Converse County Oil and Gas Plan of Development

July 25, 2016

Prepared by

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ACRONYMS AND ABBREVIATIONS

Anadarko	Anadarko Petroleum Company
APD	Application for Permit to Drill
AQD	Air Quality Department
BACT	Best Available Control Technology
BLM	Bureau of Land Management
CBNG	Coalbed Natural Gas
CFO	Casper Field Office
CFR	Code of Federal Regulations
Chesapeake	Chesapeake Energy Corporation
Devon	Devon Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EOG	EOG Resources, Inc.
EPA	Environmental Protection Agency
hp	horsepower
IM	Instruction Memorandum
MSDS	Material Safety Data Sheet
NEPA	National Environmental Policy Act of 1969
NOS	Notice of Staking
OG	Operator Group
POD	Plan of Development
RCRA	Resource Conservation and Recovery Act
ROW	Right-of-Way
SARA	Superfund Amendments and Reauthorization Act
SM	SM Energy
SPCC	Spill Prevention Control and Countermeasures
TBNG	Thunder Basin National Grassland
USFS	U.S. Forest Service
WDEQ	Wyoming Department of Environmental Quality
WOGCC	Wyoming Oil and Gas Conservation Commission

SECTION 1 - INTRODUCTION

1.1 Project Location and Background

This comprehensive Plan of Development (POD) presents the detailed information necessary to understand the full-field oil and natural gas development project proposed by the Operator Group (OG). The OG is comprised of Anadarko Petroleum Company (Anadarko), Chesapeake Energy Corporation (Chesapeake), EOG Resources, Inc., (EOG), Devon Energy (Devon), and SM Energy (SM) as well as representing the interests of other operators within the project area.

The Converse County Project Area ("project area") encompasses 1,501,707 acres, including 88,423 acres of public lands administered by the Bureau of Land Management (BLM) Casper Field Office (CFO), 100,966 acres of land administered by the State of Wyoming, 63,886 acres of Thunder Basin National Grasslands, 1,246,918 acres of private land, and 1,514 acres of land under water. The mineral estate in the project area is comprised of 964,525 acres of federal mineral estate and 537,182 acres of non-federal mineral estate of which approximately 345,000 is State-owned, and is generally located within Townships 32 through 40 North, Ranges 67 through 76 West, 6th Principal Meridian in Converse County, Wyoming (see **Figure 1**). The project area is located entirely in Converse County, Wyoming, with its northern boundary being the Campbell County line. As evidenced by the acreage numbers listed, the majority of the federal mineral estate (808,154 acres) is located below private surface lands, in what is called a "split-estate" situation.

1.2 Overview of the Proposed Action

The Proposed Action is to drill up to 5,000 oil and gas wells over 10 years. Although actual operations are subject to change as the project proceeds, the OG would drill wells at an average rate of approximately 500 wells per year for 10 years. Prospective zones for the Converse County Oil and Gas Project include (but are not limited to) the Sussex, Shannon, Frontier, Niobrara, Muddy, Mowry, Parkman, Tea Pot, Tekla, and Turner. Other prospective zones may be identified in the future. To the extent possible, the OG intends to conduct drilling and development operations within the project area on a year-round basis in order to maximize the use of horizontal development from multi-well pads. As part of this Plan of Development, the OG commits to working with the BLM and U.S. Fish and Wildlife Service to develop an approach that will allow the BLM to grant exceptions to timing limitations for raptor nests and non-Core Area greater sage-grouse leks. This approach should be explicit and systematic, clearly articulating how applications for exceptions will be reviewed and granted. The approach should also contain a series of avoidance, minimization, and compensatory mitigation measures the OG would implement to receive exceptions. Without an explicit and systematic approach for requesting and granting exceptions, the timing limitations would force members of the OG to move drilling rigs in and out of areas during portions of the year, which would increase operations costs, decreases efficiencies, and potentially increase impacts to wildlife and other sensitive resources.

Project construction would generally include well pads, roads, pipelines, power lines, compressor stations, and ancillary facilities. In addition, the OG could drill a limited number of vertical exploratory oil and gas

wells; these vertical wells are captured in the 5,000 oil and gas well count and surface disturbance estimates and would not change the total number of wells or pads. The total number of wells drilled, as well as the annual drilling rate, would depend on factors largely outside the control of the OG such as new geologic information and associated successes, engineering technological development, economic factors, regulatory permitting, availability of equipment and a trained workforce, performance of commodity markets, contract lease, and unit stipulations and restrictions.

Types of Surface Disturbance

Short-term: Initial (peak) disturbance during construction

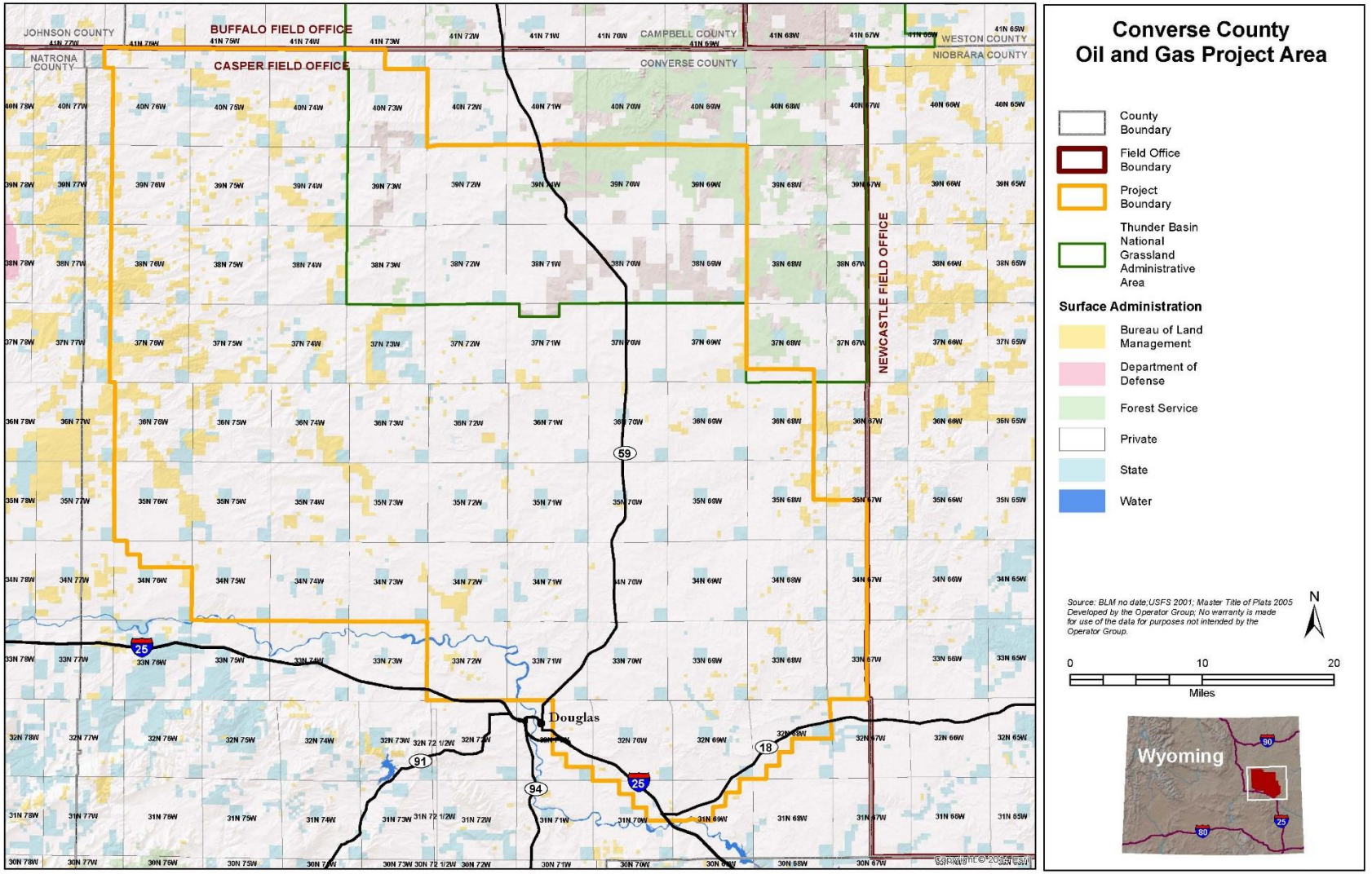
Long-term: Disturbance that is not reclaimed following initial construction or after drilling/completion

The anticipated initial drilling and completion pad size would be on average 12 acres; however, individual pad sizes may vary based on the number of wells per pad and constraints related to lease/landowner agreements, operational safety, and topography. The number of wells drilled from each pad would vary from 1 to 16. If productive, the portions of the well pad not needed for routine operations would be reclaimed to reduce surface disturbance to an average of 6 acres for the life of the wells on the pad. After the last well is plugged and abandoned, the pad would be fully reclaimed. Estimated initial (short-term) and post-interim reclamation (long-term) surface disturbances from the 1,500 proposed multi-well pads and all associated infrastructure are 53,547 acres and 21,338 acres, respectively. The total estimated long-term surface disturbance for the Proposed Action would be approximately 1.4 percent of the project area.

1.3 Purpose and Need

The purpose of the Proposed Action is to allow the OG to conduct drilling and development operations on a year-round basis, produce, and market oil, natural gas, and associated hydrocarbon products, pursuant to their rights and obligations under existing oil and gas leases issued by the BLM, State of Wyoming, and private mineral owners. The BLM oil and gas leasing program encourages development of domestic oil and gas reserves, consistent with the BLM's multiple-use mission. The oil and gas resources produced from this project are needed to meet national domestic energy demand.

Figure 1-1. Converse County Oil and Gas Project Area



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SECTION 2 - PROJECT DESCRIPTION

2.1 Introduction

This section defines the project area boundary, describes the existing and planned oil and gas facilities present within the project area, and it presents the OG's Proposed Action. It also includes standard development and production activities to facilitate understanding of how project elements would be constructed and operated.

