroleum Engineering Tech.	Office: 970-876-9036 Cell: 970-319-2509
Todd Sieber Petroleum Engineering Tech.	Office: 970-876-9044 Cell: 970-319-7887
BLM Front Desk	Phone: 970-876-9000 Fax: 970-876-9090

1. Twenty-four hours *prior* to (a) spudding, (b) conducting BOPE tests, (c) running casing strings, and (d) within twenty-four hours *after* spudding, the GSFO shall be notified. One of the following GSFO inspectors shall be notified by phone: Steve Ficklin at 970-876-9036, Dave Giboo at 970-876-9038, and Todd Sieber at 970-876-9044.
2. A GSFO 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, changes or

variances to the BOPE, deviating from conditions of approval, and conducting other operations not specified within the APD. Please contact Will Howell at 970-876-9049 (office) or 970-319-5837 for verbal approvals. As a secondary contact, Dane Geyer at 970-876-9048 (office) or 970-589-6887 (cell) for verbal approvals.

3. If a well control issue arises (e.g. kick, blowout, or water flow), casing failure occurs, or an increase in bradenhead pressure occurs during drilling/fracturing operations, Will Howell (970-876-9049) shall be notified within 24 hours from the time of the event. IADC, Driller's Logs, and Pason Logs (mud logs) shall be forwarded, within 36 hours of a well control event, to Will Howell/Dane Geyer, Bureau of Land Management, 2300 River Frontage Road, Silt, CO 81652.
4. The BOPE shall be tested and conform to Onshore Order #2 for a **3M** system.
5. A casinghead rated to 3,000 psi or greater shall be utilized.
6. An electrical/mechanical mud monitoring equipment shall be functional and tested prior to drilling out the surface casing shoe. As a minimum, this equipment shall include a trip tank, pit volume totalizer, stroke counter, and flow sensor. It is recommended that periodic/weekly functional tests/kick drills be conducted for well control/safety issues.
7. Gas detecting equipment shall be installed in the mud return system, prior to drilling out the surface casing shoe, and hydrocarbon gas shall be monitored for pore pressure changes.
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 well head 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. Surface casing shall extend to 800 feet to protect a potential water source/aquifer.
10. After the surface casing is cemented, a Pressure Integrity Test/FIT shall be performed on the first well drilled in accordance with OOGO No. 2; Sec. III, B.1. i. in order to make sure the surface casing is set in a competent formation. Submit the results from the test via email (william_howell@blm.gov) on the first well drilled on the pad and record results in the IADC log within 24 hours.
11. Prior to commencing fracturing operations, the production casing shall be tested to the maximum anticipated surface fracture pressure and held for 15 minutes. If leak-off is found, Will Howell 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.
12. As a minimum, cement shall be brought to 200 feet above the Mesaverde. After WOC for the production casing, a CBL shall be run (from TD to 200 feet above the TOC) and an electronic and/or hard copy submitted within 48 hours to Will Howell/Dane Geyer, Bureau of Land Management, 2300 River Frontage Rd; Silt, CO 81652. If the TOC is lower than required or the cement sheath of poor quality, then prior to commencing fracturing operations, a GSFO petroleum engineer shall be notified for further instruction/cement remediation.

Note: BBC cement calculations were based on Halliburton recommendations. Cement calculations should be recalculated to assure top of cement 200' feet above the Williams Fork Formation/Mesaverde Group (See APD cement calculations).

13. 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 accordance with 43 CFR 3162.4(b), which states that the operator shall submit a complete set of electrical/mechanical logs in .LAS format with standard Form 3160-4, Well Completion or Recompletion Report, and LOG. Please contact Karen Conrath at 970-876-9053 or karen_conrath@blm.gov for clarification.
14. 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 with the well completion report. Please contact Will Howell for clarification.
15. APD-Step 6 Air drilling, as mentioned in Step 6, is denied; the specifics concerning the use of air drilling are not addressed and do not conform to Onshore Order No. 2.
16. APD-Step 6 Diesel Additives; Drilling mud used on BLM leases/lands/wells shall not use oil-based mud or contain diesel additives (Step 6). The environmental concerns/issues do not outweigh the benefits.
17. APD-Step 11 in the above listed well APDs; requesting a variance to Onshore Order No. 5 concerning gas measurement is denied in these APDs. The request shall be resubmitted in a Sundry Notice with supporting information/documentation.

