2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION

The BLM, as directed by the NEPA, must ―study, develop, and describe appropriate alternatives to the recommended course of action in any proposal that involves unresolved conflicts concerning alternative uses of available resources…" (NEPA Section 102[2][e]). Developing a range of alternatives allows for exploration of options designed to meet the purpose and need for the action.

Along with No Action Alternative, BLM is considering the Proposed Action and three other action alternatives relative to the Project. These alternatives were developed in response to key issues identified during public and agency scoping (see Table 1-2). Alternatives are described in this chapter, along with other projects and activities in the vicinity of the Proposed Action that may result in incremental and cumulative effects on resources in the RBPA. Other possible alternatives were considered in the course of development of the EA. These are also included in this chapter, but have been dismissed from further consideration.

According to the CEQ, NEPA 40 Most Asked Questions, Section 1502.14 requires the EA to examine all reasonable alternatives to the proposal. In determining the scope of alternatives to be considered, the emphasis is on what is "reasonable" rather than on whether the applicant likes or is itself capable of carrying out a particular alternative (40 CFR Parts 1500–1508). The CEQ goes on to conclude that, ―An alternative that is outside the legal jurisdiction of the lead agency must still be analyzed in the EIS if it is reasonable." As a result of this guidance, the alternatives developed in this EA compare and contrast the effects of adding, eliminating, or modifying Project components regardless of their jurisdiction, in order to evaluate options that exist to reduce or minimize Project impacts while still meeting the purpose and need.

The effects of BLM actions and non-federal actions must still be evaluated and disclosed for all reasonable alternatives, along with the impacts of all ―reasonable and foreseeable" cumulative actions, regardless of BLM jurisdiction over the actions. Based on the BLM NEPA Handbook H-1790-1 Sections 6.5.2.1 and 6.6.3, a FONSI can be reached where the federal components of a project would not result in significant impact in and of themselves, even if project components outside the federal agency‘s jurisdiction may exceed the significance threshold.

2.2 NO ACTION ALTERNATIVE

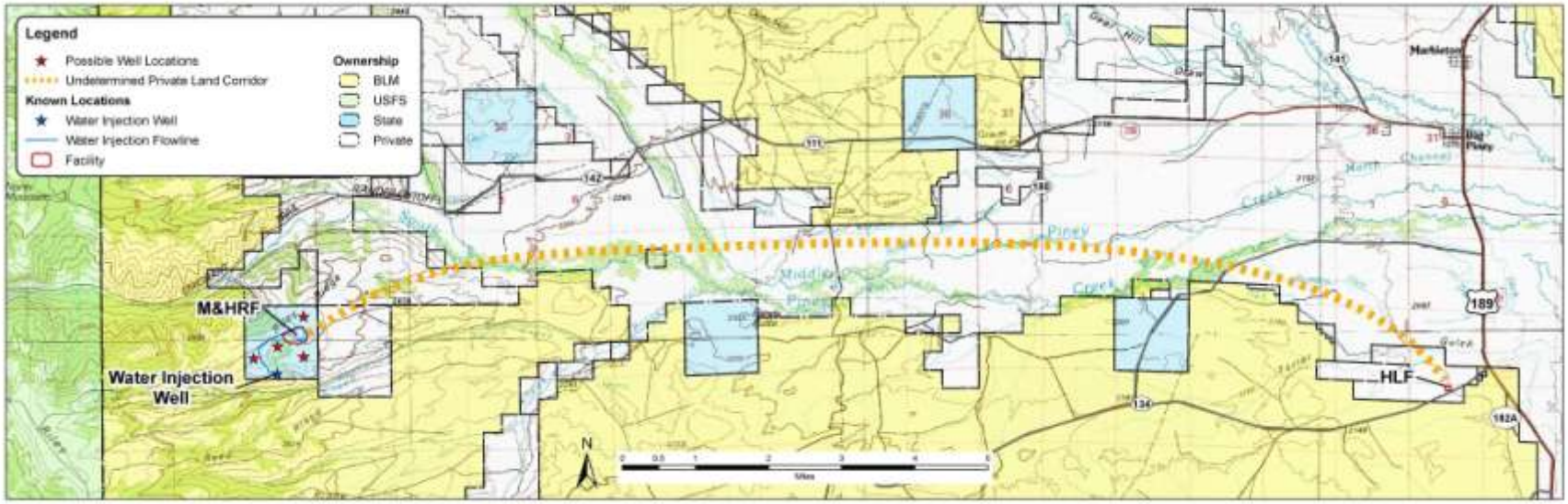
Under the No Action alternative, the BLM would not meet the purpose and need of providing federal access for ROW or new federal gas leases. The No Action Alternative would preclude all pending Federal Actions (e.g., the proposed APDs, the natural gas pipeline, helium pipeline, the fiber-optic line, the H_2S/CO_2 injection well, and the 69-kV and 230-kV power lines) proposed in Alternatives 1 through 4 from being approved and constructed on BLM-administered lands. Under the No Action Alternative, use of the existing BLM access roads would continue to provide access to current Riley Ridge Unit operations including the construction and operation of the M&HRF, based on specific conditions of the existing ROW grant WYW-116838. Without additional federal action the existing access road could not be

expanded or improved and flowlines or transport pipelines could not be developed connecting existing federal wells on the Riley Ridge Unit to the M&HRF, other private gas processing facilities, or market gas pipelines.

Without federal action to approve the Rands Butte EA, Cimarex could determine that the Project was no longer economically viable and shut down the Project. In this case, the test well at RRU 20-14 would be plugged and abandoned, and the Wyoming Special Use Lease would be terminated after meeting reclamation requirements to the satisfaction of the BLM and State of Wyoming. If Cimarex were to abandon the Project there would be no additional impacts beyond the short-term effects of the current disturbance and restoration.

More likely, however, Cimarex would proceed with several private and state actions in order to meet their objective of testing new technology for safe and efficient processing of Madison Formation gas using private and state leases. Construction of the M&HRF began in 2009, and the HLF and produced water disposal well have various applications pending and are likely to be constructed and operated privately under No Action. Several other Project components are assumed to be feasible using private and state grants and easements, such as the development of private and state gas wells, acid gas injection well, the construction staging/equipment yard, and the Cimarex 230-kV transmission line, as well as the helium and natural gas pipelines and fiber optic line, as shown in Figure 2-1. Since it can reasonably be assumed that these components on state and private lands could still occur without any federal authorizations, the environmental consequences of No Action should be taken into account, even though the BLM would have no authority to modify or change the effects.

Map 2-1 provides known locations for facilities likely to be constructed under the No Action Alternative, and Table 2-1 provides a list of potential private and state actions and the assumptions for surface disturbance under No Action Alternative. For purposes of evaluating the environmental consequences of No Action, this EA assumes that the listed facilities would be constructed and operated by Cimarex and its partners as part of an entirely private Project under the No Action Alternative. Based on these assumptions, the No Action Alternative would result in total temporary disturbance to more than 860 acres, with more than 104 acres of long-term disturbance from the private and state actions described in the following sections.



Map 2-1. No Action Alternative infrastructure detail.

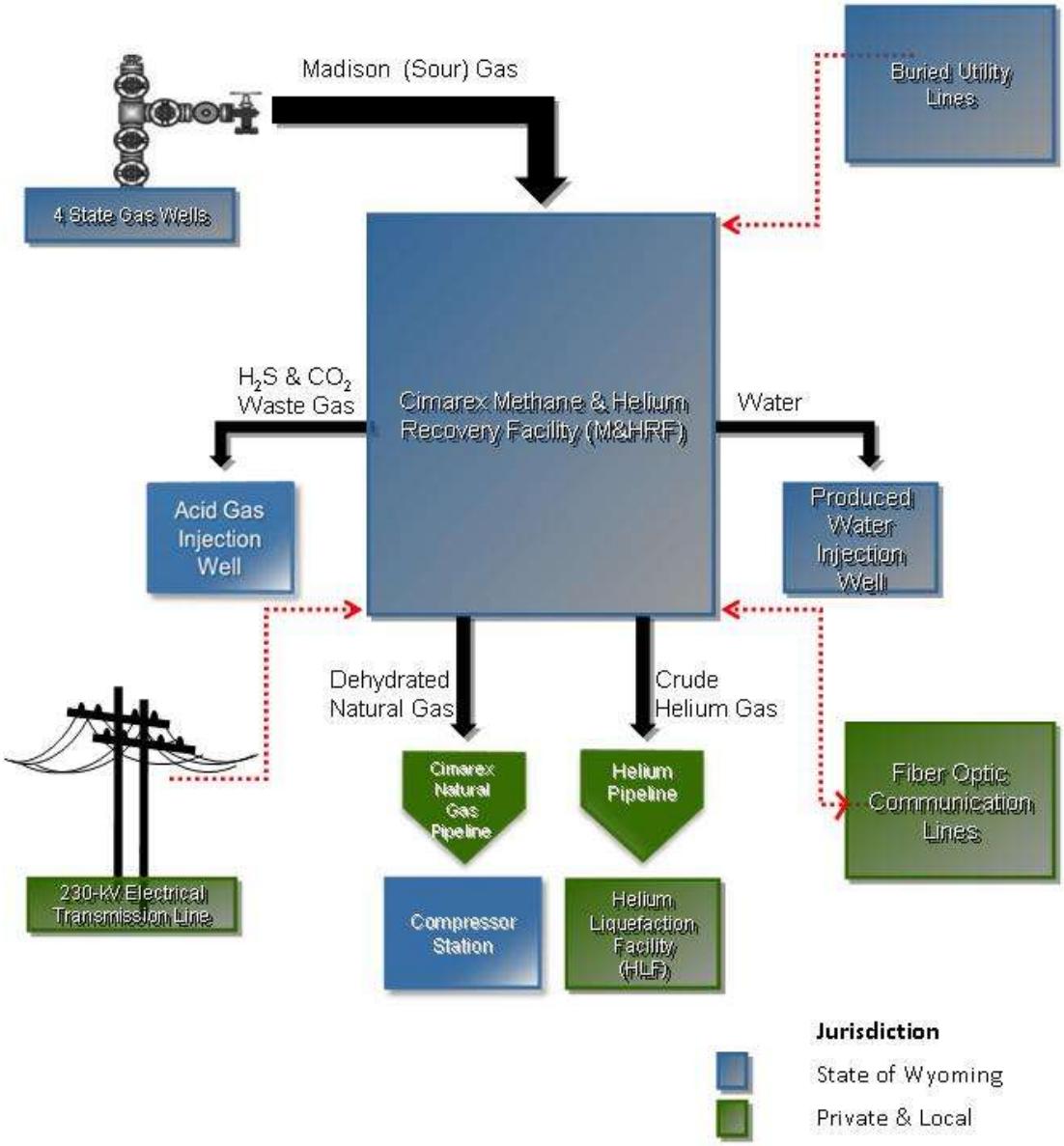


Figure 2-1. Major Project components and jurisdictions of No Action Alternative.

Table 2-1. No Action Project Components and Disturbance Calculations (Assumed).

Project Component	Description	Assumed Ownership or Authority	Known Location?	Disturbance Calculation Assumptions	# of Structure Sites or Length of Feature(s)	Estimated Short-term Surface Disturbance (acres)	Estimated Long-term Surface Disturbance (acres)
Natural gas well(s)	Minimum of 2 and maximum of 4 new Madison production wells	Private or state mineral and surface use lease(s)	No	5 acres each; less if directionally drilled from multi-well pad	1–4 sites	15–20	5–12
Acid gas injection well	Single Class II gas injection well	Private or state mineral and surface use lease	No	5 acres	1 site	5	3
Raw gas and acid gas flowlines	From M&HRF to well pads	Private or state mineral and surface use lease	No	5 facilities with 50-foot ROW width each. Some overlap with other flowlines.	5 facilities, length assumed <1.0 mile each	Unknown	Unknown
Cimarex natural gas pipeline	Blading and trenching of pipeline, followed by recontouring and reclamation (partially overlapping ROW with helium pipeline and fiber optic cable).	Private and state easements	No	100-foot initial disturbance width (adjacent 50-foot temporary use corridor)	Assumed 8.6 miles (approximate distance to Williams market gas pipeline via private ROW)	Approximately 95	Unknown since private reclamation standards may vary

Project Component	Description	Assumed Ownership or Authority	Known Location?	Disturbance Calculation Assumptions	# of Structure Sites or Length of Feature(s)	Estimated Short-term Surface Disturbance (acres)	Estimated Long-term Surface Disturbance (acres)
Compressor station	Blading and construction of foundations and building located within existing market gas ROW	Private easement	No	5-acre site	1 site; 5-acre easement	5	5
Helium pipeline	Blading and trenching, followed by recontouring and reclamation. Partially overlapping ROW with gas pipeline for approximately 8.0 miles.	Private/state	No	100-foot construction corridor for 8.6 miles; 50-foot construction corridor for 12.4 miles	8.6 miles × 100 feet + 12.4 miles × 50 feet (21 miles total)	241	Unknown since private reclamation standards may vary
Underground fiber optic cable	Plowed in or in shared trench with helium pipeline	Private/state	No	Overlapping ROW. No additional disturbance.	NA	0	0
Electrical distribution lines	Above ground or underground electrical distribution from M&HRF and wells	State	No	Uncertain ROW width and length	Unknown	Unknown	Unknown

Project Component	Description	Assumed Ownership or Authority	Known Location?	Disturbance Calculation Assumptions	# of Structure Sites or Length of Feature(s)	Estimated Short-term Surface Disturbance (acres)	Estimated Long-term Surface Disturbance (acres)
Cimarex 230-kV transmission line	Wooden and steel monopole high voltage overhead transmission line from M&HRF to Chimney Butte Substation via private and state easements	Private ROW grants of approximately 150-foot width	No	Estimated: 63 H-frame structures (126 wooden poles); 15 steel monopole structures; 9 pulling and tensioning pads; 3 dead-end structure (9 poles)	21.7 miles	394	Unknown since private reclamation standards may vary
Access roads	Maintain and use existing BLM access road and temporary and long-term use of new private access roads, as needed.	BLM access road permit (WYW-116838) and new private easements	No	Estimate based on Alternative 2	21.7 miles	26.3	26.3
Air Products 69-kV transmission line	Wooden and steel monopole 69-kV overhead transmission line from tie-in on existing 69-kV line	Private ownership	No	Approximately 6 steel monopoles; 2 pulling and tensioning pads; 2 dead-end structure (3 poles)	0.5 mile	30	<0.1
M&HRF	Complete conversion of land to industrial site.	Wyoming Special Use Lease	Yes	34	1	26	10

Project Component	Description	Assumed Ownership or Authority	Known Location?	Disturbance Calculation Assumptions	# of Structure Sites or Length of Feature(s)	Estimated Short-term Surface Disturbance (acres)	Estimated Long-term Surface Disturbance (acres)
Produced water injection well	Blading, pit and berm development, construction disturbance followed by approximately 40% reclamation.	State Class III Lease	Yes	5 acres	1	5	3
Produced water pipeline (with fiber optic and electrical)	Blading, trenching, followed by 100% recontouring and reclamation of flowline.	State Easement	Yes	40-foot initial disturbance width	0.43 mile	2	0
HLF	Complete conversion to industrial site.	Private ownership	Yes	10 acres	1	10	10
Construction staging/equipment yard	Blading with packed gravel cover. No reclamation is planned.	unknown	No	10 acres	1	10	10
Estimated Total Private/State Surface Disturbance (Acres)						**860+**	**104+**

ROW = right-of-way
M&HRF = methane and helium recovery facility
HLF = helium liquefaction facility

The location, surface disturbance, and relative environmental impacts of the M&HRF, HLF, and the water injection well are known from various applications, documents, and agreements made available by Cimarex. These Project components would remain the same for the No Action Alternative and all other alternatives under consideration. Assumptions for potential No Action surface disturbance have been made for other necessary private and state facilities based on current permit applications and facility descriptions and similar project requirements, as shown in Table 2-1. The production wells and the acid gas injection well are assumed to be located on state land near the M&HRF because of the availability of state mineral lease on state lands. However, the exact location and number or disturbance size of No Action wells and other facilities cannot be determined since individual landowner agreements would specify location, construction methods, and final ROW widths, and other requirements for construction management and reclamation.

2.2.1.1 Natural Gas Wells

The processing capacity of the M&HRF would be able to handle as few as two and as many as four Madison Formation gas production wells for the Project. If approved by WOGCC, these new large-bore wells would be drilled and completed on state land near the M&HRF. The exact location, depth, drilling technology, rates, and reclamation plan cannot be determined for the No Action Alternative, and would depend on state permit conditions. The four sour gas production wells would be the full anticipated extent of production drilling and/or re-completion proposed under No Action.

It is estimated that drilling of four new gas wells could result in approximately 5 acres of initial disturbance per well, or less if a multi-well pad is used. Approximately 40% of the initially disturbed area could be recontoured and reseeded as part of an interim reclamation plan, resulting in 12 to 20 acres of long-term disturbance at the well pads with No Action.

2.2.1.2 Raw Gas Flowlines

The No Action Alternative would require construction of a flowline for each of the four producing sour gas wells to the M&HRF. Based on Cimarex technical information, the flowlines would be between 6.625 and 10.750 inches in diameter and would be constructed of non-corrosive carbon steel (API-5L) pipe with Inconel 825 liners. The flowlines would be buried in trenches a minimum of 4 feet deep and designed to operate at 2,250 pound-force per square inch (psig) and 280 degrees Fahrenheit (°F). Due to the corrosive nature of the Madison Formation gas mixture, corrosion–resistant materials would be used. Typical service circuits would be buried along with the production flow lines in corridors established along the side of existing access roads from the wells to the new M&HRF. The flowline ROW would also include instrumentation, control, and medium-voltage electrical service circuits between the plant site and the wells. The underground electrical distribution and fiber optic lines would allow continuous remote monitoring and emergency shut-off of the wells.

Construction of the flowlines with No Action would probably include overlapping ROW with other raw gas pipelines and utilities. All of the initially disturbed area would be recontoured and reseeded as part of an interim reclamation plan, resulting in no long-term disturbance from the flowlines.

2.2.1.3 Acid Gas (H_2S/CO_2) Injection Well

If approved by the WOGCC, an acid gas injection well would be drilled and completed on state land under No Action. The purpose of the well would be to inject 100% of the H_2S and CO_2 removed from the raw gas at the M&HRF back to the Madison Formation. The acid gas injection well would be operated according to all specifications of the WOGCC. The gas would be injected at pressures of approximately 2,250 pounds per square inch (psi) at the wellhead, with continual monitoring and emergency shutdown capability. All wellhead components would be of non-corrosive material. Highly sensitive ambient air H_2S monitors would be placed at several locations nearby, providing electronic signals for emergency shut-down, as well as audible signals to alert any nearby workers. Internal leak detection would also provide electronic signals to engage the emergency shut-down process.