2.2 Description of the Project Area

Topography ranges from steep rugged rock outcrops to relatively gentle slopes. Elevations within the project area range from approximately 4,800 to 6,300 feet above mean sea level. The project area encompasses a number of physiographic provinces and is located within the Platte River drainage system. The area has historically been used for livestock grazing, oil and gas development, wildlife habitat, and recreation. This area provides summer and fall grazing for cattle, sheep, and horses. The area has also been the site of historic and ongoing oil and gas development. The OG and other operators active in the project area continue to implement approved oil and gas development, including drilling new wells and constructing new infrastructure.

2.3 Existing and Planned Oil and Gas Development in the Project Area

2.3.1 Introduction

This section describes existing and planned oil and gas development in the project area. Existing development is defined as what is currently on the ground. Planned development has either already been approved by other permitting mechanisms (including National Environmental Policy Act of 1969 [NEPA] and Application for Permit to Drill [APD] approval) and will be implemented before the end of 2017, or it is anticipated to be approved before the end of 2017. Existing and planned oil and gas infrastructure forms the basis for current and ongoing operations and serves to inform the OG's Proposed Action, which uses this infrastructure to the extent practical in its full-field development.

2.3.2 Existing Oil and Gas Infrastructure

The project area is vast in scale and scope, and numerous small and large operators have ongoing operations in the area. This section uses the best available information from a number of, primarily, public sources to describe the existing oil and gas development in the project area. The use of public information (e.g., oil and gas well data from the Wyoming Oil and Gas Conservation Commission [WOGCC]) provides a more complete picture of existing conditions because it includes information for operators who may not be part of the OG and whose wells and facilities could be missed if only internal, OG data were employed. Information from

publicly available sources has been augmented with additional information directly from the OG where publicly available data is lacking.

Note: while the OG provides periodic updates to the POD to reflect changes in the proposed project (e.g., changes in technology or regulations that substantially alter the project approach), data on existing development will generally not be updated, and should be viewed as a "snapshot" of development activity at the time of the original POD in 2014. Should changes in existing development alter the OG's Proposed Action, the OG may elect to update relevant existing development information in subsequent versions of the POD. The BLM's EIS will contain the most up-to-date existing development information.

2.3.2.1 Wells

As of July 2014, the WOGCC database contained approximately 3,014 records for existing and permitted wells in the project area. Of those wells 1,236 had been permanently abandoned and another 73 had a subsequent report of abandonment. Abandoned wells are assumed to have been fully reclaimed and are therefore, along with 9 wells with no available classification, excluded from consideration in this POD. The WOGCC database identified 1,234 wells as under active development or producing and 307 wells with WOGCC permits to drill. Table 2-1 summarizes the type and status of wells in the project area at the time of this data collection. Wells with approved WOGCC permits to drill may still require additional approvals prior to drilling, especially for wells that require access to federal surface or mineral estate. As shown in Table 2-1, the majority of the wells in the project area were identified as oil wells with smaller numbers identified as gas wells (which include CBNG wells), disposal and injector wells, and "other" and monitoring wells. Existing and permitted wells in the project area included various combinations of federal, state, and fee ownership of mineral and surface estate, with the most common being fee surface and federal minerals (604 or 35%) and fee surface and minerals (393 or 23%).

According to the Wyoming Pipeline Authority, rig counts across Wyoming have fluctuated between 40 and 70, with a high in December 2011 and a low in April 2012 (Wyoming State Pipeline Authority 2013). Data specific to Converse County indicates that there were up to two dozen rigs active in the project area between April and June 2014.

Table 2-1. Oil and Gas Well Type and Status as of July 2014

WELL STATUS	WELL CLASS						TOTAL
	OIL	GAS	DISPOSAL	INJECTOR	OTHER	MONITORING	
Active, Producing	1,128	72	13	11	9	1	**1,234**
Permit to Drill	303	1	2	0	1	0	**307**
Inactive, Not-Producing	122	16	6	1	11	1	**157**
Unknown Status	3	4	0	0	0	0	**7**

Table 2-1. Oil and Gas Well Type and Status as of July 2014

WELL STATUS	WELL CLASS						TOTAL
	OIL	GAS	DISPOSAL	INJECTOR	OTHER	MONITORING	
Total	**1,556**	**93**	**21**	**12**	**21**	**2**	**1,705**

Source: WOGCC July 2014

Note: Well class and status categories from WOGCC database were grouped according to the row and column headings in the table for ease of interpretation.

[1] *Inactive, not-producing wells include those that are dormant, have a notice of intent to abandon, are shut-in, have suspended operations, or are temporarily abandoned. This status as reported in this table does not include permanently abandoned wells or those with a subsequent report of abandonment.*

For purposes of estimating the surface disturbance from existing wells in the project area, the OG further refined the WOGCC data displayed in Table 2-1; the results of this refinement are included under wells and pads in Table 2-2. WOGCC data indicated that the majority of the existing oil and gas wells in the project area were conventional Vertical Wells (1,000 or 59% of total wells). For purposes of estimating existing surface disturbance, the OG placed all WOGCC wells classified as non-CBNG vertical oil or gas wells, as well as the small subset of vertical wells classified as "other" and "monitoring" wells, into this facility type in Table 2-2. The OG then classified WOGCC wells listed as both "horizontal" (640 or 38% of total wells) or "directional" (18 or 1% of total wells) as Horizontal Well facilities in Table 2-2. WOGCC wells classified as either "injector" (12 or <1% of total wells) or "disposal" (21 or 1% of total wells) were place in to the Disposal Well category in Table 2-2. Finally, the small subset of wells identified as tapping into coal bed reservoirs (14 wells or <1%of total wells) were included as CBNG Wells.

2.3.2.2 Access/Roads

Existing wells in the project area are accessed by the public road network (e.g., county roads) and existing oil and gas access roads. Oil and gas products are either transported via truck or via crude oil and natural gas pipelines to central processing facilities.

As of 2013, there were more than 6,756 miles of existing roads in the project area, including approximately 236 miles of State and Federal Highways, 299 miles of county roads, 1,261 miles of light duty roads, and 4,960 miles of rough bladed and two-track roads (BLM 2013). In addition, the project area was crossed by approximately 96 miles of existing rail lines. These roads and railroads serve a variety of resource purposes, including oil and gas development and production. For purposes of reporting in this document and consistency with the Proposed Action, only certain portion of these roads are assumed to support oil and gas development (see Table 2-2); to be consistent with the Proposed Action, the OG has assumed an average of one mile of access road per existing well pad.

2.3.2.3 Pipeline and Electrical Supply Infrastructure

Existing linear facilities in the project area include 184 miles of gas pipelines. See Table 2-2 for additional details.

2.3.2.4 Powerlines

Rocky Mountain Power provides electricity to the majority of the Project Area. As of 2014, this power provider owns and operated approximately 115 miles of overhead transmission lines (>35 kV), which was consistent with transmission line data available from Platts (Rocky Mountain Power 2013 and Platts 2014). Additionally, there were approximately 492 miles of overhead and 28 miles of buried transmission lines (<35 kV) (RMP 2013). Niobrara Electric services the southeast corner of the Project Area, though transmission line data from that provider was not available.

2.3.3 Planned (but not constructed) Oil and Gas Development in the Project Area

In addition to existing development, planned drilling and completion of oil and gas development wells and infrastructure would continue in the project area through 2017 (anticipated Converse County project initiation or Record of Decision). This planned development is described below and summarized in Table 2-2. Planned development includes facilities disclosed in NEPA documents or approved by other agencies but not yet constructed. Oil and gas development within the project area is still in the exploration and delineation phase; as a result, the exact location of many of the planned but not constructed wells, roads, pipelines, and related infrastructure is unknown at this time. The information included in this section is therefore based on the best available information and estimates developed by the OG.

2.3.3.1 Operator Group Field Development Plan

Planned ongoing oil and natural gas development in the project area includes those facilities described in NEPA documents from the following previously approved or proposed development projects:

- Spearhead Ranch Environmental Assessment (EA) (56 to 224 wells on 56 well pads)
- Highland Loop Road EA (37 to 148 wells on 37 well pads)
- East Converse EA (18 to 72 wells on 18 well pads)
- Hornbuckle EA (288 wells on 48 well pads)
- Powder River Basin Oil and Gas Project Environmental Impact Statement (EIS) (up to 150 wells on 40 well pads)
- Scott Field EA (150 wells on 40 well pads)
- In or near Douglas Core Area EAs - Proposed (up to 150 wells on 25+ well pads)
- Mohawk EA – Proposed (up to 32 wells on 7 well pads)

2.3.3.2 Access/Roads

Access to the planned well and production pad locations would require construction of approximately 221 miles of new roads, comprised of collector roads, which will provide primary access to large blocks of land in the project area, and well pad access roads (see Table 2-2).

2.3.3.3 Wells and Associated Infrastructure

Planned development would result in ongoing drilling, completion, and construction of wells and associated infrastructure. Table 2-2 identifies those existing and planned oil and gas facilities present or anticipated within the project area by the end of 2017 and their associated surface disturbance.