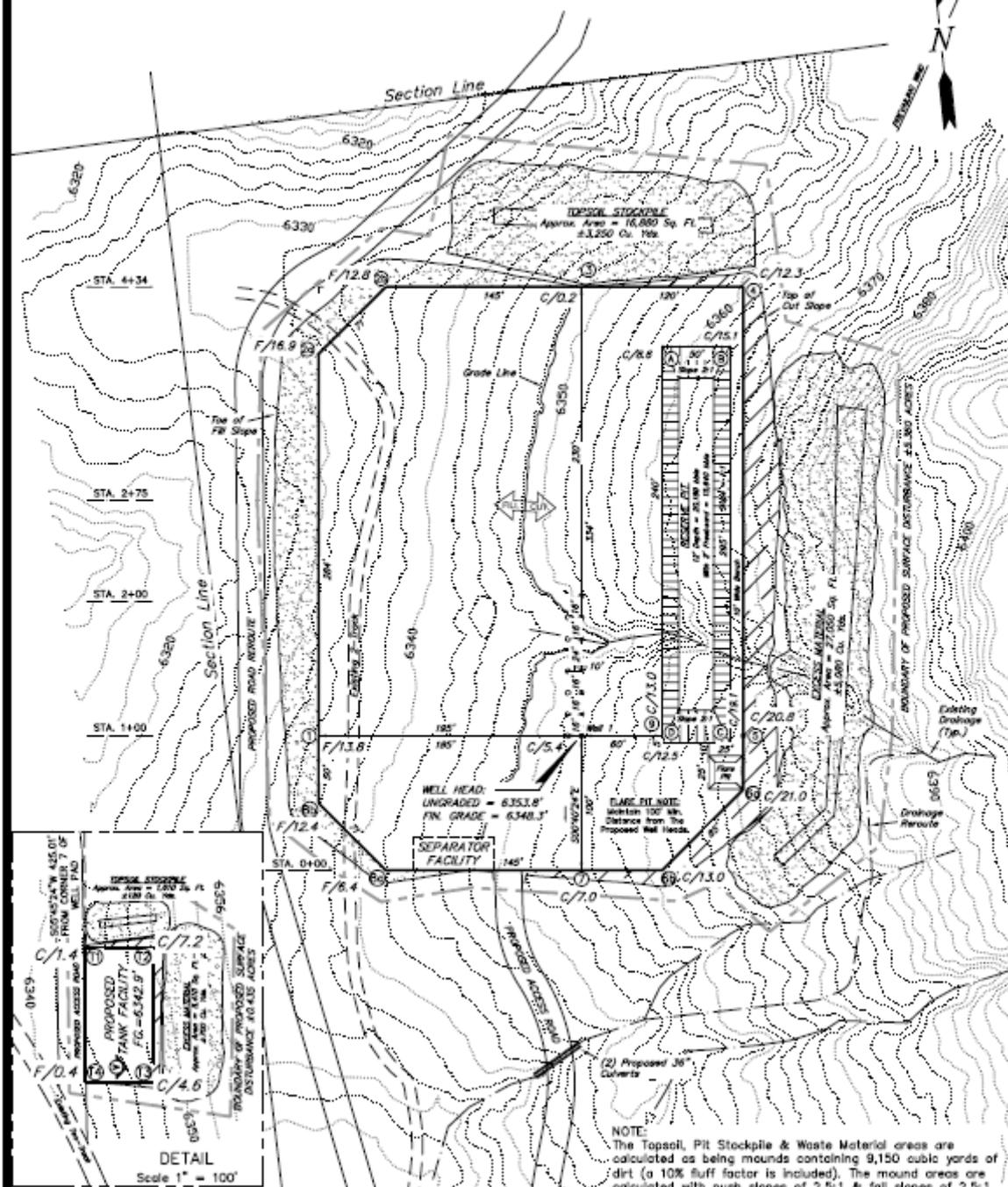
Appendix D

Plat Packages

Detailed survey plat information for the proposed well pads and associated wells requiring Federal authorization is available for review at the BLM Office in Silt, Colorado, upon request.

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BILL BARRETT CORP.
LOCATION LAYOUT
WELL PAD: (GGU GAP PAD 2)
Section 33, T6S, R91W, 6th P.M.



NOTE:
 The Topsoil, Pit Stockpile & Waste Material areas are calculated as being mounds containing 9,150 cubic yards of dirt (a 10% fluff factor is included). The mound areas are calculated with push slopes of 2.5:1 & fall slopes of 2.5:1.

SURVEYED BY: K.S.	DATE SURVEYED: 06-06-05
DRAWN BY: D.COX	DATE DRAWN: 05-05-08
SCALE: 1" = 100'	REVISED: R.V.C. 05-15-09

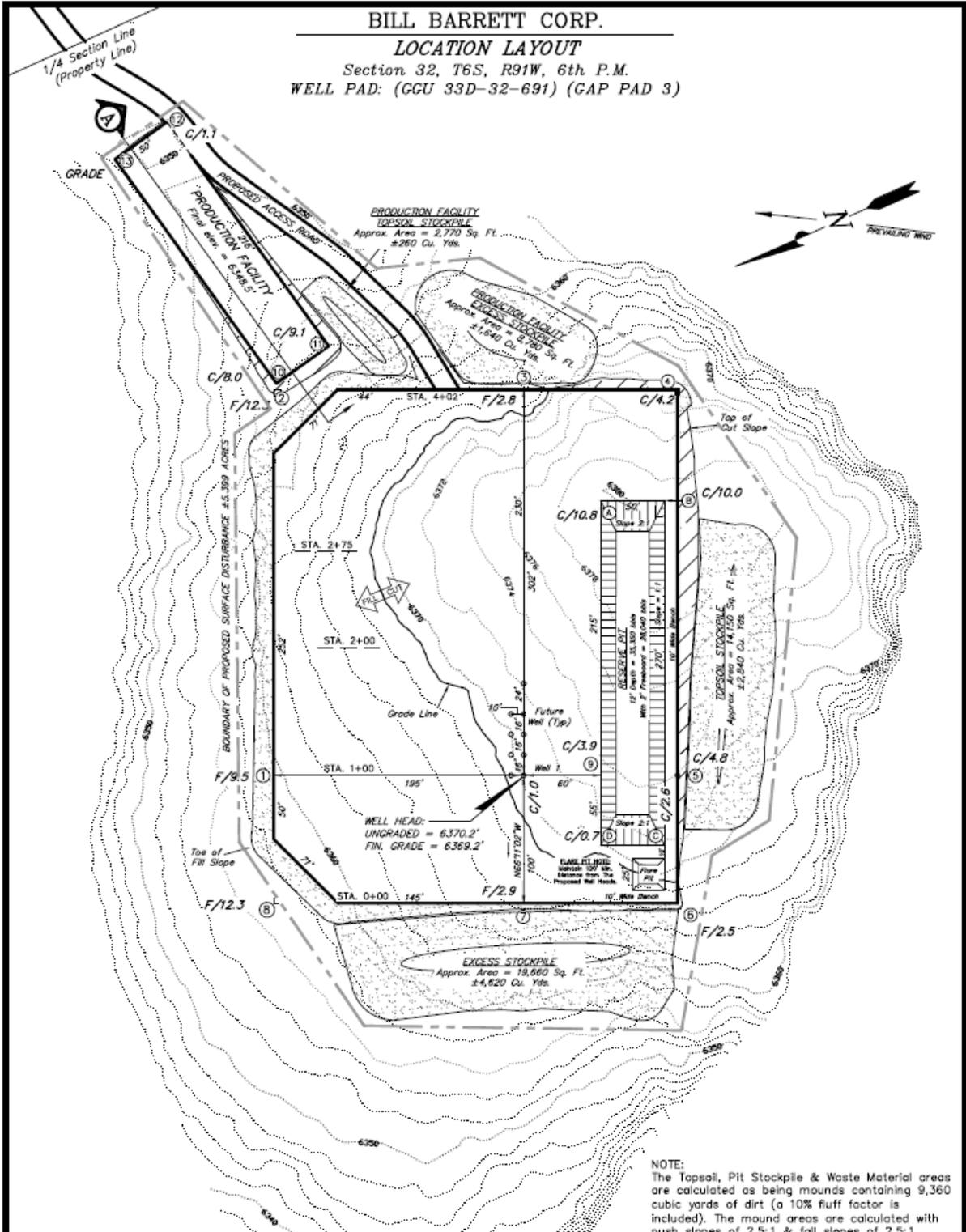
Tri State
Land Surveying, Inc.
 180 NORTH VERNAL AVE. VERNAL, UTAH 84078
 (435) 781-2501

SHEET
4
 OF 11

BILL BARRETT CORP.