2.2.1.4 Acid Gas Flowline

A pipeline would be required under No Action to carry compressed H_2S/CO_2 gasses from the M&HRF to the acid gas injection well. The acid gas flowline would be constructed of a 6.625-inch-diameter corrosion-resistant material and buried a minimum of 4 feet deep. The pipeline would be designed to operate under pressure of 2,250 psig at 100°F.

2.2.1.5 Cimarex Natural Gas Pipeline

The No Action Alternative would include a new private natural gas pipeline to transport processed natural gas from the M&HRF to a delivery point generally east of the plant, such as the Williams Natural Gas Company sales pipeline, approximately 7 miles west of Big Piney. The length of the natural gas pipeline cannot be determined for the No Action Alternative, but would be at least 8 miles.

The Cimarex natural gas pipeline would not carry toxic substances and would only transport dry processed natural gas. The pipeline would be buried at a minimum depth of 3 feet and a maximum of 8 feet to top of pipe. The permanent width of the natural gas pipeline private ROW is assumed to be 50 feet, with a 50-foot adjacent private ROW for temporary access and staging.

For purposes of consistency in analysis of the No Action Alternative, the natural gas pipeline is assumed to operate at 1,000 to 1,200 psig with a pipeline design pressure of 1,480 psig at 100°F. The operating temperature of the natural gas sales pipeline would average 60°F. The natural gas pipeline would be constructed of 8-inch-diameter carbon steel between the M&HRF and the junction facility, located in Township (T) 29 North (N), Range (R) 113 West (W) near Rands Butte. From the junction tie-in to the tie-in at the Hare‘s Ear Compressor, the gas pipeline would increase in diameter to 12 inches. This would allow the pipeline to be used for expanded future dehydrated gas, if authorized, without additional ROW disturbance.

It is also assumed that pipeline construction would use adjacent or overlapping ROWs wherever possible. Bulldozers and/or road graders would first clear vegetation and topsoil. Trenching would be used to bury the gas pipeline, except as landowners request boring or other methods of stream crossing. The helium and natural gas pipelines would be constructed at the same time with the same crews. Pipeline construction is expected to take 36 weeks, require 150 to 200 heavy truckloads, and use a work crew of 75 to 100 people.

Surface disturbance of pipeline construction cannot be determined for the No Action Alternative since location, length, and construction methods would be determined by landowner preference.

2.2.1.6 Compression Station

A 5-acre compression station would be required to boost compression of the natural gas stream prior to tie-in to the William‘s pipeline. It is assumed that the compression station would be located within existing private William‘s pipeline ROW.

2.2.1.7 Helium Pipeline

The No Action Alternative would include a crude helium (helium mixed with nitrogen) dry gas pipeline, constructed of carbon steel pipe, is proposed to transport crude helium from the M&HRF to the HLF. The pipeline would be 6-inch-diameter from the M&HRF to the junction facility, located on state land, at which point it would increase to 8-inch-diameter to accommodate future helium in-flows, should it be requested. As with the natural gas pipeline, the junction facilities would be designed to allow for inspections, future upgrades, or additional tie-in connections while minimizing future ground-disturbing activities.

The helium pipeline would operate at 500 to 700 psig with a pipeline design pressure of 1,480 psig at 100°F. The operating temperature of the helium pipeline would average 60°F. The crude helium pipeline would not carry toxic or flammable substances and would only transport a crude helium and nitrogen gas mixture. The crude helium pipeline would be buried at a minimum depth of 3 feet.

The length and surface disturbance associated with the helium pipeline in the No Action Alternative cannot be determined since the location and length would depend on landowner preference. A private ROW width of 50 feet is assumed, with an adjacent 50-foot private ROW for temporary access and staging.

Trenching would be used to bury the helium pipeline, except at specific stream and wetland crossings per the request of the landowner. The helium pipeline ROW would be overlapped with fiber optic cable ROW for the entire length.

2.2.1.8 Underground Fiber Optic Cable

Fiber optic cable would also be installed under No Action for communication and data transfer between the M&HRF and the Cimarex Project office in Big Piney. This fiber optic transmission system would provide continuous data transmission off site and monitoring of production and safety parameters and emergency shutdown. A permanent ROW would overlap with private ROW for buried electrical distribution lines, raw gas pipelines, and the helium pipeline wherever possible.

2.2.1.9 Underground Electrical Distribution

Underground electrical distribution lines of 5-kV or less would be installed from the M&HRF substation to provide electricity to wellheads for operation, monitoring, and emergency shut-down.

2.2.1.10 Cimarex 230-kV Electrical Transmission Line

Under the No Action Alternative, a single-circuit 230-kV three-phase power line would be constructed on state, and private land from the high-voltage substation within the M&HRF to the Chimney Butte Substation south of Calpet Road (Sublette County Road [CR] 134), near U.S. 189. The permanent electrical transmission ROW width would be 150 feet, but the length and disturbance area cannot be determined. The line would be constructed, owned, and operated by Rocky Mountain Power and would be dedicated to servicing the Cimarex Project.

The 230-kV power line would be constructed above ground on private and state land. The location and surface disturbance of the power line cannot be determined with No Action since it would vary depending on landowner preferences. Typical structures would be approximately 70 to 100 feet tall, located at intervals of 500 to 1,000 feet. Examples of typical transmission structures are provided in Appendix A. The transmission line would include wooden H-frame structures with two poles each and steel monopole structures of rust-stabilized Core-ten metal. Pole type varies depending on slope, soil conditions, and alignment factors. Some pole structures may require guyed triple-pole configuration, and additional A-frame structures may be required at designated locations for reinforcement.

The 230-kV line would consist of three conductors forming the three-phase single circuit with an optical ground wire in the top position and a static wire on the opposite top position on each structure. The 230-kV line would consist of a three-phase single circuit 230-kV with an optical ground wire in the top position on each structure. Minimum conductor height above ground would be based on National Electrical Safety Code and Rocky Mountain Power‘s standards. Conductors would be non-reflective and structures would be constructed using standard practices and raptor protection features.

The tangent structures of the 230-kV line would have polymer suspension insulators 80 to 86 inches long, as shown in Appendix A. The angle and dead end structures would have polymer insulators 92 to 99 inches long. One polymer insulator per phase would be used on all tangent structures, and up to three insulators per phase on the dead end and angle structures would be used. All angle and dead end structures would have associated down guying, except where steel poles with foundations are used. Steel A-frame or other structures may be installed at designated locations along the transmission ROW.

The construction of the high-voltage transmission line would require structure site clearing and grading, pole pad construction, and hole auguring and pole setting, followed by conductor cable installation and tensioning. The authorized ROW would be used to reach pole locations and pulling/tensioning and guard structures inaccessible by existing roads. At each structure site, leveled areas (pads) are needed to facilitate the safe operation of large equipment. The leveled area required for safe operation of construction equipment and framing of the structure would be a rectangle approximately 75 feet in front of the structure location by 75 feet left and right of the structure by 100 feet behind the structure for a total area of 150 feet (width of the ROW) by 175 feet (along the ROW).

The pads would be cleared of vegetation only to the extent necessary for surveying, vehicle and heavy equipment safety, and conductor clearance. After line construction, all pads would

be graded and reseeded to mitigate surface disturbance. Pole setting would occur simultaneously at a number of sites on different sections of the line. Conductors would be strung using powered pulling equipment at one end and powered braking or tensioning equipment at the other end. Sites for tensioning equipment and pulling equipment would be approximately 2 miles apart depending on the terrain and line angles. Transmission line construction is expected to take 22 weeks, require 150 to 200 heavy truckloads, and use a work crew of 10 to 20 people, as shown in Table 2-2.

Table 2-2. Summary of No Action Alternative Construction and Operations Workforce.

Project Element	Construction Employment	Heavy Equipment Loads	Permanent Employment
Private/State Actions			
Gas and Production and Injection Wells (5 total)	24–30	660–720	0
Cimarex and Air Products Transmission Lines	10–20	150–200	0
Helium and Natural Gas Pipelines including Williams Pipeline Area	75–100	150–200	0
Fiber Optic Line	5–10	Included in pipeline loads	0
Methane & Helium Recovery Facility	50–150	200–400	15–20
Helium Liquefaction Facility	15–25	50–80	10–12
Water Injection Well	10–20	2–5	0
Corporate Office (Big Piney)	0	Lease	4–6
2009–2010 Subtotal	*189–355*	*1,212–1,605*	*NA*
2010–2012 Subtotal	*24–30*	*250–300*	*29–38*
Project Total	**203–365**	**1,460–1,900**	**29–38**

Reclamation would follow transmission line construction, as directed by landowners. Long-term disturbance is estimated to occur from permanent pole structures and from vehicular access along the power line ROW, if authorized by the landowner.

2.2.1.11 Helium Liquefaction Facility

A private helium plant, the HLF, would be constructed on a 10-acre parcel of private land near Calpet Road and U.S. 189, south of Big Piney. The facility would be constructed, owned, and operated by Air Products, Inc. Nitrogen is separated from the crude gas mixture in the HLF, and the resulting pure helium processed using cryogenic treatment to liquefy the gas for specialized truck transport. The HLF is designed for an initial processing capacity of 100 million cubic feet per year of liquefied helium. The HLF would not process any toxic or flammable gases; the plant would process only the dry crude helium product.

The facility would consist of a metal-enclosed industrial building approximately 10,000 square feet in size, with additional large outdoor tanks, vessels, air-exchange coolers, and electrical transformers. Typical diagrams of the facility are provided in Appendix A. Finished

heights of the facilities and tanks range from 50 to 43 feet. The HLF would contain a single loading bay.

Construction of the HLF is expected to take four months, require 50 to 80 heavy truckloads, and use a work crew of 15 to 25 people (see Table 2-2). The HLF would be operated 24 hours per day, 365 days per year, and maintained by a crew of approximately 4 to 6 personnel on site during day shifts, and approximately 2 personnel during night shifts.

2.2.1.12 Air Products 69-kV Transmission Line

Under the No Action Alternative, a single-circuit 69-kV three-phase power line would be need to be constructed on private land, most likely from the existing 69-kV electrical substation in Big Piney to the substation located at the HLF. The permanent ROW location and length cannot be determined, but the ROW width would be 150 feet. The line would be constructed and operated by Rocky Mountain Power and dedicated to servicing the HLF.

The transmission line would be constructed above ground on a combination of steel monopoles and wooden H-frame structures. Typical structures would be approximately 70 to 100 feet tall, located at intervals of 500 to 1,000 feet. Angles in the line may require a guyed triple-pole configuration for reinforcement. A-frame structures may be required at the HLF property fence.

2.2.1.13 Methane and Helium Recovery Facility

A Special Land Use Lease (provided in Appendix B) has been obtained from the State of Wyoming for an M&HRF, which is being constructed by Cimarex at the time of the publication of the Draft EA. The facility is located on a 34-acre leased parcel of state land, approximately 17 miles west of Big Piney at Zone 12 Universal Transverse Mercator (UTM) 547468.8; 4705517.4. The recovery facility will occupy approximately 10 acres of state land, with roads, gas flowlines, water flowline, and transmission line ROW converging on different sides of the fenced facility.

A minimum incoming gas stream of approximately 100 MMSCFD would be required under the No Action Alternative for initial testing of M&HRF processing technology. Initial production would result in approximately 19 MMSCFD dehydrated natural gas outflow to the Cimarex natural gas pipeline. Maximum production may be achieved under No Action with the addition of new well capacity, which would also require additional compression and processing capability at the M&HRF. The final processing capacity of the facility under No Action could be approximately 200 MMSCFD in-flow gas, producing approximately 39 MMSCFD dehydrated natural gas for the life of the Project. Gas production would continue at the M&HRF for as long as the gas wells are capable of commercial production and a demand for the recovered gases exists. The estimated life of the M&HRF is 40 years.

Appendix A provides typical diagrams of the M&HRF facility. The facility would have seven buildings, with possible structures added in the future, depending on design. Currently planned buildings include a control room/office/shop, two motor control centers, compressor building, process building, sour gas building, and an injection pump building. A warehouse and/or electrical substation switchgear/control building may also be required. A domestic

water well would be permitted and drilled to service normal plant operations. Steel monopoles or other high-voltage transmission structures would provide incoming 230-kV power. A dual-train electrical high-voltage substation would be installed to step-down incoming power.

The M&HRF includes, but is not limited to, the following systems:

- an inlet area with corrosion-resistant equipment for the handling of production fluids;
- a proprietary cryogenic nitrogen rejection and crude helium recovery process, including cold boxes and heat exchangers to separate nitrogen, helium, and methane gases;
- a propane refrigeration system to assist in cryogenic processing and other process uses; a proprietary sour gas removal process;
- a molecular sieve gas dehydration system that ensures continuous operation of the dehydration process;
- a heat transfer fluid heater to provide all process heating in the plant; and
- various aboveground storage tanks with containment dikes and process pressure vessels would be present on the site.

General process features include inlet separation, dehydration, propane refrigeration, sour gas removal, cryogenic processing, communications and data infrastructure, and various electric motor-driven pumping and compression services. The M&HRF would also have an emergency flare stack with pilots, an emergency generator, and other service and utility systems. The facility would be served by incoming 230-kV power that would be stepped-down with a dual-train electrical transformer to power various large electric motor-driven compression systems to deliver processed methane and helium to sales gas lines and drive the internal recycle compressors. Following cryogenic treatment and separation of economic gas streams, produced water would be separated and pumped into the water injection pipeline and the CO_2 and H_2S would be pumped into the acid gas injection system.

One emergency flare stack would be installed, with lighted pilot burners intended to ignite and burn off gas only in emergency and in limited startup flaring situations. The flare stack would be approximately 90 feet tall and smokeless, using plant sales gas to assist in thermal destruction of sour gas during any limited sour gas flaring.

Communications infrastructure may include a microwave tower and/or radio antennas, small satellite communication dishes or boosted cellular phone systems, and security fencing with a minimum 8-foot chain link with three-strand security wire and gates would surround the developed facility. Extensive signage would be used on access roads to warn the public of ongoing sour gas operations. In the event of a power failure, an emergency generation system would provide power to critical control systems so that operations could be safely stabilized and, if necessary, shut down.

The boundary of the M&HRF would be security fenced and access controlled at all times. Perimeter fencing with hazard warning would be used around production facilities, and locked

gates at public access points would be used to reduce public access. Well site pressure control would not be required for this Project. Wells, pipelines, transmission line, and other infrastructure would receive regularly scheduled inspection and maintenance.

According to the Cimarex Surface Use Permit, construction of the M&HRF would begin on May 1, 2009, and be complete and operational by November 2010. Construction between November 15, 2009, and May 1, 2010, would be restricted to indoor activities. Construction would involve approximately 200 to 400 heavy loads of materials and equipment and 50 to 150 personnel.

The M&HRF would be operated 24 hours per day, 365 days per year. It would be maintained by a crew of approximately 10 personnel on site during day shifts and 3 personnel during night shifts, as shown in Table 2-2. The personnel would travel from local communities to the plant site daily. Snow control structures and snow removal programs would be required for winter access. Continuous remote monitoring of the production wells would be maintained from within the M&HRF, with remote emergency shutdown capability. Continuous remote monitoring of the gas recovery and processing equipment would be maintained both within the M&HRF and from the Cimarex Project Office in Big Piney, with remote emergency shutdown capability at either site. The Cimarex Project Office in Big Piney would employee approximately four to six full-time personnel for the life of the Project.

2.2.1.14 Produced Water Injection Well

The gas production wells are expected to produce approximately 25 gallons per minute (gpm) or 850 barrels per day (bpd) of byproduct water that would exceed standards established by the WDEQ for livestock use (WDEQ 2009a). One new water injection well would be drilled on state lands at an existing and unused well pad, RRU 24-16, to a depth of approximately 13,100 feet, for disposal of produced water from the Madison Formation into the Nugget Formation. The Nugget Formation, like the Madison, is a hydrocarbon-bearing formation.

2.2.1.15 Produced Water Pipeline and Utility Line

The incoming raw Madison Formation gas would be dehydrated as the first step in safe processing within the M&HRF. The resulting byproduct water would be removed from the produced gas and pumped into a pipeline for direct flow to the injection well without storage in reservoirs or ponds. The Fiberspar pipeline would be 6 inches in diameter and buried a minimum of 4 feet deep. The ROW would overlap with raw gas pipelines for a short distance, then continue across state land to the injection well pad, resulting in initial disturbance of 2.1 acres.

2.2.1.16 Snow Control Structures

A snow control plan including snow fence design and recommendations for improved winter access is being prepared for Cimarex by a registered professional engineer. Snow fencing would be installed adjacent to specific access roads, well pads, and the M&HRF to reduce drifting of snow, reduce requirements for snow removal, and improve winter operations and access.

2.2.1.17 Roads

Under No Action, Cimarex's existing ROW grant WYW-116838 would be used to access the M&HRF and any other facilities on state land in the Riley Ridge Unit. Other existing roads would be used wherever possible for access to the proposed pipeline and overhead transmission line ROWs and all production and injection wells. If required, new unimproved road sections would be constructed to access private ROW areas.

2.2.1.18 Construction Staging and Equipment Yard

Temporary staging, work, and access would occur at a private yard located near Calpet Road, and approved by Sublette County and local authorities. Cimarex has identified a 10-acre parcel of land to be used for construction and equipment storage on private land off of Calpet Road as its primary construction staging area. Other staging areas on private lands may be required and would be coordinated by the contractor with the landowner in advance of construction.

2.3 ALTERNATIVE 1 (PROPOSED ACTION)

Cimarex proposes several interrelated actions that form the Project components of Alternative 1. Figure 2-2 provides an overview of the primary project components and the jurisdiction which applies to each component for Alternative 1, the Proposed Action. Table 2-3 provides a comparison of the BLM actions that apply for each alternative under consideration in this EA, including Alternative 1. Table 2-3 also provides a similar comparison of possible private and state project components which would fall outside of BLM jurisdiction under each of the alternatives under consideration in this EA. BLM actions under Alternative 1 would result in total temporary disturbance to 811.32 acres, with 31.56 acres of long-term disturbance. Private and state actions would result in 61.0 acres of temporary and 23.0 acres of long-term disturbance, as discussed in the sections below.