Table 2-2. Summary of Existing and Planned Surface Disturbance

	EXISTING AS OF 2014			PLANNED BEFORE THE END OF 2017[3]		
FACILITY	NUMBER OR MILES	SIZE OR WIDTH	EXISTING LONG-TERM SURFACE DISTURBANCE[1] (ACRES)	NUMBER OR MILES	SIZE OR WIDTH	ESTIMATED LONG-TERM SURFACE DISTURBANCE[1] (ACRES)
Wells and Pads	***(#)***	***(acres)***		***(#)***	***(acres)***	
Horizontal Wells/Well Pads	658[2,4]/436[11]	6[5]	2,616	1,048[6]/271	6	1,626
Vertical Wells/Well Pads	1,000/1,000[2]	1.5[5]	1,500	15/15	1.5	23
CBNG Wells/Well Pads	14/14[2]	0.2[5]	3	0	0	0
Disposal Wells/Well Pads	33/33[2]	10[5]	330	5	10	50
Production Pads	67	5[5]	335	20	5	100
Well Pad Subtotal	-	-	**4,784**	-	-	**1,799**
Roads and Rails	***(miles)***	***(feet)***		***(miles)***	***(feet)***	
Well Pad Access Roads	1,477[4,7]	24	4,297	286[7, 8]	32	1,109
Primary Collector Roads	535[10]	40	2,593	NA	NA	0
Rail Lines	96	40	465	0	0	0
Roads and Rails Subtotal	-	-	**7,356**	-	-	**1,109**
Construction/Production Facilities	***(#)***	***(acres)***		***(#)***	***(acres)***	
Gas Plant	5[10]	40	200	2	100	200
Centralized Processing Facilities	1[10]	10	10	0	0	0
Compression Facilities	18[10]	5	90	14	5	70
Equipment/Pipe Storage Yards	1	10	10	0	0	0
Workforce Facility	1	10	10	2	10	20

Table 2-2. Summary of Existing and Planned Surface Disturbance

	EXISTING AS OF 2014			PLANNED BEFORE THE END OF 2017[3]		
FACILITY	NUMBER OR MILES	SIZE OR WIDTH	EXISTING LONG-TERM SURFACE DISTURBANCE[1] (ACRES)	NUMBER OR MILES	SIZE OR WIDTH	ESTIMATED LONG-TERM SURFACE DISTURBANCE[1] (ACRES)
Fresh Water Make-up Ponds	6	8	48	7	8	56
Water Processing/Recycling Facility	-	-	-	1	15	15
Construction/Production Facilities Subtotal	**-**	**-**	**368**	**-**	**-**	**361**
Linear Facilities (miles)	***(miles)***	***(feet)***		***(miles)***	***(feet)***	
Oil and Gas – Gas Gathering Pipeline(s) Within Common Road Disturbance	184	30	0	75	30	0
Oil and Gas – Gas Gathering Pipeline(s) New Cross-Country Disturbance	NA	NA	NA	75	75	0
Linear Facilities Subtotal	**184**	**-**	**0**	**150**	**-**	**0**
Total Disturbance (acres)			**12,508**			**3,269**

Table 2-2. Summary of Existing and Planned Surface Disturbance

	EXISTING AS OF 2014			PLANNED BEFORE THE END OF 2017[3]		
FACILITY	NUMBER OR MILES	SIZE OR WIDTH	EXISTING LONG-TERM SURFACE DISTURBANCE[1] (ACRES)	NUMBER OR MILES	SIZE OR WIDTH	ESTIMATED LONG-TERM SURFACE DISTURBANCE[1] (ACRES)

CBNG *Coal bed natural gas*

NA *Not Applicable*

WOGCC *Wyoming Oil and Gas Conservation Commission*

Note: Due to rounding, totals may not be additive.

[1] *Long-term disturbance is disturbance that is not reclaimed following initial construction or after drilling/completions.*

[2] *Well numbers are based on available WOGCC well data for the project area, with permanently abandoned wells or wells with subsequent reports of abandonment removed.*

[3] *The OG assumes that interim reclamation has been completed by the start of Converse County Project development activities and only long-term disturbance remains.*

[4] *For purposes of analysis, Horizontal Wells consist of 640 horizontal wells and 18 directional wells identified in the WOGCC database.*

[5] *Where available, well pad acreages are based on comparable facility sizes from the OG's proposed project; CBNG is not part of the Converse County Project, and therefore CBNG well pad acreages are based on the BLM Buffalo Field Office Environmental Assessment for Anadarko Petroleum Corporation Table Mountain Phase 4 Coalbed Natural Gas Plan of Development (BLM 2010)*

[6] *The Horizontal Wells/Well Pads "Planned Before the End of 2017" represents an average of the low and high projections for previously approved or proposed development projects identified in section 2.3.3.1 (881+1,214=2,095/2=1,048).*

[7] *Consistent with assumptions for the OG's proposed project, Table 2-2 assumes a road length of 1 mile/well pad (horizontal, vertical, and CBNG) for existing wells and wells planned before the end of 2017.*

[8] *For wells planned before the end of 2017, roads include both collector roads, which provide primary access to large blocks of land in the project area, and well pad access roads, which are spur roads that provide access from collector roads to a specific well pad or group of well pads (1 mile/pad). Because the locations and mix of proposed collector versus well pad access roads planned before the end of 2017 are not known at this time, the OG has addressed both road types in single "Roads" facility type. To allow consideration of the surface disturbance from these roads, the OG has assumed that the average road width will be between the projected width of collector and access roads, or 48 feet at initial disturbance and 32 feet following interim reclamation.*

[9] *Existing primary access roads include Converse County roads and Wyoming State Highways (BLM 2013)*

[10] *Figures were sourced from the Wyoming State Pipeline Authority (2013). All other figures were provided by the Operator Group from internal company data.*

[11] *A subset of horizontal and directional wells in the project area sit on multi-well pads. To estimate the number of multi-well pads, the OG employed a GIS exercise that assumed all horizontal and directional wells within 100 feet of each other were on the same pad. The results of this analysis are available on request.*

2.4 Converse County Project Proposed Action

The OG would drill a maximum of 5,000 new oil and gas wells on approximately 1,500 well pads over a ten-year period between 2018 and 2027. The actual pace of development will depend on factors largely outside the control of the OG including, but not limited to, commodity prices, permitting timelines, and the availability of equipment and personnel. The OG would drill the horizontal wellbores at an average rate of 500 wells per year for 10 years; to the greatest extent possible, drilling and development operations would occur on a year-round basis. Approximately two-thirds of the wells drilled would intersect federal mineral estate. The total number of wells (federal, fee, and state) that would be drilled during the life of the project or during any particular year would vary depending on factors (some of which would be outside the control of the OG) such as permit approvals, production success, engineering technology, economic factors, commodity prices, rig availability, and lease stipulations. Each well pad would contain between 1 to 16 well bores. Operators will determine the location of a proposed well by the location of the subsurface reservoir, the topography of the area, and WOGCC spacing rules.

The productive life of each well is estimated to be approximately 30 years. Based on experience near the project area, the OG assumes that less than one percent of the drilled wells might be dry and would be plugged and abandoned as soon as practicable.

To support the 5,000 oil and gas wells on the 1,500 oil and gas well pads, the OG would develop roads, production facilities and production pads (375), disposal (30) and water source pads (50), and pipelines. A summary of surface disturbance from all project elements associated with implementation of the Proposed Action is presented in Table 2-3. The information in Table 2-3 shows new proposed development and surface disturbance that would occur as a result of the OG's proposed project. Some of the wells could be located on existing pads, but such details are not available at this time and do not change the overall 5,000 wells on 1,500 well pads estimate for this project. Where new wells are located on existing pads, some of the pad locations would likely have been addressed through existing NEPA documents. To the extent practicable, the OG's Proposed Action leverages existing and planned (but not constructed) facilities.

Table 2-3. Proposed Action Summary of New Surface Disturbance

FACILITY	NUMBER OR MILES	SIZE OR WIDTH	ESTIMATED SHORT-TERM SURFACE DISTURBANCE (ACRES)	SIZE OR WIDTH	ESTIMATED LONG-TERM SURFACE DISTURBANCE (ACRES)
Well Pads	***(#)***	***(acres)***		***(acres)***	
Oil and Gas Well Pads[1]	1,500	12	18,000	6	9,000
Disposal Well Pads	30	10	300	10	300
Production Pads	375	8	3,000	8	3,000
Water Source Well Pads	50	2	100	1	50
Well Pad Subtotal	**1,955**	**-**	**21,400**	**-**	**12,350**
Roads[2]	***(miles)***	***(feet)***		***(feet)***	
Well Pad Access Roads	1,500	45	8,182	24	4,364
Primary Collector Roads	390	75	3,545	50	2,364
Roads Subtotal	**1,890**	**-**	**11,727**	**-**	**6,727**
Construction/Production Facilities	***(#)***	***(acres)***		***(acres)***	
Gas Plant	2	100	200	100	200
Oil/Condensate Storage	6	3	18	3	18
Centralized Processing Facilities	2	5	10	0	0
Compression Facilities	50	5	250	5	250
Equipment/Pipe Storage Yard[3]	1	50	50	50	50
Electrical Substation	12	3	36	3	36
Workforce Facility	1	10	10	10	10
Fresh Water Make-up Ponds	30	8	240	0	0
Water Processing/Recycling Facility[5]	4	15	60	15	60
Construction/Production Facilities Subtotal	**-**	**-**	**874**	**-**	**624**
Linear Facilities (miles)	***(miles)***	***(feet)***		***(feet)***	
Oil and Gas - Gas Gathering Pipeline(s) Within Common Road Disturbance	750	30	2,727	0	0
Oil and Gas - Gas Gathering Pipeline(s) New Cross-Country Disturbance	750	75	6,818	0	0
Oil and Gas - Main Trunk Pipeline(s)	500	75	4,545	0	0
Water – Temporary Surface Water Pipeline (above ground)	900	-	0	-	0
Overhead Electric Distribution - Adjacent to New Road Disturbance[4]	1,350	30	4,909	9	1,472
Overhead Electric Distribution - Cross-country Disturbance	150	30	545	9	164
Linear Facilities Subtotal			**19,545**		**1,636**
Total Disturbance (acres)			**53,547**		**21,338**

Table 2-3. Proposed Action Summary of New Surface Disturbance

FACILITY	NUMBER OR MILES	SIZE OR WIDTH	ESTIMATED SHORT-TERM SURFACE DISTURBANCE (ACRES)	SIZE OR WIDTH	ESTIMATED LONG-TERM SURFACE DISTURBANCE (ACRES)

Note: Due to rounding, totals may not be additive.

[1]The OG could drill a limited number of exploratory vertical oil and gas wells; however, because the number of such wells are unknown at this time and the surface disturbance associated with each vertical well pad would be less than that of the proposed horizontal well pads, these vertical wells are assumed to be captured in the disturbance estimates for the 5,000 horizontal well count.

[2]Widths are for proposed surface disturbance and do not indicate long-term rights-of-way across BLM or National Forest System lands. ROWs are discussed in section 2.4.1.2.