LOCATION LAYOUT

Section 32, T6S, R91W, 6th P.M.
WELL PAD: (GGU 33D-32-691) (GAP PAD 3)

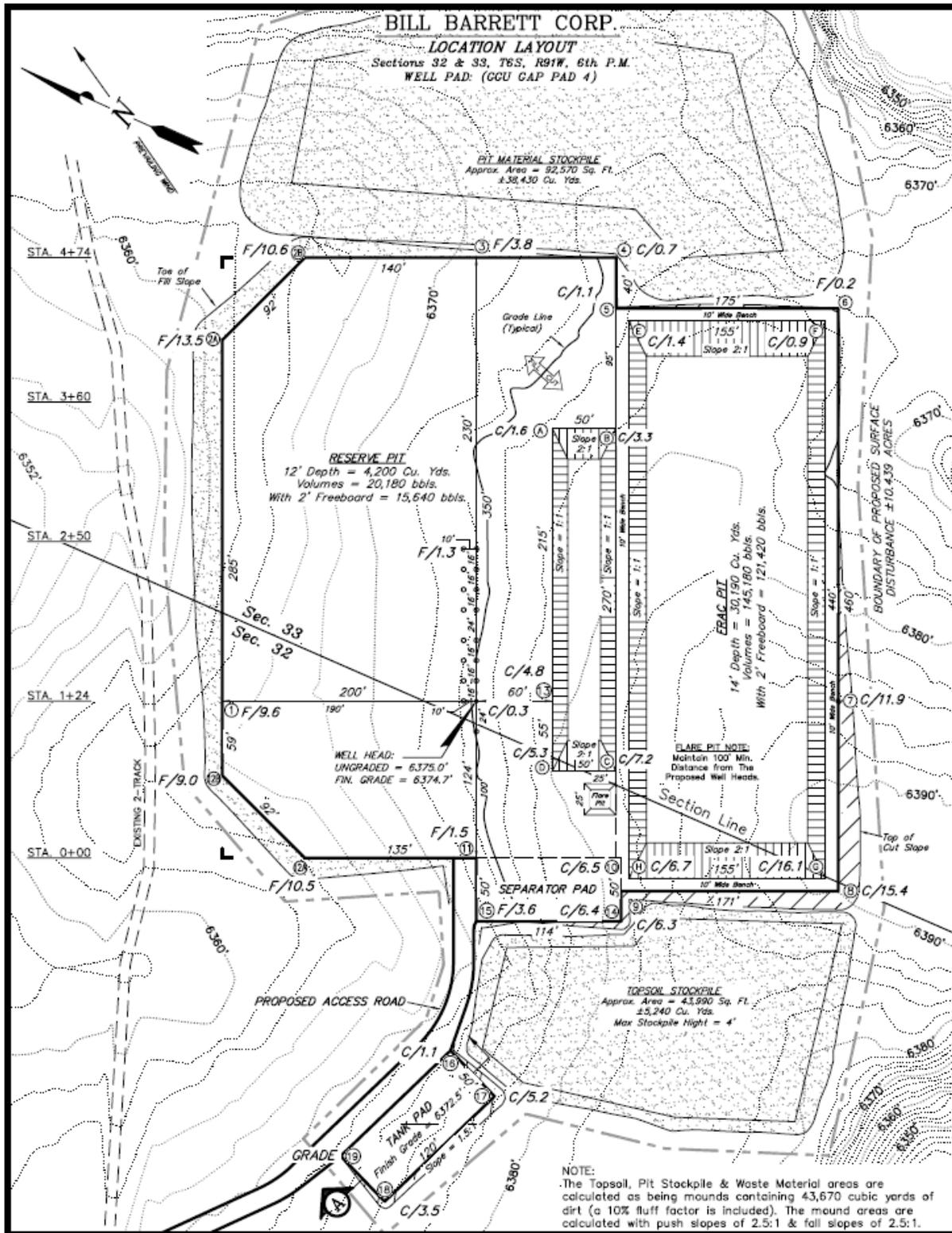


NOTE:
The Topsoil, Pit Stockpile & Waste Material areas are calculated as being mounds containing 9,360 cubic yards of dirt (a 10% fluff factor is included). The mound areas are calculated with push slopes of 2.5:1 & fall slopes of 2.5:1.

SURVEYED BY: C.D.S.	DATE SURVEYED: 06-06-05
DRAWN BY: D.COX	DATE DRAWN: 03-08-08
SCALE: 1" = 100'	REVISED: F.T.M. 09-10-08

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SURVEYED BY: K.S.	DATE SURVEYED: 06-06-05
DRAWN BY: D.COX	DATE DRAWN: 08-22-08
SCALE: 1" = 100'	REVISED: 12-02-08 R.V.C.