2.3.1 Alternative 1 Project Components with BLM Jurisdiction

2.3.1.1 BLM Natural Gas Wells

Four Madison Formation gas production wells would be used for the Project. Three new large-bore wells would be directionally drilled and completed from an existing disturbed surface location adjacent to an existing well (RRU 17-34). These four wells consist of:

- three new Madison Formation sour gas producing wells (RRU 16-24, RRU 18-14, and RRU 13-14); and
- one existing Madison Formation sour gas production well (RRU 10-14).

Directional drilling would be used to reach widely separated subsurface locations for the three new wells. Cimarex is also exploring the possibility of ―sidetracking" one or both of the existing boreholes on the RRU 17-34 well pad. Sidetracking (drilling the same borehole but with a different kick-off point) would reduce the amount of time needed to complete the well. The existing RRU 10-14 is a vertical bore which would be re-completed from the existing disturbed well pad; no reserve pit and no recontouring or additional dirt work would be

needed at this location. The four sour gas production wells are the full anticipated extent of production drilling and/or re-completion proposed for the Project.

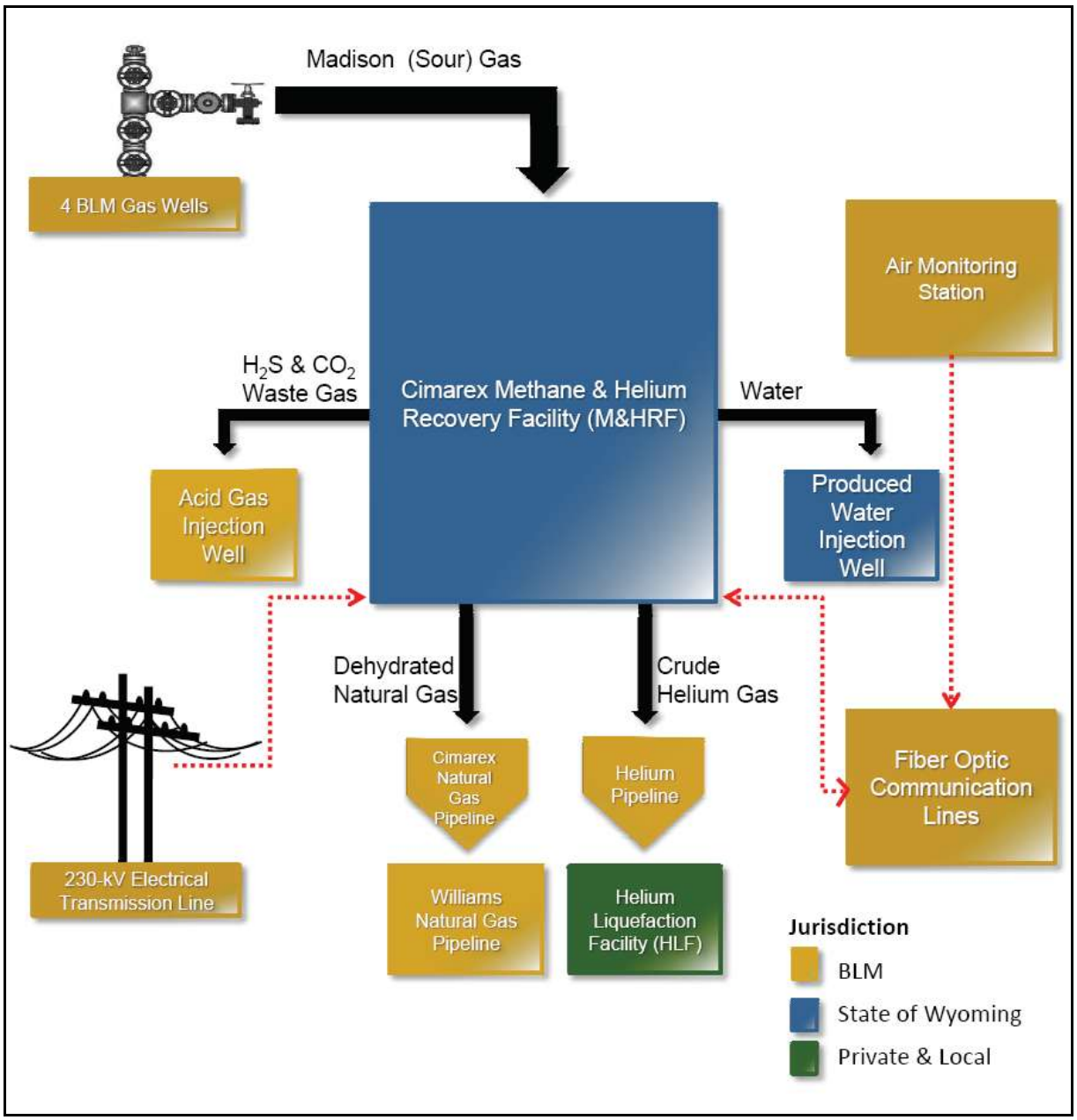


Figure 2-2. Alternative 1 major Project components and jurisdictions.

Table 2-3. Alternative 1 Project Components, by Jurisdiction.

Project Component	Description	Permanent ROW Width or Grant Size	Disturbance Calculation Assumptions	# of Structure Sites or Length of Feature(s) – all ownership	Total Short-term Surface Disturbance – all ownership (acres)	Construction ROW (acres)	Total Long-term Surface Disturbance – all ownership (acres)
Alternative 1 Project Components within BLM Jurisdiction							
Natural gas wells: 2 well pads	3 wells on multi-well pad; 1 well on single-well pad. Blading, pit and berm development, drilling and construction disturbance followed by reclamation.	5 acres each site	5 acres initial with no reclamation on multi-well pad. 5 acres initial with 40% reclamation on single-well pad.	2	10.00	0	8.00
Raw gas flowlines	3 overlapping ROWs from multi-well pad; 1 partially overlapping ROW from single-well pad; bladed and trenched, followed by recontouring and reclamation.	50 feet	Average 60-foot initial disturbance width	2.4 miles	15.10	0	0
Acid gas well	Blading, pit and berm development, drilling and construction disturbance. No reclamation at shared multi-well pad.	5 acres	5 acres shared disturbance	1	No additional disturbance	0	0
Acid gas flowline	Overlapping ROW, bladed and trenched, followed by recontouring and reclamation.	50 feet	Overlapping 60-foot ROW disturbance width	1.45 miles	No additional disturbance	0	0
Cimarex gas pipeline	Blading and trenching, followed by recontouring and reclamation.	50 feet	100-foot initial disturbance width (adjacent 50-foot temporary use corridor)	8.8 miles	106.20	53.10	0.20
Temporary use areas for directional drilling of stream crossings	Blading and excavation of temporary access and boring equipment pads, followed by recontouring and reclamation.	0	150- by 100-foot initial disturbance width--new disturbance only if outside ROW.	2 (1 each side of Beaver Creek)	0.12	0.12	0
Helium pipeline	Blading and trenching, followed by recontouring and reclamation.	50 feet	100-foot initial disturbance for 8.0 miles from M&HRF to Williams pipeline corridor; 50-foot construction corridor for 9.2 miles from Williams pipeline to HLF.	8.0 miles × 100 feet + 9.2 miles × 50 feet (17.2 miles total)	204.60	104.30	0
Underground fiber optic cable	Shared ROW with other facilities; trenching or plowing followed by reclamation.	30 feet	Plowed trench from Calpet Rd to M&HRF, gas wells, and AAM&WS	17.2 miles shared with helium ROW; 3.97 miles shared with electrical line ROW.	No additional disturbance	0	0
Underground electrical distribution	Shared ROW with other facilities; trenching or plowing followed by reclamation.	30 feet	Average 30-foot initial disturbance width	2.6 miles	0.40	0	0
Cimarex 230 kV transmission line	Augering of wooden and steel monopoles, followed by back-fill; blading or crushing of vegetation for equipment access and construction, followed by recontouring and revegetation.	150 feet	40 H-frame structures (80 wooden poles); 15 steel monopole structures; 7 pulling and tensioning pads; 1 dead-end structure (3 poles)	16.1 miles	301.40	12.70	0.05

Project Component	Description	Permanent ROW Width or Grant Size	Disturbance Calculation Assumptions	# of Structure Sites or Length of Feature(s) – all ownership	Total Short-term Surface Disturbance – all ownership (acres)	Construction ROW (acres)	Total Long-term Surface Disturbance – all ownership (acres)
Air Products 69 kV transmission line	Augering of wooden and steel poles, followed by back-fill; blading or crushing of vegetation for equipment access and construction, followed by recontouring and revegetation	150 feet, partially overlapping an existing ROW	5 single poles, 3 of which are on federal ground	0.4 mile	26.50	None	<0.01
Long-term ROW disturbance (two-track)	Unauthorized use of transmission line ROW by off-road vehicles.	N/A	10-foot disturbance width	15.9 miles	19.30	0	19.30
AAM&WS	Vegetation crushing. Plow in conduit, install fence, followed by reclamation.	4-acre site	4-acre construction area	1	4.00	None	4.00
Williams pipeline	Blading and trenching, followed by recontouring and reclamation.	50-foot federal ROW; 75-foot private/state	50- + 25-foot temporary use for initial disturbance width (federal); 75- + 25-foot temporary use for initial disturbance with private/state.	12.7 miles	123.70	30.00	0
Snow control structures	Crushing and leveling of vegetation by equipment during structure installation.	30 feet	TBD	TBD	TBD	TBD	TBD
Access roads	Maintain and use existing access roads per existing ROW grant WYW-116838, along with state permits and private grants.	30 feet	Existing roads only--no new disturbance	23.0 miles	No additional disturbance	N/A	N/A
Total BLM Disturbance					***811.32***	***200.52***	***31.56***
Alternative 1 Project Components within Private/State Jurisdiction							
M&HRF	Complete conversion to industrial site.	State grant	34	1	33.90	N/A	10.00
Produced water injection well	Blading, pit and berm development, construction disturbance followed by approximately 40% reclamation.	State grant	5 acres	1	5.00	N/A	3.00
Produced water pipeline (with fiber optic and electrical)	Blading, trenching, followed by 100% recontouring and reclamation of flowline.	State grant	40-foot initial disturbance width	0.43 mile separate state easement + no additional disturbance from 0.57 mile overlapped with BLM utility ROW	2.10	N/A	None
HLF	Complete conversion to industrial site.	Private ownership	10 acres	1	10.00	N/A	10.00
Construction staging/equipment yard	Blading with packed gravel cover. No reclamation is planned.	Private grant	10 acres	1	10.00	N/A	0
Total Private/State Disturbance					***61.00***	***N/A***	***23.0***
Estimated Total Disturbance (Acres)					***872.32***	***200.52***	***54.56***

AAM&WS = ambient air monitoring and weather station
BLM = Bureau of Land Management
HLF = helium liquefaction facility
M&HRF = methane and helium recovery facility
N/A = not applicable
ROW = right-of-way
TBD = to be determined

A water-based mud system would be used for the drilling operations. Drilling mud and cuttings would be placed in an earthen reserve pit with an impermeable synthetic liner to prevent seepage into the soil. A segmented reserve pit system would be used at the multi-well pad, allowing one segment to be used during the drilling of each well, then closed following well completion to reduce exposure of drilling fluids at the site. Reserve pits would be managed to deter wildlife, livestock, and bird entry. If present, hydrocarbons floating on the surface of the reserve pit would be removed as soon as possible after detection. Reserve pit fluids would be allowed to dry by evaporation and would be removed as soon as practical. Following successful completion of each well, the reserve pit would be closed using a method approved by the WOGCC. Drilling and completion activities are anticipated to require 10.3 acre-feet of water, which would be obtained from valid existing water rights from local supplies originating from Beaver Creek.

Spill Prevention, Control, and Countermeasure (SPCC) Plans would be developed and maintained during drilling operations. The average water estimate for the drilling and completion of a well is 10,000 to 15,000 barrels, which would be obtained from permitted municipal sources, private water rights, and other surface water sources. Approximately 80,000 barrels of water for drilling and completion may be required. Drilling of a new water supply well is not planned.

Well completion would involve perforation or stimulation of productive zones. Such operations, if conducted, require heavy equipment to be brought to the well site. Hydraulic fracture stimulation of the Madison Formation is not anticipated. Well cleanup and initial fluid flowback would go directly to the central M&HRF using flareless flowback technology. Limited flaring of flowback gas using assist gas and an elevated flare may be required at the M&HRF to ensure flow continuity from the formation to the gas recovery units and safe disposal of the limited startup gas flows.

No condensate storage, metering, or compressors would be installed at the well sites. Well production would flow in corrosion-resistant alloy flowlines from the well heads to the M&HRF for processing.

Drilling operations would proceed at the rate of one well per year over a four-year period, with seasonal stipulations. Approximately 110 to 120 heavy truckloads of equipment and materials would be required to complete the drilling of each well, for a total of 330 to 360 loads. Total rig-up activities, including rig move to location and installation of ancillary facilities, would take approximately 10 to 14 days to complete per well. Directional drilling of the well would take approximately 138 days, with completion operations adding an additional 25 to 35 days. Remote monitoring technology would be used where feasible to reduce the amount of traffic associated with drilling. The extent of additional traffic would depend on the phase of the drilling operation, but would not exceed 50 total vehicles per day during peak activity during rig moving, with 20 to 30 truckloads anticipated for normal drilling and completion operations. Due to the size of the rigs and the proximity of the proposed surface locations to each other, only one rig could be on site at any given time.

Drilling of the three new gas wells at the RRU 17-34 existing well pad would result in 5 acres of initial disturbance at a previously disturbed pad. Because four wells would be drilled and

operated at this pad, little or no reclamation would be completed. The reworking of the existing well at RRU 10-14 would result in 5 acres of initial disturbance at a previously disturbed pad. Approximately 40% of the initially disturbed area would be recontoured and reseeded as part of an interim reclamation plan, resulting in 3 acres of long-term disturbance at the well pads.

2.3.1.2 Raw Gas Flowlines

The Project includes construction of 2.48 miles of flowline for each of the four producing sour gas wells. The flowlines would be 10.75 inches in diameter from the multi-well pad to the M&HRF and 6.625 inches in diameter from the single-well location to the M&HRF and would be constructed of non-corrosive carbon steel (API-5L) pipe with Inconel 825 liners. The flowlines would be buried in trenches a minimum of 4 feet deep and designed to operate at 2,250 pound-force per square inch (psig) and 280°F. Due to the corrosive nature of the Madison Formation gas mixture, corrosion–resistant materials would be used. Typical service circuits would be buried along with the production flow lines in corridors established along the side of existing access roads from the wells to the new M&HRF. Flowline ROW would also include instrumentation, control, and medium-voltage electrical service circuits between the plant site and the wells, as described in Sections 2.3.1.9 and 2.3.1.10. The underground electrical distribution and fiber optic lines would allow continuous remote monitoring and emergency shut-off of the wells.

Construction of the flowlines would result in 15.3 acres of initial disturbance, with overlapping ROW with other raw gas pipelines and utilities. All of the initially disturbed area would be recontoured and reseeded as part of an interim reclamation plan, resulting in no long-term disturbance from the flowlines.

2.3.1.3 Acid Gas (H2S/CO2) Injection Well

If approved by the WOGCC, RRU 20-14 would become an acid gas injection well under Alternative 1, injecting 100% of the H_2S and CO_2 removed from the raw gas at the M&HRF back to the Madison Formation. The purpose of acid gas injection is to protect the public from exposure to sour gas, preserve reservoir energy, minimize drainage to offset units, and preserve federal options to produce, process, and extract and sell CO_2 and/or H_2S from the Madison Formation in the future.

BLM approved a permit to drill a test well beginning in 2008 at the existing RRU 17-34 well pad. The test well will collect additional information on Madison Formation reservoir structure and pressure data to better determine the formation‘s capability for re-injection of H_2S/CO_2 gasses in support of the WOGCC injection well permitting processes. It could also be applied as a Madison Formation producer well in the future, should it not be permitted as an injection well.

As described for the No Action Alternative, the acid gas injection well would be operated according to all specifications in BLM Onshore Order 6, as well as the permit requirements of the WOGCC. All wellhead components would be of non-corrosive material. Highly sensitive ambient air H_2S monitors would be placed at several locations nearby, providing electronic signals for emergency shut-down, as well as audible signals to alert any nearby workers.

Internal leak detection would also provide electronic signals to engage the emergency shut-down process.

Approximately 110 to 120 heavy truckloads of equipment and materials would be required to complete the drilling of this well. Drilling of the acid-gas injection well would be part of the initial 5 acres of initial disturbance at the RRU 17-34 multi-well pad. Because a total of four wells would be operated at this pad, little or no reclamation would be completed.

2.3.1.4 Acid Gas Flowline

With Alternative 1, a pipeline 1.45 miles long would carry compressed H_2S/CO_2 gasses from the M&HRF to the acid gas injection well at the multi-well pad, to be injected into RRU 20-14. The acid gas flowline would be constructed of a 6.625-inch-diameter corrosion-resistant material and buried a minimum of 4 feet deep. The pipeline would be designed to operate under pressure of 2,250 psig at 100°F.

Construction of the flowline would result in no additional disturbance, since the ROW would overlap and be part of the 15.3-acre initial disturbance of the raw gas pipelines. All of the initially disturbed area would be re-contoured and reseeded as part of an interim reclamation plan, resulting in no long-term disturbance from the flowline.

2.3.1.5 Cimarex Natural Gas Pipeline

Under Alternative 1, a new natural gas sales pipeline would transport processed natural gas from the M&HRF to a delivery point generally east of the plant at the Williams Natural Gas Company (Williams) Hare‘s Ear Compressor Station, approximately 7 miles west of Big Piney. The length of the natural gas pipeline would be 8.8 miles.

The Cimarex natural gas pipeline would not carry toxic substances and would only transport dry processed natural gas. The pipeline would be buried at a minimum depth of 3 feet and a maximum of 8 feet to top of pipe. The permanent width of the natural gas pipeline ROW would be 50 feet, with a 50-foot adjacent ROW for temporary access and staging. The helium pipeline and natural gas sales pipelines may be located in overlapping or adjacent ROWs to minimize surface disturbance.

The natural gas pipeline would operate at 1,000 to 1,200 psig with a pipeline design pressure of 1,480 psig at 100°F. The operating temperature of the natural gas sales pipeline would average 60°F. The natural gas pipeline would be constructed of 8-inch-diameter carbon steel between the M&HRF and the junction facility, located on state land in Township (T) 29 North (N), Range (R) 113 West (W) near Rands Butte. From the junction tie-in to the tie-in at the Hare‘s Ear Compressor, the gas pipeline would increase in diameter to 12 inches. This would allow the pipeline to be used for expanded future dehydrated gas, if authorized, without additional ROW disturbance.