[3] The total surface disturbance anticipated from the development of storage yards is 50 acres. Because multiple operators are involved in the Converse County Project, the OG anticipates the 50 acre disturbance could take the form of multiple, smaller, operator-specific storage yards, instead of a single larger storage yard.

[4]Assumes a 30-foot wide initial disturbance. Long term disturbance is assumed to be approximately 30 percent of the initial disturbance. Overhead electrical distribution lines would be installed along road ROW to the extent practicable; however, the OG assumes that in some cases, new, cross-country electrical distribution lines may be required.

[5]Water processing/recycling facilities are included for purposes of analysis. As noted in the OG's Water White Paper (2014), the OG would consider recycling and re-use of flowback and produced water in the project area if and when it proves technologically and economically feasible.

2.4.1 Project Development

The following sections summarize pre-construction activities, project and well pad access roads development, well pad construction and well bore drilling operations, completion activities, well production and maintenance, and reclamation for each well pad location. In addition, these sections include information on water use and disposal and hazardous and waste management practices. Techniques and procedures may vary somewhat from those presented in this section depending on site-specific conditions, and these variances would be identified at the time of APD submittal.

2.4.1.1 Surveying, Notice of Staking, and Application for Permit to Drill

Prior to the start of construction, operators would complete the following activities:

- Make a good faith effort to notify the surface owner prior to entry for planning, staking or resource surveying purposes;
- Stake and survey each location, access road, and pipeline;
- Submit Notice(s) of Staking, APD(s), and right-of-way (ROW) application(s), as applicable, to the BLM;
- Participate in onsite evaluations with BLM personnel and surface owners in split-estate situations;
- Submit site-specific applications (e.g., Surface Use Plan of Operations) and modify them, as needed;
- Submit detailed construction plans, as needed;
- Perform cultural, paleontological, biological, and/or other surveys, as required by the BLM.

Each operator would obtain required permits from the BLM prior to initiating project activities on BLM-administered land. To initiate the permitting process, operators would file a Notice of Staking (NOS) and/or APD for each proposed well. The BLM would process the applications to determine if they meet all requirements and would subsequently notify the operator of dates, times, and places to meet and conduct onsite inspections of the proposed locations.

APDs would be submitted to the BLM where appropriate. Any submitted APDs would be technically and administratively complete, and would consist of a completed 3160-3 form, well plat, drilling plan, surface use plan of operations, bonding, operator certification, and onsite inspection (BLM Onshore Order #1 III D). A surface use plan of operations contains information describing construction operations, access roadway(s) and pipeline corridors, water supply and haul route, well site layout, production facilities, waste disposal, and restoration or reclamation associated with the site-specific well development proposal. The drilling plan would generally include information describing the technical drilling aspects of the specific proposal, including subsurface resource protection and royalty accountability. The BLM would determine the suitability of the proposed design, construction techniques, and procedures during the APD-review process.

2.4.1.2 Project Roads

The Proposed Action would use or upgrade the existing road network to the extent practicable. Existing roads would be upgraded as necessary to facilitate safe transport and to maximize use of the existing road system. Upgrades may include, but are not limited to, ditching, drainage improvements, graveling, crowning, and capping the roadbed. Based on experience in the project area, the OG assumes that upgrades to existing roads will not result in appreciable increases in road width.

The Proposed Action includes the construction of 1,890 miles of new roads, which equates to approximately one mile of new road per well pad (1,500 miles) plus 390 miles of additional primary collector roads. New roads to support the proposed action would provide primary access to large blocks of land in the project area, and well pad access roads, which are spur roads that would provide access from collector roads to a specific well pad or group of well pads. The surface disturbance associated with collector roads would be 75 feet wide during construction (reclaimed to a 50-foot wide running surface following interim reclamation), and the surface disturbance associated with well pad access roads would be 45 feet wide (reclaimed to a 24-foot wide running surface following interim reclamation). Estimated initial and post-interim reclamation surface disturbances from roads would be 11,727 and 6,728 acres respectively. New roads would be constructed and maintained to provide year-round access. The OG would apply for temporary and permanent ROWs for proposed roads across BLM-managed and National Forest System lands. Any roads developed on private surface would be sited, constructed, and maintained in accordance with the landowner's executed surface agreements.

All new roads would be designed, constructed, and maintained in accordance with standards described in Chapter 4 (*Construction and Maintenance*) of *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, 4th Edition* (commonly referred to as the Gold Book) (BLM 2007) and BLM Manual 9113 (BLM 2011). Precise design characteristics for new roads would follow standard operating procedures as described below and would vary based on site-specific topography and soil characteristics supplied with individual well plats in APDs. Whenever practicable, roads would be designed to disturb less

than the identified initial disturbance width, potentially through the incorporation of additional turnouts or other methods, so long as traffic and safety concerns are satisfied. However, in limited circumstances, larger disturbance widths may be necessary to meet engineering and safety standards. New roads would be constructed with 6" base of 3" minus gravel with a 3:1 slope for ditches on both sides. Water turnouts would be installed within the ROW where necessary to provide proper drainage along the road. Construction activity would not be conducted using frozen or saturated soils material or during periods when watershed damage was likely to occur.

Roads would be built to be permanent, and would remain in place for at least the productive life of the wells. Roads would be maintained and kept in good repair while in service, including maintaining proper crown, ditching, and drainage to prevent unnecessary erosion. The OG would be responsible for road maintenance to the extent set forth in applicable road use agreements with private surface owners and Converse County.

Interim and final reclamation activities for all road disturbances would be consistent with the guidance contained in Chapter 6 (*Reclamation and Abandonment*) of the Gold Book (BLM 2007) and BLM Wyoming Instruction Memorandum 2012-032 (BLM 2012). Following road construction, stockpiled topsoil would be evenly redistributed over the road embankment and borrow ditch slopes. These areas would be stabilized and reclaimed with the approved seed mix as soon as practicable in the next appropriate seeding season. Temporary roads required for the construction of facilities and other roads, which are not needed for project operations would be reclaimed fully as soon as practicable. Temporary roads would primarily serve pipeline, electrical distribution line, or other facility construction; surface disturbance associated with these temporary features is captured in Table 2-3. The OG prepared a project-specific Transportation Plan as a supporting document for this POD; please refer to that plan for additional details about proposed project transportation.

2.4.1.3 Drilling and Completion

WELL PAD CONSTRUCTION

The OG would construct up to 1,500 well pads, each with an initial footprint of on average 12 acres (including areas of cut/fill and the pad itself) during drilling and completion. Under the Proposed Action, each well pad would be designed to accommodate the drilling of multiple wells. Drilling and completion well pads would be constructed as shown in the typical well pad layout provided in Figure 2-1. If productive, the portions of the well pad not required for routine operations would be reclaimed thereby reducing the pad to an average size of 6 acres for the life of the multiple wells on the pad. The OG could also construct approximately 375 production pads of approximately 8 acres in size see Figure 2-3; these production well pads would not be subject to initial reclamation and would remain at approximately 8 acres over the long term. Some of the projects water supply needs would be met from up to 50 new water supply wells. Well pads for water supply wells would be 2 acres in size, but would be reduced to 1 acre following interim reclamation. Additionally, 30 disposal well pads, each approximately 10 acres in size, would be constructed to handle some of the project's produced water disposal needs. A water disposal pad would typically consist of one disposal well, water storage tanks, and a pump station. The disposal well pads would not host dehydration units. Estimated initial and post-interim reclamation surface disturbances from all oil and gas well pads and associated disposal, water supply, and production pads would be 21,350 and 12,300 respectively. While the

Proposed Action is for an average of 12-acre well pads, actual individual pad sizes requested during subsequent APDs and analyzed in site-specific NEPA would vary based on the number of wells proposed for the pad, constraints related to lease/landowner agreements, operational safety regulations (e.g., required setback distances and placement considerations for equipment and facilities), and location-specific topography. The OG would attempt to limit surface disturbances from well pads, particularly in circumstances including, but not limited to, areas of extensive cuts and/or fills, proximity to ephemeral drainages. Final determination on the size of individual well pads would be made during the APD process.

Figure 2-1. Example Drilling and Completion Horizontal Well Pad Layout (during drilling)