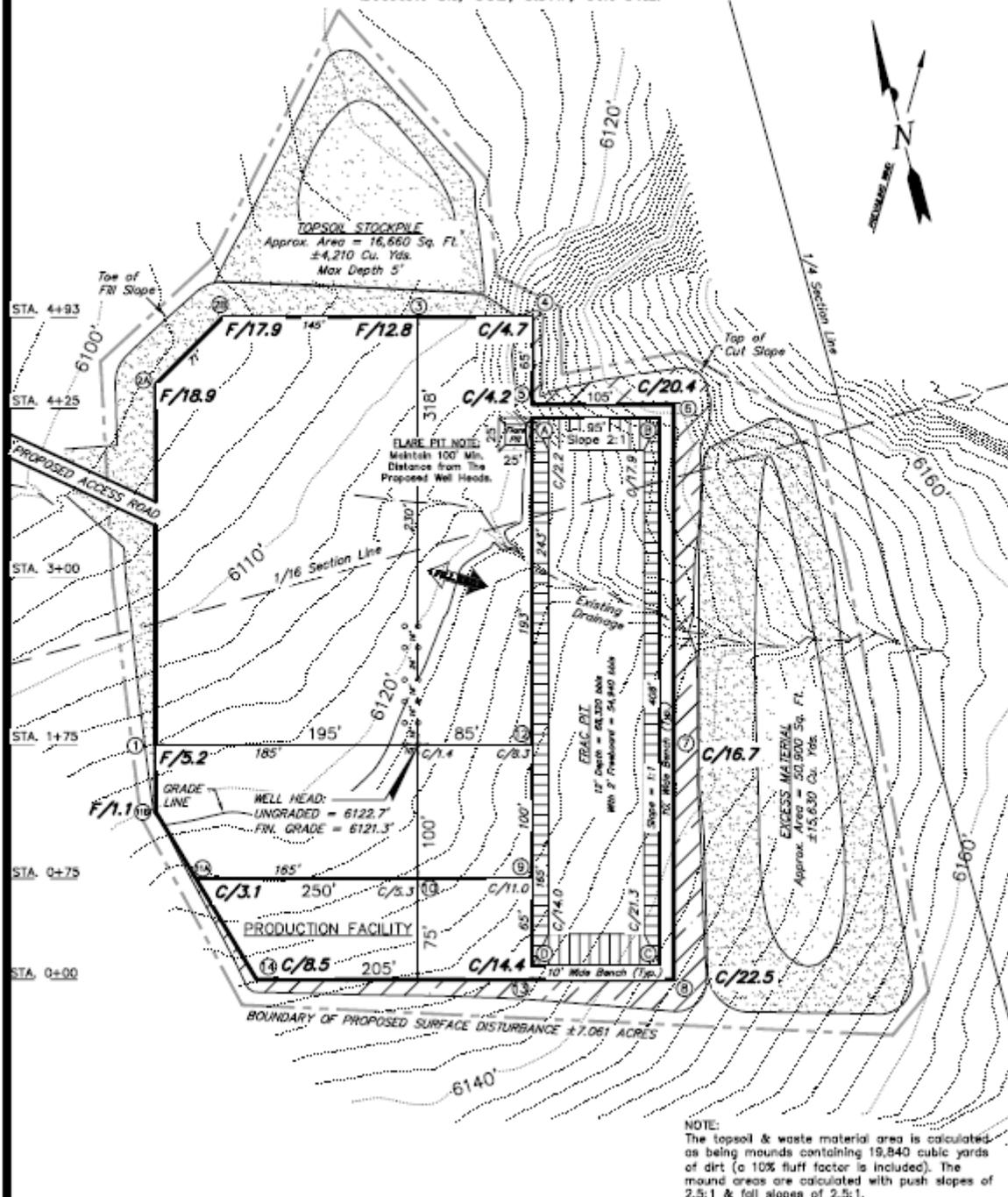
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4
 OF 11

BILL BARRETT CORP.

LOCATION LAYOUT

WELL PAD (GGU GAP PAD 6)
Section 32, T8S, R91W, 6th P.M.



NOTE:
The topsoil & waste material area is calculated as being mounds containing 19,840 cubic yards of dirt (a 10% fluff factor is included). The mound areas are calculated with push slopes of 2.5:1 & fall slopes of 2.5:1.

SURVEYED BY: C.D.S.	DATE SURVEYED: 08-18-08
DRAWN BY: F.T.M.	DATE DRAWN: 09-23-08
SCALE: 1" = 100'	REVISED: F.T.M. 12-05-08

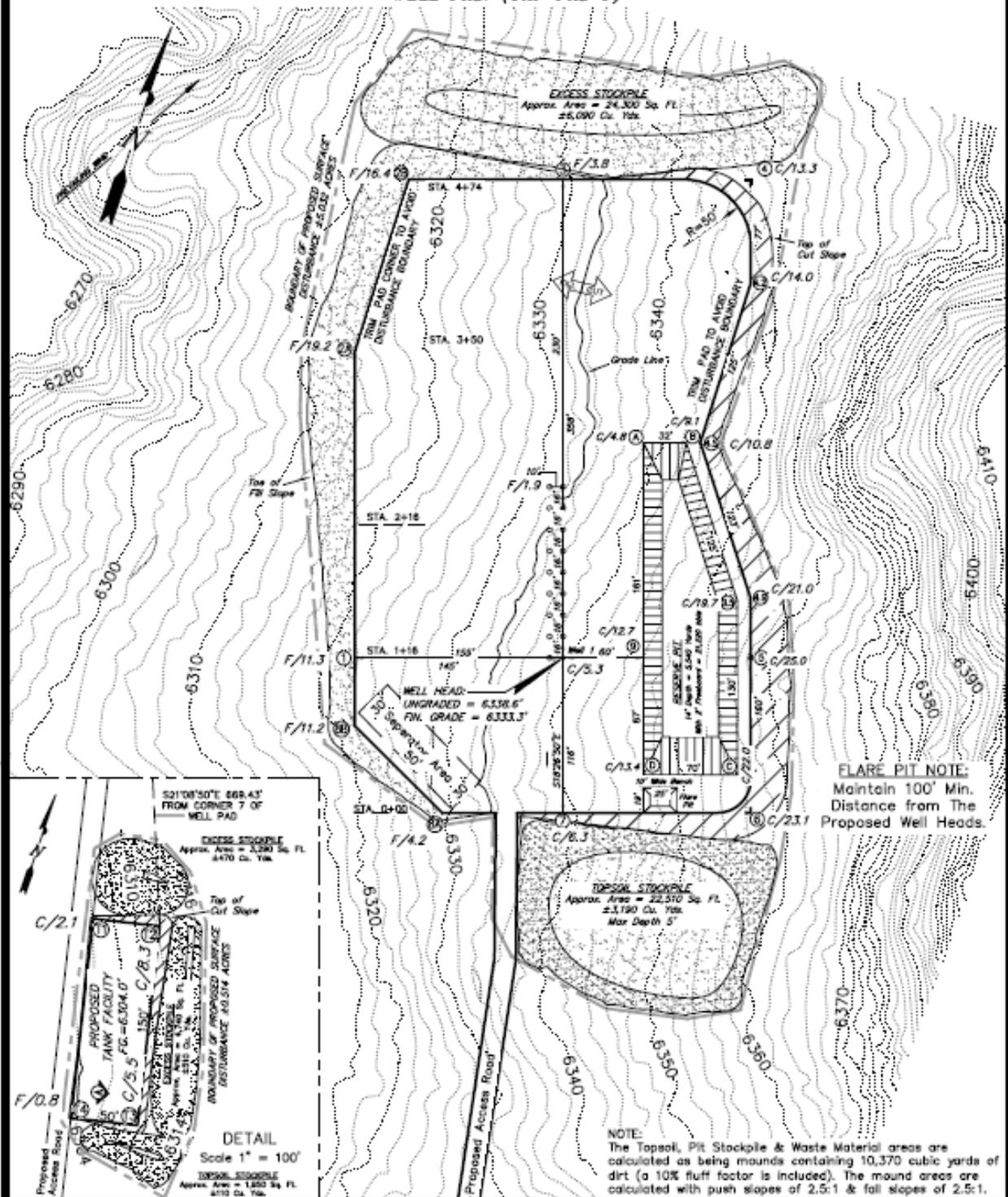
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SHEET 4 OF 11