The junction facility would also be designed to allow for inspections, future upgrades, or connections while minimizing future ground-disturbing activities. Emergency shutdown valve stations, check valves, emergency vent valves, and other devices such as a pigging station would be installed at the junction facility within the proposed ROW for the natural gas sales pipelines. The facility would be located approximately 20 feet south of South Piney West

Road, on the pipeline ROW on state land. The fenced and graveled facility would fall 25 feet outside the permanent ROW width; the access road would be graveled between South Piney West Road and the site.

Pipeline construction would use adjacent or overlapping ROWs wherever possible. Cimarex has requested a 50-foot temporary construction corridor adjacent to the full length of the pipeline ROW[1]. Bulldozers and/or road graders would first clear vegetation and topsoil. All available topsoil would be removed, stockpiled, and placed where it can be retrieved easily but does not impede watershed and drainage flows. Trenching would be used to bury the gas pipeline, except at specific stream and wetland crossings per the request of the landowner. Cimarex‘s plans include trenching across Spring Creek and completing a directional bore beneath Beaver Creek, at the landowner‘s request, for Alternative 1. The helium pipeline and Cimarex natural gas pipeline would share the trench and borehole for both stream crossings. The helium and natural gas pipelines would be constructed at the same time with the same crews. Pipeline construction is expected to take 36 weeks, require 150 to 200 heavy truckloads, and use a work crew of 75 to 100 people.

Construction of the pipeline would result in 106.7 acres of initial disturbance. Reclamation would begin immediately after pipeline construction and hydrostatic testing. All of the initially disturbed area would be recontoured and reseeded as part of a reclamation plan, resulting in no long-term disturbance from the pipeline.

2.3.1.6 Helium Pipeline

A crude helium (helium mixed with nitrogen) dry gas pipeline, constructed of carbon steel pipe, is proposed to transport crude helium from the M&HRF to a HLF to be constructed, owned, and operated by Air Products on private land south of Big Piney near the intersection of Calpet Road and U.S. 189. The pipeline would be 6-inch-diameter from the M&HRF to the junction facility, at which point it would increase to 8-inch-diameter to accommodate future helium in-flows, should it be requested. As with the natural gas pipeline, the junction facilities would be designed to allow for inspections, future upgrades, or additional tie-in connections while minimizing future ground-disturbing activities.

The helium pipeline would operate at 500 to 700 psig with a pipeline design pressure of 1,480 psig at 100°F. The operating temperature of the helium pipeline would average 60°F. The crude helium pipeline would not carry toxic or flammable substances and would only transport a crude helium and nitrogen gas mixture. The crude helium pipeline would be buried at a minimum depth of 3 feet.

The helium pipeline would be 17.2 miles long with a permanent ROW width of 50 feet,. Cimarex has requested an adjacent 50-foot ROW for temporary access and staging from the M&HRF to the Williams pipeline crossing[1]. Construction of the pipeline is estimated to result in 208 acres of short-term surface disturbance where the ROW is bladed and trenched.

1 BLM does not typically grant Temporary Use Permits for the full length of the pipeline corridor, but does authorize specific TUAs as needed.

Trenching would be used to bury the helium pipeline, except at specific stream and wetland crossings per the request of the landowner. The helium pipeline ROW would be overlapped with fiber optic cable ROW for the entire length, to avoid additional surface disturbance. Cimarex's plans include trenching across Spring Creek and completing a directional bore beneath Beaver Creek, at the landowner's request, for Alternative 1. The helium pipeline and Cimarex natural gas pipeline would share the trench and borehole for both stream crossings. Construction personnel and equipment needs are summarized in Table 2-4.

Table 2-4. Summary of Alternative 1 Construction and Operations Workforce.

Project Element	Construction Employment	Heavy Equipment Loads	Permanent Employment
BLM Actions			
Gas and Production and Injection Wells (5 total)	24–30	660–720	0
Transmission Lines	10–20	150–200	0
Helium and Natural Gas Pipelines including Williams Pipeline Area	75–100	150–200	0
Fiber Optic Line	5–10	Included in pipeline loads	0
Air Quality Monitoring Station	10–20	2–5	0
Private/State Actions			
Methane & Helium Recovery Facility	50–150	200–400	10-15
Helium Liquefaction Facility	15–25	50–80	6-8
Water Injection Well	10–20	2–5	0
Corporate Office (Big Piney)	0	Lease	4–6
2009–2010 Subtotal	*189–355*	*1,212–1,605*	*NA*
2010–2012 Subtotal	*24–30*	*250–300*	*20–29*
Project Total	**213–385**	**1,462–1,905**	**20-29**

2.3.1.7 Underground Fiber Optic Cable

Fiber optic cable would also be installed for communication and data transfer between the M&HRF and Calpet Road. This fiber optic transmission system would provide continuous data transmission off site and monitoring of production and safety parameters and emergency shutdown.

A permanent ROW width of 50 feet is requested, with overlap of this ROW and/or trench sharing with buried electrical distribution lines, raw gas pipelines, and the helium pipeline, resulting in no additional surface disturbance. Between the M&HRF and wellheads, the fiber optic line ROW would overlap with raw gas flowlines. From the multi-well pad to the AAM&WS, the fiber optic line would be plowed in alongside the existing two-track road in an overlapping ROW with the underground electrical distribution line. From the M&HRF to Calpet Road, the fiber optic cable ROW would overlap with the helium pipeline ROW. Hand holes (–pull boxes") would also be located within this ROW. Ten pull boxes would be installed within the fiber optic ROW to facilitate installation of the fiber optic cable, future splicing, and terminations. These boxes are typically 30 inches wide by 60 inches long by 30

inches deep and would be buried with the cover flush to the restored grade of the ROW. The boxes are traffic rated for protection and will only need to be accessed for any future splicing of the fiber optic cable or to service the system should a cable or fiber strand fail or be cut.

2.3.1.8 Underground Electrical Distribution

Underground electrical distribution lines of 5-kV or less would be installed from the M&HRF substation to gas production wells and the AAM&WS to provide electricity to these facilities for operation, monitoring, and emergency shut-down.

A permanent ROW width of 50 feet is requested, with overlap of this ROW and/or trench sharing with fiber optic cable and raw gas pipelines. From the multi-well pad to the AAM&WS, a new ROW would occur, resulting in 0.7 acre of additional surface disturbance. This ROW would overlap with the fiber optic cable.

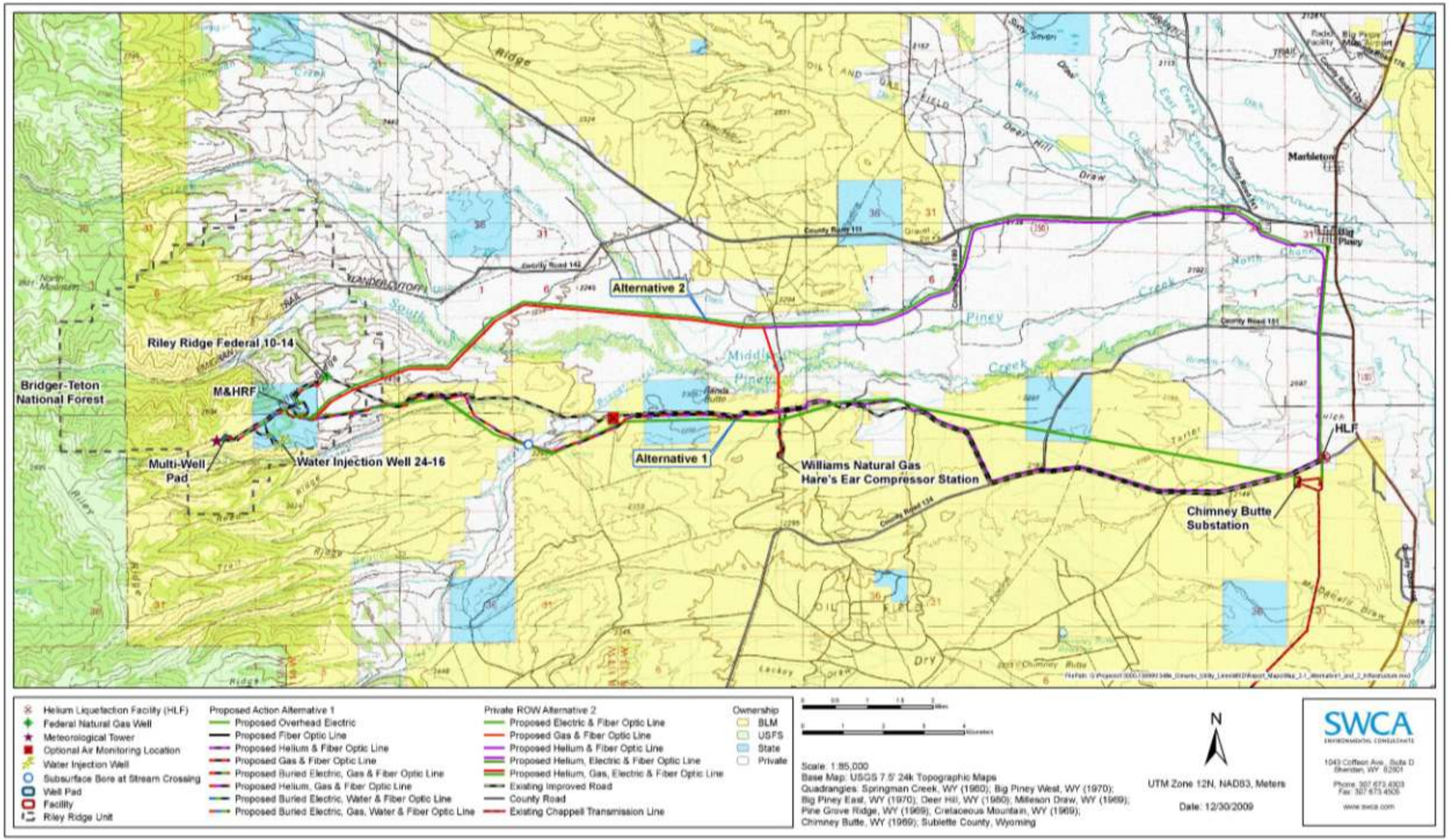
2.3.1.9 Cimarex 230-kV Electrical Transmission Line

A single-circuit 230-kV three-phase power line would be constructed on federal, state, and private land from the high-voltage substation within the M&HRF to the Chimney Butte Substation south of Calpet Road (Sublette County Road [CR] 134), near U.S. 189, as shown in Map 2-2. The permanent electrical transmission ROW length would be 16.5 miles and the width would be 150 feet. Although the line would be dedicated to servicing the Cimarex Project, it would be constructed, owned, and operated by Rocky Mountain Power.

The 230-kV power line would be constructed above ground on wooden H-frame structures. Typical structures would be approximately 70 to 100 feet tall, located at intervals of 500 to 1,000 feet. Examples of typical transmission structures are provided in Appendix A. The transmission line would include 40 wooden H-frame structures with two poles each and approximately 15 steel monopole structures. At least one angle in the line may require a guyed triple-pole configuration, and additional steel monopoles or A-frame structures may be required at designated locations for reinforcement.

The 230-kV line would consist of three conductors forming the three-phase single circuit with an optical ground wire in the top position and a static wire on the opposite top position on each structure. Minimum conductor height above ground would be based on National Electrical Safety Code and Rocky Mountain Power‘s standards. Conductors would be non-reflective and structures would be constructed using standard practices and raptor protection features.

The tangent structures of the 230-kV line would have polymer suspension insulators 80 to 86 inches long, as shown in Appendix A. The angle and dead end structures would have polymer insulators 92 to 99 inches long. One polymer insulator per phase would be used on all tangent structures, and up to three insulators per phase on the dead end and angle structures would be used. All angle and dead end structures would have associated down guying, except where steel poles with foundations are used. Steel A-frame or other structures may be installed at designated locations along the transmission ROW.



Map 2-2. Alternatives 1 and 2 infrastructure detail.

The construction of the high-voltage transmission line would follow a general sequence with structure site clearing and grading, pole pad construction, and hole auguring and pole setting, followed by conductor cable installation and tensioning. The authorized ROW would be used to reach pole locations and pulling/tensioning and guard structures inaccessible by existing roads. At each structure site, leveled areas (pads) are needed to facilitate the safe operation of large equipment. The leveled area required for safe operation of construction equipment and framing of the structure would be a rectangle approximately 75 feet in front of the structure location by 75 feet left and right of the structure by 100 feet behind the structure for a total area of 150 feet (width of the ROW) by 175 feet (along the ROW).

The pads would be cleared of vegetation only to the extent necessary for surveying, vehicle and heavy equipment safety, and conductor clearance. After line construction, all pads would be graded and reseeded to mitigate surface disturbance. Pole setting would occur simultaneously at a number of sites on different sections of the line. Conductors would be strung using powered pulling equipment at one end and powered braking or tensioning equipment at the other end. Sites for tensioning equipment and pulling equipment would be approximately 2 miles apart depending on the terrain and line angles. Transmission line construction is expected to take 22 weeks, require 150 to 200 heavy truckloads, and use a work crew of 10 to 20 people, as shown in Table 2-4. No additional permanent staff would be employed as a result of the Project.

Construction of the transmission line would result in 284.26 acres of initial disturbance from structure installation, pulling and tensioning pad leveling, and crushing of vegetation and/or churning of soils during equipment access and egress. Reclamation would begin immediately following transmission line construction, as shown in Table 2-3. All of the initially disturbed area except for pole structures would be recontoured and reseeded as part of an interim reclamation plan. Long-term disturbance is estimated to occur from permanent pole structures and unauthorized access of the power line ROW by off-highway vehicles (OHVs), resulting in approximately 20 acres of estimated long-term surface disturbance.

2.3.1.10 Air Products 69-kV Transmission Line

A single-circuit 69-kV power line would be constructed across federal and private land from the Chimney Butte Substation located south of Calpet Road (CR 134), near U.S. 189, and a substation located at the HLF. RMP Consulting, Inc. has submitted a ROW request for the 69-kV line from the Chimney Butte Substation to the Air Products HLF site. The line would be 1,790 feet long and would include five poles; 1,080 feet and three poles would be located on BLM-administered lands. The projected disturbance of the 69-kV ROW would occur within existing ROW for the Chimney Butte Substation and the 230-kV line from the substation to Big Piney, previously addressed in the Chimney Butte EA #WY-100-EA-08-034. . Although the line would be dedicated to servicing the HLF, it would be constructed and operated by Rocky Mountain Power for Air Products, Inc.

The transmission line would be constructed above ground on wooden H-frame structures. Typical structures would be approximately 70 to 100 feet tall, located at intervals of 500 to 1,000 feet. Angles in the line may require a guyed triple-pole configuration for reinforcement. A-frame structures may be required at the HLF property fence.

2.3.1.11 AAM&WS

Cimarex would construct, operate, service, and monitor a new AAM&WS to be owned by Cimarex Energy and other Working Interest Owners of the Riley Ridge Unit. The AAM&WS would provide a regular link to either the Interagency Monitoring of Protected Environments and/or WDEQ air quality monitoring program real-time data programs. The location would be approximately 700 feet west of the multi-well pad at RRU 17-34. The station would consist of scientific equipment and a small structure, within a permanently enclosed, approximately 400-square-foot area surrounded by a chain-link fence. A permanent ROW width of 50 feet would be required for an electrical service line and communication/data line buried in the centerline of an unimproved access road. Construction of the AAM&WS is expected to take 4 weeks, require 2 to 5 heavy truckloads, and use a work crew of 10 to 20 people.

2.3.1.12 Williams Natural Gas Pipeline

Williams Pipeline Company would construct, own, and operate a natural gas pipeline expansion loop adjacent to their existing market gas pipeline. The expansion loop would be 12.7 miles long, including 9.9 miles of BLM ROW. The pipeline permanent BLM ROW would be 50 feet wide, with a 20-inch-diameter pipeline buried in a trench a minimum of 3 feet to top of pipe and 4 feet wide. The ROW width would vary when crossing private land.

The natural gas sales pipeline would not carry toxic substances and would only transport dry processed natural gas. The pipeline would be constructed parallel to an existing pipeline running from the Williams Big Piney compressor station (Section 20, T28N, R113W) to the Big Piney Trunk A pipeline (Section 14, T26N, R113W). Pipeline construction would use adjacent ROWs wherever possible.

Williams has also applied for a 25-foot temporary use area adjacent to, and along the entire length of, the permanent ROW. This corridor would be used to store the cut and spoil pile during construction. Bulldozers and/or road graders would first clear vegetation and topsoil. All available topsoil would be removed, stockpiled, and placed where it can be retrieved easily, but does not impede watershed and drainage flows. Pipeline construction is expected to take 8 weeks, require 35 to 40 heavy truckloads, and use a work crew of 25 to 40 people.

Construction of the pipeline would result in 123.2 acres of initial disturbance. Reclamation would begin immediately after pipeline construction and hydrostatic testing. All of the initially disturbed area would be recontoured and reseeded as part of an interim reclamation plan, resulting in no long-term disturbance from the pipeline.

2.3.1.13 Snow Control Structures

A snow control plan including snow fence design and recommendations for improved winter access is being prepared for Cimarex by a recognized expert in the field and registered professional engineer. Snow fencing would be installed adjacent to specific access roads, well pads, and the M&HRF to reduce drifting of snow, reduce requirements for snow removal, and improve winter operations and access. The plan would identify the exact placement and configuration of fencing, based on the BLM Preferred Alternative alignment.

2.3.1.14 Roads

The Project would use existing upgraded and two-track roads for access to the proposed pipeline and overhead transmission line ROWs; the state section with additional existing primitive roads would provide access to all production and injection wells, the M&HRF, and the AAM&WS. Use and maintenance of these access roads has been previously permitted, and all roads would be maintained using standard equipment and techniques.

Some existing road segments may require upgrading for safe passage of equipment and personnel during the course of construction and operations. Improvements may include minor spot upgrading and ditching to maintain positive drainage away from the travel way, in conformance with Cimarex's ROW grant WYW-116838. Public hazard warning signs would be placed on public roads and existing locked gates. Access road initial maintenance is expected to take three weeks. This work would take place concurrently with the construction of other Project components.