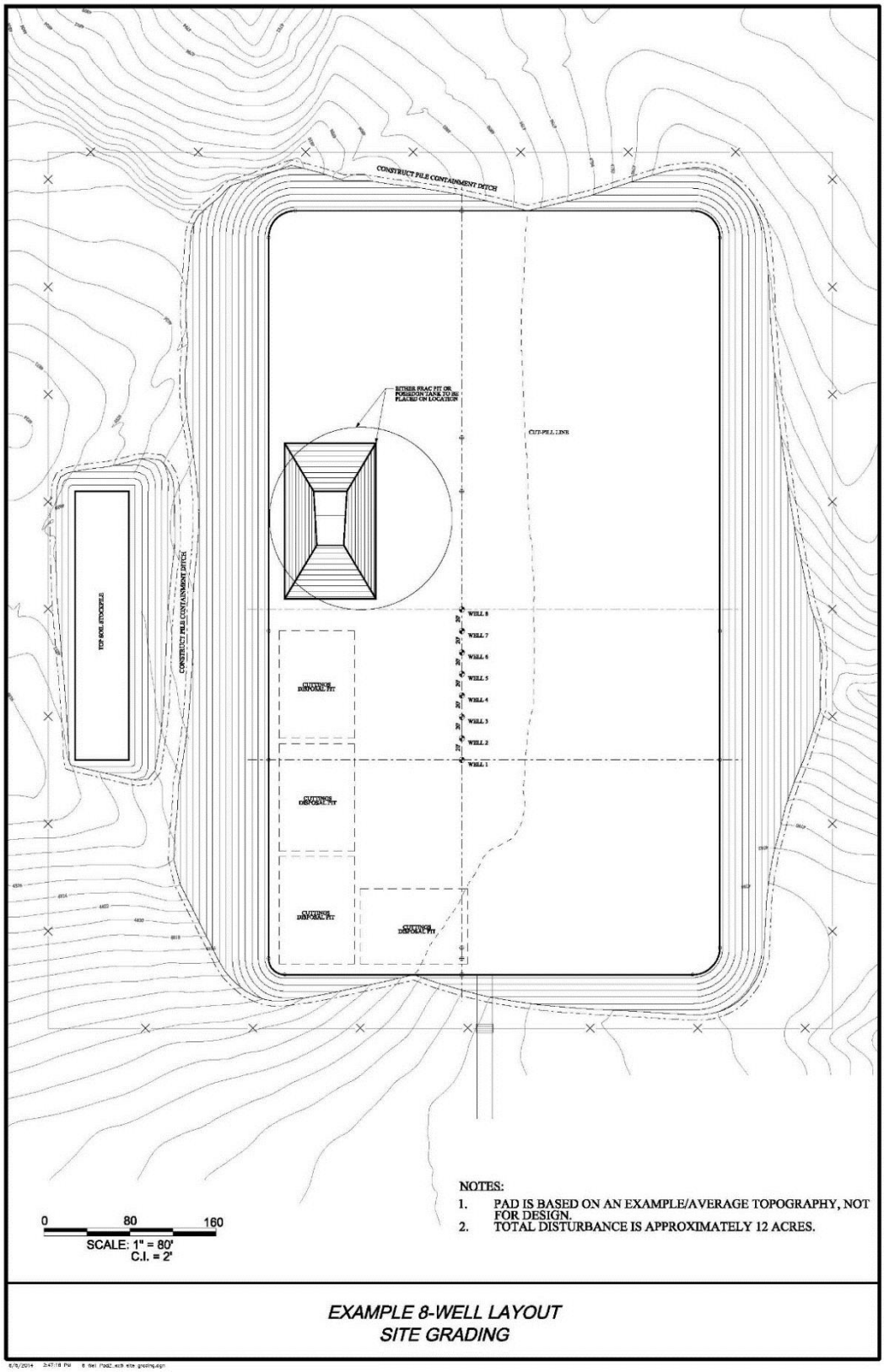


Figure 2-2. Example Drilling and Completion Horizontal Well Pad Layout (during production)

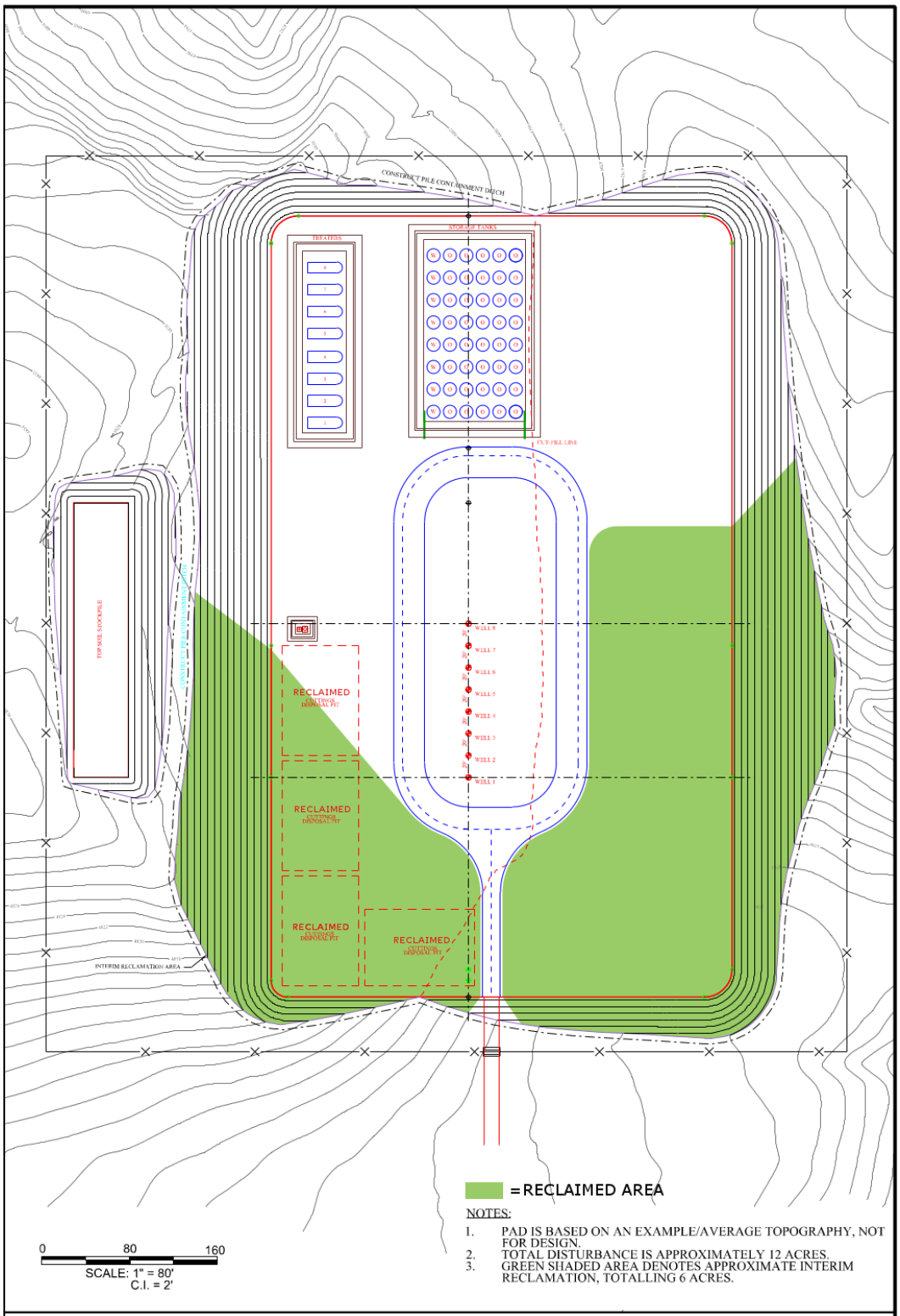
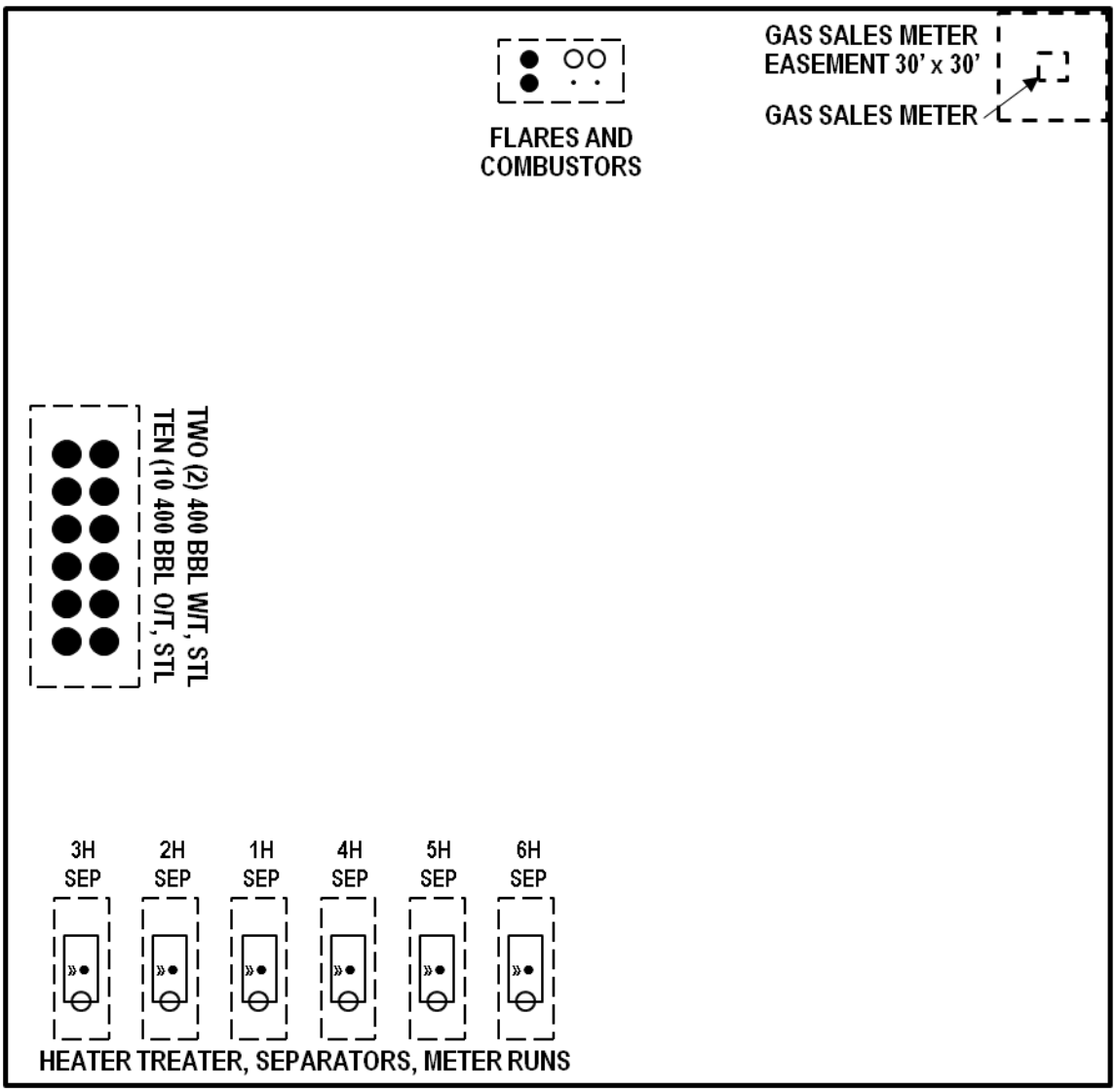


Figure 2-3. Example Production Pad Layout



BBL	*barrel*
W/T	*water tank*
O/T	*oil tank*
STL	*steel*

**Note: production pads would contain support facilities only; they would not include oil and gas wells.*

Well pad construction activities would be conducted in accordance with the guidelines and standards as set forth in the joint BLM/U.S. Forest Service (USFS) publication: Surface Operating Standards for Oil and Gas Exploration and Development Fourth Edition (BLM 2007). Well pads would be constructed to create a level surface for drilling and/or production equipment utilizing the native materials present at the site. Mineral materials from outside the project area would not be required. Locations would be leveled by balancing cut and fill areas. Site-specific reclamation and construction plans will be developed for individual locations based on on-the-ground conditions. Topsoil would be removed and separately stockpiled to ensure that this resource is protected until it can be reapplied during site reclamation. Based on experience in this area, the OG anticipates that an average six inches of topsoil would be available. If topsoil is stored for longer than 6 months, it would be stabilized and re-vegetated until needed. Topsoil would be stored in an area where it could be retrieved without causing additional disturbance and where it would not impede watershed and drainage flows.