BILL BARRETT CORP.

LOCATION LAYOUT

Section 28, T6S, R91W, 6th P.M.
WELL PAD: (GAP PAD 9)



SURVEYED BY: C.D.S.	DATE SURVEYED: 01-21-09
DRAWN BY: F.T.M.	DATE DRAWN: 05-21-09
SCALE: 1" = 100'	REVISED:

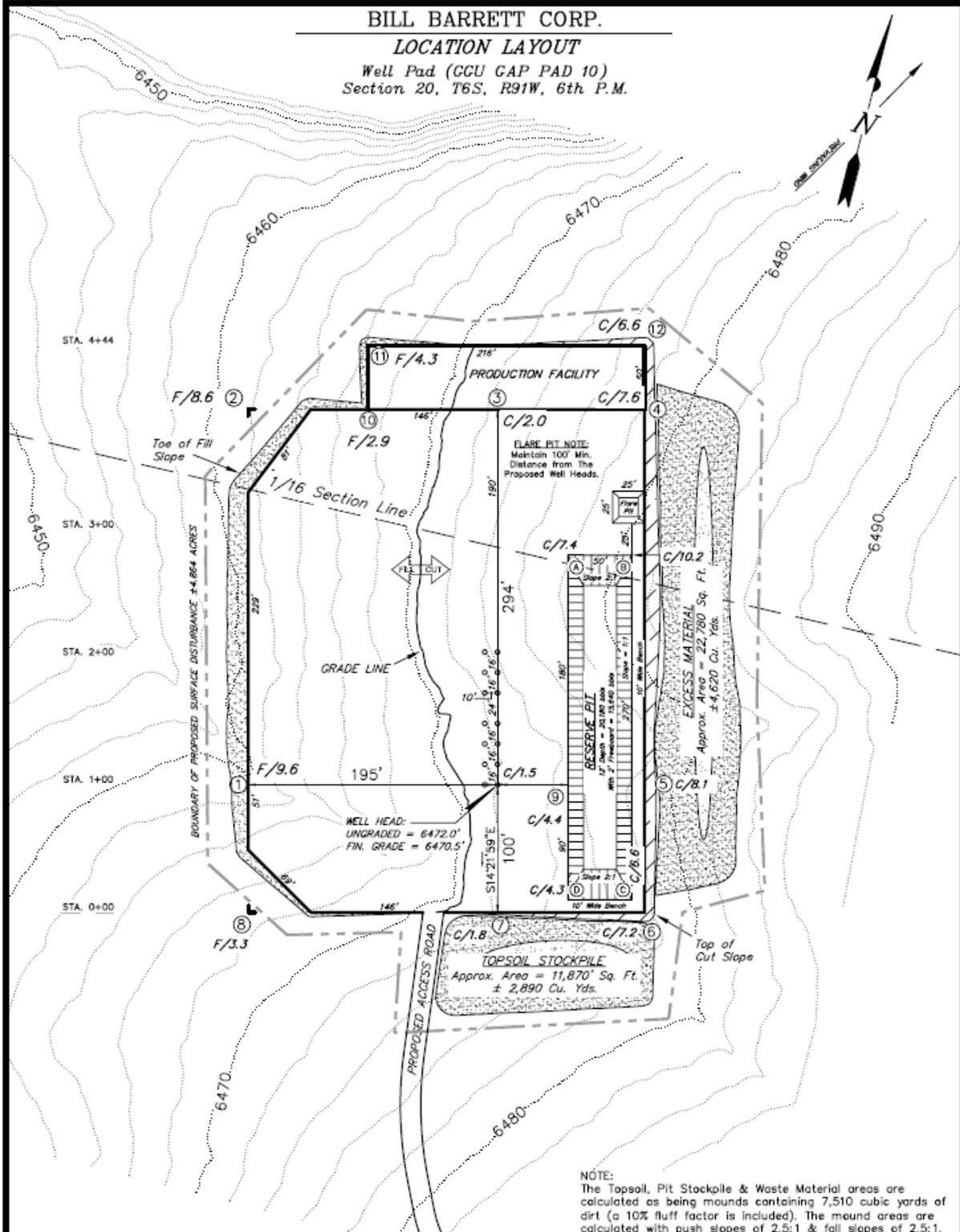
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SHEET
4
OF 11

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LOCATION LAYOUT

Well Pad (CGU GAP PAD 10)
Section 20, T6S, R91W, 6th P.M.



NOTE:
The Topsoil, Pit Stockpile & Waste Material areas are calculated as being mounds containing 7,510 cubic yards of dirt (a 10% fluff factor is included). The mound areas are calculated with push slopes of 2.5:1 & fall slopes of 2.5:1.