2.3.1.15 Other BLM Temporary Use Areas and Construction Practices

Directional drilling of pipelines across Beaver Creek would require two temporary work areas 150 feet wide and 100 feet long, one on either side of Beaver Creek. The drill rig would combine the 6-inch crude helium and the 8- to 12-inch residue gas lines in a tandem drill in which both pipelines are pulled through a single 16- to 18-inch-diameter borehole. The fiber optic conduit would be installed by the same drill rig using a separate 2- to 3-inch borehole offset by approximately 10 feet from the pipeline bore. The length of the directional borehole would depend on the specific stream crossing and the surrounding topography. The proposed borehole for crossing Beaver Creek would be approximately 580 feet.

Drilling of gas wells would be conducted in compliance with all federal oil and gas regulations and Onshore Orders, all WOGCC rules and regulations, and all applicable local rules and regulations. Surface-disturbing activities would include trenching, mechanical leveling, auguring, boring, grading, and vegetation clearing using standard equipment. BLM BMPs would be implemented during all construction phases.

All contractors would use design features and BMPs approved in the PFO RMP ROD, Appendix 3 (BLM 2008b). Erosion and sedimentation would be controlled by promptly revegetating all disturbed areas in the fall or spring season following construction activity and by providing surface water drainage controls, such as berms, sediment collection traps, diversion ditches, and erosion stops, as needed.

Except where identified as part of ROW applications, construction contractors would use existing disturbed areas under lease on private land for construction staging areas. Any additional temporary use areas needed on federal land would be identified in advance and included in the BLM review and permitting process.

Upon completion of construction activities, Cimarex would reclaim all construction access along the pipeline routes and transmission line. Cimarex would maintain access roads in working condition similar to or better than the original condition. When maintenance causes damage to existing roads, restoration procedures following completion of repair work would be similar to those during construction. Should more significant roadwork be required, BLM

permits would be required to authorize the road upgrades and new terms and conditions may apply.

Reclamation efforts would be ongoing, until such time as written approval is received from the BLM. All disturbed areas would be reclaimed and reseeded during frost-free periods in the spring or fall. Topsoil would be conditioned to ensure revegetation, and surfaces recontoured to their pre-construction condition. Seeding would be completed with seed mixtures of plant species indigenous to the area and approved by the BLM or applicable Conservation District.

2.3.2 Alternative 1 Project Components with Private/State Jurisdiction

2.3.2.1 Methane and Helium Recovery Facility

A Special Land Use Lease (provided in Appendix B) has been obtained from the State of Wyoming for an M&HRF to be constructed and operated by Cimarex. The location, design, and operation of the facility would be the same as that described in Section 2.2.2 under No Action Alternative.

2.3.2.2 Produced Water Injection Well

One new water injection well would be drilled on state land, as described in Section 2.2.2.2 under No Action Alternative. This water injection well would be the same for all alternatives.

2.3.2.3 Produced Water Pipeline and Utility Line

A new pipeline would be constructed on state land connecting the M&HRF with the produced water injection well, as described in Section 2.2.2.3 under No Action Alternative. This pipeline would be the same in all alternatives.

2.3.2.4 Helium Liquefaction Facility

A new HLF would be constructed on a 10-acre parcel of private land near Calpet Road and U.S. 189, south of Big Piney. The facility would be designed, constructed, owned, and operated as described in Section 2.2.2.4 under the No Action Alternative, and would be the same with all alternatives.

2.3.2.5 Construction Staging and Equipment Yard

Temporary staging, work, and access would occur at a private yard located near Calpet Road, as described in Section 2.2.2.5 under the No Action Alternative.

2.3.3 Construction Practices

Under Alternative 1, Construction would commence following APD or ROW approval and Notice to Proceed, subject to stipulations and/or COAs. Approximately 22 months of construction are anticipated to complete all essential components of the Project. The construction period may be extended to account for seasonal stipulations. Drilling and construction of many of the interrelated Project components and facilities would take place concurrently. As many as 385 construction workers would be present on the RBPA during certain periods of intensive construction from the proposed inception of the Project in 2009 through plant startup in November 2010 (see Table 2-2). Construction activity would be dispersed among various locations in the 17-mile Project corridor. Industry standard

construction management strategies would be employed to track and manage several construction crews and ensure strict adherence to the all environmental commitments and permit terms and conditions.

Additional drilling and minor construction activity involving crews of 25 to 50 persons would continue for approximately two years after plant startup and testing, as the final wells are drilled and completed, and within the M&HRF.

2.4 ALTERNATIVE 2

Alternative 2, as shown in Figure 2-3 and Map 2-2, would use private land ROWs for the Cimarex helium pipeline, fiber optic cable, natural gas pipeline, and electrical transmission line, allowing these ROW facilities to avoid sensitive wildlife habitats. Detailed description of project components within BLM jurisdiction and private and state jurisdiction is provided in Table 2-5. BLM actions under Alternative 2 would result in total temporary disturbance of 169.2 acres, with 12.0 acres of long-term disturbance. Private and state actions would result in 984.5 acres of temporary and 59.7 acres of long-term disturbance.

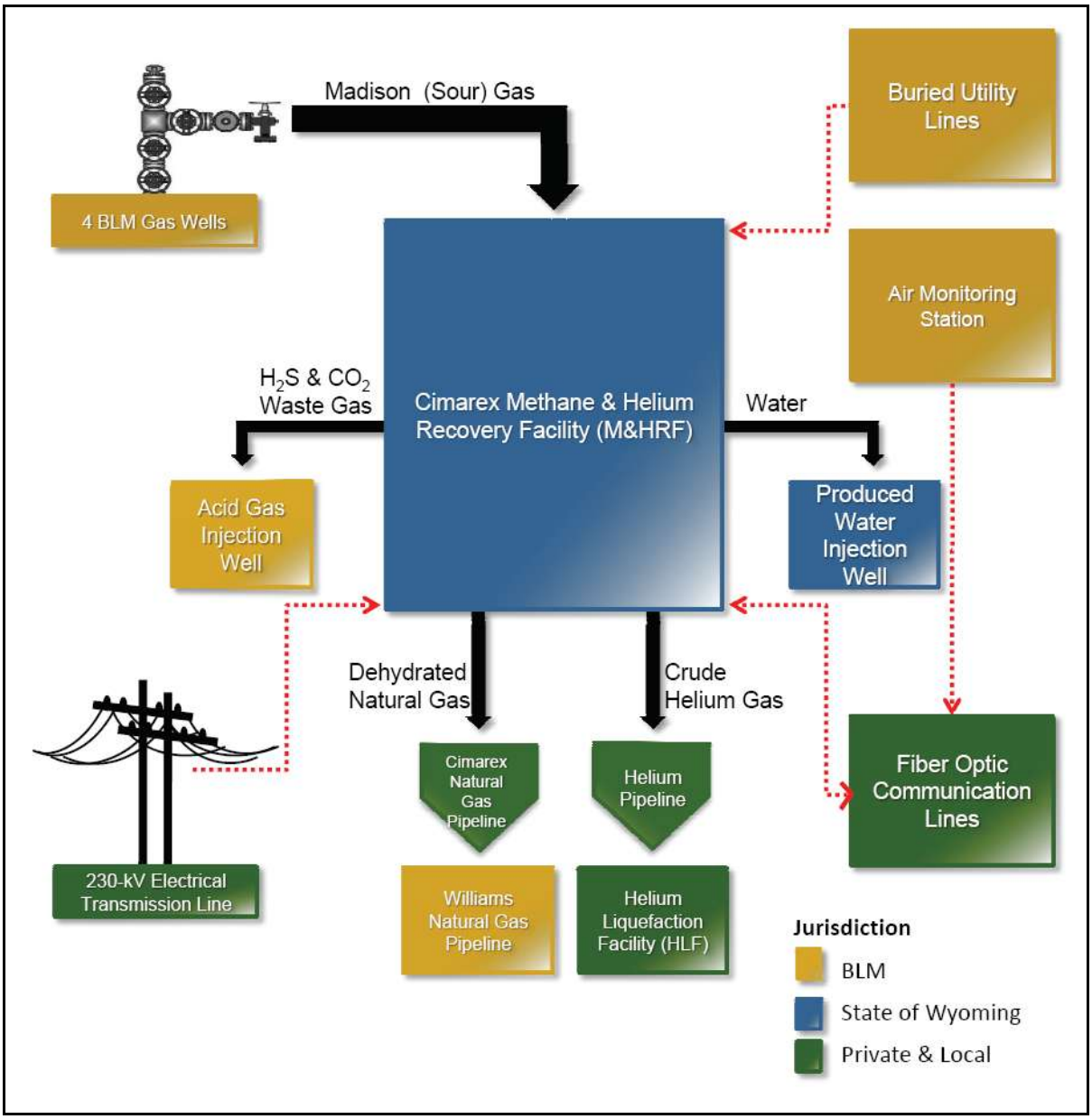


Figure 2-3. Alternative 2 major project components and jurisdictions.

Table 2-5. Alternative 2 Project Components, by Jurisdiction.

Project Component	Description	Permanent ROW Width or Grant Size	Disturbance Calculation Assumptions	# of Structure Sites or Length of Feature(s) – all ownership	Total Short-term Surface Disturbance – all ownership (acres)	Construction ROW (acres)	Total Long-term Surface Disturbance – all ownership (acres)
Alternative 2 Project Components within BLM Jurisdiction							
Natural gas wells: 2 well pads	3 wells on multi-well pad; 1 well on single-well pad. Blading, pit and berm development, drilling and construction disturbance followed by reclamation.	5 acres each site	5 acres initial with no reclamation on multi-well pad. 5 acres initial with 40% reclamation on single-well pad.	2	10.00	0	8.00
Raw gas flowlines	3 overlapping ROWs from multi-well pad; 1 partially overlapping ROW from single-well pad; bladed and trenched, followed by recontouring and reclamation.	50 feet	Average 60-foot initial disturbance width	2.4 miles	15.10	0	0
Acid gas well	Blading, pit and berm development, drilling and construction disturbance. No reclamation at shared Multi-well pad.	5 acres	5 acres shared disturbance	1	No additional disturbance	0	0
Acid gas flowline	Overlapping ROW, bladed and trenched, followed by recontouring and reclamation.	50 feet	Overlapping 60-foot ROW disturbance width	1.45 miles	No additional disturbance	0	0
Cimarex gas pipeline	Blading and trenching, followed by recontouring and reclamation.	50 feet	100-foot initial disturbance width (adjacent 50-foot temporary use corridor)	1.3 miles	15.90	0.65	0
Underground fiber optic cable	Shared ROW with other facilities; trenching or plowing followed by reclamation.	30 feet	Plowed trench from Calpet Road to M&HRF, gas wells, and AAM&WS	17.2 miles shared with helium ROW; 3.97 miles shared with electrical line.	No additional disturbance	0	0
Underground electrical distribution	Shared ROW with other facilities; trenching or plowing followed by reclamation.	30 feet	Average 30-foot initial disturbance width	2.6 miles	0.40	0	0
Other out-of ROW permitted temporary use	To be determined in semi-final design and BLM Temporary Use Permit.	TBD	TBD	NA	TBD	TBD	TBD
AAM&WS	Vegetation crushing. Plow in conduit, install fence, followed by reclamation.	4-acre site	4-acre construction area	1	4.00	None	4.00
Williams pipeline	Blading and trenching, followed by recontouring and reclamation.	50-foot federal ROW; 75-foot private/state	50- + 25-foot temporary use for initial disturbance width (federal); 75- + 25-foot temporary use for initial disturbance with private/state.	12.7 miles	123.70	30.00	0
Snow control structures	Crushing and leveling of vegetation by equipment during structure installation.	30 feet	TBD	TBD	TBD	TBD	TBD
Access roads	Maintain and use existing access roads per existing ROW grant WYW-116838, along with state permits and private grants.	30 feet	Existing roads only--no new disturbance	23.0 miles	No additional disturbance	N/A	N/A
Air Products 69 kV transmission line	Augering of wooden poles, followed by back-fill; blading or crushing of vegetation for equipment access and construction, followed by recontouring and revegetation	150 feet, partially within an existing ROW	5 single poles, 3 of which are on federal ground	0.40 mile	26.50	None	<0.001
Total BLM Disturbance					**195.60**	**30.70**	**12.00**

Project Component	Description	Permanent ROW Width or Grant Size	Disturbance Calculation Assumptions	# of Structure Sites or Length of Feature(s) – all ownership	Total Short-term Surface Disturbance – all ownership (acres)	Construction ROW (acres)	Total Long-term Surface Disturbance – all ownership (acres)
Alternative 2 Project Components within Private/State Jurisdiction							
M&HRF	Complete conversion to industrial site.	State grant	34	1	33.90	N/A	10.00
Produced water injection well	Blading, pit and berm development, construction disturbance followed by approximately 40% reclamation.	State grant	5 acres	1	5.00	N/A	3.00
Produced water pipeline (with fiber optic and electrical)	Blading, trenching, followed by 100% recontouring and reclamation of flowline. No additional disturbance from 0.57 mile overlapped with BLM utility ROW.	State grant	40-foot initial disturbance width	0.43 mile separate state easement	2.10	N/A	None
Cimarex gas pipeline	Blading and trenching, followed by recontouring and reclamation (partially overlapping ROW with helium pipeline and fiber optic cable).	Private grants	100-foot initial disturbance width (adjacent 50-foot temporary use corridor)	8.6 miles	94.7	N/A	0
Temporary use areas for directional drilling of stream crossings	Blading and excavation of temporary access and boring equipment pads, followed by recontouring and reclamation.	Private grants	150- by 100-foot initial disturbance width	TBD by private landowners	TBD	N/A	0
Helium pipeline and underground fiber optic cable	Blading and trenching, followed by recontouring and reclamation. Partially overlapping ROW with gas pipeline for 8.0 miles.	50 feet	100-foot initial disturbance for 8.6 miles from M&HRF to Williams pipeline corridor; 50-foot construction corridor for 12.4 miles from Williams pipeline to HLF.	8.6 miles × 100 feet + 11.7 miles × 50 feet (21 miles total)	236.10	N/A	0
Cimarex transmission line	Augering of wooden and steel monopoles, followed by back-fill; blading or crushing of vegetation for equipment access and construction, flowed by recontouring and revegetation.	150 feet	63 H-frame structures (126 wooden poles); 15 steel monopole structures; 9 pulling and tensioning pads; 3 dead-end structure (9 poles)	20.5 miles	372.50	N/A	<0.05
Long-term two-track access	Long-term disturbance from two-track access road along transmission ROW (unless prohibited by landowner agreement).	N/A	10-foot disturbance width	20.5 miles	24.70	N/A	24.70
HLF	Complete conversion to industrial site.	Private ownership	10 acres	1	10.00	N/A	10.00
Construction staging/equipment yard	Blading with packed gravel cover. No reclamation is planned.	Private grant	10 acres	1	10.00	N/A	0
Total Private/State Disturbance					**789.00**	**N/A**	**47.70**
Estimated Total Disturbance (Acres)					**984.50**	**30.70**	**59.70**

AAM&WS = ambient air monitoring and weather station
BLM = Bureau of Land Management
HLF = helium liquefaction facility
M&HRF = methane and helium recovery facility
N/A = not applicable
ROW = right-of-way
TBD = to be determined

2.4.1 Alternative 2 Project Components with BLM Jurisdiction

2.4.1.1 Gas Wells and Raw Gas Flowlines

The location, drilling and completion techniques, flowline locations, and reclamation for the four Madison Formation gas wells and their raw gas flowlines would be the same in Alternative 2 as described for Alternative 1.

2.4.1.2 Acid Gas Injection Well and Flowline

The acid gas injection well and the acid gas flowline from the M&HRF to the injection well would have the same location, drilling and construction plan, and operation as in Alternative 1. The target formation for injection of acid gas would be the Madison Formation.

2.4.1.3 Cimarex Gas Pipeline

BLM actions with Alternative 2 would include approximately 1.3 miles of Cimarex gas pipeline from the point at which the pipeline enters the federal ROW parallel to the Williams pipeline in Section 10, T29N, R113W, until reaching the Hare‘s Ear Compressor and tie-in point. Construction of this pipeline section would result in approximately 16 acres of initial disturbance, all of which would be recontoured and reclaimed following construction. The main length of the Cimarex pipeline would consist of private and state surface ownership and would be outside of BLM jurisdiction.

2.4.1.4 Underground Fiber Optic Data Cable and Electrical Distribution

BLM actions in Alternative 2 would include fiber optic cable and electrical distribution lines in overlapping ROW to reach the federal wells and the AAM&WS. As with Alternative 1, these features would result in 2.6 miles of new ROW disturbance.

2.4.1.5 AAM&WS

The location, design, and construction methods for the AAM&WS would be the same for Alternative 2 as Alternative 1.

2.4.1.6 Williams Pipeline

Alternative 2 would still require that the 12.6-mile natural gas expansion loop be constructed within and parallel to the existing Williams market gas pipeline ROW in Sublette and Lincoln counties. This would be the same location, design, construction method, and surface disturbance as with Alternative 1.

2.4.1.7 Air Products 69-kV Transmission Line

There would be no change in the location or design of the 69-kV transmission line from the Chimney Butte Substation to the HLF compared with Alternative 1.

2.4.1.8 Snow Control Structures and Access Roads

As with Alternative 1, the location and design of snow control structures would need to be determined for Alternative 2, and existing BLM roads would be the only access to and from the Project.

2.4.2 Alternative 2 Project Components with Private/State Jurisdiction

2.4.2.1 M&HRF

There would be no change in the location, design, construction methods, or operation of the M&HRF compared with No Action and Alternative 1.

2.4.2.2 Produced Water Injection Well and Flowline

There would be no change in the location, design, construction methods, or operation of the produced water injection well and flowline compared with No Action and Alternative 1.

2.4.2.3 Cimarex Gas Pipeline

The Cimarex product gas pipeline would change location, as shown in Map 2-1, but other aspects of design or operation with Alternative 2 would not change from Alternative 1. The pipeline would leave the M&HRF and state section in a northeast direction and downslope, across private lands, and crossing South Piney Creek at the base of Riley Ridge. The pipeline would then proceed northeast and east to cross the Middle Piney Creek before intercepting the Williams pipeline.

The exact alignment and terms and conditions for pipeline construction would depend on specific landowner agreements. To the extent that these agreements would allow, the pipeline would have overlapping ROW with the 230-kV transmission line, helium pipeline, and fiber optic cable, as shown in Table 2-3, to reduce surface disturbance.