DRILLING

Following road and well pad construction, drilling rigs would be transported to the well site and erected on the well pad. Each rig is expected to drill an average of 10 - 12 wells each year, and up to fifty drill rigs are anticipated to be operating in the project area. Horizontal wells would be drilled vertically from each surface location to a predetermined point above the target formation, referred to as the "kickoff point." From here, the wellbore would curve from its vertical trajectory to intersect the target reservoir at the "entry point," then continue horizontally through the reservoir until reaching the desired bottom hole location.

The quantity and composition of drilling fluids would be determined on a well-by-well basis. Drilling fluids typically consist of fresh water- and oil-based mud. Drilling mud would be specifically engineered and managed throughout the drilling operation to control the flow of fluids (water, oil, and gas) from the well bore. The use of oil- versus water- based mud would be formation-dependent. Oil-based muds would not be used in formations that contain water with total dissolved solids of 10,000 or less. In the project area, this generally means that oil-based mud would only be used below the Fox Hills formation. OG members will generally use closed or semi-closed loop systems. Cuttings will either be removed and hauled offsite to authorized disposal facilities or buried in cuttings pits on location. Cuttings from oil-based muds would not be placed in an onsite cuttings pit unless they are properly treated (fly ash or Soil-bond) and the solidification process is permitted through the WOGCC. Although not specifically proposed or anticipated, reserve pits could be constructed if and when appropriate based on site-specific conditions. It is not reasonably foreseeable at this time to predict when or under what conditions reserve pits would be necessary. As such, additional analysis may be required at the site-specific stage if reserve pits are constructed.

Prior to setting casing, open-hole well logs may be run to evaluate a well's production potential. If the evaluation concludes that sufficient oil and/or gas is present and recoverable, then steel production casing would be run and cemented in place in accordance with the well design, as specified in the approved APD and conditions of approval. The casing and cementing program would be designed to isolate and protect shallower formations encountered during drilling, prohibiting pressure communication or fluid migration between zones. Setting the surface casing to protect the base of fresh water would be accomplished using the drilling rig itself. The cement would protect the well by preventing formation pressure from damaging the casing and retarding corrosion by minimizing contact between the casing and formation fluids. Certain

cased-hole evaluation logs also may be run subsequent to setting and cementing production casing. At the kick off point, the well is directionally drilled with specialized tools to steer the well in a curve to the target formation. Frequently, once the wellbore is drilled into the target formation, the intermediate casing is run and cemented. Occasionally, the well is drilled through the formation to its total planned depth before casing is run and cemented. In this case, the casing string run would also be the production casing. After the intermediate casing is run and cemented, the lateral, or horizontal leg, of the wellbore is drilled in the formation until the total measured depth is reached. The production casing is run to the total measured depth and may or may not be cemented in the formation. The production casing may also have annular packers on it to compartmentalize the lateral section for completion. Another technique commonly used in conjunction with the production casing are frac sleeves in combination with the annular packers or cement.

After drilling operations are complete, but before completion equipment and personnel are moved to the location, all productive wells drilled on a particular location will usually be equipped for production. This will include the installation of production equipment and tanks described in more detail later in this section. Depending on the availability of personnel and equipment, there may be a delay between the termination of drilling activities, the installation of production equipment, and the commencement of completion operations.

COMPLETIONS

After the well is drilled, cased, and cemented, the drilling rig would be moved off location. The location would be redressed to accommodate the completion activities and facilities, which include cleaning out the well bore, pressure testing the casing, perforating and hydraulic fracturing in the horizontal portion of the well bore, and running production tubing to facilitate commercial production. A completion rig would then be moved onto the well pad.

Hydraulic fracturing would be performed at selected intervals in the target formation to increase the surface area available for mineral drainage and improve fluid movement from the rock into the well bore. These hydraulic fracturing operations would typically consist of pumping a thick fluid mixture (proppant), consisting of approximately 98 percent sand and water, into the down hole under pressure. Chemical additives would be added to the hydraulic fracturing fluids to improve performance. The fracturing fluid would be determined based on compatibility with the formation minerals and fluid composition, and recoverability.

Hydraulic fracturing processes and required disclosures would be conducted in accordance with all WOGCC, BLM, and other applicable rules. The WOGCC requires operators to disclose the types and amounts of hydraulic fracturing chemicals used prior to stimulation (WOGCC 2016). The OG would also disclose the contents of hydraulic fluid used in the proposed wells to the public through FracFocus, a website managed jointly by the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission (http://fracfocus.org). The website allows the public access to general information, water volumes, and chemical information for registered wells in a format consistent with material safety data sheets, including the Chemical Abstract Service number and the ingredient percentage in both the additive and hydraulic fracturing fluids. This registry provides a means for oil and gas operators to voluntarily provide key information to the public in a timely fashion.

The proppant mixture would enter the target formation through perforations in the production casing or openings in a temporarily installed casing string designed to facilitate the fracturing process. Pumping pressures would be monitored throughout the entire program and increased to the point at which fractures initiate in the target formation at the perforations into the formation. The proppant props the created fractures open after the pressure drops, which would facilitate the flow of reservoir fluids into the well bore and to the surface.

The OG would use both fresh water pits and tanks to store water for hydraulic fracturing. Fresh water pits would be permitted through the WOGCC and/or the State Engineer's Office (SEO). Pits on location or fresh water make-up ponds would only be used for fresh water; no water would be flowed back into the fresh water pits. In locations where shallow groundwater is identified, Poseidon tanks may be used. After completion operations are finished, additional equipment such as pumps may be installed. Upon completion of the hydraulic fracturing operation, temporary production equipment would be used to recover as much of the hydraulic fracturing fluids as practicable and to clean excess sand out of the lateral prior to bringing production equipment on location.

Most operators would have a cuttings pit onsite. Solidification and subsequent reclamation of the cuttings pits would be accomplished as soon as practicable following well completion (BLM 2011a and WOGCC 2014). Those operators who do not use cuttings pits would haul their waste to a permitted land farm or disposal facility. Cuttings from oil-based muds would not be placed in the cuttings pit unless properly treated (fly ash or Soil-bond) and permitted through the WOGCC. Flaring would be used during well production testing to determine the pressure, flow, and composition of the gas or oil from the well. Testing duration would depend on well performance but would typically only be conducted long enough for fluid rates to drop to a level production equipment could safely process. Flaring would also be used in emergency situations where equipment or piping is in danger of being over-pressured. In such instances, valves on the equipment would automatically release gas to flare stacks. All flaring would occur at a distance from the wellhead that protects equipment, structures, and personnel safety.

2.4.1.4 Production

Production facilities at each pad location typically include a well head and rod pump jack, heater-treater, recirculating pump, and a tank battery typically comprised of four to eight storage tanks. Sometimes, a gas lift system or electric submersible pump may be used instead of a rod pump jack. Any of these artificial lift methods used on non-flowing wells require power. The OG anticipates the use of 115 horsepower (hp) Ajax® gas engines, using the best available control technology (BACT) for stack emissions and noise control. These gas pump engines would be permitted and approved by Wyoming Department of Environmental Quality (WDEQ)/ Air Quality Department (AQD) under standard air permitting practices and the pumping unit engine emissions policy. Production facilities would typically be installed on the disturbed portion of each well pad. The OG would maintain and operate facilities to adhere to relevant executive orders and requirements for noise to protect greater sage-grouse and other resources.

Power used during well production would typically be supplied via electric power lines; on a temporary basis, this equipment may be powered by diesel or natural gas-powered generators. Diesel and natural gas generators would be phased out as electric lines are constructed; however, in some remote locations,

natural gas generators could remain onsite for the life of the well. The Proposed Action would consist of approximately 1,500 miles of above ground electric distribution lines required to bring power to the proposed wells and facilities. Above ground distribution lines would be installed adjacent to new and existing roads where feasible, and would require an initial disturbance width of 30 feet (5,454 acres of surface disturbance) and a post-interim disturbance width of 9 feet (1,636 acres of surface disturbance) to allow for access to the lines, which would ultimately have 3-foot diameter disturbance per pole at 15 poles per mile. Based on the experience of the OG in the area, it is anticipated that a trunk line would have 60-foot tall poles using vertical construction and cross-arm construction for the laterals. Overhead powerlines typically follow lease roads and/or pipeline ROW. When a line is placed cross-country, the third-party power provider would select a route that is accessible by truck. Additionally, the OG anticipates that power providers would follow guidance in the BLM Gold Book, which also refers to Suggested Practices for Raptor Protection on Power Lines (APLIC 2006) during design and installation of these lines.

All permanent above-ground production facilities installed on the producing federal well sites would be painted one of the standard environmental colors recommended by the Rocky Mountain Five-State Interagency Committee to be selected at the BLM's discretion and agreed upon with the surface landowner.

2.4.1.5 Routine Operations

During the course of production most wells will require a workover or other routine maintenance activities. Well maintenance activities may require the mobilization of a smaller workover rig to repair the well bore equipment (casing, tubing, rods, or pumps) or the wellhead. In some cases, a workover may involve development activities designed to improve or restore production from the target formation. Workovers may also involve reservoir evaluation and stimulation treatments. Workover operations are typically performed during daylight hours and are of short duration. Depending on the scope the work to be completed, workovers can take either a few days or several weeks. Additional surface disturbance is rarely necessary to conduct workover operations. Approval from the BLM Authorized Office will be requested should the need for new surface disturbance arise. The definition of routine operations varies by agency and by individual operator. To further define the meaning of routine operations for purposes of analysis for this project, the OG may provide supplemental information for BLM's consideration in the future.