SURVEYED BY: C.D.S.	DATE SURVEYED: 10-15-07
DRAWN BY: R.V.C.	DATE DRAWN: 04-30-08
SCALE: 1" = 100'	REVISED: F.T.M. 05-21-09

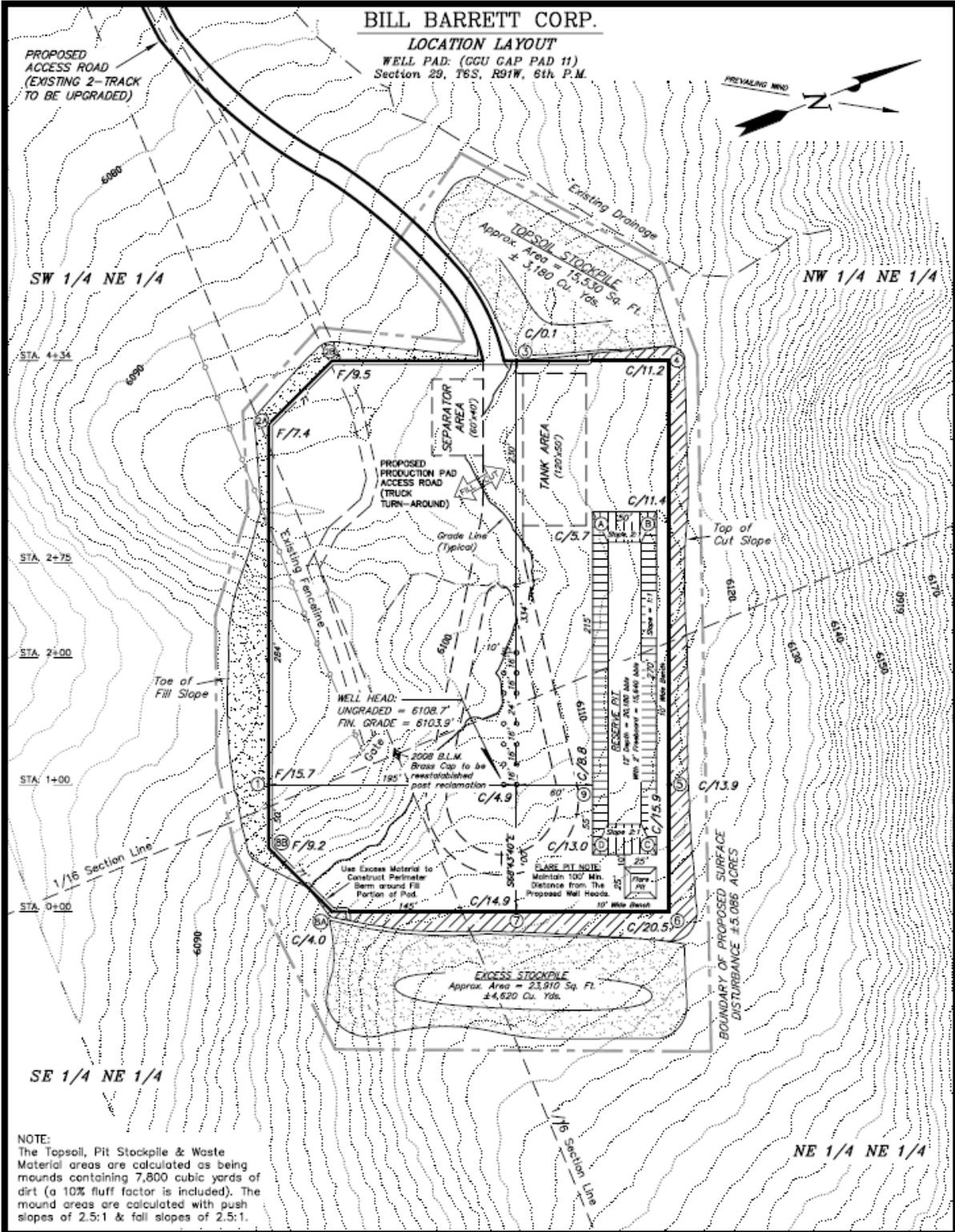
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BILL BARRETT CORP.

LOCATION LAYOUT

WELL PAD: (GCU GAP PAD 11)
Section 29, T6S, R91W, 6th P.M.



NOTE:
The Topsoil, Pit Stockpile & Waste Material areas are calculated as being mounds containing 7,800 cubic yards of dirt (a 10% fluff factor is included). The mound areas are calculated with push slopes of 2.5:1 & fall slopes of 2.5:1.