For purposes of this document, it is assumed that the private permanent ROW corridors for the Cimarex natural gas pipeline would be 50 feet wide, and would be parallel and adjacent to the transmission line ROW (150 feet), the helium pipeline/fiber optic cable ROW (50 feet), for a total 250-foot ROW for the 8.0-mile alignment from the M&HRF to the Williams pipeline ROW, as indicated in Table 2-3. At this point, the natural gas pipeline would overlap with the Williams ROW, turning south to parallel the existing market gas pipeline until reaching the tie-in point at the Hare‘s Ear Compressor, a distance of 0.8 mile.

2.4.2.4 Temporary Use Areas and Drilling of Stream Crossings

Private access roads and other temporary use areas would be established to provide equipment access to pipelines and transmission lines across private lands in Alternative 2. In addition, Alternative 2 could cross South Piney Creek and Middle Piney Creek twice with two pipelines and a fiber optic cable. The location and construction methods for pipeline and fiber optic stream crossings would depend on landowner preference and other permit requirements. If trenching of stream crossings is not allowed, additional private temporary use areas would be required on either side of the stream crossing to conduct directional bores.

2.4.2.5 Helium Pipeline and Fiber Optic Cable

In Alternative 2, the exact location of the private ROW alignments would depend on landowner permissions. The helium pipeline and fiber optic cable would exit the M&HRF in overlapping ROWs parallel to the Cimarex gas pipeline and would remain on private and state land until reaching their destination at the HLF and Calpet Road, a total distance of approximately 21 miles, depending on landowner agreements. It is assumed that the private permanent ROW corridors for the helium pipeline/fiber optic cable would be 50 feet wide,

and would be parallel and adjacent to the transmission line ROW (150 feet) and the Cimarex natural gas pipeline ROW (50 feet), for a total 250-foot ROW for the 8.0-mile alignment from the M&HRF to the Williams pipeline ROW, as indicated in Table 2-3.

To the extent of landowner authorization, the parallel facilities would cross South Piney Creek and Middle Piney Creek in T29N, R113W, before separating from the Cimarex gas pipeline ROW. The helium pipeline/fiber optic ROW and transmission line ROW corridors would then continue east after crossing the Williams pipeline. The ROWs would remain parallel and adjacent to one another on the north side of Middle Piney Creek, striking an angle to the northeast to cross CR 180, then turn to the east again at the intersection of CR 180 and CR 111, remaining parallel to and just south of CR 111 for approximately 5 miles.

Near the intersection of CR 141 and CR 111, the parallel transmission line and helium pipeline/fiber optic ROWs would turn to the southeast and south until reaching the ROW for an existing 69-kV transmission line just south and west of the Big Piney Substation. At this second transmission line, the 230-kV transmission line ROW and the helium pipeline/fiber optic ROWs would turn south and remain parallel and on the west side of the existing transmission line ROW. The parallel facilities would cross Middle Piney Creek, South Piney Creek, and CR 151. Approximately 0.5 mile north of Calpet Road the helium pipeline/fiber optic cable would turn to the east and terminate at the location previously identified for the HLF.

2.4.2.6 Cimarex Transmission Line

The private land route of the 230-kV overhead transmission line estimated for Alternative 2 would be approximately 21.7 miles long, with a 150-foot permanent ROW corridor. The design and construction would be the same as with Alternative 1. The overland route for the Cimarex transmission line would terminate at the existing Chimney Butte 230-kV Substation south of Calpet Road

As with other private ROWs identified in Alternative 2, the BLM would have no decision jurisdiction. Final facility alignments in Alternative 2 would vary depending on landowner preferences, private lease arrangements, and geotechnical studies for secure pole and pipeline placement. The preferred stream crossing method for pipelines would be to trench through and restore, unless landowners dictate otherwise.

For purposes of comparing this alternative with others, it is assumed that the permanent ROW corridors would be the same for private land agreements as in BLM permits for the transmission line (150 feet), natural gas pipeline (50 feet), and helium pipeline/fiber optic line (50 feet), and would parallel each other along the entire route. All ROWs would be adjacent to each other, resulting in a 250-foot-wide corridor until reaching the Williams pipeline corridor, and a 200-foot-wide corridor to the east of the Williams pipeline.

2.4.2.7 HLF

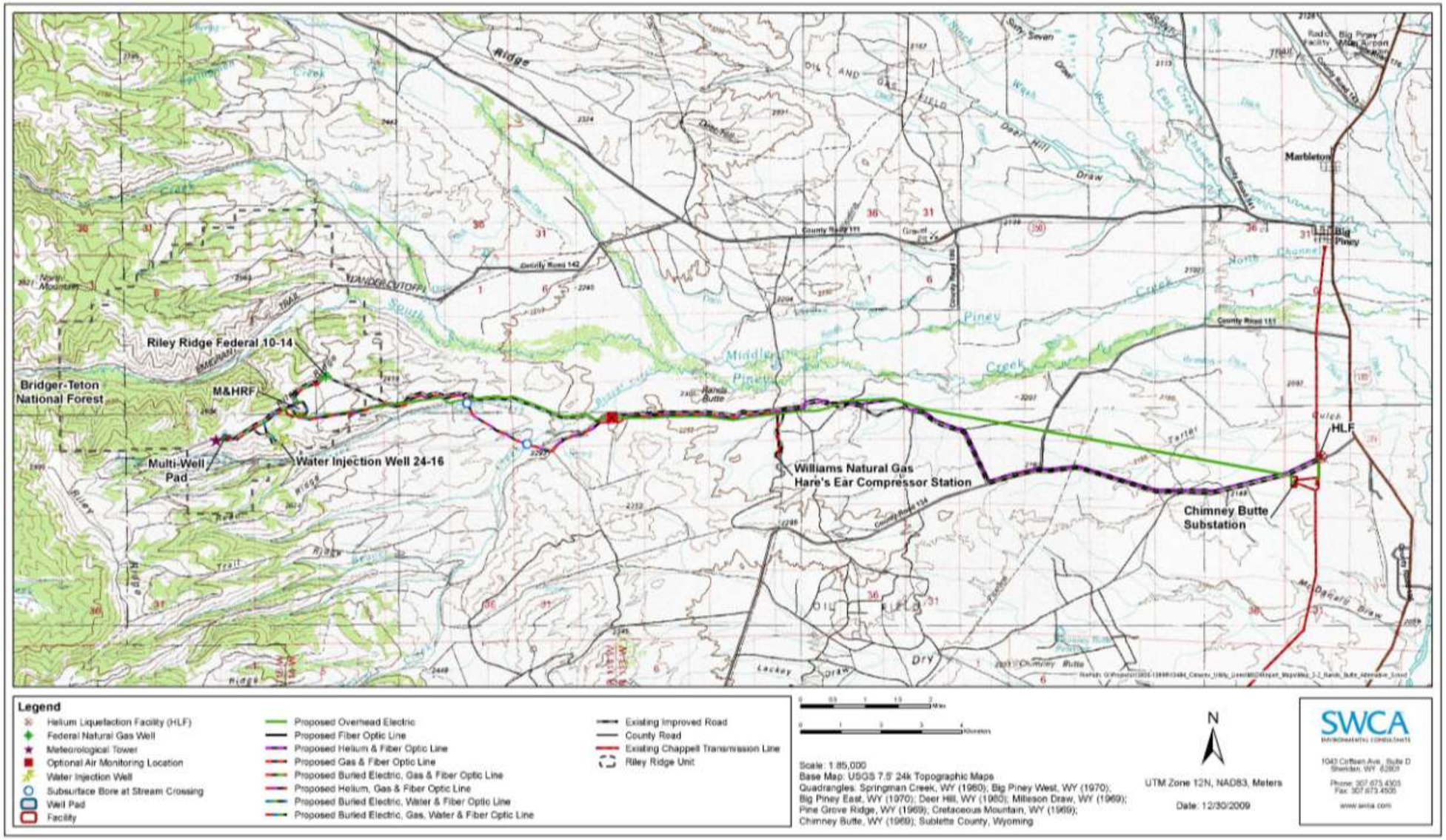
There would be no change in the location, design, construction methods, or operation of the HLF compared with Alternative 1.

2.4.2.8 Construction Staging/Equipment Yard

There would be no change in the location, design, construction methods, or operation of the 10-acre construction staging and equipment yard compared with Alternative 1.

2.5 ALTERNATIVE 3 (BLM PREFERRED ALTERNATIVE)

Alternative 3 would use alternative design features and location of some project components, compared with Alternative 1, with the goal of reducing overall surface disturbance for BLM jurisdictional components. Map 2-3 and Figure 2-3 provide an overview of the alternative. Detailed description of Alternative 3 Project components within BLM jurisdiction and private and state jurisdiction is provided in Table 2-6. BLM actions would result in temporary disturbance to 631.3 acres, with 25.7 acres of long-term disturbance. Private and state actions would result in 61.0 acres of temporary and 23.0 acres of long-term disturbance, as discussed in the sections below.



Map 2-3. Alternative 3 infrastructure detail.

Table 2-6. Alternative 3 Project Components, by Jurisdiction.

Project Component	Description	Permanent ROW Width or Grant Size	Disturbance Calculation Assumptions	# of Structure Sites or Length of Feature(s) – all ownership	Total Short-term Surface Disturbance – all ownership (acres)	Construction ROW (acres)	Total Long-term Surface Disturbance – all ownership (acres)
Alternative 3 Project Components within BLM Jurisdiction							
Natural gas wells: 2 well pads	3 wells on multi-well pad; 1 single-well pad. Blading, pit and berm development, drilling and construction disturbance followed by reclamation.	5 acres each site	5 acres initial with no reclamation on multi-well pad. 5 acres initial with 40% reclamation on single-well pad.	2	10.00	0	8.00
Raw gas flowlines	3 overlapping ROWs from multi-well pad; 1 partially overlapping ROW from single-well pad; bladed and trenched, followed by recontouring and reclamation.	50 feet	Average 60-foot initial disturbance width	2.4 miles	15.10	0	0
Acid gas well	Blading, pit and berm development, drilling and construction disturbance. No reclamation at shared multi-well pad.	5 acres	5 acres shared disturbance	1	No additional disturbance	0	0
Acid gas flowline	Overlapping ROW, bladed and trenched, followed by recontouring and reclamation.	50 feet	Overlapping 60-foot ROW disturbance width	1.45 miles	No additional disturbance	0	0
Cimarex gas pipeline	Blading and trenching, followed by recontouring and reclamation	50 feet	60-foot initial disturbance width (adjacent 10-foot temporary use corridor, ROW and shared trench with helium pipeline and fiber optic cable).	8.9 miles of total new pipeline disturbance. 8.1 miles of shared ROW	88.70	44.35	0.2
Temporary use areas for directional drilling of stream crossings	Blading and excavation of temporary access and boring equipment pads, followed by recontouring and reclamation.	0	150- by 100-foot initial disturbance width--new disturbance only if outside ROW.	4 (1 on each side of Beaver Creek; Spring Creek)	0.50	0.50	0
Helium pipeline	Blading and trenching, followed by recontouring and reclamation.	50 feet	60-foot (50 foot ROW plus 10 foot TUA) initial disturbance for 8.1 miles from M&HRF to Williams pipeline corridor shared with other facilities; 50-foot construction corridor for 9.2 miles from Williams pipeline to HLF, with TUAs if needed.	17.3 miles total length	54.20	27.10	0
Underground fiber optic cable	Shared ROW with other facilities; trenching or plowing followed by reclamation.	30 feet	Plowed trench from Calpet Road to M&HRF, gas wells, and AAM&WS	21.17 miles total: 18.1 miles overlapping with helium ROW. 3.07 miles overlapping with sour gas and underground electrical ROW.	No additional disturbance	0	0
Underground electrical distribution	Shared ROW with other facilities; trenching or plowing followed by reclamation.	30 feet	Average 30-foot initial disturbance width	2.6 miles	0.40	0	0
Cimarex 230 kV transmission line	Augering of wooden and steel monopoles, followed by back-fill; blading or crushing of vegetation for equipment access and construction, flowed by recontouring and revegetation.	150 feet (4.97 miles with 75 feet of shared ROW)	79 H-frame structures (158 wooden poles); 35 steel monopole structures; 2 pulling and tensioning pads; 3 dead-end structures (9 poles)	15.9 miles	293.40	12.70 (dead-end structure)	0.05

Project Component	Description	Permanent ROW Width or Grant Size	Disturbance Calculation Assumptions	# of Structure Sites or Length of Feature(s) – all ownership	Total Short-term Surface Disturbance – all ownership (acres)	Construction ROW (acres)	Total Long-term Surface Disturbance – all ownership (acres)
Long-term ROW disturbance (two-track)	Unauthorized use of transmission line ROW by off-road vehicles.	N/A	10-foot disturbance width in areas where transmission ROW is more than 200 feet from improved road	8.87 miles	10.76	0	9.40
AAM&WS	Vegetation crushing. Plow in conduit, install fence, followed by reclamation.	4-acre site	4-acre construction area	2	8.00	None	8.00
Williams pipeline	Blading and trenching, followed by recontouring and reclamation.	50-foot federal ROW; 75-foot private/state	50- +25-foot temporary use for initial disturbance width (federal); 75- + 25-foot temporary use for initial disturbance with private/state.	12.7 miles	123.70	30.00	0
Snow control structures	Crushing and leveling of vegetation by equipment during structure installation.	30 feet	TBD	TBD	TBD	TBD	TBD
Access roads	Maintain and use existing access roads per existing ROW grant WYW-116838, along with state permits and private grants.	30 feet	Existing roads only--no new disturbance	23.0 miles	No additional disturbance	N/A	N/A
Air products transmission line	Includes poles, pulling and tensioning, and construction disturbance from Chimney Butte Substation to HLF.	Private grant, 150-foot width	Partial 500-foot radius + 1,812 feet × 150-foot width	0.4 mile	26.50	N/A	<0.01
Total BLM Disturbance					**631.30**	**114.70**	**25.70**
Alternative 3 Project Components within Private/State Jurisdiction							
M&HRF	Complete conversion to industrial site.	State grant	34	1	33.90	N/A	10.00
Produced water injection well	Blading, pit and berm development, construction disturbance followed by approximately 40% reclamation.	State grant	5 acres	1	5.00	N/A	3.00
Produced water pipeline (with fiber optic and electrical)	Blading, trenching, followed by 100% recontouring and reclamation of flowline.	State grant	40-foot initial disturbance width	0.43 mile separate state easement + no additional disturbance from 0.57 mile overlapped with BLM utility ROW	2.10	N/A	None
HLF	Complete conversion to industrial site.	Private ownership	10 acres	1	10.00	N/A	10.00
Construction staging/equipment yard	Blading with packed gravel cover. No reclamation is planned.	Private grant	10 acres	1	10.00	N/A	0
Total Private/State Disturbance					**61.00**	**N/A**	**23.00**
Estimated Total Disturbance (Acres)					**692.30**	**114.70**	**48.70**

AAM&WS = ambient air monitoring and weather station
BLM = Bureau of Land Management
HLF = helium liquefaction facility
M&HRF = methane and helium recovery facility
N/A = not applicable
ROW = right-of-way
TBD = to be determined

2.5.1 Alternative 3 Project Components with BLM Jurisdiction

2.5.1.1 Gas Wells and Raw Gas Flowlines

In Alternative 3 there would be no change in the location, design, drilling methods, or operation of the four federal Madison Formation gas wells or the raw gas flowlines connecting the wells with the M&HRF, compared with Alternative 1.

Detailed description of project components within BLM jurisdiction and private and state jurisdiction is provided in Table 2-6.

2.5.1.2 Acid Gas Injection Well and Flowline

The acid gas injection well and the acid gas flowline from the M&HRF to the injection well would have the same location, drilling and construction plan, and operation as in Alternative 1. The target formation for injection of acid gas would be the Madison Formation.

2.5.1.3 Cimarex Gas Pipeline and Helium Pipeline/Fiber Optic Cable

In Alternative 3, the Cimarex natural gas pipeline, as shown in Map 2-2, would consist of all components and operations identified for Alternative 1, but the location, construction methods, and ROW width would be unique to this alternative.

Table 2-4 identifies pipeline design features for Alternative 3. The permanent ROW would be 50 feet wide for each facility (natural gas pipeline, helium pipeline, and fiber optic cable. However, the ROW for the gas pipeline would be completely overlapped with the ROWs for the helium pipeline and fiber optic cable, allowing the two pipelines and fiber optic cable to share a trench in order to reduce surface disturbance. In addition, 4.97 miles of the shared pipeline corridor would also be shared with overhead transmission lines.

A single 10-foot temporary use area adjacent to the centerline of the shared ROW would allow for construction of the facilities. Additional TUAs may be granted by BLM as necessary to allow for construction in steep terrain, such as west of Beaver Creek, and for boring beneath both Spring Creek and Beaver Creek (see Section 2.5.1.4). As with Alternative 1, the fiber optic line would also share the pipeline trench. The alignment of the shared pipeline ROW would be the same as Alternative 1 between the M&HRF and the Williams pipeline ROW. The pipeline construction corridor width would be reduced from 200 feet for all three parallel facilities in Alternatives 1 and 2, to 60 feet total disturbance width for Alternative 3, except where additional temporary use areas are needed.

At the Williams pipeline ROW, the natural gas pipeline would turn south to parallel and overlap the existing pipeline ROW, while the helium pipeline/fiber optic cable would continue in a shared trench with ROWs remaining overlapped within the 50-foot ROW until reaching the HLF near Calpet Road with TUAs on a site specific basis as needed.

2.5.1.4 Temporary Use Areas for Directional Drilling of Stream Crossings

Alternative 3 would include boring the pipelines at both the Spring Creek and Beaver Creek crossings. Temporary equipment pads would be leveled on the slope on either side of each creek to place the boring equipment, resulting in 0.44 acre of temporary disturbance. After the bore is completed and the pipelines are placed, the surface disturbance would be reclaimed.

2.5.1.5 Underground Fiber Optic Cable and Electrical Distribution

There would be no change in the location, design, construction methods, or operation of the underground fiber optic or electrical distribution lines compared with Alternative 1.

2.5.1.6 Cimarex Transmission Line

The Cimarex 230-kV transmission line would be located adjacent to existing access roads for most of the distance between the M&HRF and the Chimney Butte Substation, as shown in Map 2-2. This alternative would avoid crossing Spring Creek, and would cross Beaver Creek downstream from the pipeline crossing compared to Alternative 1. The transmission line would require steel monopoles near the Beaver Creek crossing to avoid interference with irrigation ditches and the access road.

The transmission design includes approximately 15.9 miles of high-voltage transmission ROW with 35 steel monopole structures, 3 wooden dead-end structures, and 79 wooden H-frame transmission structures. The ROW would be 150 feet wide, but would have 75 feet of the ROW shared with either the pipeline or road ROW for distance of 4.97 miles, as shown in Table 2-6.