2.4.1.6 Oil and Gas Pipelines and Midstream Facilities

Based on expected production rates, the OG anticipates that approximately 50 gas compression and processing facilities of approximately 16,000 horsepower, which are capable of handling approximately 100 wells each, would be constructed to facilitate the flow of gas from the proposed well through the pipelines. Compression and processing facilities would also have equipment to strip and recover liquids from the gas; this dehydration equipment would be co-located with the compression equipment and would generally not increase the facility footprint.

Produced gas from the proposed wells would be collected and transported through a new system of gas gathering pipelines designed to collect the natural gas produced from each individual well for transport to a main trunk line. The trunk line would transport the gas to tie-in points with a third-party tie-in/gas processing plant.

The OG assumes that oil and gas gathering pipelines would be installed adjacent to or in a common ROW with new or upgraded roads where feasible approximately half the time, and in new cross-country ROWs for the remainder. Pipelines in road ROWs would require 30 feet of additional initial disturbance. Where paralleling an access road is not feasible and a new cross-country pipeline is necessary, a new 75-foot ROW would be required. The Proposed Action would require approximately 750 miles of gas pipelines installed adjacent to existing roads, resulting in 2,727 acres of temporary disturbance. The installation of 750 miles of cross-country gas pipelines and 500 miles of main trunk pipelines would add another 6,818 acres and 4,545 acres of temporary disturbance, respectively. All surface disturbances resulting from pipeline installation would be subsequently reclaimed, resulting in no post-interim reclamation disturbance.

GAS PLANTS/CENTRALIZED PROCESSING FACILITIES

Gas from the field would go to an existing or new proposed processing facility for distribution. Centralized processing facilities could also house other facilities, including dehydration units, required to process oil and gas products for transport. Oil would be transported by truck or rail to an existing refinery for further processing and distribution. No new rail loadouts are included in the OG's proposed project.

2.4.1.7 Water Supply and Use

Drilling water would be obtained from approved, permitted surface water and groundwater sources in the vicinity, including approximately 50 new water supply wells in the project area. The specific water sources will be identified at the time of APD submittal.

The Proposed Action would result in the use of an average of 13 acre-feet of water per well during well drilling and completions. Actual water needs for drilling and completions may range from 6.5 to 16 ac-ft depending on the length of the lateral, but this would not change the overall estimated project water needs, as longer laterals would result in fewer wells within a given target area. Additionally, the project would require approximately 0.1 ac-ft of water per well for dust abatement for the duration of the project. Water for the proposed project would primarily be obtained from existing and proposed groundwater supply wells, with the remainder drawn from existing permitted surface water sources. On BLM surface, water wells would be plugged and abandoned per BLM regulations once they are no longer in use. On private surface, water wells would be managed according to the landowner's preference and in accordance with State regulations. Refer to the Water White Paper (2014) for more information on water volumes and sources. The specific source of this fresh water used in drilling operations for each well would be identified at the time of APD submittal.

The Proposed Action would include the use of temporary surface lines and trucked water, and would not include the use of buried water pipelines. Fresh water used for drilling and completion purposes would be transported from water supply locations to well pads by trucks. Some water would be delivered to fresh water make-up ponds and then transported to well pads via a surface line; fresh water make-up ponds would have a capacity of 20 acre-feet each, and would be off-channel and lined. These fresh water make-up ponds (or the pads on which they are located) would be fenced. Fresh water make-up ponds would also be designed to discourage their use by breeding mosquitos. Mosquito-deterring design features would include

lining the ponds and a lack of a "shoreline" (land-water transition area), both of which would reduce the likelihood of stagnant water conditions conducive to mosquito breeding.

Water would be used for hydrostatic testing of gas lines and main trunk lines. For smaller gas sale or flow lines between wells and production facilities, operators would typically test using ~20 to 40 bbls of water. Because of the low volume, water from these smaller lines would typically be recycled following hydrostatic testing. Hydrostatic testing from larger main trunk lines would require greater volumes of water, but would also generally be recycled by the installing midstream company. Where water is not recyclable, operators or midstream companies would apply for temporary discharge permits.

Some operators may construct central water processing/recycling facilities that would include lined pits for storing fresh water suitable for drilling and completions as well as lined pits for flowback water that would be treated, as needed, and recycled for use in drilling and completions. In some cases these central water processing/recycling facilities would be co-located with water source wells. These facilities would serve wells by trucking or via temporary surface line delivery of water to well pads.

2.4.1.8 Wastewater Management

Wastewater from the Converse County Project would include flowback water and produced water. Water disposal needs per well may range from 30 to 80 percent of completion water as flowback per well with an assumed average of 60 percent. For purposes of estimating maximum capacity needs, the OG estimates an average of 25 bbls/day per well (0.7 gpm) over the life of a well. Actual rates of produced water may range from 0 to 100 bbls/day from individual wells. Projected annual volume of wastewater would be approximately 9,750 acre-feet per year. Produced water volumes would decline as wells reach the end of their anticipated life and are plugged and abandoned. Refer to the Water White Paper (2014) for more information on wastewater volumes and disposal.

Flowback and produced water would be separated from the oil and gas and stored in tanks on or adjacent to the well pads. Both oil tanks and water tanks would typically have a 400 or 500-barrel capacities and would be placed inside of containment constructed completely around the production facilities. The containment would consist of impervious compacted subsoil or lined structures and would hold a minimum of 110 percent of the capacity of the largest tank. Some of the collected flowback and produced water would be transported to disposal facilities authorized for Resource Conservation and Recovery Act (RCRA) exempt waste within the project area. In addition to the existing disposal wells in the project area, and the OG has proposed another 30 disposal wells to managed wastewater produced by the project. The OG would also consider disposal at 3rd-party evaporation ponds in or near the Project Area but does not propose the development of such facilities to support the disposal of wastewater for this project. Measurement of all produced fluids would be made per Onshore Order Nos. 4 and 5 and State of Wyoming rules, and would be reported to the State of Wyoming and the Federal government in compliance with reporting requirements.

If and when it proves technologically and economically feasible, the OG would consider recycling and re-use of flowback and produced water in the project area. Potential recycling options could include the use of produced water from existing oil and gas wells or the new wells included in the Proposed Action as a completion water source for use during hydraulic fracturing. Such use could reduce the need to transport

water to disposal well or evaporation ponds. If conditions allow, the operators may also recycle water remaining in the freshwater mud system for use during drilling of additional wells on a pad. The extended timeframe associated with the project makes it difficult to commit to a particular amount of or specific method/technique for water recycling. Over time, technology used in all aspects of oil and gas development has improved substantially, increasing the likelihood some water recycling in the project area may be feasible in the future. However, where and how much water might be recycled is speculative and would need to consider site-specific issues that are not known at this time.

2.4.1.9 Reclamation

INTERIM RECLAMATION

Sufficient topsoil to facilitate revegetation would be segregated from the subsoil during construction and stockpiled for future reclamation of the disturbed areas. Topsoil stockpiles would be graded to a "rounded" appearance with slopes no steeper than 3:1 and would be maintained in a weed-free condition through treatment and use of sterile and/or desired native cover crops for soil that is stockpiled for more than 6 months. The salvaged topsoil would be evenly distributed over those disturbed surfaces subject to reclamation upon termination of drilling and completion operations. All disturbed surfaces would be reclaimed as soon and as near as practicable to their original condition.

Portions of well pads not needed for production would be reclaimed primarily through backfilling the cuttings pits, leveling, and recontouring of "nonworking" disturbed areas, redistribution of stockpiled topsoil over these disturbed areas, installation of erosion control measures, and reseeding as recommended by the BLM and/or private surface owner.

Erosion control measures would be implemented as soon as practical to do so and could include surface roughening, wattles, silt fence, crest & toe of slopes, berms, & check dams. Rat and mouse holes would be filled and compacted from bottom to top immediately upon release of the drilling rig from the location or in accordance with guidelines established by the BLM.

Seeding would occur in the next appropriate seeding season following the completion of surface disturbing activities, generally within 180 days of the last well being completed on the pad. In the fall, seeding would take place after September 15th and prior to ground frost, and in the spring after the frost has left the ground and prior to June 1st. Seed mixes will be prescribed either by the surface owner or the BLM.

Following road construction, stockpiled topsoil would be evenly redistributed over the road embankment and borrow ditch slopes. These areas would be stabilized and reclaimed with the approved seed mix as soon as practicable in the next appropriate seeding season, as discussed above. Pipeline ROW disturbance areas would be completely reseeded as soon as practicable in the next appropriate seeding season in accordance with the seeding recommendations obtained from either the private surface owner or the BLM, as appropriate. Prior to re-seeding, the OG will assess soil compaction using on onsite visual inspections. Compacted areas would be scarified by ripping or chiseling to loosen compacted soils where underlying material would not significantly degrade topsoil, with a goal of improving seed establishment. Any required

monitoring for reclamation success would be conducted by a qualified operator representative (in coordination with the BLM).

The OG submitted a programmatic Reclamation Plan that provides anticipated reclamation techniques, strategies, and monitoring efforts to be implemented. Reclamation Plan was prepared in compliance with a variety of statutes, regulations, and guidelines; however, because site characteristics will vary in the field, individual operators will develop separate site-specific reclamation plans to support federal APDs submitted under the auspices of the Converse County Project. Additionally, on private surface within the project area, operators will be required to comply with the terms, conditions, and reclamation requirements set forth in private surface use agreements. On State of Wyoming lands, reclamation requirements will be dictated by the Office of State Lands and Investments and, if applicable, the desires of lessees of State of Wyoming Lands.

FINAL RECLAMATION

At the time of final abandonment, all surface equipment, including surface gathering pipelines, would be removed from the site. Site and access road locations would be cleared of all production equipment, gravel, surfacing materials, and any other material/equipment that had been imported (including culverts, cattle guards, and fence materials). Drainage basins would be contoured to maintain the profile and dimensions approximate to the natural or otherwise pre-existing conditions of the location. Appropriate erosion control measures would be taken to prevent run-off into drainages in proximity to disturbed areas, and no depressions would be left to trap water. With the exception of roads or other facilities retained for future use, all remaining disturbances would be reclaimed according the same procedures for interim reclamation. Any follow-up surveys and weed treatments would be conducted by a qualified operator representative.