SURVEYED BY: K.S.	DATE SURVEYED: 06-06-05
DRAWN BY: D.COX	DATE DRAWN: 05-20-08
SCALE: 1" = 100'	REVISED: R.V.C. 01-16-09

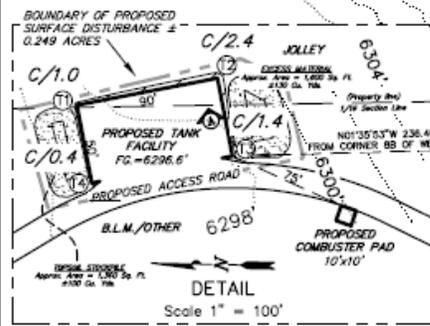
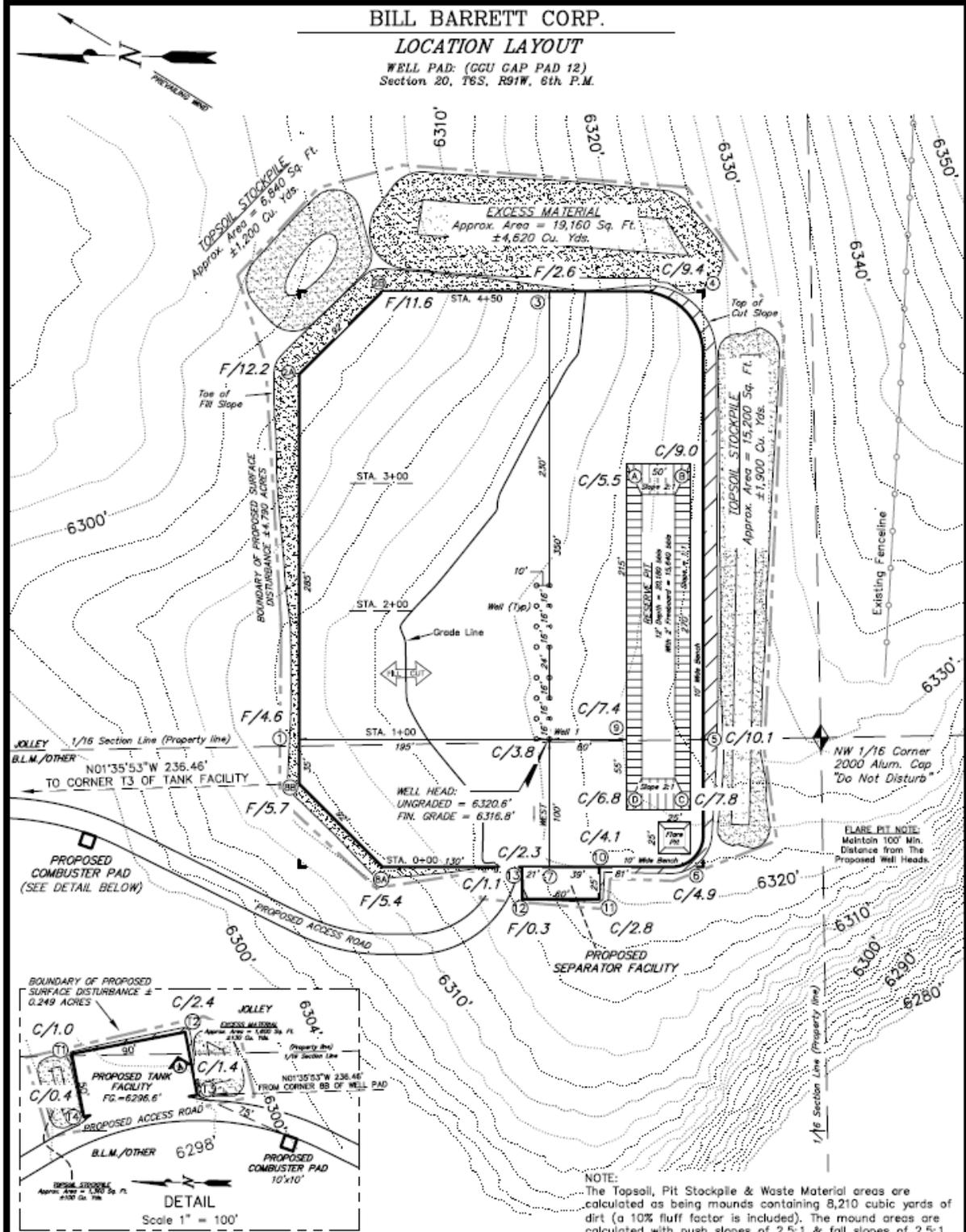
Tri State Land Surveying, Inc. (435) 781-2501
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SHEET 4 OF 11

BILL BARRETT CORP.

LOCATION LAYOUT

WELL PAD: (CGU GAP PAD 12)
Section 20, T6S, R91W, 6th P.M.



NOTE:
The Topsoil, Pit Stockpile & Waste Material areas are calculated as being mounds containing 8,210 cubic yards of dirt (a 10% fluff factor is included). The mound areas are calculated with push slopes of 2.5:1 & fall slopes of 2.5:1.

SURVEYED BY: C.D.S.	DATE SURVEYED: 10-15-07
DRAWN BY: F.T.M.	DATE DRAWN: 08-04-08
SCALE: 1" = 100'	REVISED: F.T.M. 05-04-09

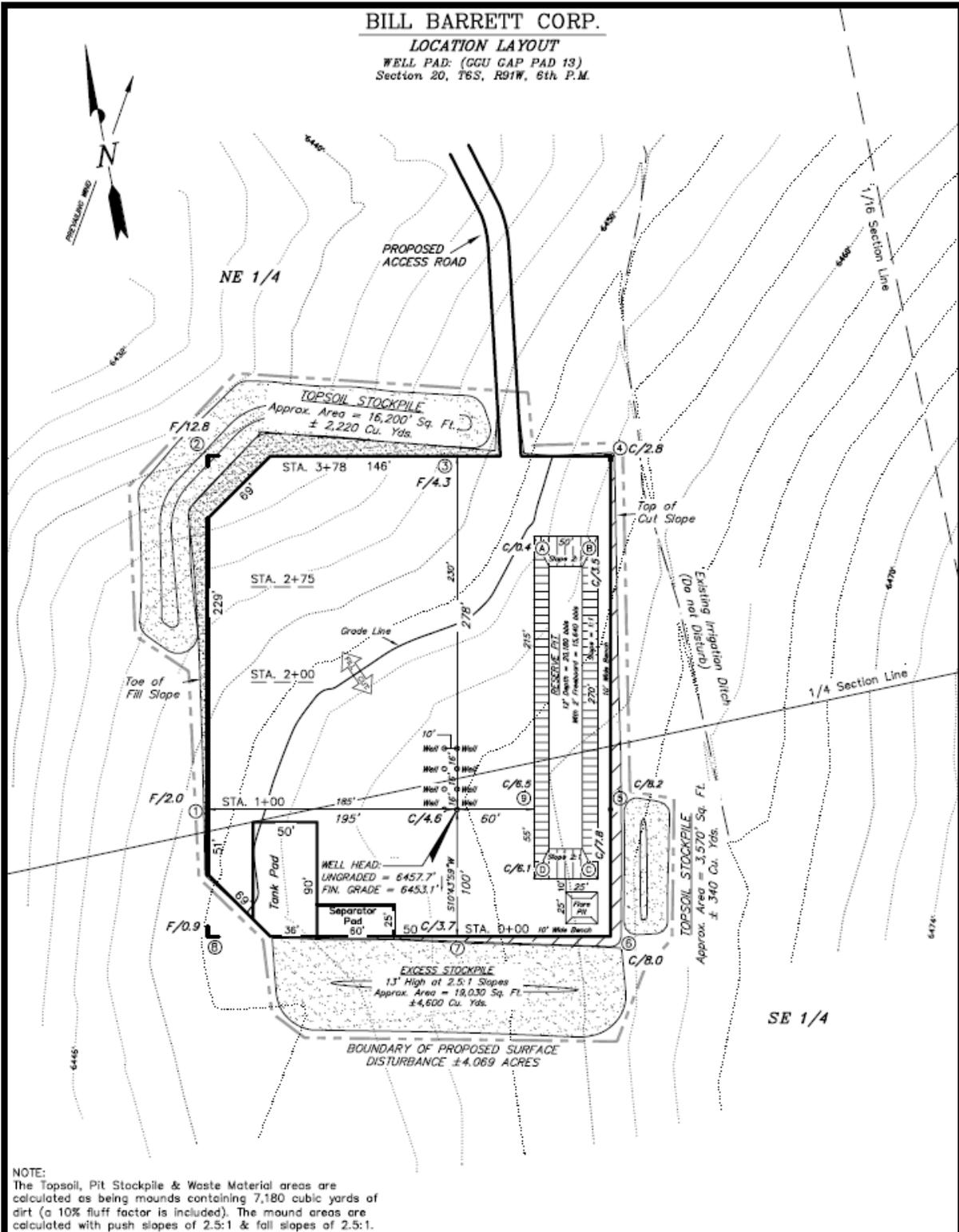
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SHEET 4 OF 11