2.5.1.7 Air Products Transmission Line

There would be no change in the location or design of the 69-kV transmission line crossing BLM land from the Chimney Butte Substation to the HLF, as described under Alternative 1.

2.5.1.8 AAM&WS

There would be no change in the location, design, construction methods, or operation of the AAM&WS compared with Alternative 1.

2.5.1.9 Williams Pipeline

There would be no change in the location, design, construction methods, or operation of the Williams Natural Gas Expansion Loop compared with Alternative 1.

2.5.1.10 Snow Control Structures

As with Alternative 1, the location and design snow control structures would be determined in final design for the BLM Preferred Alternative.

2.5.1.11 Access Roads

As with Alternative 1, only existing permitted road use would be allowed, and road maintenance would be in accordance with existing permits and BLM BMPs.

2.5.2 Alternative 3 Project Components with Private or State Jurisdiction

2.5.2.1 M&HRF

There would be no change in the location, design, construction methods, or operation of the M&HRF compared with Alternative 1.

2.5.2.2 Produced Water Injection Well and Flowline

There would be no change in the location, design, construction methods, or operation of the produced water injection well and flowline compared with Alternative 1.

2.5.2.3 HLF

There would be no change in the location, design, construction methods, or operation of the HLF compared with Alternative 1.

2.5.2.4 Construction Staging/Equipment Yard

There would be no change in the location, design, construction methods, or operation of the 10-acre construction staging and equipment yard compared with Alternative 1.

2.6 ALTERNATIVE 4

Alternative 4 would provide an alternative approach to energizing the M&HRF, as shown in Figure 2-4. In this alternative, Cimarex would construct and operate a gas-fired electrical generating station (EGS) on 7 acres of State of Wyoming land near the M&HRF, with an ancillary 0.5-mile pipeline and transmission line, as shown in Map 2-4. The gas for this plant would come from new or existing wells within the production field. Figure 2-4 illustrates the project components based on regulatory jurisdiction. A detailed description of Alternative 4 Project components within BLM jurisdiction and private and state jurisdiction is provided in Table 2-7. Under Alternative 4, BLM actions would result in temporary disturbance to 492.4 acres, with 12.2 acres of long-term disturbance from activities authorized by BLM. Private and state actions would result in 78.4 acres of temporary and 42.4 acres of long-term disturbance, as discussed in the sections below.

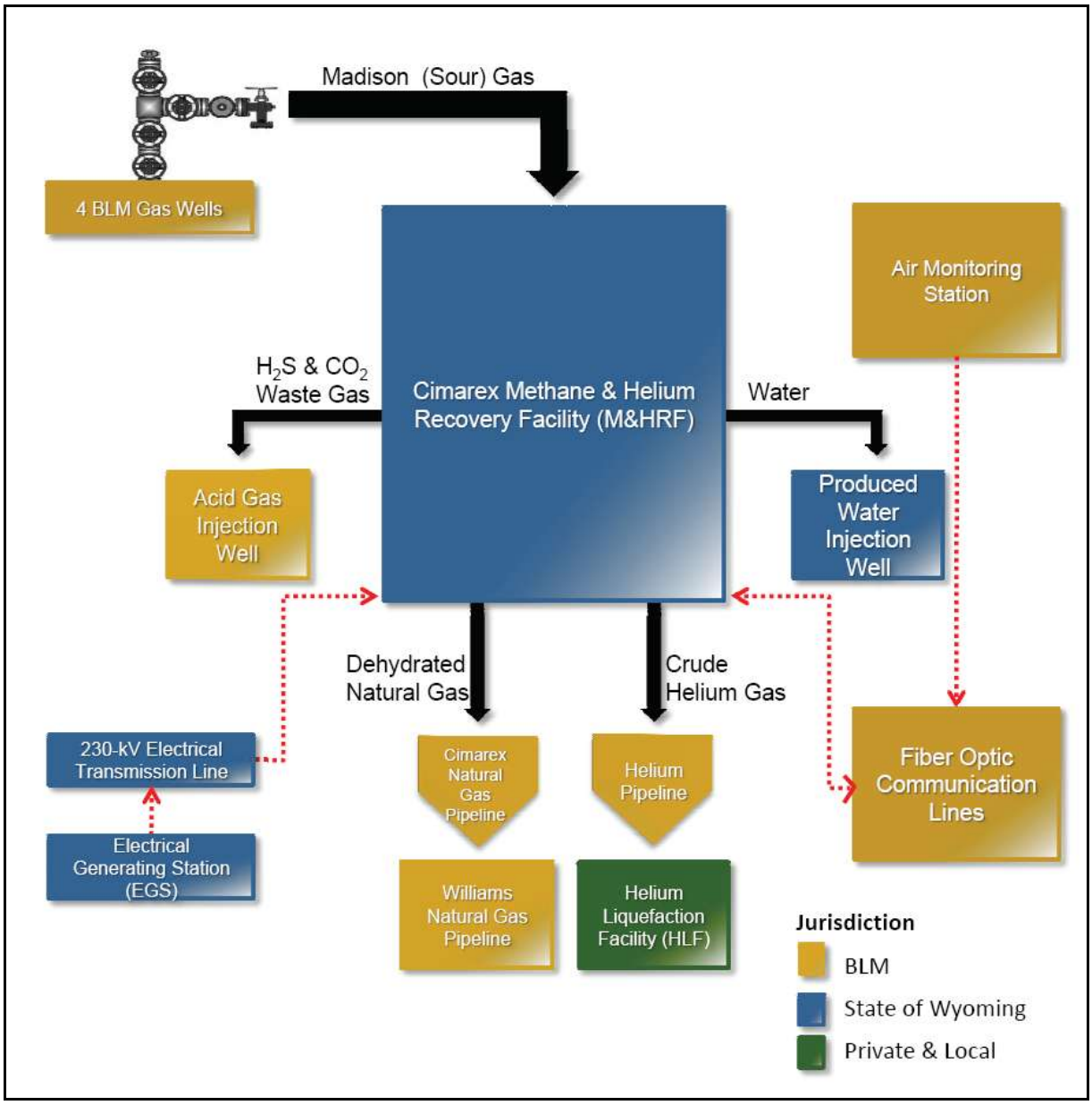


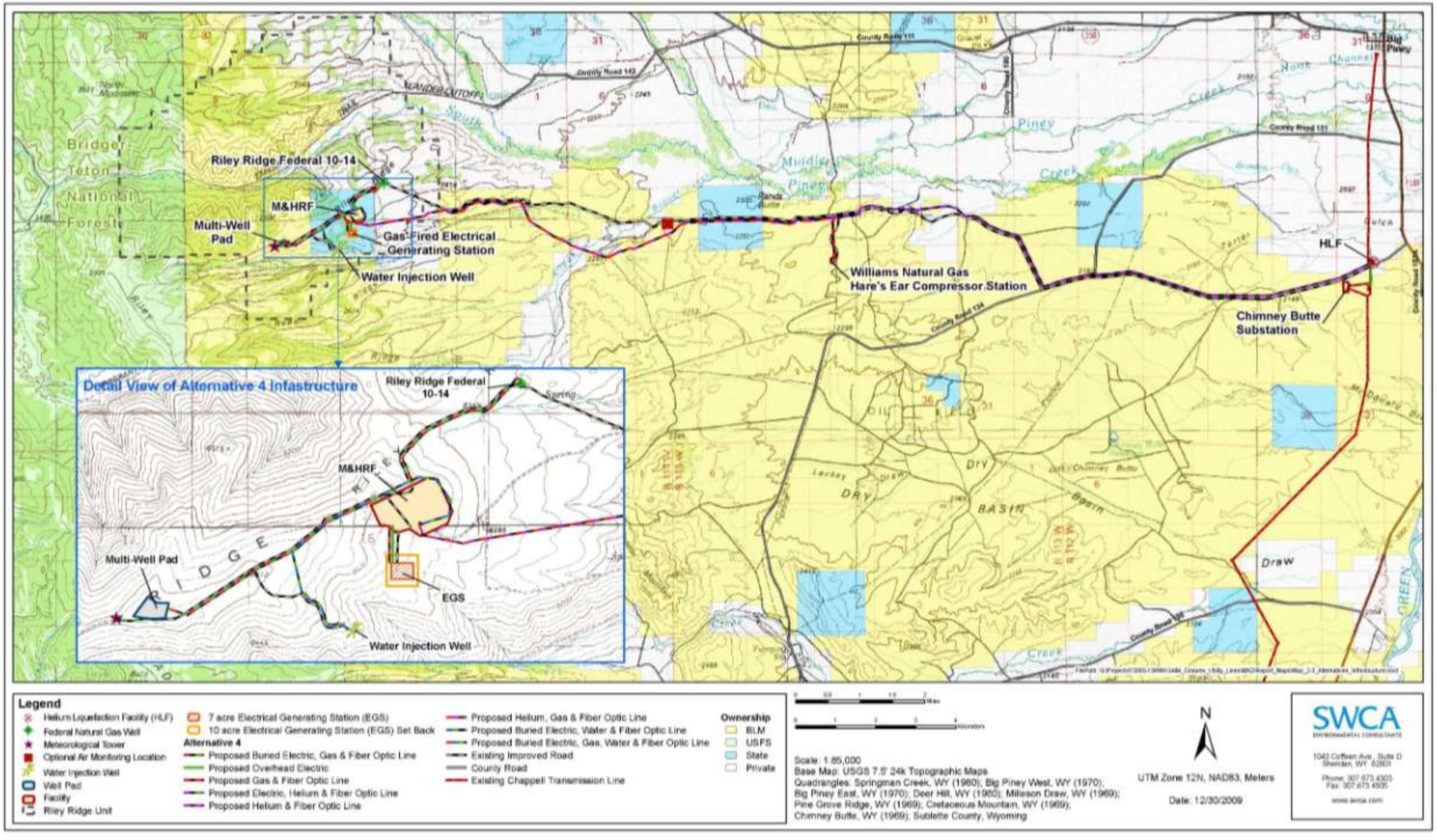
Figure 2-4. Alternative 4 major Project components and jurisdictions.

Table 2-7. Alternative 4 Project Components, by Jurisdiction.

Project Component	Description	Permanent ROW Width or Grant Size	Disturbance Calculation Assumptions	# of Structure Sites or Length of Feature(s) – all ownership	Total Short-term Surface Disturbance – all ownership (acres)	Construction ROW (acres)	Total Long-term Surface Disturbance – all ownership (acres)
Alternative 4 Project Components within BLM Jurisdiction							
Natural gas wells: 2 well pads	3 wells on multi-well pad; 1 well on single-well pad. Blading, pit and berm development, drilling and construction disturbance followed by reclamation.	5 acres each site	5 acres initial with no reclamation on multi-well pad. 5 acres initial with 40% reclamation on single-well pad.	2	10.00	0	8.00
Raw gas flowlines	3 overlapping ROWs from multi-well pad; 1 partially overlapping ROW from single-well pad; bladed and trenched, followed by recontouring and reclamation.	50 feet	Average 60-foot initial disturbance width	2.4 miles	15.10	0	0
Acid gas well	Blading, pit and berm development, drilling and construction disturbance. No reclamation at shared multi-well pad.	5 acres	5 acres shared disturbance	1	No additional disturbance	0	0
Acid gas flowline	Overlapping ROW, bladed and trenched, followed by recontouring and reclamation.	50 feet	Overlapping 60-foot ROW disturbance width	1.45 miles	No additional disturbance	0	0
Cimarex gas pipeline	Blading and trenching, followed by recontouring and reclamation.	50 feet	100-foot initial disturbance width (adjacent 50-foot temporary use corridor)	8.8 miles	106.20	53.10	0.20
Temporary use areas for directional drilling of stream crossings	Blading and excavation of temporary access and boring equipment pads, followed by recontouring and reclamation.	0	150- by 100-foot initial disturbance width--new disturbance only if outside ROW.	2 (1 each side of Beaver Creek)	0.12	0.12	0
Helium pipeline	Blading and trenching, followed by recontouring and reclamation.	50 feet	100-foot initial disturbance for 8.0 miles from M&HRF to Williams pipeline corridor; 50-foot construction corridor for 9.2 miles from Williams pipeline to HLF.	8.0 miles × 100 feet + 9.2 miles × 50 feet (17.2 miles total)	206.4	103.20	0
Underground fiber optic cable	Shared ROW with other facilities; trenching or plowing followed by reclamation.	30 feet	Plowed trench from Calpet Road to M&HRF, gas wells, and AAM&WS	17.2 miles shared with helium ROW; 3.97 miles shared with sour gas and underground electrical ROW	No additional disturbance	0	0
Underground electrical distribution	Shared ROW with other facilities; trenching or plowing followed by reclamation.	30 feet	Average 30-foot initial disturbance width	2.6 miles	0.40	0	0
AAM&WS	Vegetation crushing. Plow in conduit, install fence, followed by reclamation.	4-acre site	4-acre construction area	1	4.00	None	4.00
Williams pipeline	Blading and trenching, followed by recontouring and reclamation.	50-foot federal ROW; 75-foot private/state	50- +25-foot temporary use for initial disturbance width (federal); 75- + 25-foot temporary use for initial disturbance with private/state.	12.7 miles	123.70	30.00	0
Snow control structures	Crushing and leveling of vegetation by equipment during structure installation.	30 feet	TBD	TBD	TBD	TBD	TBD
Access roads	Maintain and use existing access roads per existing ROW grant WYW-116838, along with state permits and private grants.	30 feet	Existing roads only--no new disturbance	23.0 miles	No additional disturbance	N/A	N/A

Project Component	Description	Permanent ROW Width or Grant Size	Disturbance Calculation Assumptions	# of Structure Sites or Length of Feature(s) – all ownership	Total Short-term Surface Disturbance – all ownership (acres)	Construction ROW (acres)	Total Long-term Surface Disturbance – all ownership (acres)
Air products transmission line	Includes poles, pulling and tensioning, and construction disturbance from Chimney Butte Substation to HLF.	Private grant, 150-foot width	Partial 500-foot radius + 1,812 feet × 150-foot width	0.4 miles	26.50	N/A	<0.01
Total BLM Disturbance					**492.40**	**186.40**	**12.200**
Alternative 4 Project Components within Private/State Jurisdiction							
M&HRF	Complete conversion to industrial site.	State grant	34	1	33.90	N/A	10.00
Produced water injection well	Blading, pit and berm development, construction disturbance followed by approximately 40% reclamation.	State grant	5 acres	1	5.00	N/A	3.00
Produced water pipeline (with fiber optic and electrical)	Blading, trenching, followed by 100% recontouring and reclamation of flowline.	State grant	40-foot initial disturbance width	0.43 mile separate state easement + no additional disturbance from 0.57 mile overlapped with BLM utility ROW	2.10	N/A	None
HLF	Complete conversion to industrial site.	Private ownership	10 acres	1	10.00	N/A	10.00
Cimarex transmission line	Includes poles, pulling and tensioning, and Construction disturbance. Auger poles, followed by rock or concrete backfill. Temporary vegetation crushing and driving disturbance; blading as necessary.	150 feet	2 steel monopoles w/6-foot buffer, 1 dead-end structure; 1 pulling & tensioning pad, and ROW construction disturbance	740 feet	9.52	N/A	<0.01
Electricity Generating Station (EGS)	Complete conversion to industrial site.	State grant	7 acres	1	7.00	N/A	7.00
EGS gas pipeline	Produced gas pipeline from M&HRF to the EGS. Overlapped ROW with underground utilities and access road.	50 feet	Blading and trenching, followed by reclamation. Acreage overlaps with the deadend P&T site.	740 feet	0.38	N/A	0
Undergound fiber optic	Overlapping ROW with service lines plowed in.	50 feet	Overlapping ROW with EGS pipeline and road	740 feet	No additional disturbance	N/A	0
EGS access road	State land road access to EGS. ROW overlapped with underground fiber optic cable and electrical distribution line.	50 feet	Blading and drainage control. Overlapping ROW with EGS pipeline. 10-foot permanent access road.	740 feet	0.50	0	0.17
Construction staging/equipment yard	Blading with packed gravel cover. No reclamation is planned.	Private grant	10 acres	1	10.00	N/A	0
Total Private/State Disturbance					**78.40**	**N/A**	**30.20**
Estimated Total Disturbance (Acres)					**570.60**	**186.40**	**42.40**

AAM&WS = ambient air monitoring and weather station
BLM = Bureau of Land Management
HLF = helium liquefaction facility
M&HRF = methane and helium recovery facility
N/A = not applicable
ROW = right-of-way
TBD = to be determined



Map 2-4. Alternative 4 infrastructure detail.

2.6.1 Alternative 4 Project Components with BLM Jurisdiction

2.6.1.1 Gas Wells and Raw Gas Flowlines

In Alternative 4 there would be no change in the location, design, drilling methods, or operation of the four federal Madison Formation gas wells or the raw gas flowlines connecting the wells with the M&HRF, compared with Alternative 1.

Detailed description of project components within BLM jurisdiction and private and state jurisdiction is provided in Table 2-5.

2.6.1.2 Acid Gas Injection Well and Flowline

The acid gas injection well and the acid gas flowline from the M&HRF to the injection well would have the same location, drilling and construction plan, and operation as in Alternative 1. The target formation for injection of acid gas would be the Madison Formation.

2.6.1.3 Cimarex Gas Pipeline

In Alternative 4, the Cimarex natural gas pipeline would follow the same alignment as with Alternative 1 and consist of all components, construction methods, and operations identified in the Proposed Action.

2.6.1.4 Helium Pipeline

As with Alternative 1, the ROW for the helium pipeline would be overlapped with the ROW for the fiber optic cable, allowing the pipeline and fiber optic cable to share a trench. The total ROW length would be 17.2 miles, resulting in approximately 208.7 acres of short-term disturbance.

2.6.1.5 Temporary Use Areas for Directional Drilling of Stream Crossings

Alternative 4 would include boring the pipelines at the Beaver Creek crossing. Temporary equipment pads would be leveled on the slope on either side of the creek to place the boring equipment. After the bore is completed and the pipelines are placed, the surface disturbance would be reclaimed.

2.6.1.6 Underground Fiber Optic Cable and Electrical Distribution

There would be no change in the location, design, construction methods, or operation of the underground fiber optic or electrical distribution lines compared with Alternative 1.

2.6.1.7 Cimarex Transmission Line

With Alternative 4 there would be no Cimarex 230-kV transmission line within BLM jurisdiction between the Chimney Butte Substation and the M&HRF, as shown in Map 2-3 and detailed in Table 2-5.