At final abandonment of wells, the casing would be cut off at the base of the cellar or three feet below the final restored ground level, whichever is deeper. The casing would be capped with a metal plate at least 0.25-inches thick welded in place, and the well location and identity would be permanently inscribed on the cap. The cap would be constructed with a weep hole.

Additional information on interim and final reclamation is available in the project reclamation plan.

2.4.1.10 Source of Construction Materials

Surfacing and base course materials would be obtained from existing, operational gravel pits located on commercial sources in the project area. Details of gravel suppliers would be identified at the time of APD submittal. It is anticipated that these materials would come from within and from sources located within 100 miles of the project area.

2.4.1.11 Hazardous Materials and Waste Management

A variety of chemicals, including lubricants, paints, and additives are used to drill, complete, and operate a well. Some of these substances may contain constituents that are hazardous. Commonly used hazardous materials include greases or lubricants, gasoline, diesel, methanol, solvents, acids, paint, and herbicides. Hazardous materials would not be stored at well locations, although they may be kept in limited quantities

on drilling sites and at production facilities for short periods of time. The OG uses limited quantities of methanol on most, if not all, sites in Wyoming as antifreeze. Methanol would be properly stored with appropriate secondary containment. The typical tank size is about 330 gallons, and thus the quantities stored typically do not trigger Tier II reporting. If the OG must store larger quantities methanol that would trigger Tier II reporting, all applicable rules and regulations would be observed. Anticipated storage volumes for natural gas liquids (NGLs) and are unknown at this time.

Activities associated with the transportation of these materials, including packing, container handling, labeling, vehicle placarding, and other safety aspects, are regulated by the US Department of Transportation under 49 Code of Federal Regulations (CFR), Parts 171–180. None of the chemicals that would be used during drilling, completion, or production operations meet the criteria to be considered acutely hazardous materials/substances or meet the quantities criteria per the BLM Washington Office Instructional Memoranda 93-344. The OG would comply with the Superfund Amendments and Reauthorization Act (SARA) Title III reporting requirements for materials used in quantities greater than 10,000 pounds during drilling and completion operations. For example, cement used to isolate the steel casing from the surrounding wellbore is a reportable SARA Title III material. In addition, extremely hazardous substances, as defined in 40 CFR Part 355, would not be used, produced, stored, transported, or disposed of while drilling or completing a well. Most wastes that would be generated at project facilities are excluded from regulation as hazardous wastes under RCRA under the exploration and production exemption in Subtitle C (40 CFR 261.4[b][5]) and Subpart D. These project wastes are generally considered to be solid wastes. These are commonly referred to as E&P (exploration and production) wastes, or E&P-exempt wastes. The management of E & P wastes is regulated by WOGCC. Exempt wastes include produced water, production fluids such as drilling mud or well stimulation flowback, and contaminated soils. The OG would comply with all regulatory requirements associated with the storage, transportation, and disposal of hazardous waste.

In the event they are constructed, the concentration of nonexempt hazardous substances in the reserve pit at the time of backfilling would not exceed the standards set forth in CERCLA as amended by the SARA. All oil and gas drilling-related CERCLA hazardous substances removed from a location and not reused at another drilling location would be disposed of in accordance with applicable federal and state regulations. Only those hazardous wastes that qualify as exempt under RCRA may be disposed of in the reserve pit, if such pits are constructed.

Any release of oil, gas, salt water, or other such fluids would be immediately cleaned up and transported to an approved disposal site. Spills would be reported to the AO and other appropriate authorities. The OG would develop and maintain site-specific Spill Prevention Control and Countermeasures Plans for each facility in the project area subject to US Environmental Protection Agency's (EPA's) oil spill prevention program under 40 CFR Part 112. To satisfy Spill Prevention Control and Countermeasures Plan requirements, if storage facilities or tanks are constructed, they would be constructed in accordance with applicable regulations. A facility would be subject to 40 CFR Part 112 if it had an aggregate aboveground oil storage capacity greater than 1,320 U.S. gallons or a completely buried storage capacity greater than 42,000 U.S. gallons, and if there were a reasonable expectation of an oil discharge into or upon navigable waters of the U.S. or adjoining shorelines. Oil of any type and in any form would be covered, including but not limited to petroleum, fuel oil, sludge, oil refuse, and other oils of plant and animal origin. A facility that meets the

criteria would comply with the Spill Prevention Control and Countermeasures Plan rule by preventing oil spills and developing and implementing a Spill Prevention Control and Countermeasures (SPCC) Plan. For spill prevention, actions that a facility owner/operator can take to prevent oil spills include the following:

- Using containers suitable for the oil stored.
- Providing overfill prevention for oil storage containers.
- Providing sized secondary containment for bulk storage containers. The containment needs to hold the full capacity of the container plus possible rainfall.
- Providing general secondary containment to catch the most likely oil spill when transferring oil to and from containers and for mobile refuelers and tanker trucks.
- Periodically inspecting and testing pipes and containers. Inspections must be documented.

The owner or operator of the facility must develop and implement an SPCC Plan that describes oil handling operations; spill prevention practices; discharge or drainage controls; and the personnel, equipment, and resources at the facility that are used to prevent oil spills from reaching navigable waters or adjoining shorelines. Although each SPCC Plan is unique to the facility, there are certain elements that must be described in every plan, including:

- Define the operating procedures at the facility to prevent oil spills.
- Identify and describe control measures (such as secondary containment) installed to prevent oil spills from entering navigable waters or adjoining shorelines.
- List countermeasures to contain, cleanup, and mitigate the effects of an oil spill that has impacted navigable waters or adjoining shorelines.

Operators would maintain a file, per 29 CFR 1910.1200 (g) containing current Material Safety Data Sheets (MSDS) for all chemicals, compounds, and/or substances used during the project. Hazardous materials found on-site may include diesel, gasoline, and engine oil as well as frac fluids, drilling mud, and cementing products which are primarily inhalation hazards, fuels (flammable and/or combustible), materials that may be necessary for well completion/stimulation activities such as flammable or combustible substances and acids/gels (corrosives). Trash containers and portable toilets would be located on construction sites. Garbage, trash, and other waste materials would be collected in portable, self-contained, fully enclosed trash cages during construction, drilling, and completion operations and disposed of at an approved landfill. Trash would not be burned on location. Motor oil would be placed in closed containers and disposed of at an approved disposal facility. In the event small quantities of hazardous wastes are generated at any sites (e.g., from equipment maintenance), they would be properly stored and disposed of at an off-site approved disposal facility.

Construction locations and well sites would be cleaned of other debris and waste materials and removed from the location after drilling and completion operations.

To support this POD, the OG submitted several example plans to the BLM related to this resource, including an example SPCC, an example Hazardous Materials Management Summary, and an example Emergency Response Plan (ERP). Any of these site-specific plans submitted by individual operators would comply with applicable rules and regulations using each company's specific format and content requirements.

2.4.1.12 Public Health and Safety

The OG is always very concerned with public safety and will comply with OSHA and all regulatory requirements associated with the storage, transportation, and disposal of hazardous waste. Additional information is contained in the Operator Committed Measures document and will be supplied via operator-specific Health and Safety Plans. As indicated above, the OG submitted an example ERP, which describes example emergency response information and procedures.

2.4.2 Project Workforce and Transportation

This section provides estimates for the anticipated workforce and vehicle trips associated with the Proposed Action. The information presented in this section is based on available current information that is subject to revision based on changing conditions.

2.4.2.1 Project Workforce

Table 2-4 shows an estimate of timing/phasing of development activities, duration of activities, and approximate numbers of employees anticipated for a typical well in the project area.

Table 2-4. Employment Estimates

ACTIVITY	WORKERS PER CREW[1]	TYPICAL ACTIVITY DURATION (DAYS)[1, 2]
Location staking / surveying / permitting	4	3
Location construction	6	19
Rig mobilization / de-mobilization	16	5 (each)
Drilling	26	29
Completion	15	10
Tank battery and other wellhead/ production equipment setup	18	40
Interim reclamation	2	1
Gathering System (per mile)	11	8
Electrical system (per mile)	8	21
Production Pad (per pad)	18	13
Water source well Pad	10	1

Table 2-4. Employment Estimates

ACTIVITY	WORKERS PER CREW[1]	TYPICAL ACTIVITY DURATION (DAYS)[1, 2]
Well Pad Access Road (per mile)	5	4
Primary Collector Road (per mile)	5	9
Gas Plant (each)	225	160
Oil/Condensate Storage Site (per site)	18	5
Centralized Processing Facilities (each)	14	8
Produced Water Injection Well / Disposal Site	7	1
Compression facilities (each)	30	8
Equipment / pipe storage yard	10	80
Electrical substation (each)	10	5
Workforce facility (each)	8	16
Fresh water make-up ponds (each)	8	13
Water processing /recycling facility (each)	5	90

Source: CCOG Investment Employment March 5, 2015 (based on internal OG data)

[1]*Numbers rounded.*

[2]*Numbers provided are based on single well pads; additional information on multi-well pads is available in the source spreadsheet supplied to the BLM in March 2015.*

2.4.2.2 Workforce Facilities

One new 10-acre workforce facility containing offices would be constructed to support the proposed development. Based on local housing availability and other factors, the OG may also consider including a man camp to house rig crews at the workforce facility site. No initial reclamation would be possible while the facility is in use, so surface disturbances would be long-term.

2.4.2.3 Project Transportation

The number of vehicle trips per day for project wells would vary by phase. The OG submitted a project-specific Transportation Plan, which describes and identifies existing roads and primary routes most likely to

be used for the Converse County Project. The Transportation Plan provides estimates of vehicle trips and vehicle use associated with the proposed project on primary routes in the transportation network during drilling, completions, and production under the proposed project. Project Year 10 (2028) is anticipated to result in peak traffic volumes. The plan also includes applicable guidelines and standards that could be implemented by OG members during project development.

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