BILL BARRETT CORP.

LOCATION LAYOUT

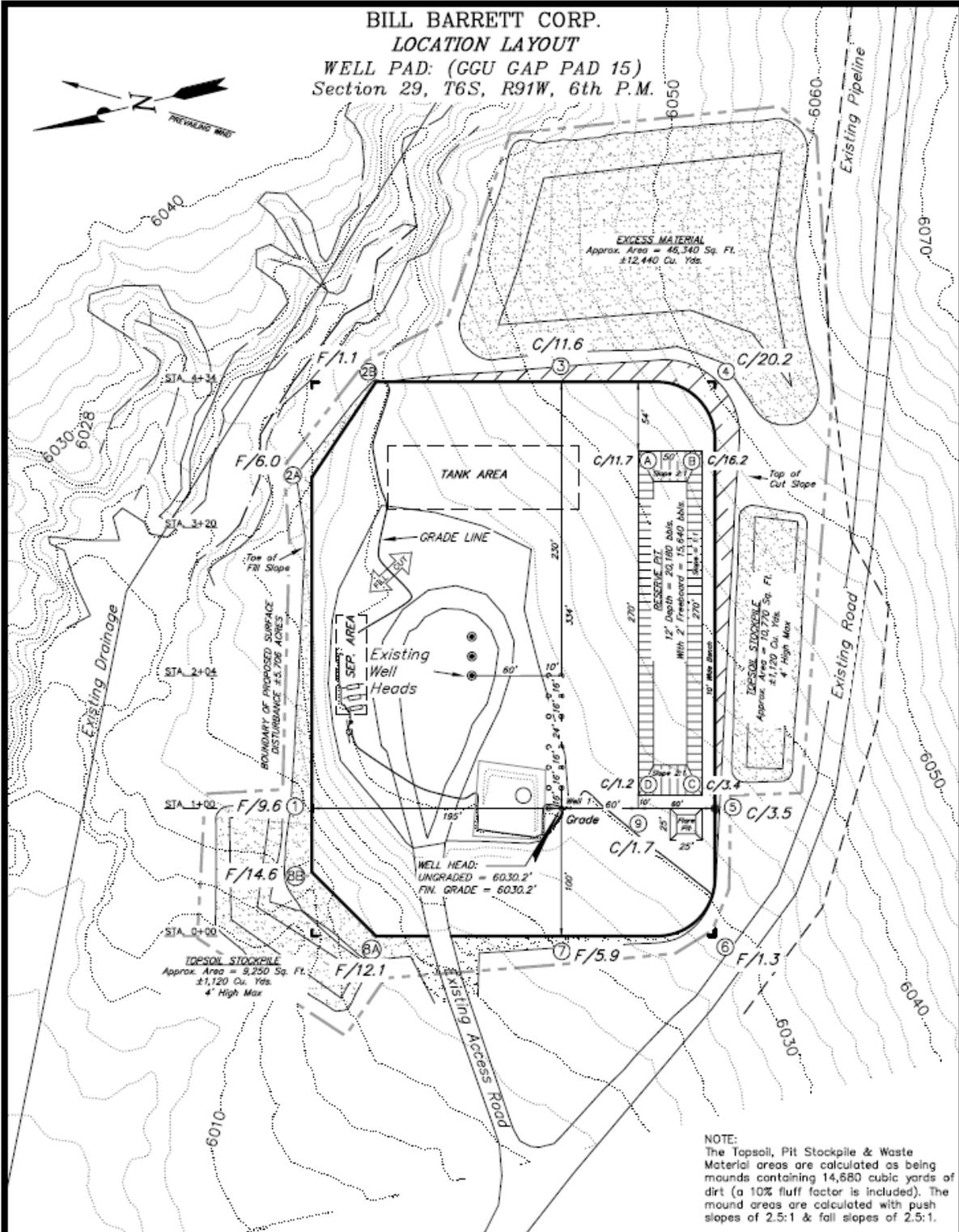
WELL PAD: (GGU GAP PAD 13)
Section 20, T6S, R91W, 6th P.M.



NOTE:
The Topsoil, Pit Stockpile & Waste Material areas are calculated as being mounds containing 7,180 cubic yards of dirt (a 10% fluff factor is included). The mound areas are calculated with push slopes of 2.5:1 & fall slopes of 2.5:1.

SURVEYED BY: K.S.	DATE SURVEYED: 06-06-05	<p>(435) 781-2501 180 NORTH VERNAL AVE. VERNAL, UTAH 84078</p>	<p>SHEET 4 OF 11</p>
DRAWN BY: F.T.M.	DATE DRAWN: 06-13-08		
SCALE: 1" = 100'	REVISED: F.T.M. 05-19-09		

BILL BARRETT CORP.
LOCATION LAYOUT
WELL PAD: (GGU GAP PAD 15)
Section 29, T6S, R91W, 6th P.M.



NOTE:
 The Topsoil, Pit Stockpile & Waste Material areas are calculated as being mounds containing 14,680 cubic yards of dirt (a 10% fluff factor is included). The mound areas are calculated with push slopes of 2.5:1 & fall slopes of 2.5:1.

SURVEYED BY: T.R.	DATE SURVEYED: 09-30-08
DRAWN BY: R.V.C.	DATE DRAWN: 09-30-08
SCALE: 1"=100'	REVISED: 11-07-08 R.V.C.

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