2.6.1.8 AAM&WS

There would be no change in the location, design, construction methods, or operation of the AAM&WS compared with Alternative 1.

2.6.1.9 Williams Pipeline

There would be no change in the location, design, construction methods, or operation of the Williams Natural Gas Expansion Loop compared with Alternative 1.

2.6.1.10 Snow Control Structures

As with Alternative 1, the location and design of snow control structures would be determined in final design for the BLM Preferred Alternative.

2.6.1.11 Access Roads

No additional BLM roads would be required with Alternative 4. Existing permitted road use would be allowed, and road maintenance would be in accordance with existing permits and BLM BMPs.

2.6.2 Alternative 4 Project Components with Private or State Jurisdiction

2.6.2.1 Air Products 69-kV Transmission Line

There would be no change in the location or design of the 69-kV transmission line from the Chimney Butte Substation to the HLF compared with Alternative 1.

2.6.2.2 M&HRF

There would be no change in the location, design, construction methods, or operation of the M&HRF compared with Alternative 1.

2.6.2.3 Produced Water Injection Well and Flowline

There would be no change in the location, design, construction methods, or operation of the produced water injection well and flowline compared with Alternative 1.

2.6.2.4 HLF

There would be no change in the location, design, construction methods, or operation of the HLF compared with Alternative 1.

2.6.2.5 EGS

A new EGS would be constructed near the M&HRF on state land to provide on-site gas-fired electricity generation. The gas production and processing components of the Project requires an estimated 374,490 mega-watt hours (MWh) of energy each year of reliable capacity and is expected to have a power factor of approximately 95% over the 40-year analysis period. Once completed, the M&HRF and gas production/injection wells would operate 24 hours per day, 365 days per year. Because of this high utilization, reliable power supply is critical to the success of the design.

The EGS would consist of the installation and operation of four Wartsila 18V50DF generators utilizing reciprocating technology. The electrical generators would burn 425 one million British Thermal Units per hour (mmbtu/hr) of natural gas. The resulting burn rate of 9.9 MMCFD would generate all electricity required to operate the proposed M&HRF for the life of the Project. Three generators would be required to fulfill the power needs of the Project, with the fourth unit used as a spare to maintain necessary reliability levels. Some air quality

control design features have been assumed for the Wartsila reciprocating technology, such as Selective Catalytic Reduction for nitrous oxide control and post-combustion catalyst.

Each reciprocating engine is approximately 62 feet long, 15 feet across, and 20 feet tall. The generators would either be housed in a building or surrounded by sound barriers sufficient to reduce noise levels to 49 A-weighted decibels (dBa) at a surrounding perimeter fence, in compliance with the terms and conditions of the Wyoming Special Use Permit. If a building is used, it would be approximately 173,400 square feet, and 40 feet high. As with the other facilities at the M&HRF, the building would be painted a color recommended by BLM as blending with the surrounding landscape.

In addition, pending final design, a small emergency fuel storage tank may be included at the EGS for emergency start-up operations. Final design would also determine if a new natural gas well or recompletion of an existing well would be required to provide additional gas if processed natural gas from the proposed four gas wells is insufficient to make the EGS economically viable.

2.6.2.6 EGS Gas Pipeline

A new 740-foot segment of natural gas pipeline would be required to carry processed natural gas from the M&HRF to the EGS. The diameter of the pipeline would be determined in final design.

2.6.2.7 Cimarex Transmission Line

Alternative 4 would require construction of an approximately 740-foot high-voltage transmission line between the M&HRF and the EGS to provide year-round access. Approximately two 90-foot monopoles and one dead-end would be needed to safely carry the high-voltage power lines. The voltage of the single circuit line would depend on final electrical design. If no step-down transformation is required, the substation to be located at the M&HRF may be eliminated from final design. The transmission line would be located on state land.

2.6.2.8 EGS Access Road

Alternative 4 would require construction of a 740-foot two-track access road between the M&HRF and the EGS to provide year-round access. The road would be located on state land and be approximately 10 feet wide.

2.6.2.9 Construction Staging/Equipment Yard

There would be no change in the location, design, construction methods, or operation of the 10-acre construction staging and equipment yard, compared with Alternative 1.

2.7 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED CONSIDERATION

Several alternative locations or design features were considered during scoping of the Project. These have been eliminated from detailed consideration by BLM because of technical infeasibility or concern for potentially adverse impacts to one or more resources. Alternatives

thus considered, but eliminated from further analysis are summarized in the following subsections.

2.7.1 Partial Use of Wind Energy

The use of wind turbines was considered but eliminated from further analysis based on the lack of suitable wind availability, the large land requirement, and the potential visual and noise impacts that would result from wind turbines sufficient to meet the 45-MW energy demand of the M&HRF.

Most commercial, wind farm-scale turbines are, on average, 1.5- to 2.5-MW machines. The M&HRF would then require approximately 18 to 30 turbines, running at full capacity, to maintain viability. The land requirement for a wind farm of this scale goes beyond the actual surface disturbance, which can be accounted for by making the following assumptions based on similar projects:

- Each turbine location would result in clearing and grading of approximately 0.5 acre (6.8–11.4 acres total).
- A network running between equally spaced turbines would result in road construction disturbance of approximately 16.6 to 34.5 additional acres.

Wind turbines are spaced approximately 3 rotor diameters (230 feet) apart, usually across highly visible ridge tops for maximum efficiency. At that spacing distance, the land requirement for 18 to 30 turbines would be approximately 500 to 800 acres, adding greatly to the visual impacts. Additionally, the noise level could have an impact on the biological environment; turbines measure 80 to 90 decibels at the tower base, although that quickly falls off to 35 decibels within 1,300 feet.

Use of wind turbines as the only electrical source for the M&HRF is not possible because of the facility‘s need for continuous power. Since the wind does not blow constantly, it cannot be the only power source, thus a transmission line would still be needed to ensure consistent, stable availability of power to the facility. Wind power potential for the Riley Ridge area is classified as marginal at best (National Renewable Energy Laboratory [NREL] 2002). Capacity factor compares the wind farm‘s actual production over a given period of time with the amount of power the plant would have produced if it had run at full capacity for the same amount of time. Modern utility-scale turbines operate 65 to 90% of the time, but often at less than full capacity. Therefore, a capacity factor of 25 to 40% is considered standard.

2.7.2 Use of Solar Energy

The use of solar energy was considered, but eliminated from further analysis due to the large land requirement, water requirement, and visual impact of a solar array sufficient to meet the 45-MW energy demand of the M&HRF. Only a partial offset would be feasible technically, due to the intermittent nature of the energy source.

The land requirement for a photovoltaic array that could produce 100% of the electricity for the M&HRF is prohibitive at 360 acres. The long-term surface disturbance and interference on the visual landscape could impact the human/biological environment to a high degree.

Even providing solar power as a supplement (5%) would require the long-term disturbance of approximately 18 acres. Additionally, a transmission line would still be required with either option.

A large amount of clean, demineralized water would be needed to clean, cool, and maintain the efficiency of the photovoltaic cells. Beyond acquiring the necessary water rights for large quantities of water, Cimarex would also have to have an acceptable means of treating the water if it was not clean enough to use and would also have to consider how the water would be disposed of.

2.7.3 Year-round Drilling

The alternative of reducing disturbance from drilling was considered. However, terms imposed by WGFD Memorandum of Agreement (MOA) specify a limited drilling period. Furthermore, the PFO RMP discourages year-round drilling. Therefore, this alternative was eliminated from further consideration.

2.7.4 Water Disposal to Existing Madison Formation Well

Two existing Madison Formation wells occur near the M&HRF. The possibility of using these wells for water disposal instead of drilling a new well to the Nugget Formation was considered. One well was determined to require redrilling before it could be safely used, and the other was eliminated due to its proximity to the South Piney Creek and its associate riparian habitat, as well as its proximity to the historic Lander Trail.

2.7.5 Completion and Use of Existing Riley Ridge Unit Madison Formation Wells

Table 2-8 lists the existing Madison Formation wells in the Riley Ridge Unit, as well as their surface ownership and current status. The five existing Madison Formation wells on the Riley Ridge Unit were evaluated for use in the Project rather than drilling new wells. All are vertical bore wells, meaning that the well pad is located above the bottom hole location, and have been Temporarily Abandoned since 1993.

Table 2-8. Existing Riley Ridge Unit Madison Wells.

Well Name	Well Location	Surface Ownership & Status
Riley Ridge Unit (RRU) 8-24	NWNW, S4, T29N, R114W	Private: Temporarily abandoned (TA)
RRU 10-14	SWNE, S5, T29N, R114W	State: TA
RRU 12-43	SWNE, S5, T29N, R114W	Forest Service: TA
RRU 17-34	NENE, S5, T29N, R114W	BLM: TA
RRU 33-24	SESW, S8, T29N, R114W	BLM: Plugged and abandoned

Cimarex determined that one of the existing Madison wells, RRU 33-24, has technical issues with the borehole that would make it unsafe to complete and use in the future.

Two existing Madison Formation wells are located in areas where completion and operation would result in adverse impacts to sensitive resources. Well RRU 8-24 is located along the narrow South Piney Creek floodplain and its associated riparian habitat, and adjacent to the

historic Lander Trail. Completion and use of a sour gas well in this location would cause potential impacts to the Lander Trail viewshed and historical setting and potential impacts to recreational uses and human health and safety. Well RRU 12-43 is located at the crest of a ridge approximately 2.5 miles northwest of the location of the M&HRF. This location is within the Bridger-Teton National Forest, in a remote and forested location. Since the use of this well would require crossing the Lander Trail with pipeline infrastructure to get gas to the M&HRF, impacts would occur to the Lander Trail viewshed and its historical setting, and to designated critical habitat for Canada lynx and grizzly bear habitat.

Cimarex has determined that, of the five existing Madison wells, only RRU 10-14 has adequate flow and bore integrity to meet the needs of the Project. Based on this analysis, RRU 10-14 was carried forward as technically viable and environmentally reasonable for consideration in the alternatives. Cimarex determined that RRU 17-34 may not have sufficient gas flow rate to meet the needs of the Project. However, Cimarex has proposed that the location of the RRU 17-34 well pad be used as the multi-well pad for directional drilling since it is near the location of RRU 10-14, and also near the location of the M&HRF.

2.7.6 Location of M&HRF on Federal Land Outside the Riley Ridge Unit

An alternative federal location for the M&HRF was considered on Trail Ridge. This location was eliminated from further consideration because of increased impacts from the following:

- The safety risk from sour gas is increased due to longer sour gas flow lines that would need to be constructed approximately 3 miles southeast of the M&HRF, through difficult topography. Additionally, the Trail Ridge location is lower in elevation, crosses natural air channels, and is subject to more human occupancy than the Riley Ridge site, increasing risk to human health and safety.
- The overall surface disturbance would increase and be dispersed across a larger portion of a sensitive watershed.
- Locating the M&HRF on the Trail Ridge site would have potential impacts to BLM sensitive fish species because of the proximity to the Beaver Creek drainage and increased surface disturbance.
- Disposal of produced water would be difficult if the plant site is not located within the unit boundary where Nugget Formation testing has been conducted.

2.7.7 Alternative State Land Locations for the M&HRF

Alternative locations were considered for the M&HRF on other parcels of state land at lower elevation. These locations were eliminated from further consideration because of concerns for increased public safety risk due to decreased wind velocities and higher public surface occupancy. Landowner concerns also indicated possibly higher animal unit month (AUM) impacts.

2.8 PROJECTS AND ACTIVITIES POTENTIALLY CONTRIBUTING TO CUMULATIVE EFFECTS

In general, the CIAA is considered to be the RBPA, shown in Map 1-1, unless otherwise noted for a specific resource category. Certain resources, such as air quality, recreation, land use, and wildlife, will evaluate cumulative impacts across a larger area in order to identify patterns of effect on these resource values. For air quality and socioeconomics, the CIAA may encompass a three-county area of southwestern Wyoming.

Current development in the CIAA has been identified and mapped for the RBPA (Roedemaker and Driese 2007). The acres of existing land disturbance from development, and the relative percent of the land area under modified land cover is shown in Table 2-9.

Table 2-9. Current Land Disturbance in the RBPA.

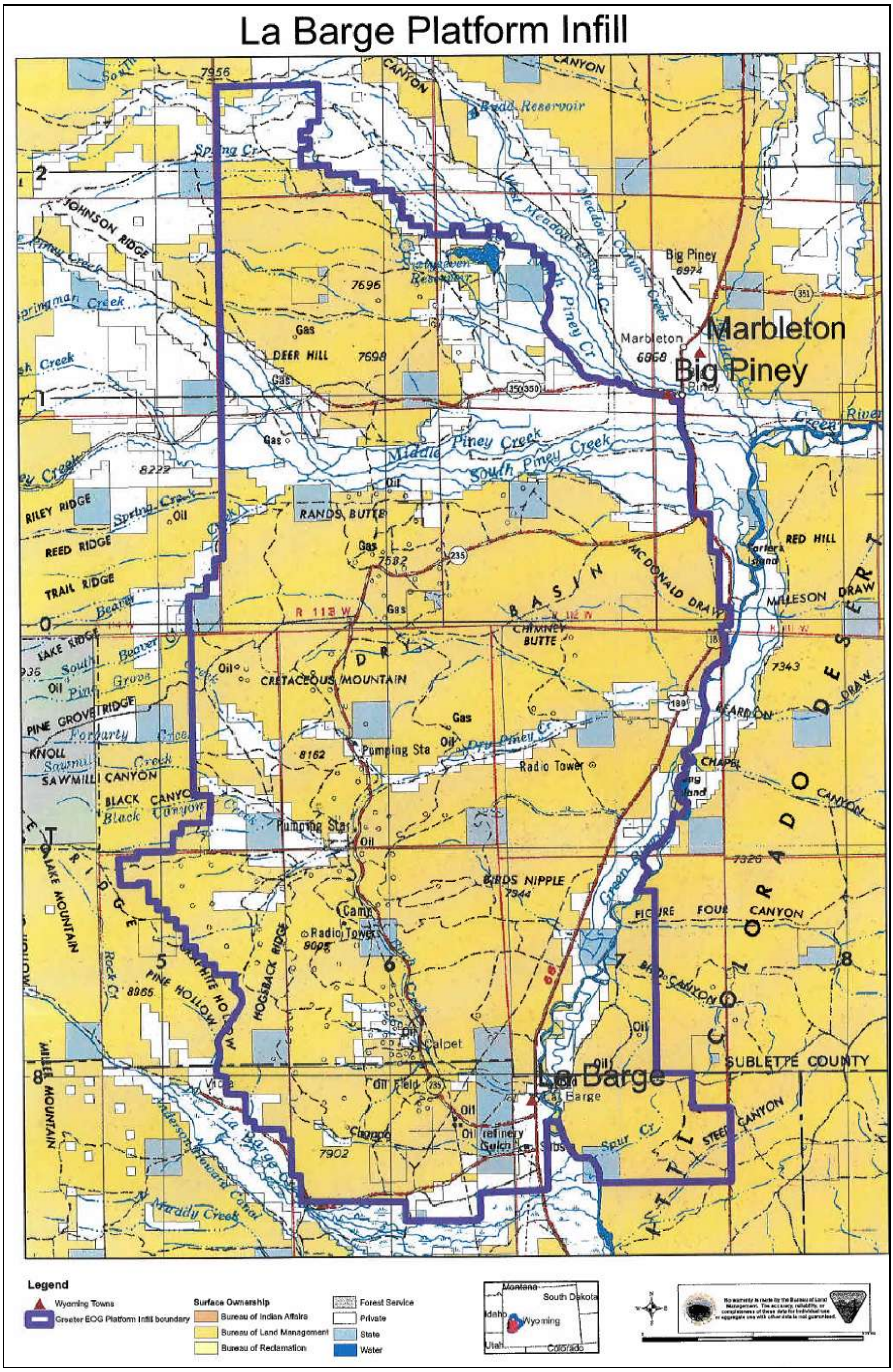
Land Development Cover Type*	Rands Butte Area	Williams Pipeline Area	Total RBPA
Total Land Area	**55,628**	**18,085**	**73,713**
Urban and Industrial (acres)	466.88	0.00	466.88
Roads and RR (acres)	1,955.07	1,587.44	3,542.51
Oil and Gas Developments (acres)	419.96	1,772.47	2,192.43
Total Current Disturbance (acres)	**2,841.91**	**3,359.91**	**6,201.82**
Relative Current Disturbance (as % of land area)	**5.11**	**18.58**	**8.41**

*As mapped by Rodemaker and Driese (2007)

Several active oil and gas fields occur in the RBPA, including the Lake Ridge, Riley Ridge, Fogarty, and Tip Top oil and gas fields. In total, 560 oil and gas wells have been drilled in the RBPA, including those in the Riley Ridge Unit. Of these wells, approximately 317 may be active. The gas fields, including the Riley Ridge Unit, have not reached a full-field development stage, and the potential exists for future large-scale hydrocarbon development projects in the area. The Williams pipeline area consists primarily of designated wellfields, including portions of the Tip Top Unit and others that make up the Big Piney-LaBarge field which has been an active field for many years. As a result, the Williams pipeline area of the RBPA is much more intensively developed than the Rands Butte area, as shown in Table 2-7.

EOG Resources, Inc. (EOG) recently notified the BLM PFO of a proposal for infill drilling and exploration within the LaBarge Platform Exploration and Development Project Area in northern Lincoln and southern Sublette counties, as shown in Map 2-5 (BLM 2009a). EOG proposes to drill 604 new oil and gas wells on an estimated 454 well pads to several target formations. Several other companies are planning to drill an additional 394 wells in the same project area; for this reason, an EIS is being prepared that will analyze a minimum of 1,000 wells. This development proposal would involve private, state, and public lands and, depending on the target reservoirs and market conditions, could result in tripling of the current well numbers and the addition of new compression, dehydration, gathering pipelines, and other wellfield infrastructure in the CIAA.

The proposed drilling would include portions of the RBPA, thereby adding to future foreseeable effects to resources in the area. Although the exact locations of the proposed well development and the full extent of secondary development that it would bring to the area cannot be known at the time of this analysis, the pattern of development can be assumed to follow the existing pattern of development. Since there are many new technologies available to reduce the surface disturbance of wellfield development, and the existing wellfields already have considerable infrastructure available, the relative amount of expected surface disturbance from future foreseeable oil and gas development is estimated by BLM to approximately double the existing disturbance over the next 40 years.



Map 2-5. La Barge Platform Infill Project Area (BLM 2009a).